REPORT NUMBER: SINCAP-MGA-2019-044

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

NISSAN MOTOR CO., LTD.
2019 Nissan Altima S 4-Door Sedan
NHTSA No.: O20195202

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: May 29, 2019

Final Report Date: September 13, 2019

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NRM-110
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590

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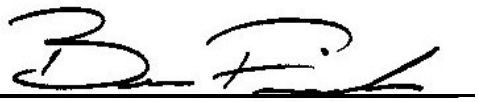
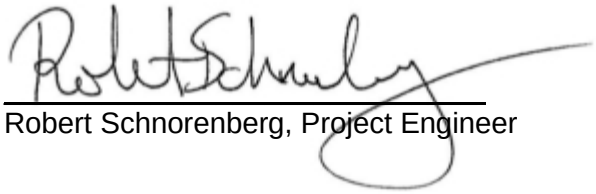
Prepared by: 
Ben Fischer, Project Engineer

Approved by: 
Robert Schnorenberg, Project Engineer

Approval Date: September 13, 2019

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

_____
COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

Technical Report Documentation Page

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9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-14-D-00353
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590		*13. Type of Report and Period Covered:* Final Test Report May 29, 2019 to September 13, 2019 *14. Sponsoring Agency Code* NRM-110
15. Supplementary Notes		

16. Abstract

A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the 2019 Nissan Altima S 4-Door Sedan in accordance with the specifications of the Office of Crashworthiness Standards NCAP Side Laboratory Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on May 29, 2019.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.12 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.6°C. The target vehicle post-test maximum crush was 276 mm at level 3. The test vehicle's performance was as follows:

		Driver ATD (ES-2re)	
Measurement Description	**Units**	Threshold	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	187
Maximum Thorax Rib Deflection	mm	44	36
Total Abdominal Force	N	2500	729
Pubic Symphysis Force	N	6000	2275
Resultant Lower Spine Acceleration	Gs	82*	44

		Passenger ATD (SID-IIs)	
Measurement Description	**Units**	Threshold	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	185
Resultant Lower Spine Acceleration	Gs	82	46
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2419
Maximum Thoracic Rib Deflection	mm	38*	13
Maximum Abdomen Rib Deflection	mm	45*	15

*Proposed IARV

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

17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs	*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590

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SECTION 1
TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2019 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 2019 Nissan Altima S 4-Door Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated October 2015.

SECTION 2
SUMMARY OF TEST RESULTS

A 2019 Nissan Altima S 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 62.12 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 May 29, 2019. 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 October 2015. 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
Primary Head CG 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

	Driver ATD (ES-2re)		
Measurement Description	**Units**	Threshold	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	187
Maximum Thorax Rib Deflection	mm	44	36
Total Abdominal Force	N	2500	729
Pubic Symphysis Force	N	6000	2275
Resultant Lower Spine Acceleration	Gs	82*	44

	Passenger ATD (SID-IIs)		
Measurement Description	**Units**	Threshold	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	185
Resultant Lower Spine Acceleration	Gs	82	46
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2419
Maximum Thoracic Rib Deflection	mm	38*	13
Maximum Abdomen Rib Deflection	mm	45*	15

*Proposed IARV

Supplemental restraint information is given below:

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side 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
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

Secondary speed trap system recorded no data at impact.

Left Lower A-Post Y recorded no valid data.
Left Mid A-Post Y recorded no valid data after 31 ms.

SECTION 3
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20195202
Model Year	2019
Make	Nissan
Model	Altima S
Body Style	4-Door Sedan
VIN	1N4BL4BV9KC136117
Body Color	Gun Metallic
Odometer Reading (km/mi)	275km / 171mi
Engine Displacement (L)	2.5L
Type/No. Cylinders	Inline 4
Engine Placement	Lateral
Transmission Type	Automatic
Transmission Speeds	CVT
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	N/A
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	Yes
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Rear Pass. Load Limiter	Yes
Other Restraint Feature	N/A

Does owner's manual provide instruction to turn off automatic door locks?	No

DATA FROM CERTIFICATION LABEL

Manufactured By	NISSAN MOTOR CO., LTD.
Date of Manufacture	10/18
Vehicle Type	Passenger Car

GVWR (kg)	1963
GAWR Front (kg)	1097
GAWR Rear (kg)	945

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				408	(A)
DSC x 68.04 kg				340	(B)
Rated Cargo and Luggage Weight (RCLW) (kg)				68	(A-B)

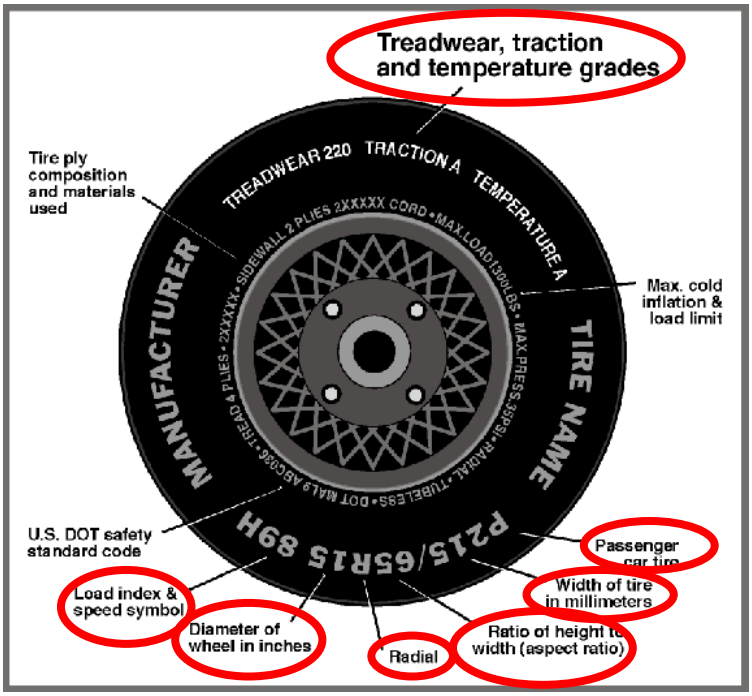
VEHICLE SEAT TYPE

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

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

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	220	220
Recommended Tire Size	215/60R16	215/60R16
Tire Size on Vehicle	215/60R16	215/60R16
Tire Manufacturer	Hankook	Hankook
Tire Model	Kinergy GT	Kinergy GT
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	2 Steel, 1 Polyester, 1 Nylon	2 Steel, 1 Polyester, 1 Nylon
Load Index/Speed Symbol	95H	95H
Tire Material	Rubber	Rubber
DOT Safety Code Left	T7V9 1BH 3518	T7V9 1BH 3518
DOT Safety Code Right	T7V9 1BH 3518	T7V9 1BH 3518

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

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

TEST PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	255	250	250	250
Tire Placard	kPa	220	220	220	220
Owner's Manual	kPa	220	220	220	220
As Tested	kPa	220	220	220	220

MDB TIRE SPECIFICATIONS

	Requirement	Units	LF	RF	LR	RR
Tire Size	P205/75R15	N/A	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire	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	444.5	298.0		485.0	377.0		484.5	396.0	
Right	kg	440.0	276.5		453.0	335.0		438.5	337.0	
Ratio	%	60.6%	39.4%		56.8%	43.2%		55.7%	44.3%	
Totals	kg	884.5	574.5	1459.0	938.0	712.0	1650.0	923.0	733.0	1656.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1459.0	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	68	(C)
Calculated Test Vehicle Target Weight (TVTW)	kg	1656.0	(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	680	684	Yes
Right Front	mm	697	688	Yes
Right Rear	mm	683	687	Yes
Left Rear	mm	667	668	Yes
Vehicle CG (Aft of Front Axle)	mm	1247	1216	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	51	36	

*** 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: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Weight of Ballast, if any	47
None	

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

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

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	22.6	13.9	18.3
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	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	18.3	0	Max	49	49	49
			Mid	25	25	25
			Min	0	0	0
Front Passenger Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	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

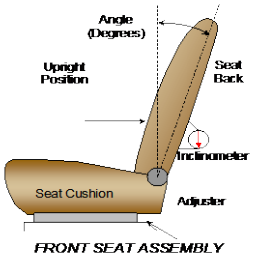
Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

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	238		119	
Front Passenger Seat	240	25	120	12
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 passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is adjusted following Appendix C, "Positioning Dummies in the Test Vehicle" in the NCAP Laboratory Test Procedure dated October 2015. The rear center and non-struck side rear outboard seat backs are positioned to match 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	76.5		2.2	
Front Passenger Seat	75.2	41	3.2	8
Front Center Seat				
Struck Side Rear Seat	Fixed		Fixed	
Non-Struck Side Rear Seat	Fixed		Fixed	
Rear Center Seat	Fixed		Fixed	

Driver and left rear passenger seat back angles measured on headrest post.

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

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1.

	Total # of Positions	Placed in Position #
Driver Seat	3	0 (Uppermost as 0)
Rear Seat	Fixed	

HEAD RESTRAINT ADJUSTMENT

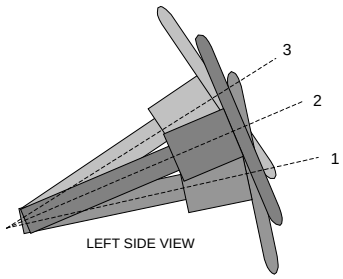
The driver's head restraint is adjusted to the highest and most full-forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most-full forward in-use position.

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

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 (deg)	Fore/Aft Position (mm)
Lowermost, Position 1	69.8	209
Geometric Center, Position 2	67.1	183
Uppermost, Position 3	64.4	156
Telescoping Steering Wheel Travel		53
Test Position	67.1	183

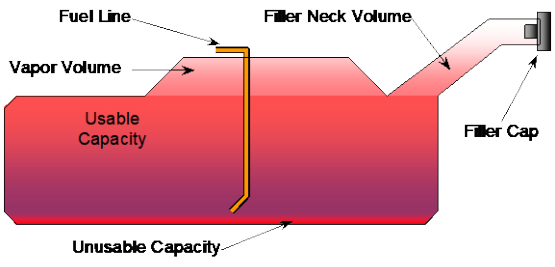


STEERING COLUMN ASSEMBLY

FUEL PUMP

Describe the fuel pump type, details about how it operates and the location of the fuel filler pipe.

The vehicle is equipped with an electronic fuel pump. The fuel pump is activated approximately 1 second after the ignition is turned on. It remains on while the engine is running. The filler neck is located on the driver's side.



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

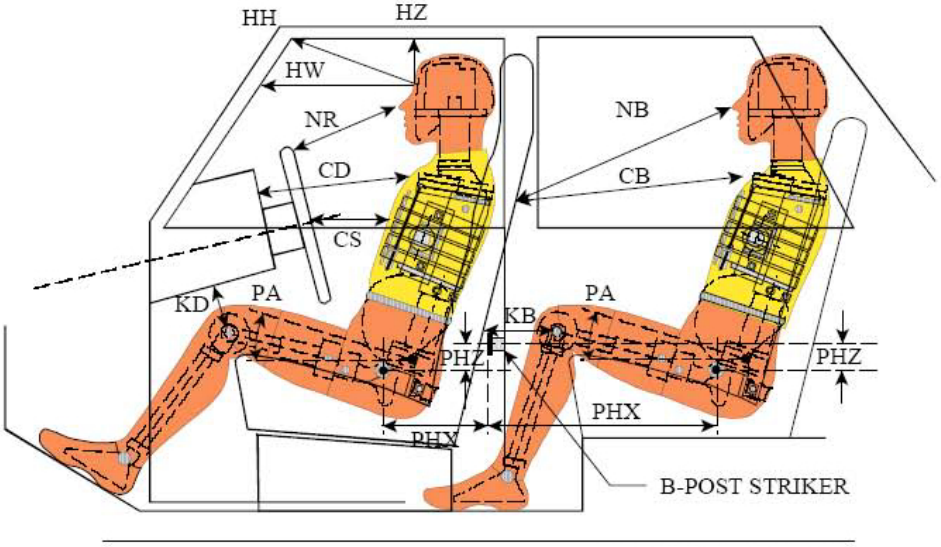
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of Standard Tank (see Form No. 1)	61.3
Usable Capacity of Optional Tank (see Form No. 1)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	61.3
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	57.0
Actual Amount of Solvent Used	56.8
1/3 of Usable Capacity	20.4

Is the actual amount of solvent used in the test equal to 93% + 1% of the Usable Capacity stated in Form No. 1? **YES**

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019



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

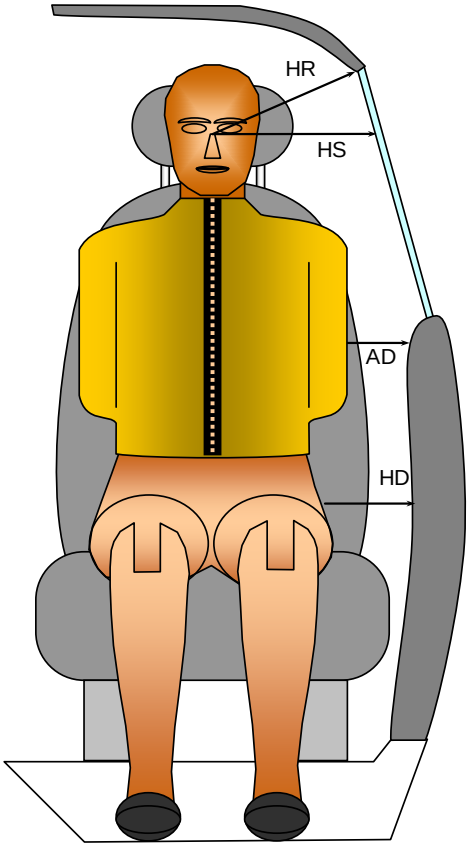
LEFT SIDE VIEW

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	343	16.1		
HW		Head to Windshield	594	0		
HZ	HZ	Head to Roof Liner	152	90	229	90
NR	NB	Nose to Rim/Seat Back	427	10.1	680	17.1
CD	CB	Chest to Dashboard/Seat Back	559	17.8	638	2.2
CS		Chest to Steering Wheel	357	5.5		
KDL	KBL	Left Knee to Dash/Seat Back	150	36.0	319	0.9
KDR	KBR	Right Knee to Dash/Seat Back	130	37.0	328	1.0
PAX	PAX	Pelvic Tilt Angle X		19.6		26.8
PAY	PAY	Pelvic Tilt Angle Y		-0.5		-0.8
PHX	PHX	Hip Point to Striker (X-Axis)	236		227	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	170		250	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019



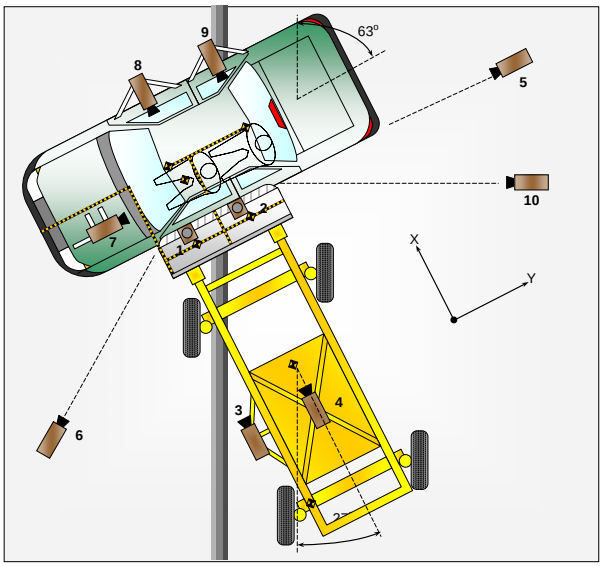
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	186	237
HS	Head to Side Window	mm	342	377
AD	Arm to Door	mm	98	192
HD	Hip Point to Door	mm	143	187

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X*	Y*	Z*		
1	Overhead Overall	1060	820	4995	8.5	1000
2	Overhead Close-Up	470	0	-4895	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	-40	6580	1490	24	1000
6	Left Front	2470	6790	1470	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

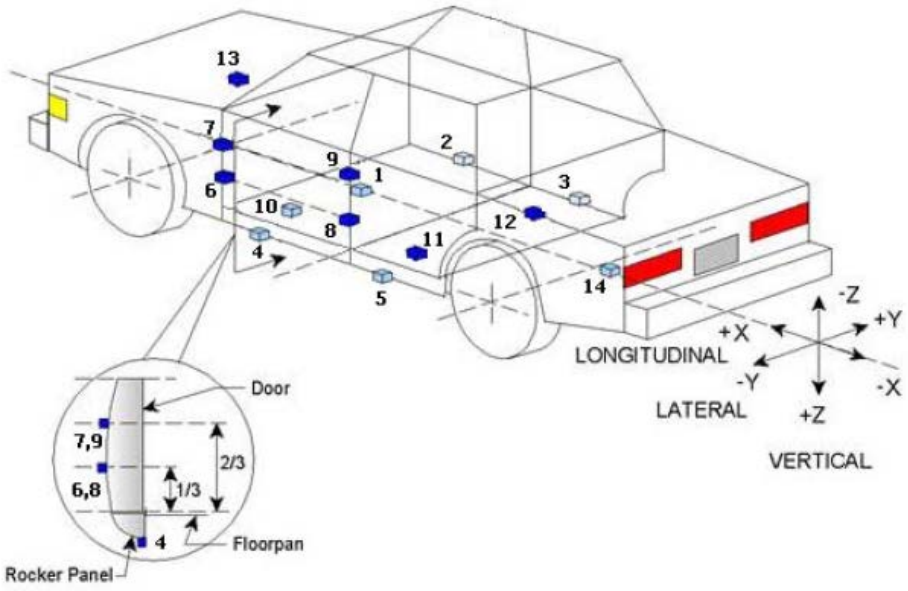
Reference: Impact Point projected to Ground; +X = To Front of MDB, + Y = To Right of MDB, +Z = Down
* All measurements accurate to ± 6 mm

INSTRUMENTATION

	Number of Channels
Driver Dummy	16
Passenger Dummy	19
Vehicle Structure	23
MDB Accelerometers	5
MDB Contacts	2
Total	65

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019



TEST VEHICLE ACCELEROMETER LOCATIONS

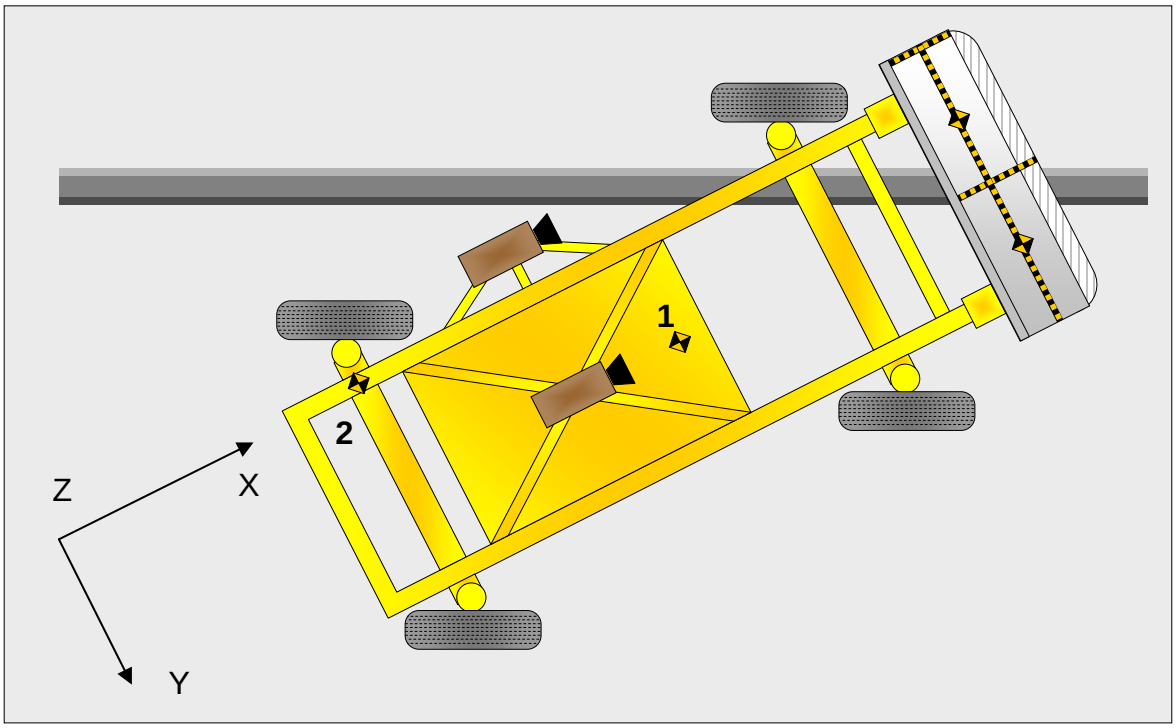
Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2720	238	-164
2	Right Sill at Front Seat	2296	752	-183
3	Right Sill at Rear Seat	1519	752	-182
4	Left Sill at Front Door	2865	-752	-179
5	Left Sill at Rear Door	1838	-752	-180
6	Left Lower A-Post	3372	-838	-535
7	Left Middle A-Post	3369	-827	-743
8	Left Lower B-Post	2271	-738	-571
9	Left Middle B-Post	2268	-734	-749
10	Front Seat Track	2373	-396	-206
11	Rear Seat Structure	1894	-354	-285
12	Rt. Rear Occ. Compartment	1963	291	-212
13	Engine Block	4067	20	-787
14	Rear Above Axle	1002	0	-518

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: 2019 Nissan Altima S 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195202
Test Date: 5/29/2019



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)

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-lis)
Face	Curtain Airbag	Curtain Airbag, Seat Back
Top of Head	Curtain Airbag	Curtain Airbag, Seat Back
Left Side of Head	Curtain Airbag, Headliner, Headrest	Curtain Airbag
Back of Head	Curtain Airbag	Curtain Airbag, Seat Back
Left Shoulder	Side Torso/Pelvis Airbag	Side Torso/Pelvis Airbag
Upper Torso	Side Torso/Pelvis Airbag	Side Torso/Pelvis Airbag
Lower Torso	Side Torso/Pelvis Airbag	Side Torso/Pelvis Airbag
Left Hip	Side Torso/Pelvis Airbag	Side Torso/Pelvis Airbag
Left Knee	Door Panel	Door Panel

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch / Other Door
	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

	Struck Side		Non-Struck Side	
Description	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 and LR Window Broken
Other Notable Effects	None

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

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side 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
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		2818
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		469
Actual Impact Point (Aft of Front Axle)	mm		468
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	1
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	-1

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length Including Honeycomb Face	4119
Wheelbase of Framework Carriage	2584
CG Location aft of Front Axle	1128

MDB WEIGHTS

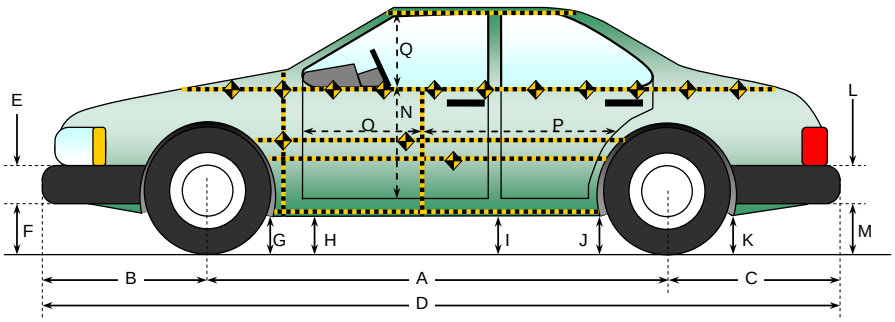
	Units	Front Axle	Rear Axle	Total
Left	kg	427.9	264.0	
Right	kg	340.6	331.2	
Ratio	%	56.4	43.6	
Totals	kg	768.5	595.2	1363.7

SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.12
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	N/A
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.1
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	26.9

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019



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

LEFT SIDE VIEW

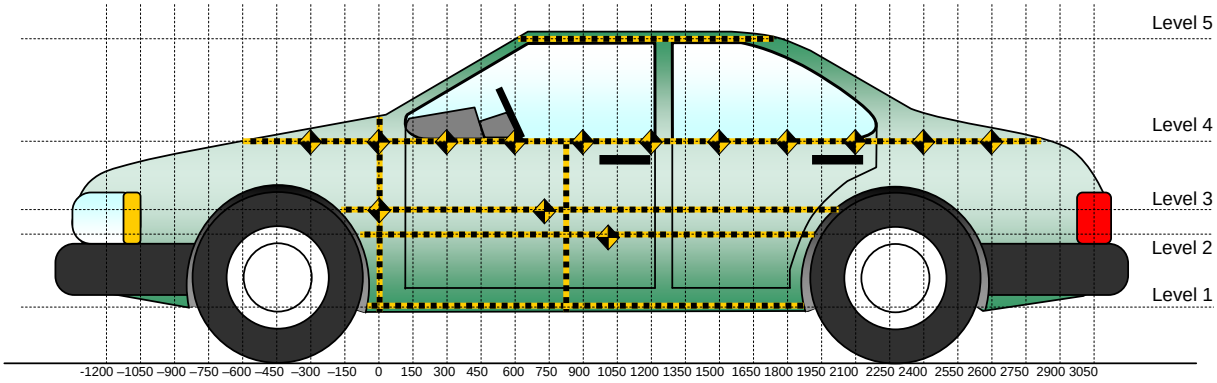
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2818	2806	12
B	Front Axle to FSOV	968	953	15
C	Rear Axle to RSOV	1114	1113	1
D	Total Length at Centerline	4900	4872	28
E	Front Bumper Thickness	120	120	0
F	Front Bumper Bottom to Ground	193	207	-14
G	Sill Height at Front Wheel Well	160	162	-2
H	Sill Height at Front Door Leading Edge	160	163	-3
I	Sill Height at B Pillar	152	168	-16
J1	Sill Height at Rear Wheel Well	149	146	3
J2	Pinch Weld Height at Rear Wheel Well	150	145	5
K	Sill Height Aft of Rear Wheel Well	188	191	-3
L	Rear Bumper Thickness	120	120	0
M	Rear Bumper Bottom to Ground	236	243	-7
N	Sill Height to Window Bottom Sill	728	640	88
O	Front Door Leading Edge to Impact CL	815	704	111
P	Rear Door Trailing Edge to Impact CL	1224	1144	80
Q	Front Window Opening	417	410	7
R	Right Side Length	3997	3995	2
S	Left Side Length	3997	3949	48
T	Vehicle Width at B Post	1879	1725	154

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195202
Test Date: 5/29/2019



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	260	139	1200
2	Occupant H-Point	465	275	1350
3	Mid Door	601	276	1800
4	Window Sill	899	215	1650
5	Window Top	1337	52	1200

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: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019

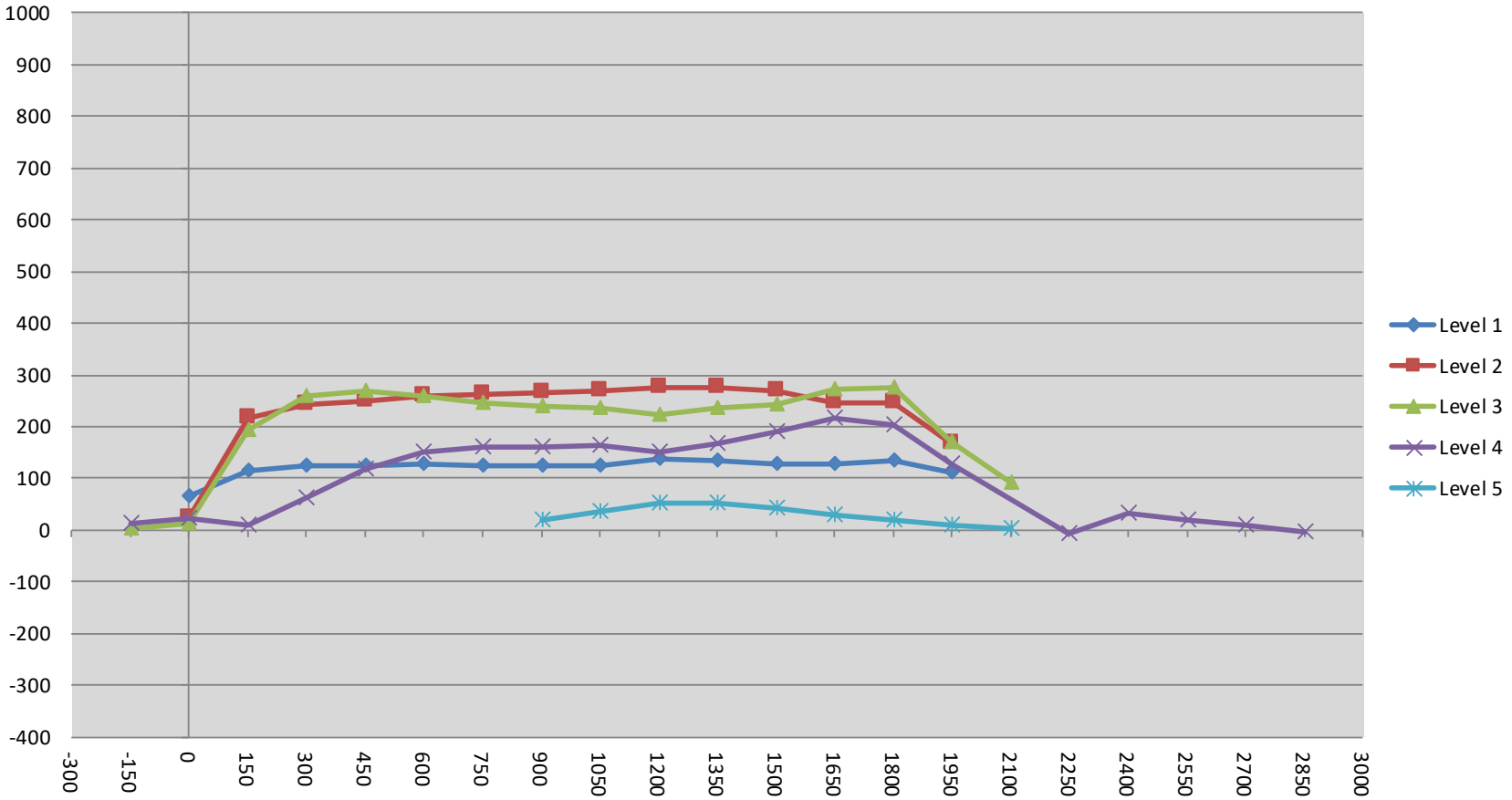
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-2100															
-1950															
-1800															
-1650															
-1500															
-1350															
-1200															
-1050															
-900															
-750															
-600															
-450															
-300															
-150			176	301				178	314				2	13	
0	213	190	193	288		280	212	206	311		67	22	13	23	
150	220	201	196	280		334	418	388	291		114	217	192	11	
300	219	198	193	270		344	442	451	333		125	244	258	63	
450	218	196	191	264		343	445	460	383		125	249	269	119	
600	217	194	189	260		344	452	447	410		127	258	258	150	
750	216	191	187	261		341	453	432	421		125	262	245	160	
900	214	190	185	262	514	337	456	425	423	534	123	266	240	161	20
1050	214	189	184	259	505	337	457	421	423	542	123	268	237	164	37
1200	213	189	183	254	503	352	463	405	404	555	139	274	222	150	52
1350	213	188	184	248	502	346	463	421	415	554	133	275	237	167	52
1500	212	188	184	242	504	340	458	426	433	547	128	270	242	191	43
1650	212	189	185	236	510	339	436	456	451	539	127	247	271	215	29
1800	212	186	184	231	517	345	433	460	435	537	133	247	276	204	20
1950	207	181	178	235	530	320	348	350	363	538	113	167	172	128	8
2100			176		543			267		546			91		3
2250				250					242					-8	
2400				259					293					34	
2550				272					291					19	
2700				286					295					9	
2850				299					296					-3	
3000															
3150															
3300															
3450															
3600															
3750															
3900															

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

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

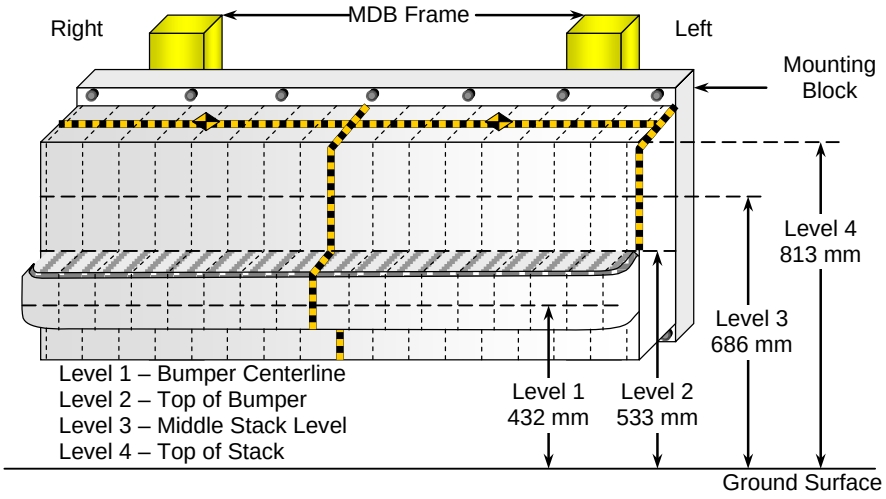
Test Vehicle: 2019 Nissan Altima S 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195202
Test Date: 5/29/2019



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019



FRONT VIEW

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

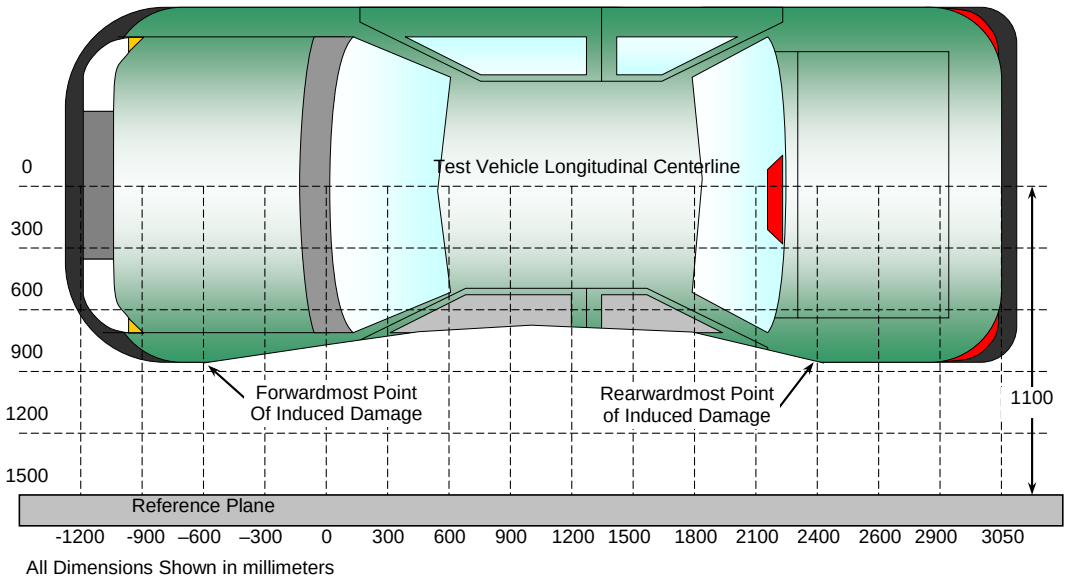
Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Right	162
B	Top of Bumper	533	800	Right	89
C	Mid-Level	686	800	Left	82
D	Top of Stack	813	800	Left	148

DEFORMABLE BARRIER STATIC CRUSH

Stack	Distance Right of Center (mm)								C_L	Distance Left of Center (mm)							
Level	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
4	28	-11	-1	9	35	71	48	40	41	35	34	41	44	40	64	111	148
3	25	0	5	10	16	25	53	50	34	20	15	15	15	18	24	37	82
2	89	86	80	78	79	73	69	67	63	62	65	65	65	65	66	73	80
1	162	157	143	135	139	147	139	129	127	122	121	121	120	120	122	133	139

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019



TOP VIEW

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	2050	3	285	180	105
2	1644	3	455	185	270
3	1238	3	411	183	228
4	832	3	431	186	245
5	426	3	464	191	273
6	20	3	271	193	78

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	638	476	162
2	480 mm right of center	1	610	463	147
3	160 mm right of center	1	595	463	132
4	160 mm left of center	1	580	463	117
5	480 mm left of center	1	590	463	127
6	800 mm left of center	1	615	476	139

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

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan
NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test
Test Date: 5/29/2019

Test Time: 11:10 am
Temperature: 21.6 °C

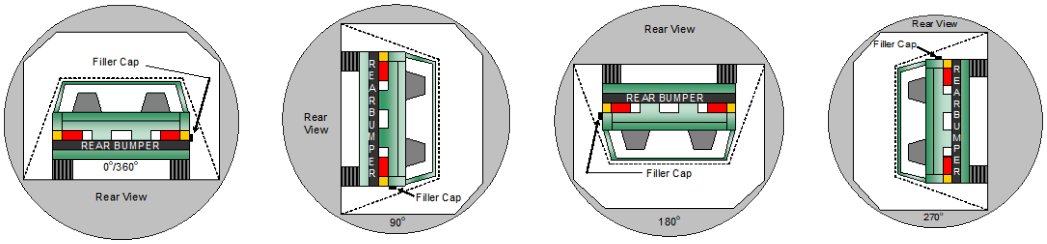
A. From impact until vehicle motion ceases: 0.0 oz.
(Maximum Allowable = 1 ounce)

B. For the 5 minute period after motion ceases: 0.0 oz.

C. For the following 25 minutes: None
(Maximum Allowable = 1 ounce / minute)

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

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

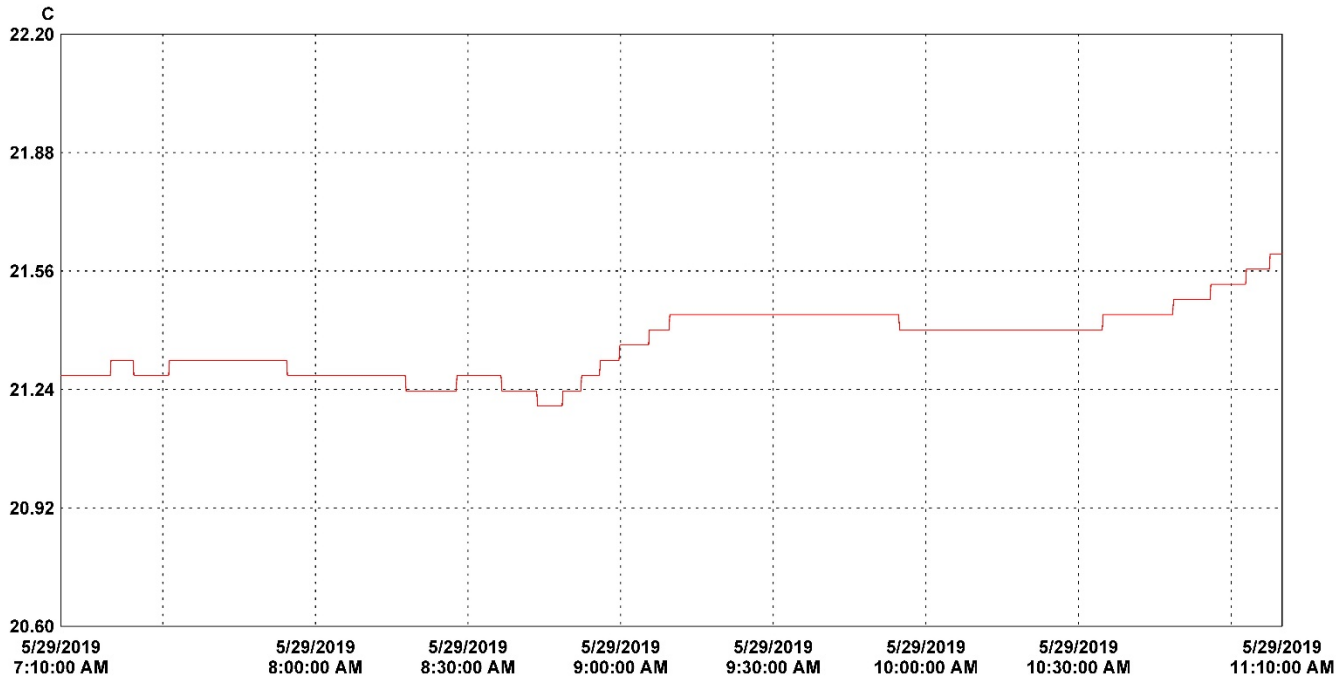
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0.0	0.0	0.0	
90° to 180°	0.0	0.0	0.0	
180° to 270°	0.0	0.0	0.0	
270° to 360°	0.0	0.0	0.0	

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 15
DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2019 Nissan Altima S 4-Door Sedan NHTSA No. O20195202
Test Program: NCAP Side MDB Impact Test Test Date: 5/29/2019



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	17012040	VSC_North_Hall	1		21.61	21.36	21.19	C	Temperature	17012040_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

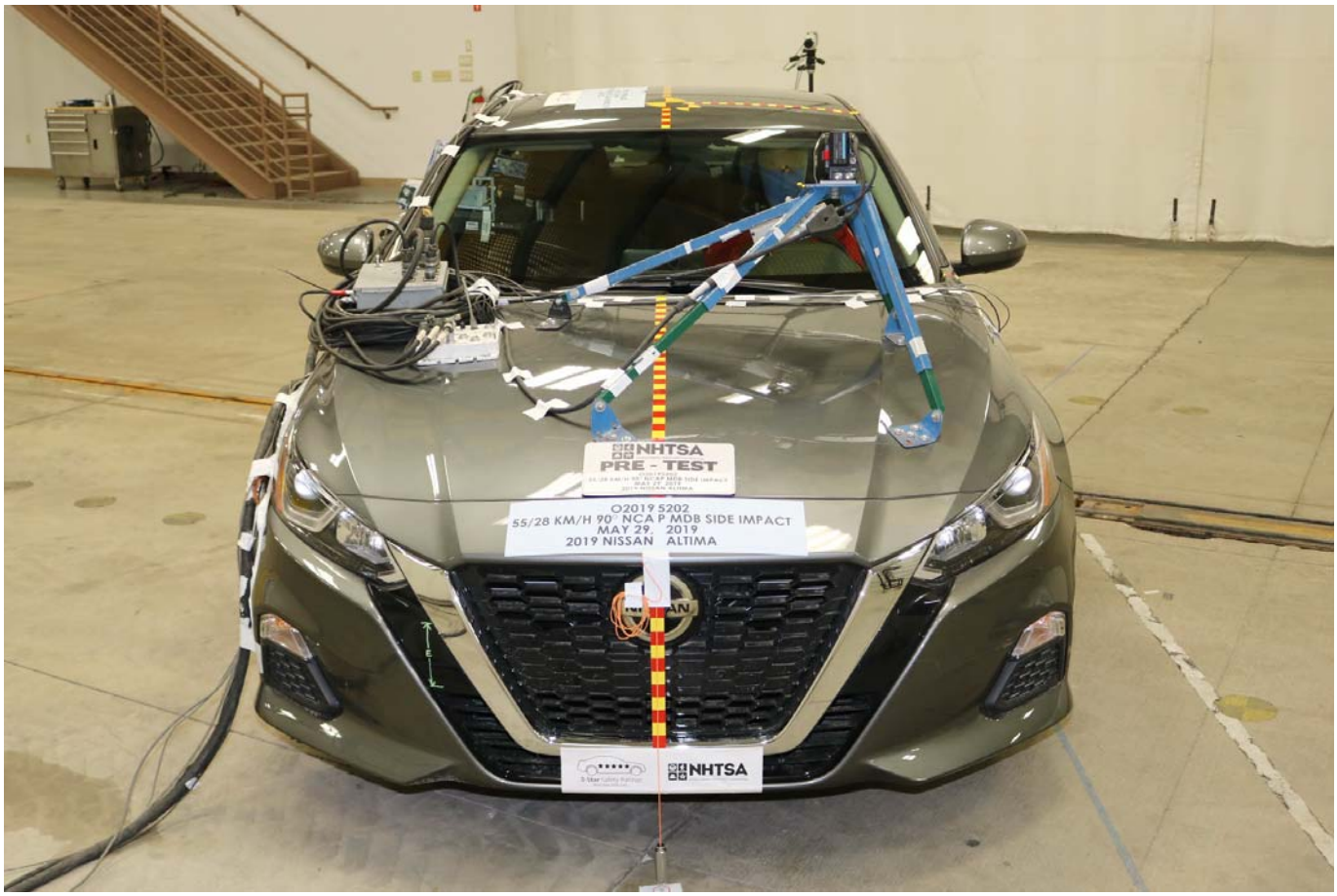


Photo No. 003 - Pre-Test Frontal View of Test Vehicle

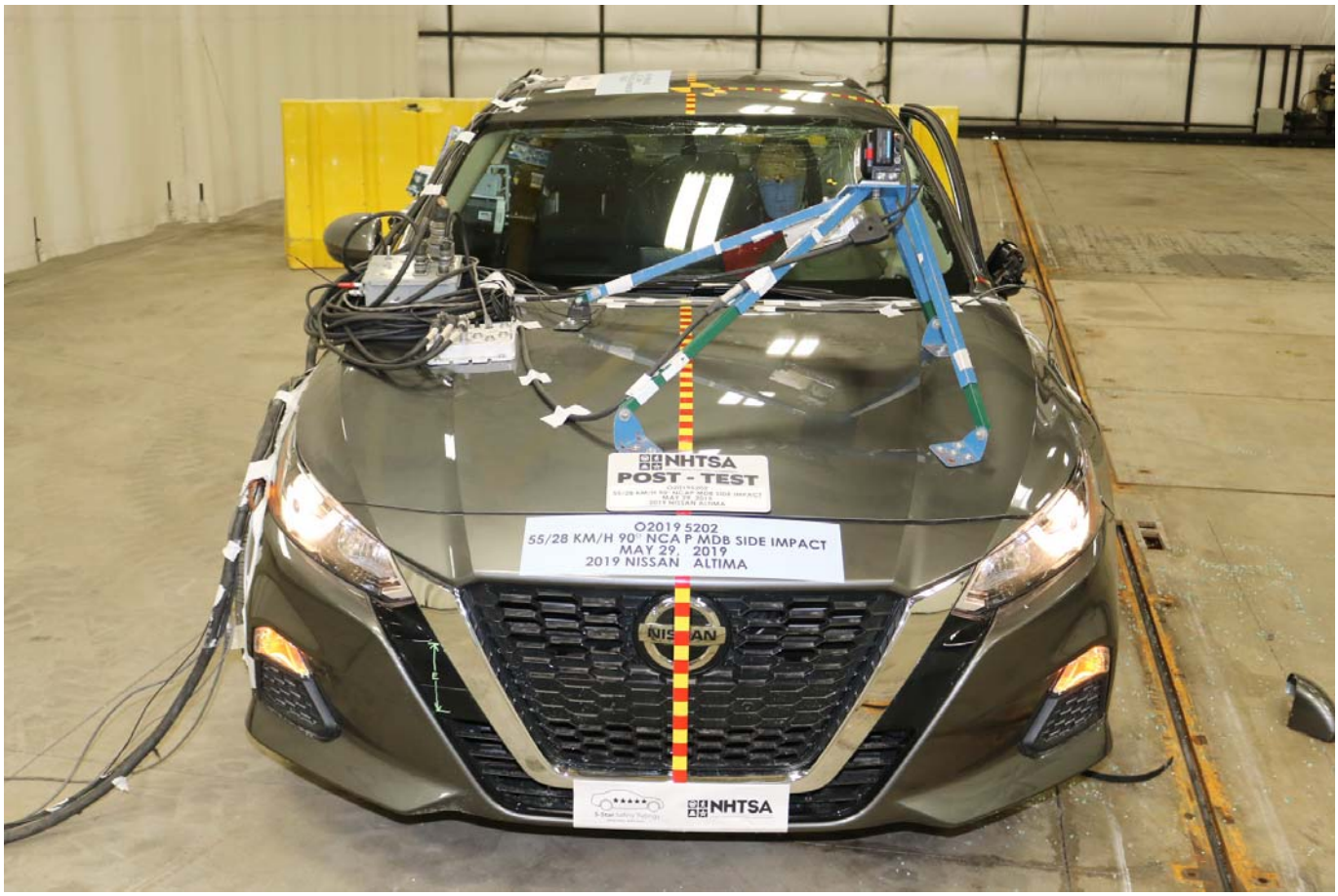


Photo No. 004 - Post-Test Frontal View of Test Vehicle

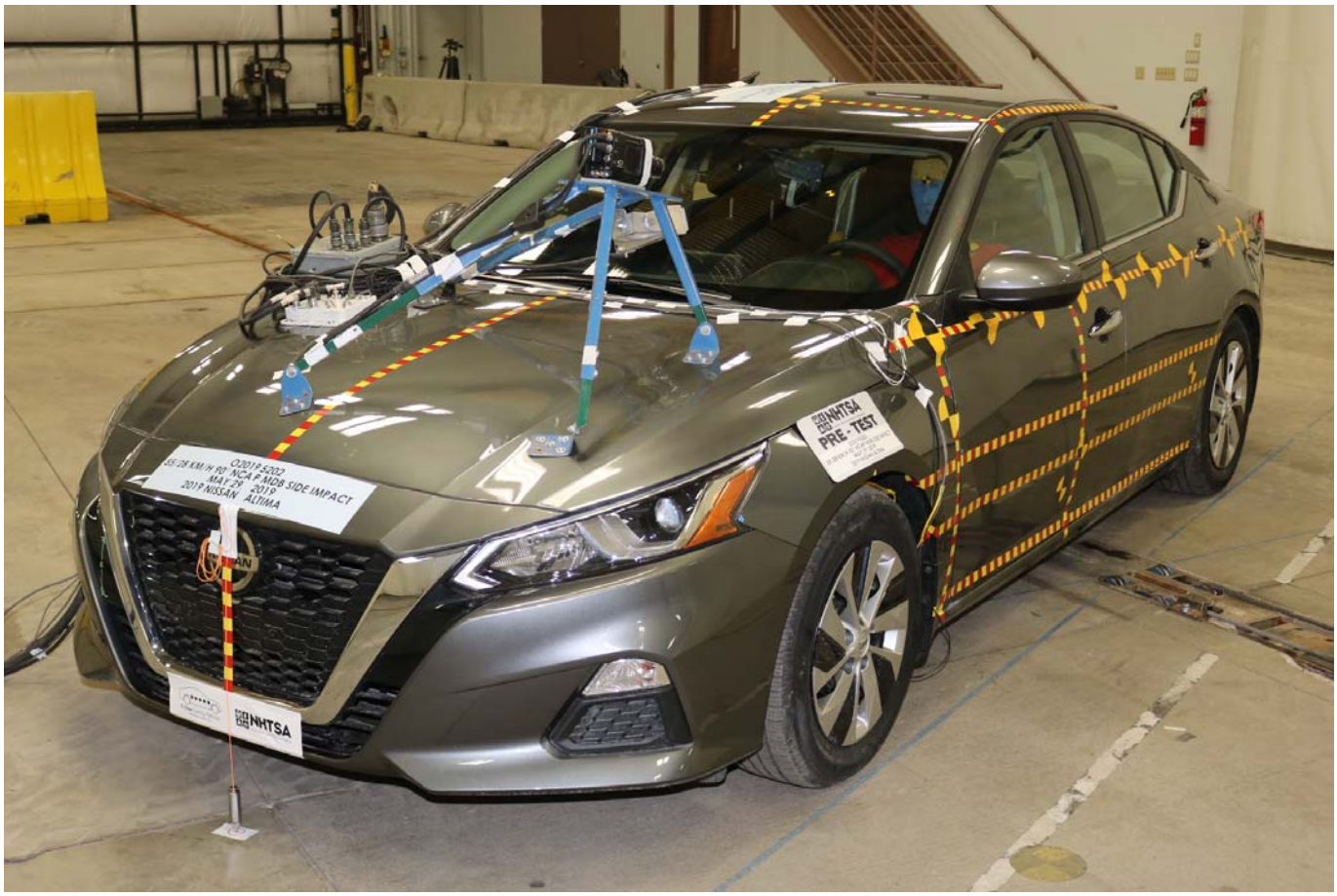


Photo No. 005 - Pre-Test Left Front Three-Quarter View of Test Vehicle

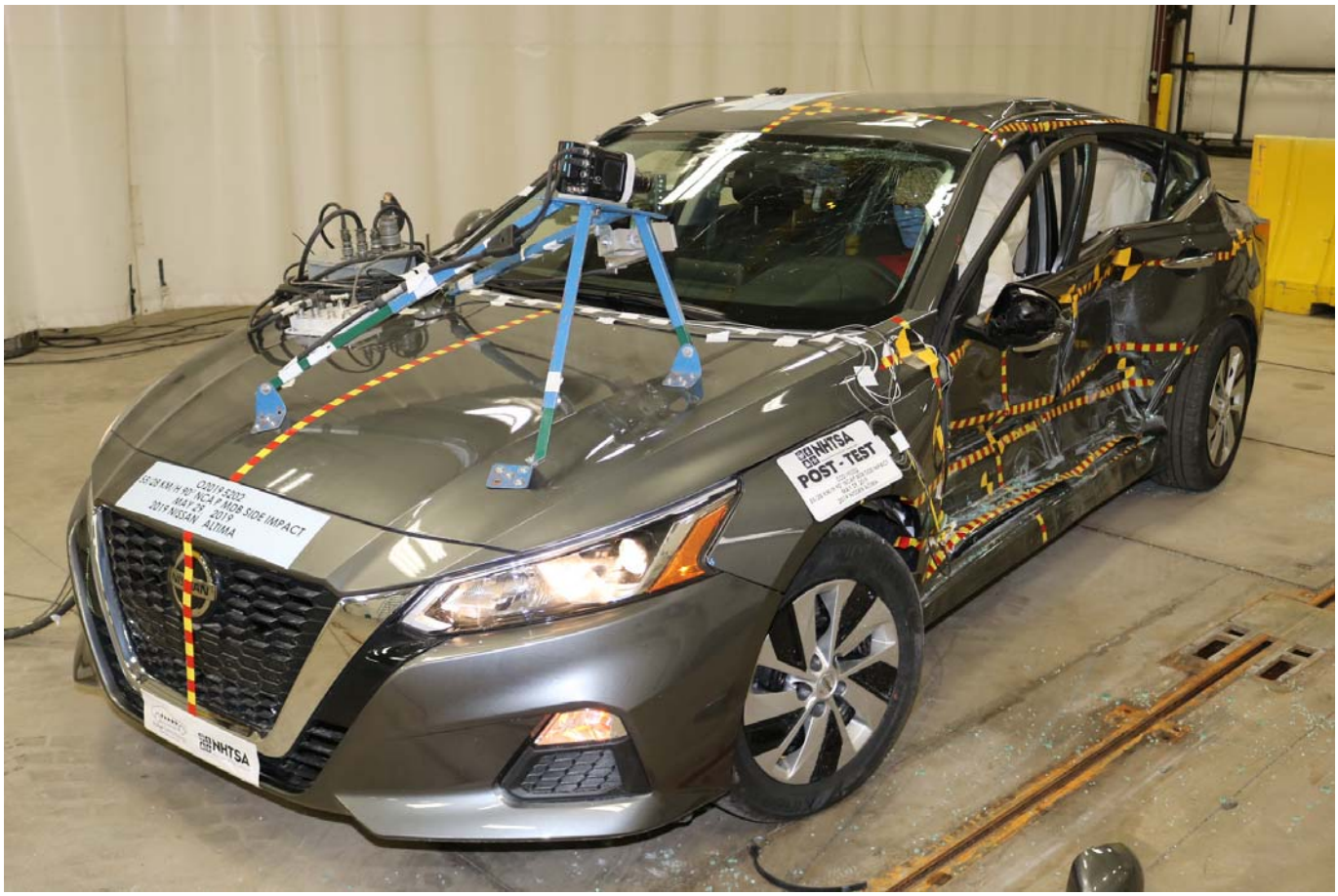


Photo No. 006 - Post-Test Left Front Three-Quarter View of Test Vehicle

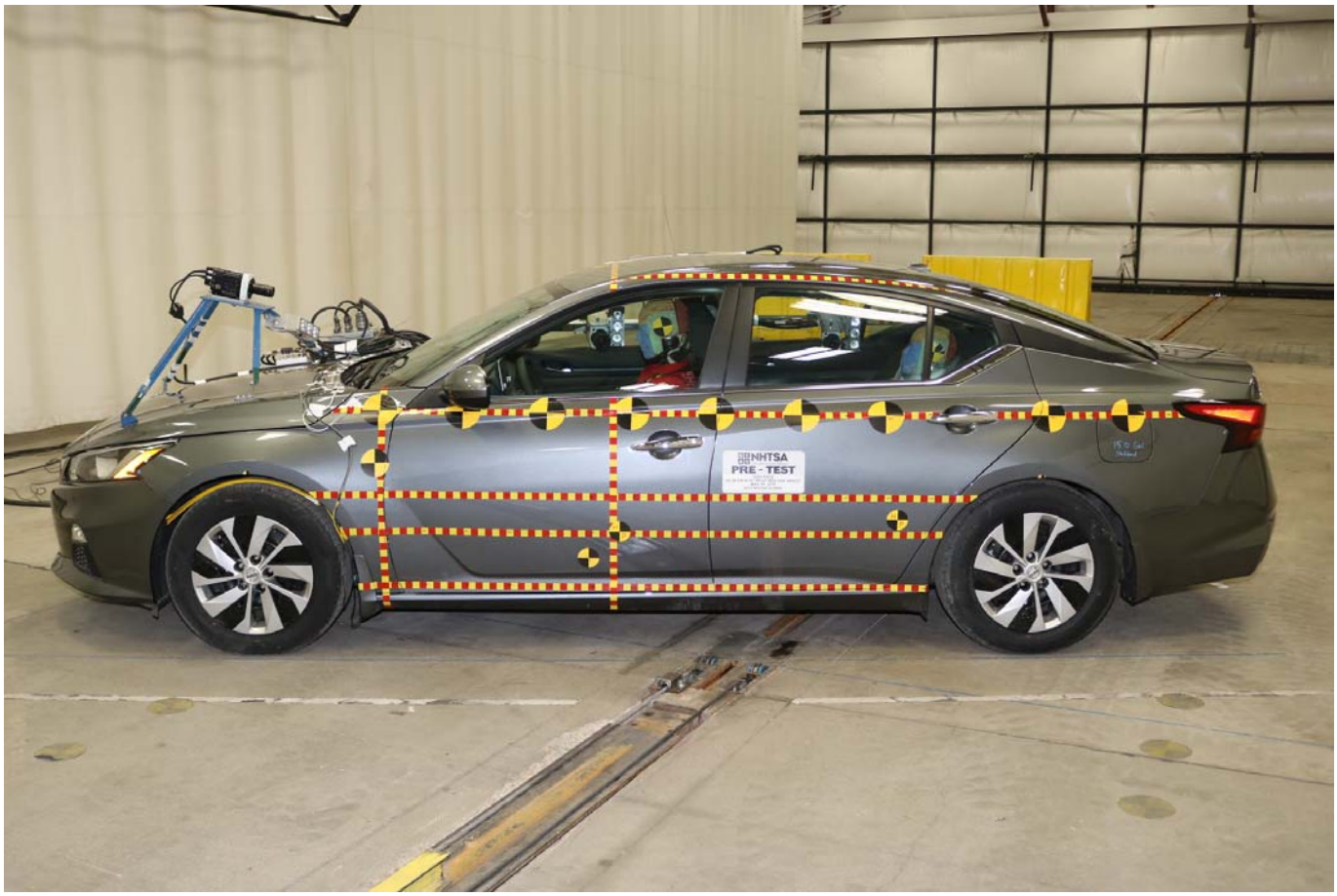


Photo No. 007 - Pre-Test Left Side View of Test Vehicle

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

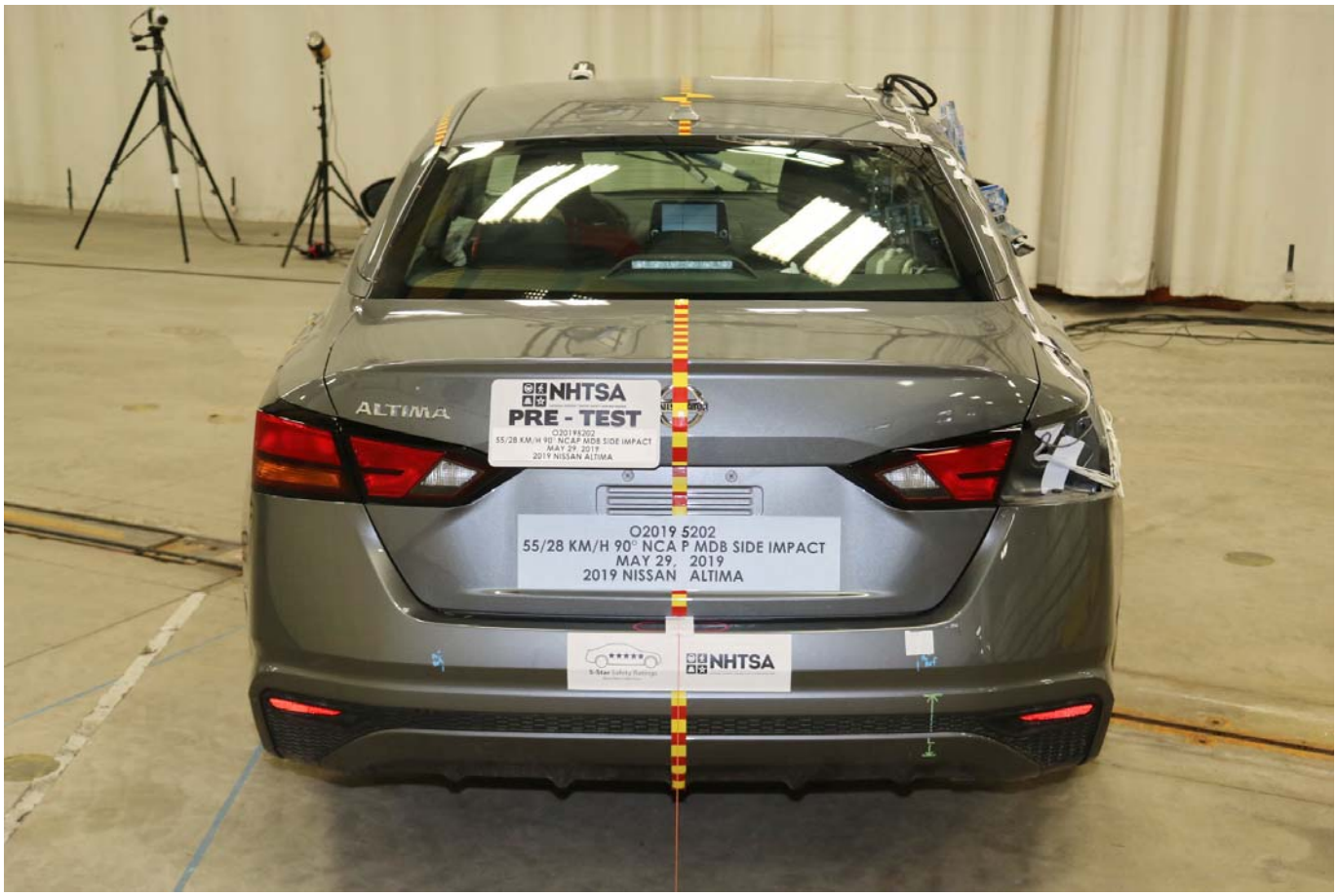


Photo No. 011 - Pre-Test Rear View of Test Vehicle

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

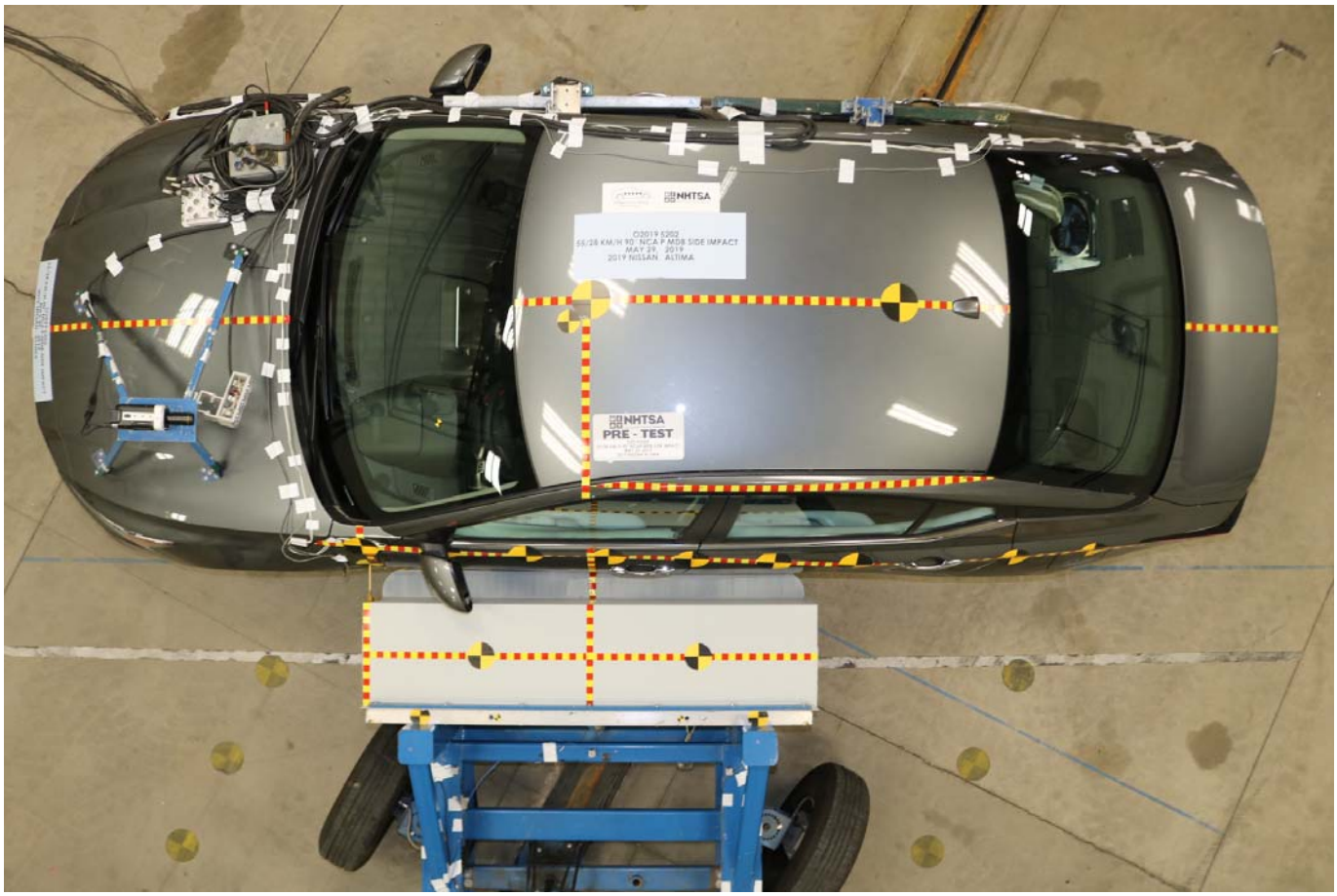


Photo No. 015 - Pre-Test Overhead View of Test Area

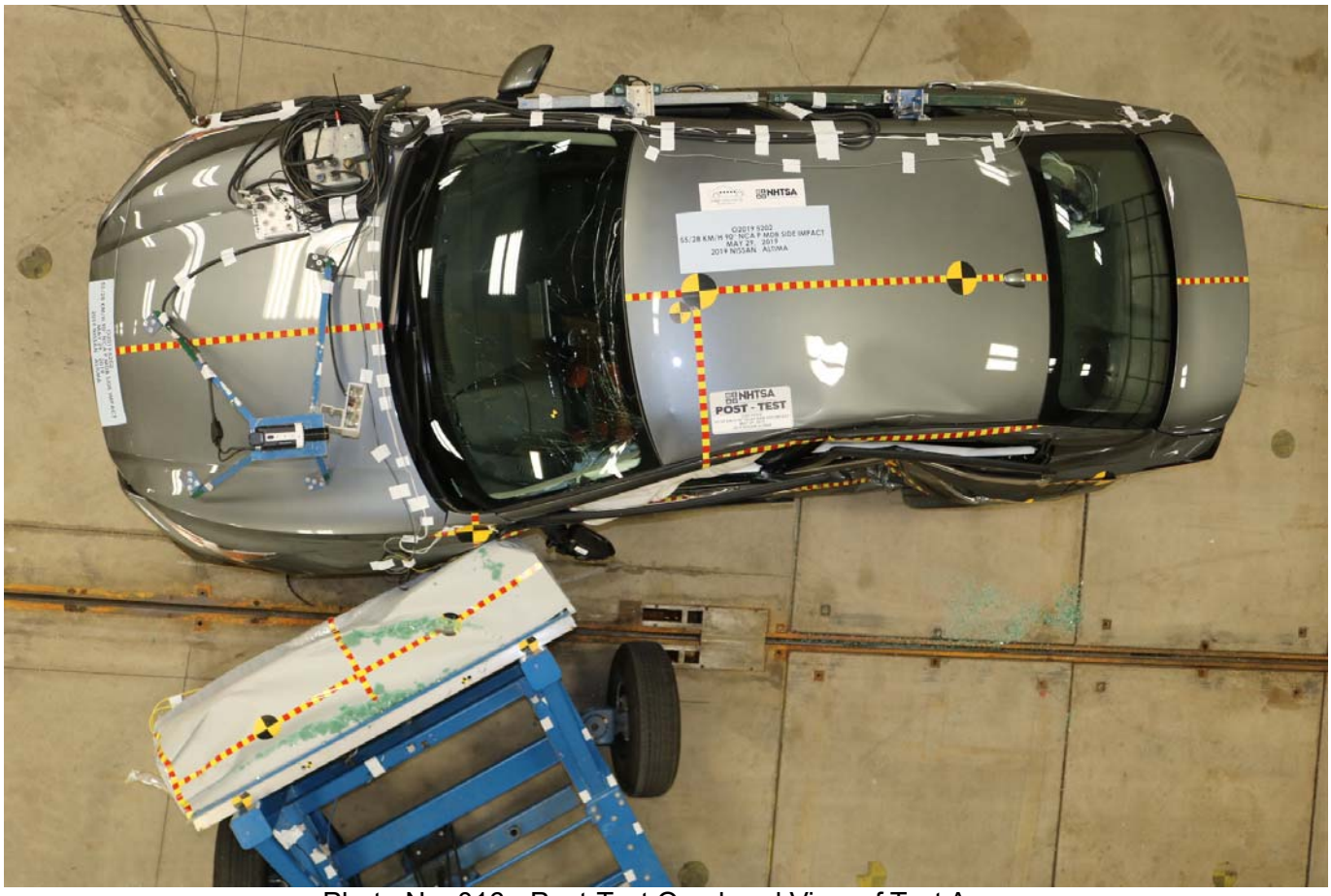


Photo No. 016 - Post-Test Overhead View of Test Area

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

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

PHOTOGRAPH NOT APPLICABLE

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

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

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

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

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

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

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

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

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

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

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

PHOTOGRAPH NOT APPLICABLE

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

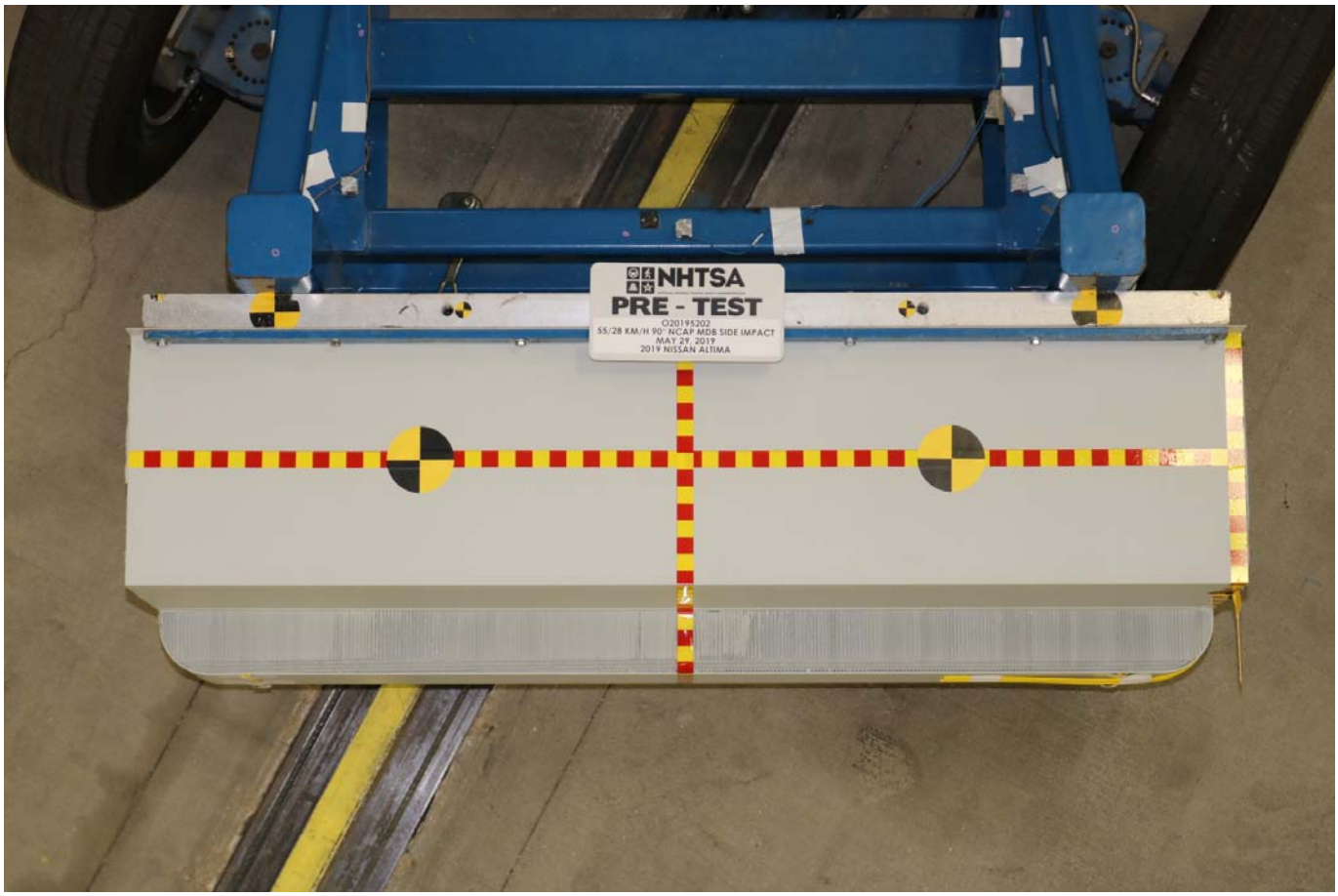


Photo No. 086 - Pre-Test Top View of MDB Impactor Face

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

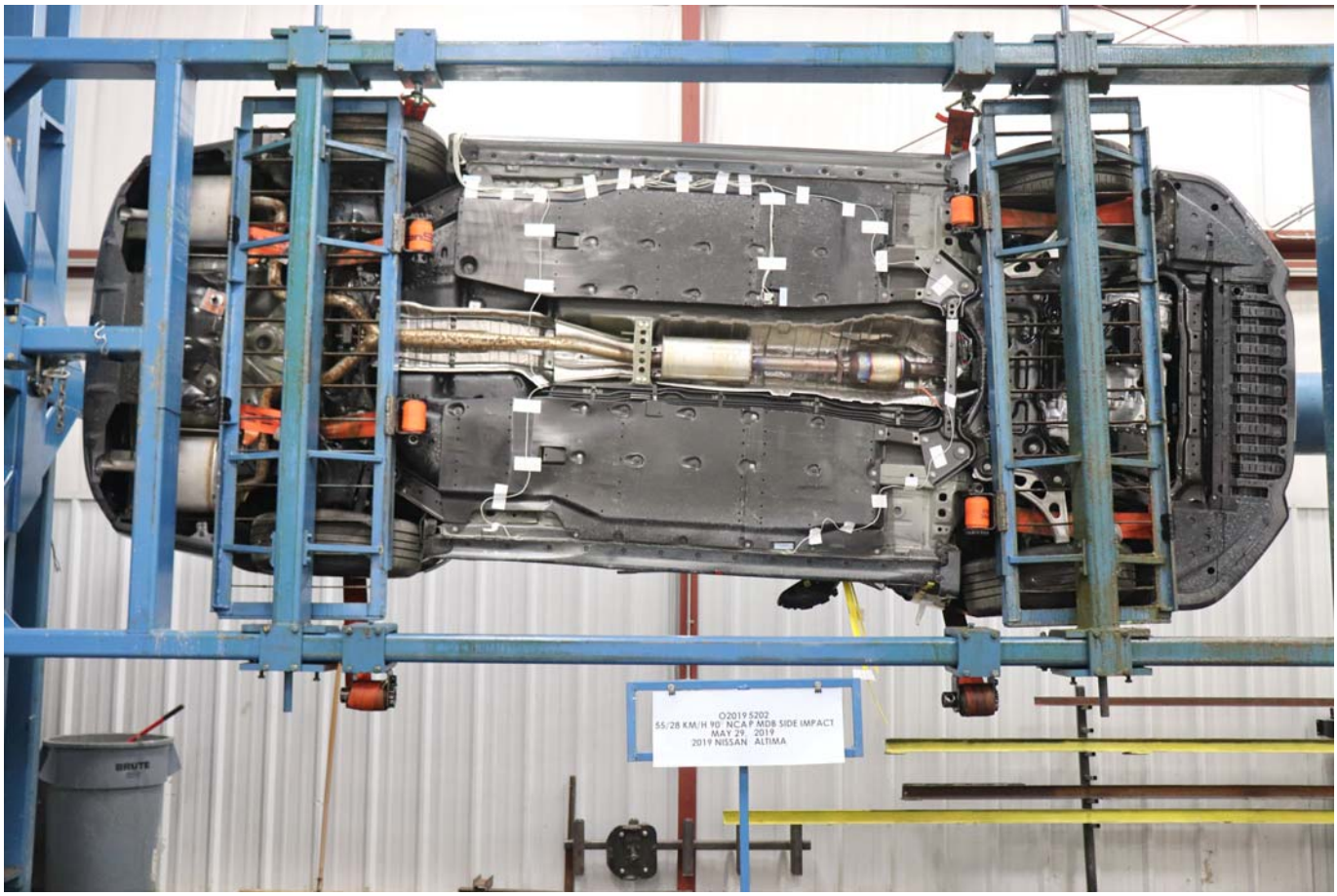


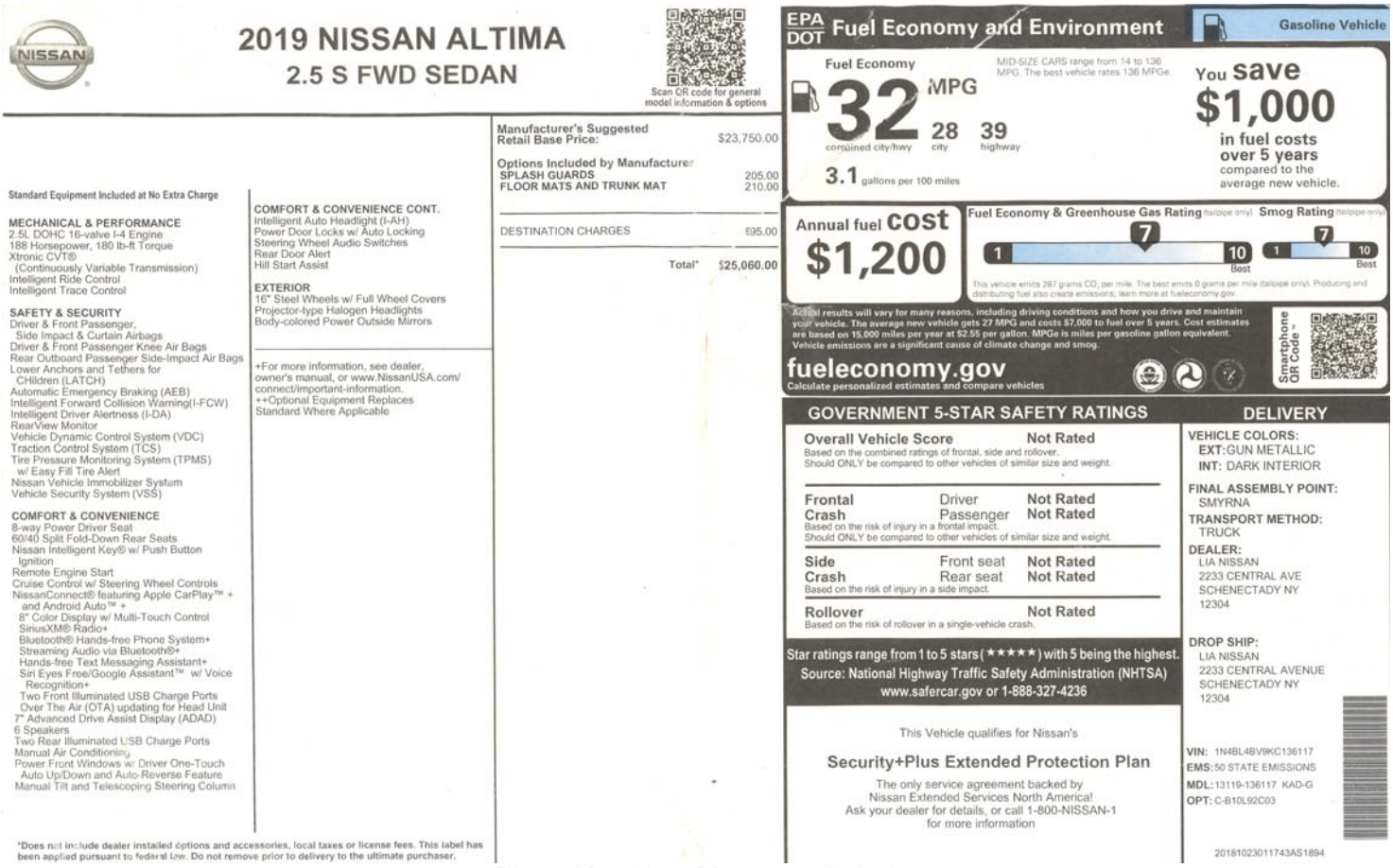
Photo No. 097 - FMVSS Photo No. 301 Static Rollover 90 Degrees

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



2019 NISSAN ALTIMA
2.5 S FWD SEDAN

Scan QR code for general model information & options

Standard Equipment Included at No Extra Charge

MECHANICAL & PERFORMANCE
2.5L DOHC 16-valve I-4 Engine
188 Horsepower, 180 lb-ft Torque
Xtronic CVT®
(Continuously Variable Transmission)
Intelligent Ride Control
Intelligent Trace Control

SAFETY & SECURITY
Driver & Front Passenger, Side Impact & Curtain Airbags
Driver & Front Passenger Knee Air Bags
Rear Outboard Passenger Side-Impact Air Bags
Lower Anchors and Tethers for Children (LATCH)
Automatic Emergency Braking (AEB)
Intelligent Forward Collision Warning(I-FCW)
Intelligent Driver Alertness (I-DA)
RearView Monitor
Vehicle Dynamic Control System (VDC)
Traction Control System (TCS)
Tire Pressure Monitoring System (TPMS) w/ Easy Fill Tire Alert
Nissan Vehicle Immobilizer System
Vehicle Security System (VSS)

COMFORT & CONVENIENCE
8-way Power Driver Seat
60/40 Split Fold-Down Rear Seats
Nissan Intelligent Key® w/ Push Button Ignition
Remote Engine Start
Cruise Control w/ Steering Wheel Controls
NissanConnect® featuring Apple CarPlay™ + and Android Auto™ +
8" Color Display w/ Multi-Touch Control
SiriusXM® Radio+
Bluetooth® Hands-free Phone System+
Streaming Audio via Bluetooth®+
Hands-free Text Messaging Assistant+
Siri Eyes Free/Google Assistant™ w/ Voice Recognition+
Two Front Illuminated USB Charge Ports
Over The Air (OTA) updating for Head Unit
7" Advanced Drive Assist Display (ADAD)
6 Speakers
Two Rear Illuminated USB Charge Ports
Manual Air Conditioning
Power Front Windows w/ Driver One-Touch Auto Up/Down and Auto-Reverse Feature
Manual Tilt and Telescoping Steering Column

COMFORT & CONVENIENCE CONT.
Intelligent Auto Headlight (I-AH)
Power Door Locks w/ Auto Locking
Steering Wheel Audio Switches
Rear Door Alert
Hill Start Assist

EXTERIOR
16" Steel Wheels w/ Full Wheel Covers
Projector-type Halogen Headlights
Body-colored Power Outside Mirrors

+For more information, see dealer, owner's manual, or www.NissanUSA.com/connect/important-information.
++Optional Equipment Replaces Standard Where Applicable

Manufacturer's Suggested Retail Base Price:	$23,750.00
Options Included by Manufacturer	
SPLASH GUARDS	205.00
FLOOR MATS AND TRUNK MAT	210.00
DESTINATION CHARGES	695.00
Total*	$25,060.00

*Does not include dealer installed options and accessories, local taxes or license fees. This label has been applied pursuant to federal law. Do not remove prior to delivery to the ultimate purchaser.

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy
32 MPG combined city/hwy
28 city
39 highway
3.1 gallons per 100 miles

MID-SIZE CARS range from 14 to 136 MPG. The best vehicle rates 136 MPGe.

You save $1,000 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $1,200

Fuel Economy & Greenhouse Gas Rating (tailpipe only) 7 (1 Best, 10)
Smog Rating (tailpipe only) 7 (1 Best, 10)

This vehicle emits 287 grams CO2 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 $7,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $2.55 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

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 Crash	Driver	Not Rated
	Passenger	Not Rated
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front seat	Not Rated
	Rear seat	Not Rated
Based on the risk of injury in a side impact.		
Rollover		Not Rated
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

This Vehicle qualifies for Nissan's
Security+Plus Extended Protection Plan
The only service agreement backed by Nissan Extended Services North America!
Ask your dealer for details, or call 1-800-NISSAN-1 for more information

DELIVERY

VEHICLE COLORS:
EXT: GUN METALLIC
INT: DARK INTERIOR

FINAL ASSEMBLY POINT:
SMYRNA

TRANSPORT METHOD:
TRUCK

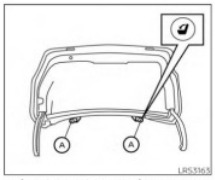
DEALER:
LIA NISSAN
2233 CENTRAL AVE
SCHENECTADY NY
12304

DROP SHIP:
LIA NISSAN
2233 CENTRAL AVENUE
SCHENECTADY NY
12304

VIN: 1N4BL4BV9KC136117
EMS: 50 STATE EMISSIONS
MDL: 13119-136117 KAD-G
OPT: C-B10L92C03

20181023011743AS1894

Photo No. 102 - Monroney Label



LRS3363

To fold down either side of the rear seat, open the trunk and pull on the knob on that side Ⓐ.

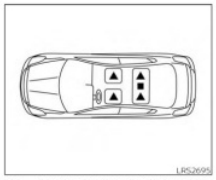

WRS0167

CENTER ARMREST

Pull the armrest down as shown.

⚠ WARNING

Head restraints/headrests supplement the other vehicle safety systems. They may provide additional protection against injury in certain rear end collisions. Adjustable head restraints/headrests must be adjusted properly, as specified in this section. Check the adjustment after someone else uses the seat. Do not attach anything to the head restraint/headrest stalks or remove the head restraint/headrest. Do not use the seat if the head restraint/headrest has been removed. If the head restraint/headrest was removed, reinstall and properly adjust the head restraint/headrest before an occupant uses the seating position. Failure to follow these instructions can reduce the effectiveness of the head restraints/headrests. This may increase the risk of serious injury or death in a collision.


LRS2695

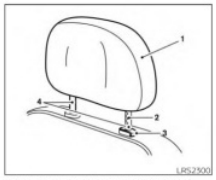
The illustration shows the seating positions equipped with head restraints/headrests.

▲ Indicates the seating position is equipped with a head restraint.

■ Indicates the seating position is equipped with a headrest.

+ Indicates the seating position is not equipped with a head restraint or headrest (if applicable).

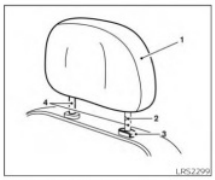
- Your vehicle is equipped with a head restraint/headrest that may be integrated, adjustable or non-adjustable.
- Adjustable head restraints/headrests have multiple notches along the stalk(s) to lock them in a desired adjustment position.
- The non-adjustable head restraints/headrests have a single locking notch to secure them to the seat frame.
- Proper Adjustment:
  - For the adjustable type, align the head restraint/headrest so the center of your ear is approximately level with the center of the head restraint/headrest.
  - If your ear position is still higher than the recommended alignment, place the head restraint/headrest at the highest position.
- If the head restraint/headrest has been removed, ensure that it is reinstalled and locked in place before riding in that designated seating position.



LRS2300

ADJUSTABLE HEAD RESTRAINT/ HEADREST COMPONENTS

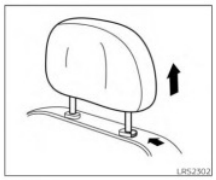
1. Removable head restraint/headrest
2. Multiple notches
3. Lock knob
4. Stalks



LRS2299

NON-ADJUSTABLE HEAD RESTRAINT/HEADREST COMPONENTS

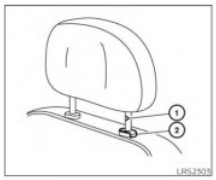
1. Removable head restraint/headrest
2. Single notch
3. Lock knob
4. Stalks


LRS2302

REMOVE

Use the following procedure to remove the head restraint/headrest.

1. Pull the head restraint/headrest up to the highest position.
2. Push and hold the lock knob.
3. Remove the head restraint/headrest from the seat.
4. Store the head restraint/headrest properly in a secure place so it is not loose in the vehicle.
5. Reinstall and properly adjust the head restraint/headrest before an occupant uses the seating position.



LRS2303

INSTALL

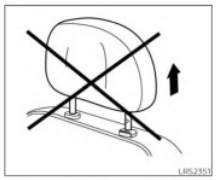
1. Align the head restraint/headrest stalks with the holes in the seat. Make sure that the head restraint/headrest is facing the correct direction. The stalk with the notch (notches) ① must be installed in the hole with the lock knob ②.
2. Push and hold the lock knob and push the head restraint/headrest down.
3. Properly adjust the head restraint/headrest before an occupant uses the seating position.


WRS0134

ADJUST

For adjustable head restraint/headrest

Adjust the head restraint/headrest so the center is level with the center of your ears. If your ear position is still higher than the recommended alignment, place the head restraint/headrest at the highest position.


LRS2351

For non-adjustable head restraint/ headrest

Make sure the head restraint/headrest is positioned so the lock knob is engaged in the notch before riding in that designated seating position.

Photo No. 103 - Head Restraint Use and Adjustment Information from Vehicle Owners 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)

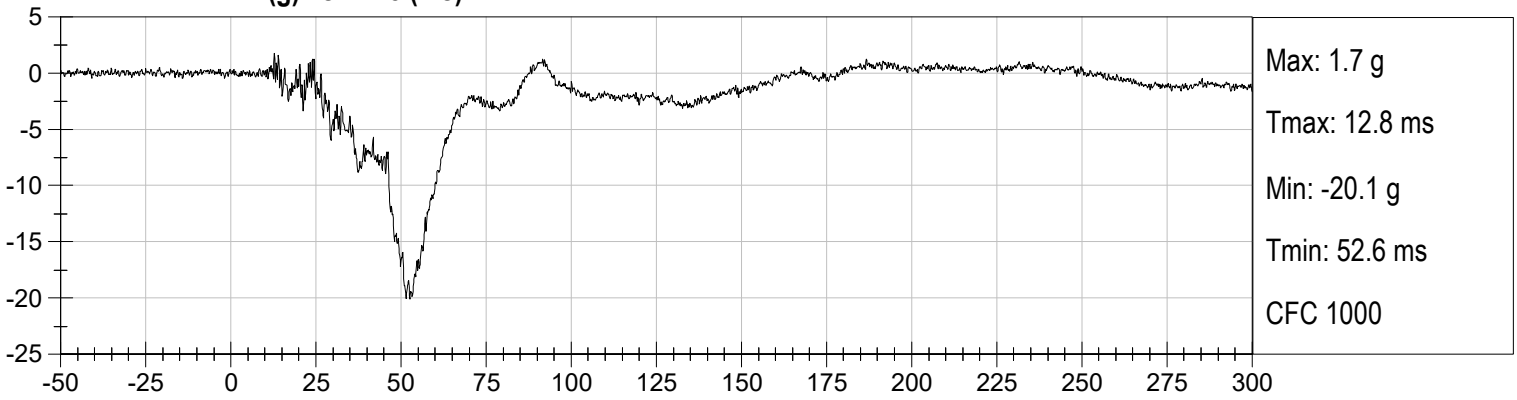
MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

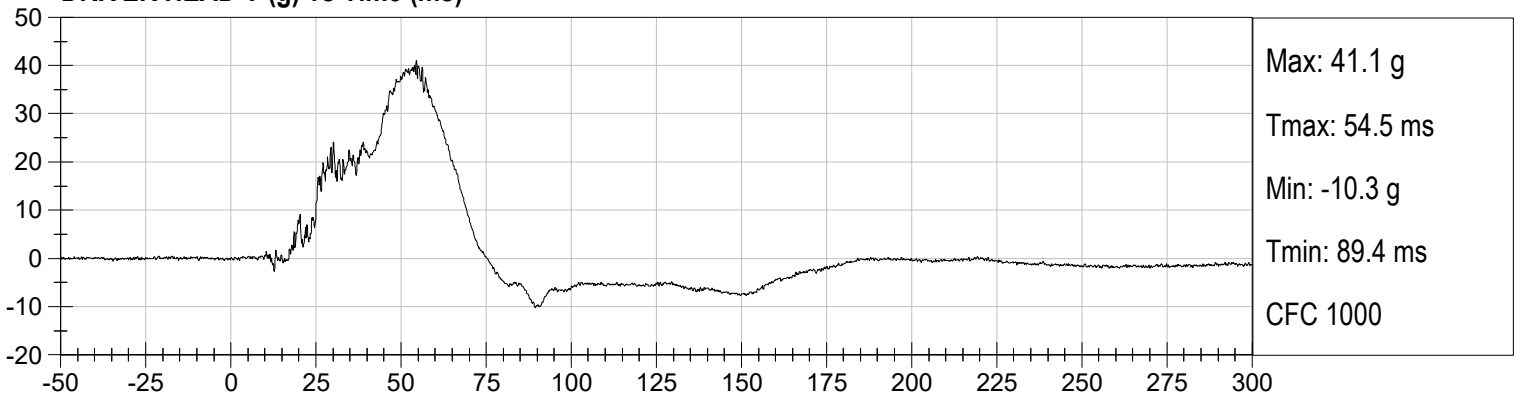
Left MDB Contact Switch

Right MDB Contact Switch

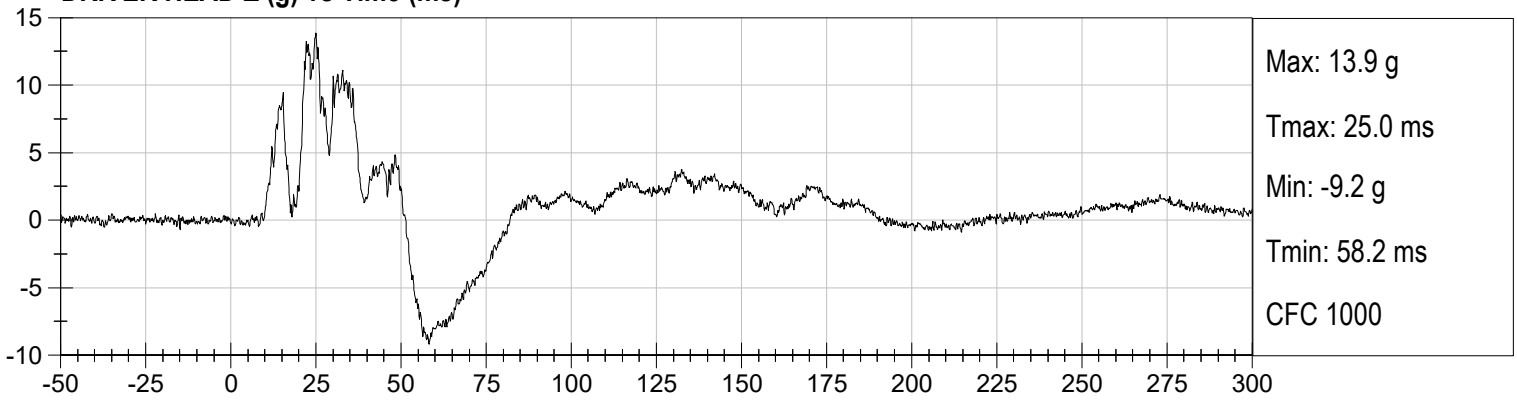
DRIVER HEAD X (g) vs Time (ms)



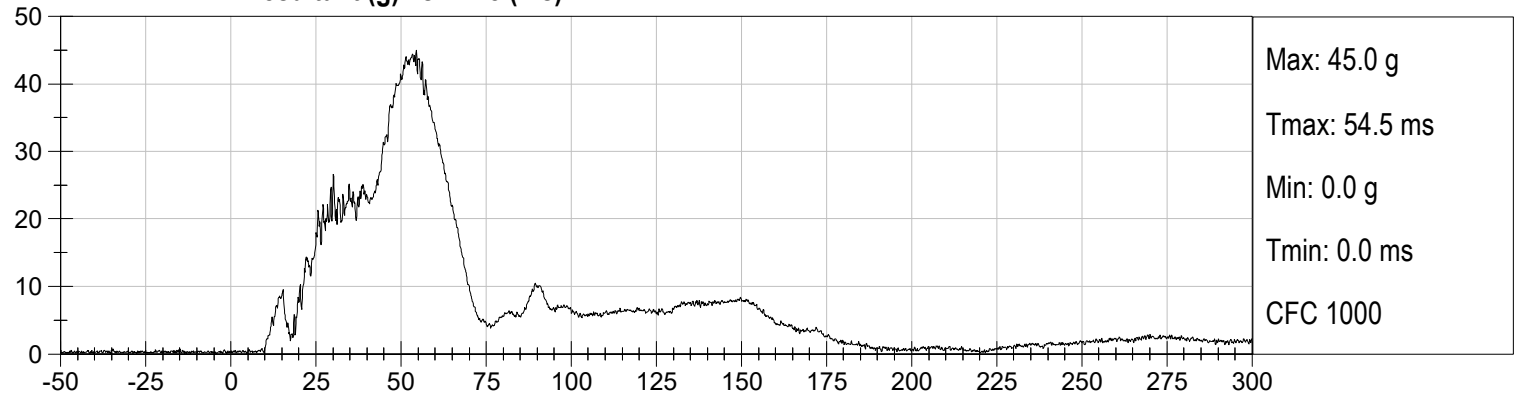
DRIVER HEAD Y (g) vs Time (ms)



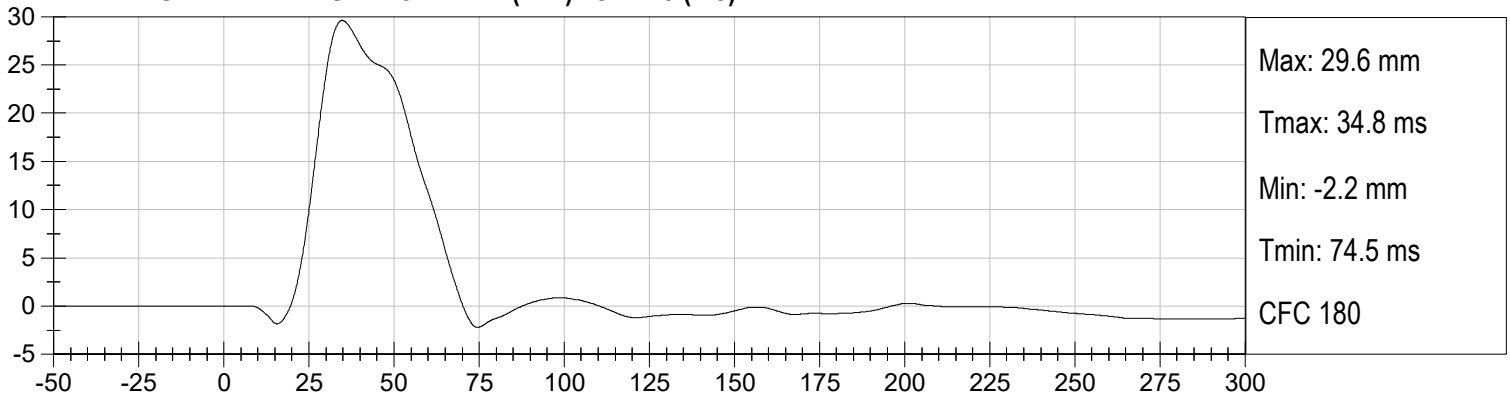
DRIVER HEAD Z (g) vs Time (ms)



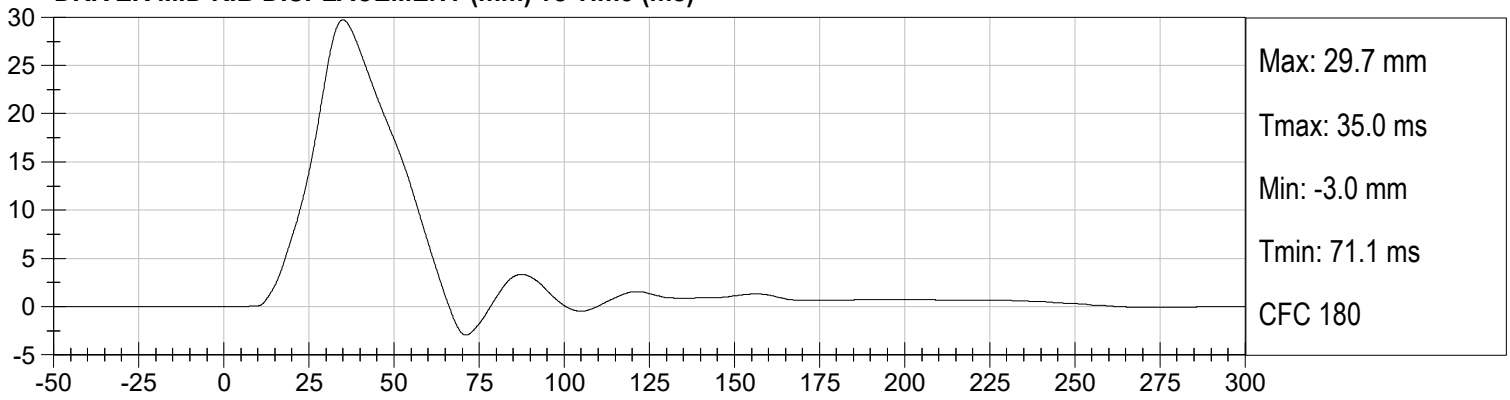
DRIVER HEAD Resultant (g) vs Time (ms)



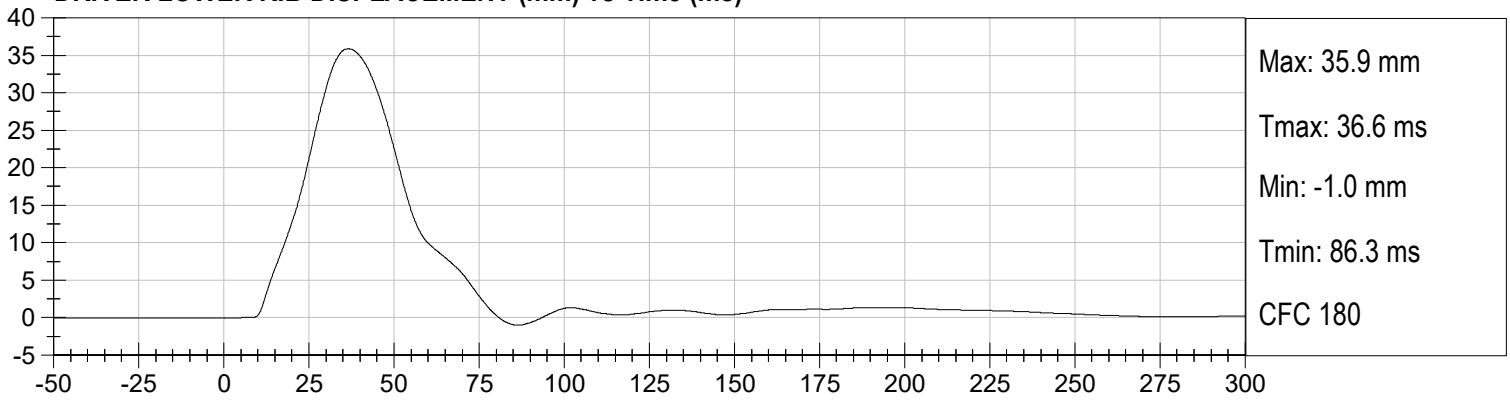
DRIVER UPPER RIB DISPLACEMENT (mm) vs Time (ms)



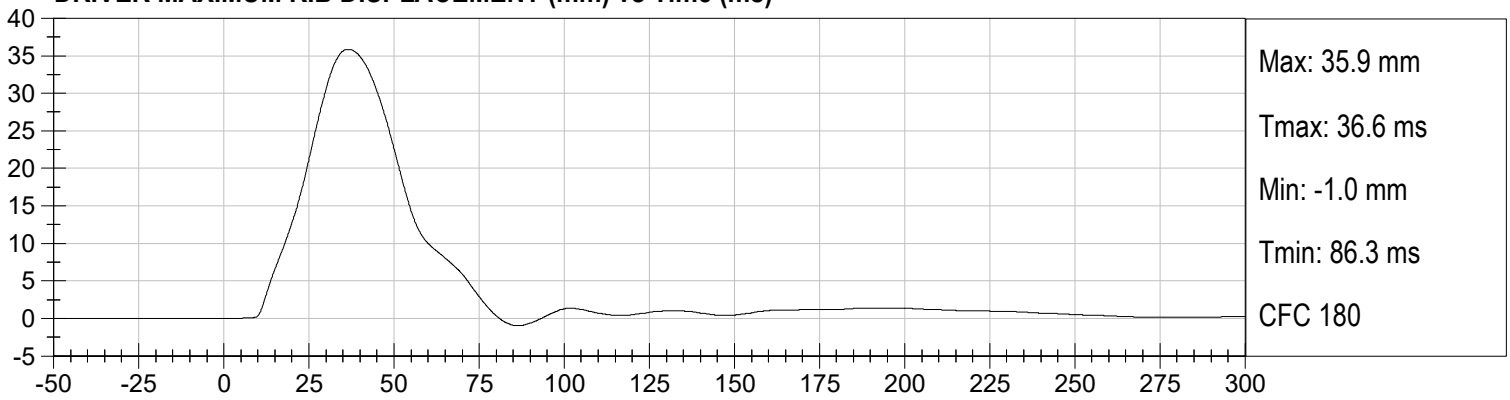
DRIVER MID RIB DISPLACEMENT (mm) vs Time (ms)



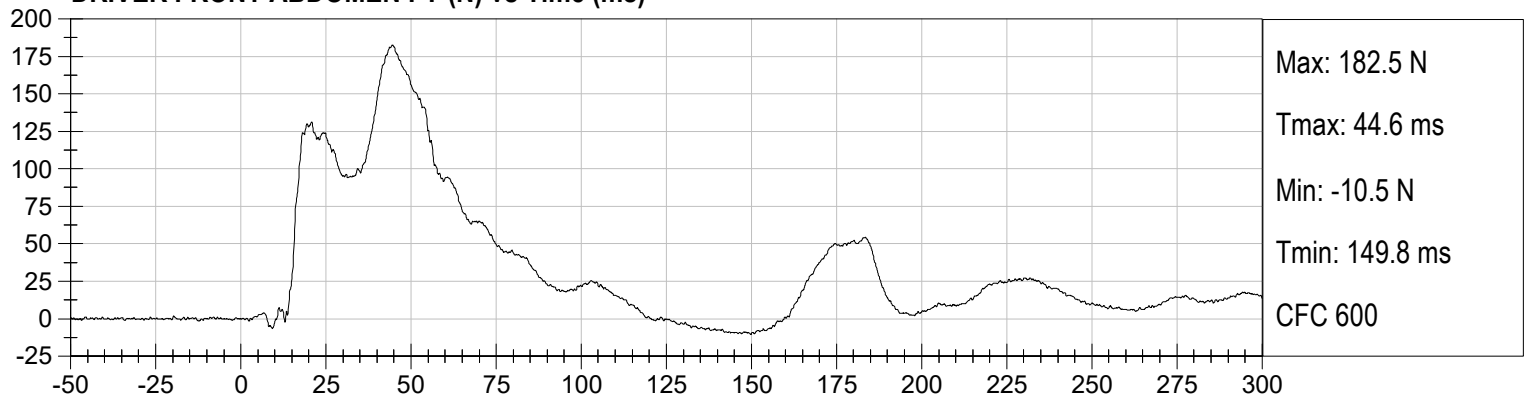
DRIVER LOWER RIB DISPLACEMENT (mm) vs Time (ms)



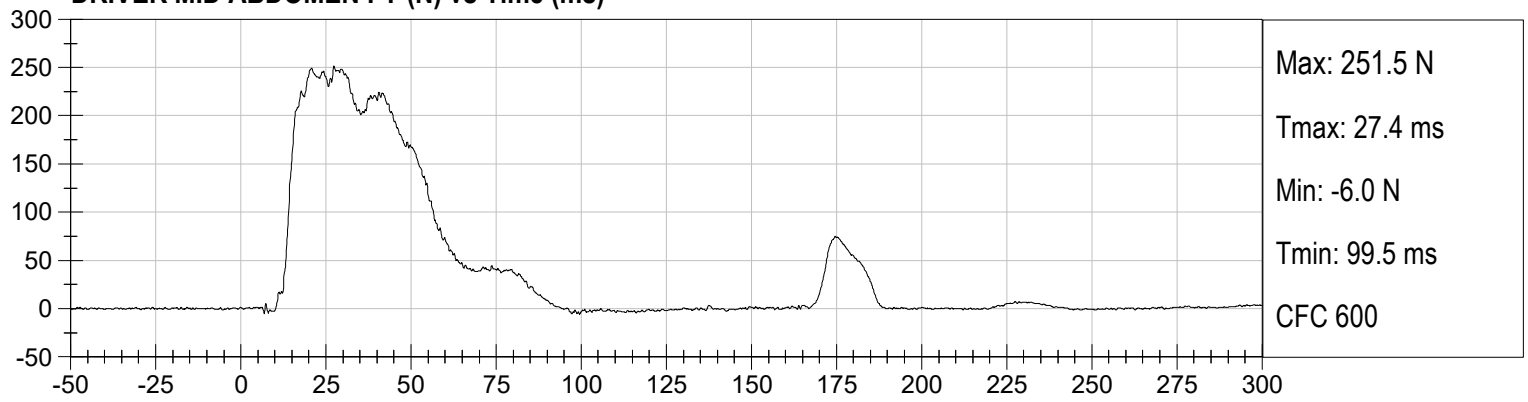
DRIVER MAXIMUM RIB DISPLACEMENT (mm) vs Time (ms)



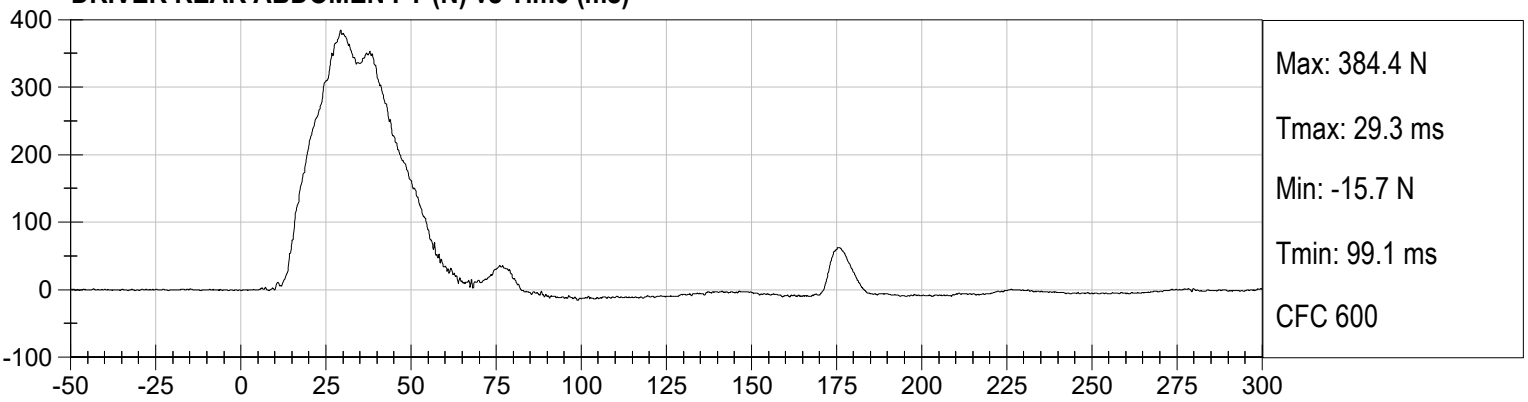
DRIVER FRONT ABDOMEN FY (N) vs Time (ms)



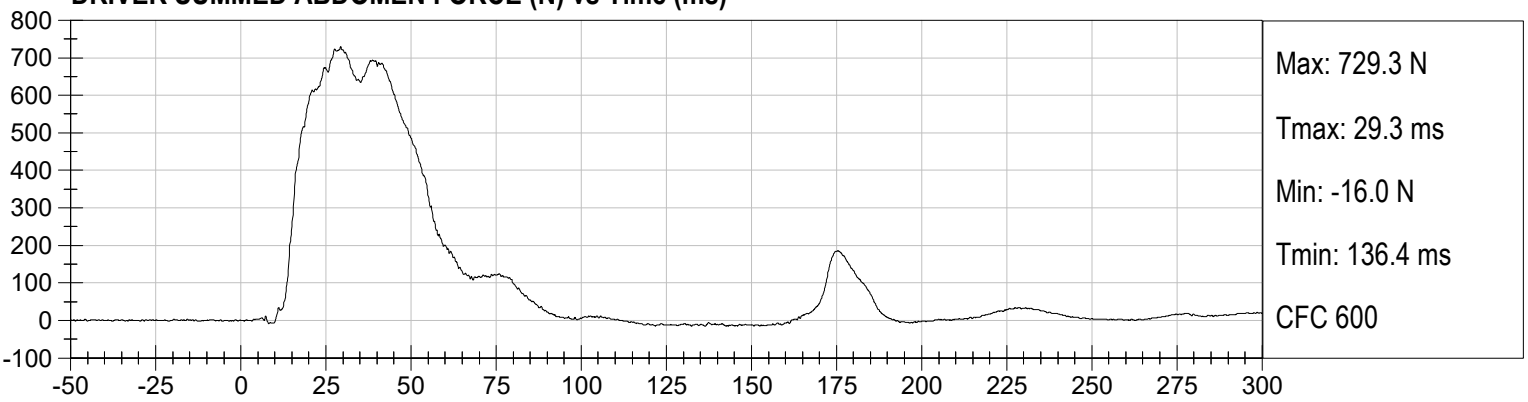
DRIVER MID ABDOMEN FY (N) vs Time (ms)



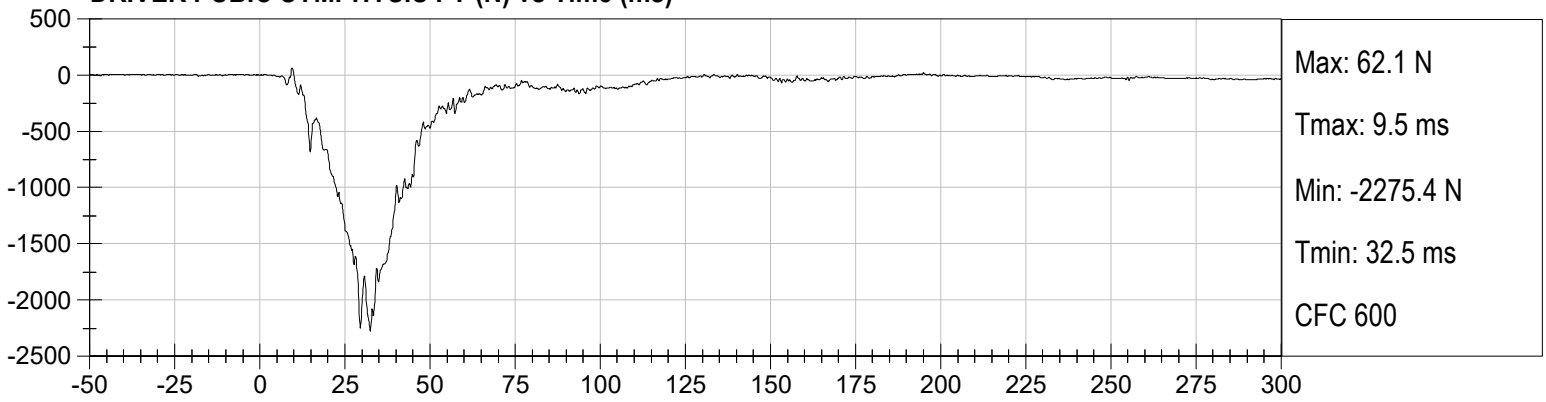
DRIVER REAR ABDOMEN FY (N) vs Time (ms)



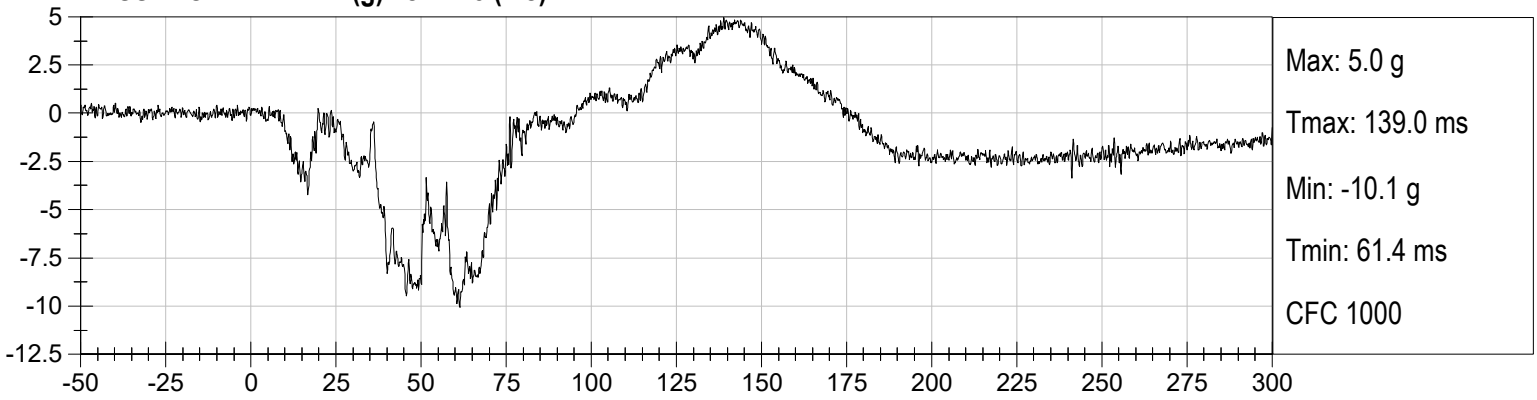
DRIVER SUMMED ABDOMEN FORCE (N) vs Time (ms)



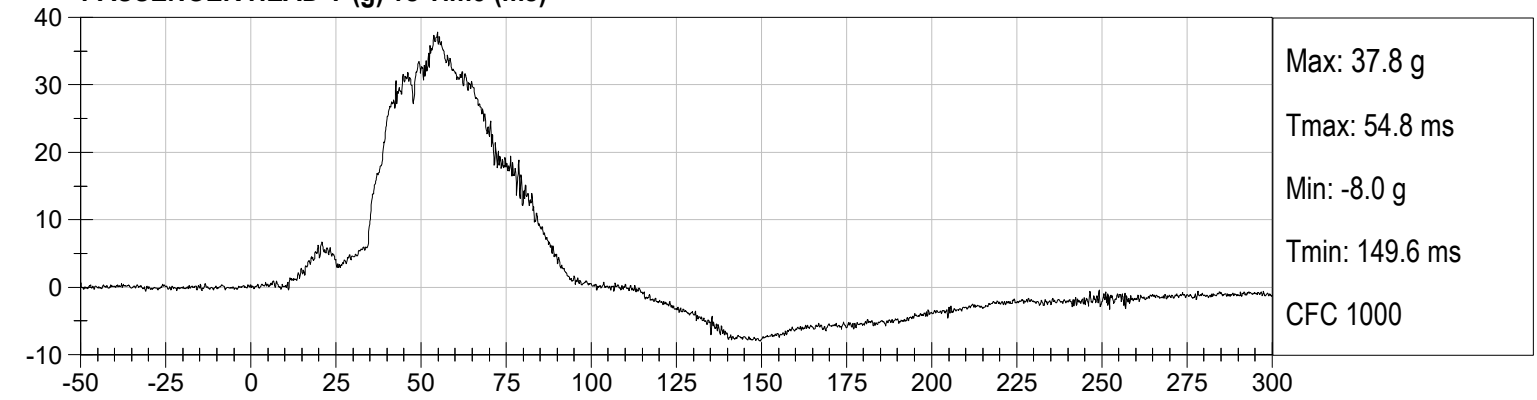
DRIVER PUBIC SYMPHYSIS FY (N) vs Time (ms)



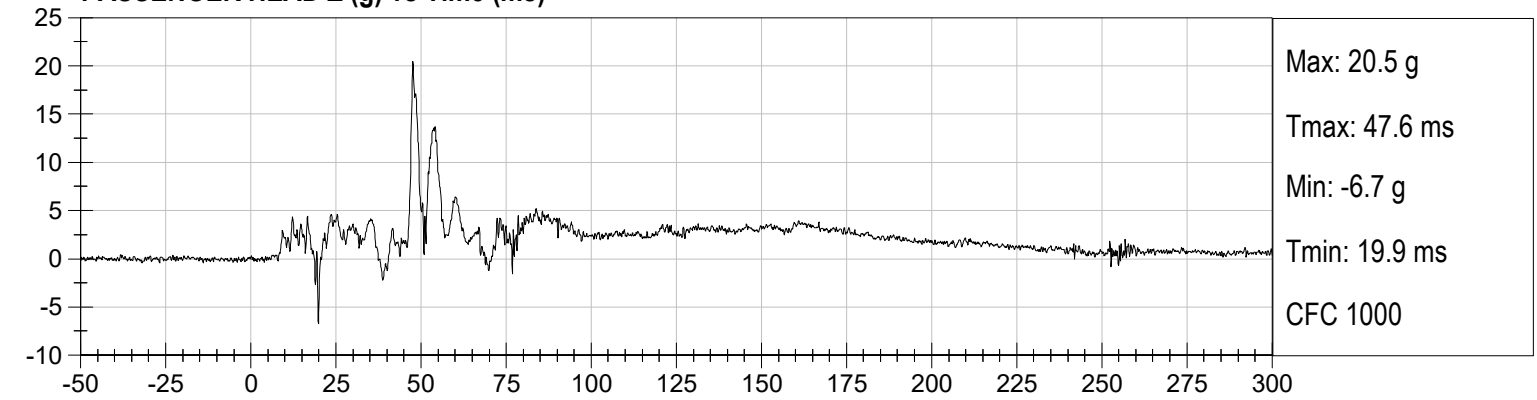
PASSENGER HEAD X (g) vs Time (ms)



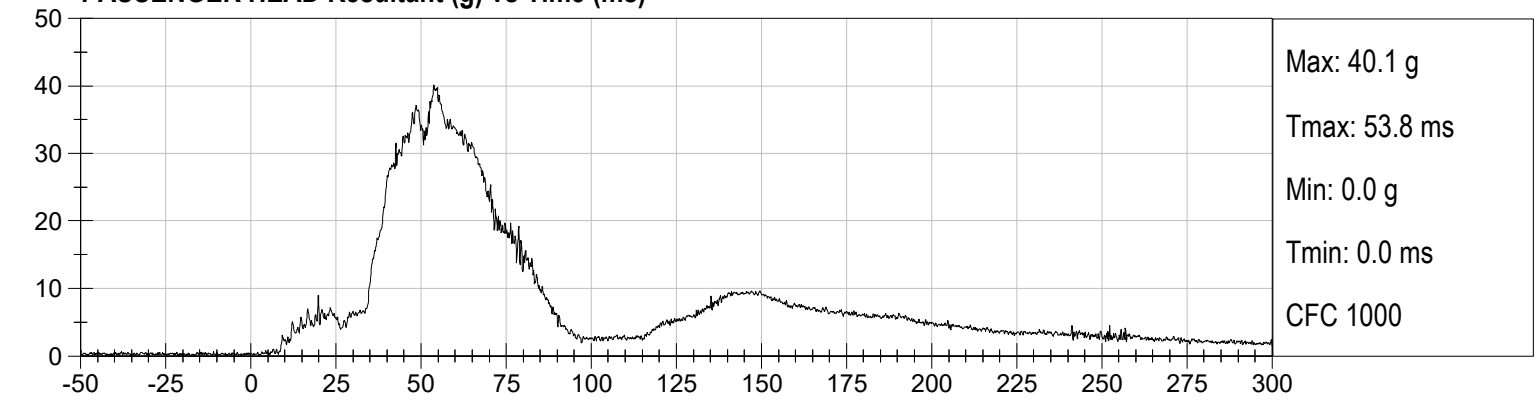
PASSENGER HEAD Y (g) vs Time (ms)



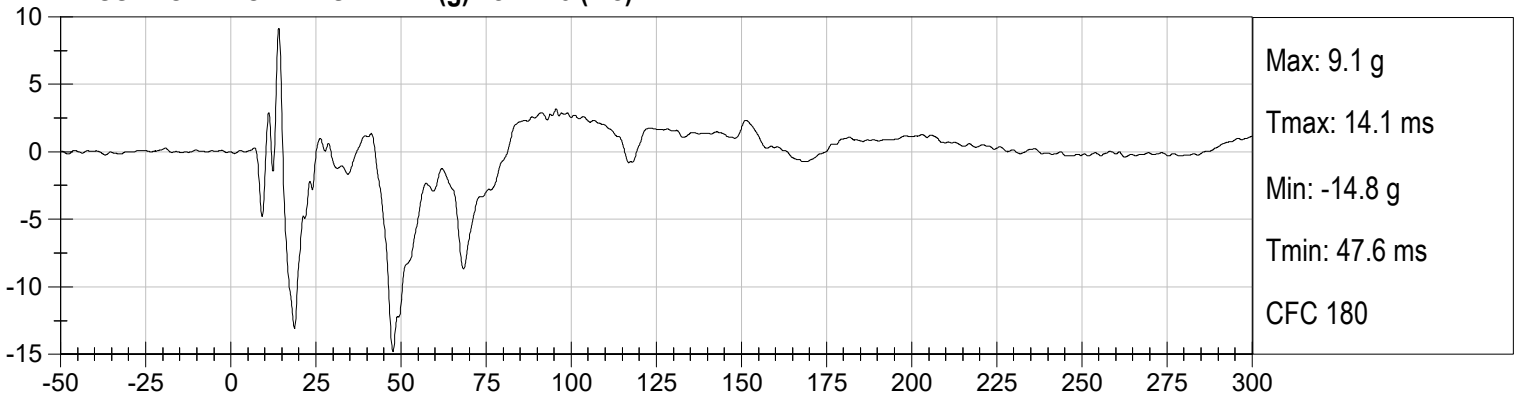
PASSENGER HEAD Z (g) vs Time (ms)



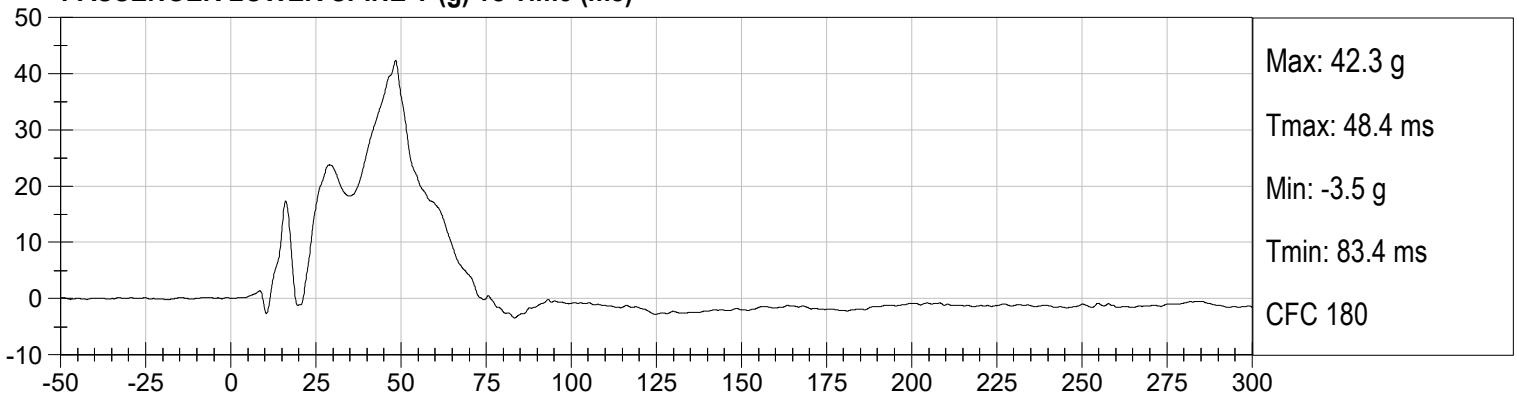
PASSENGER HEAD Resultant (g) vs Time (ms)



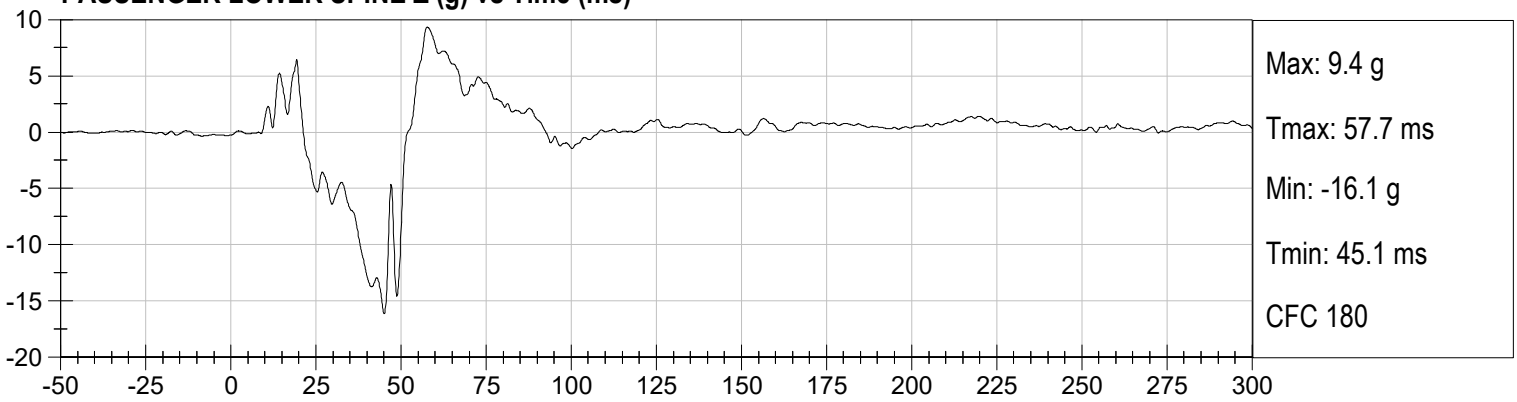
PASSENGER LOWER SPINE X (g) vs Time (ms)



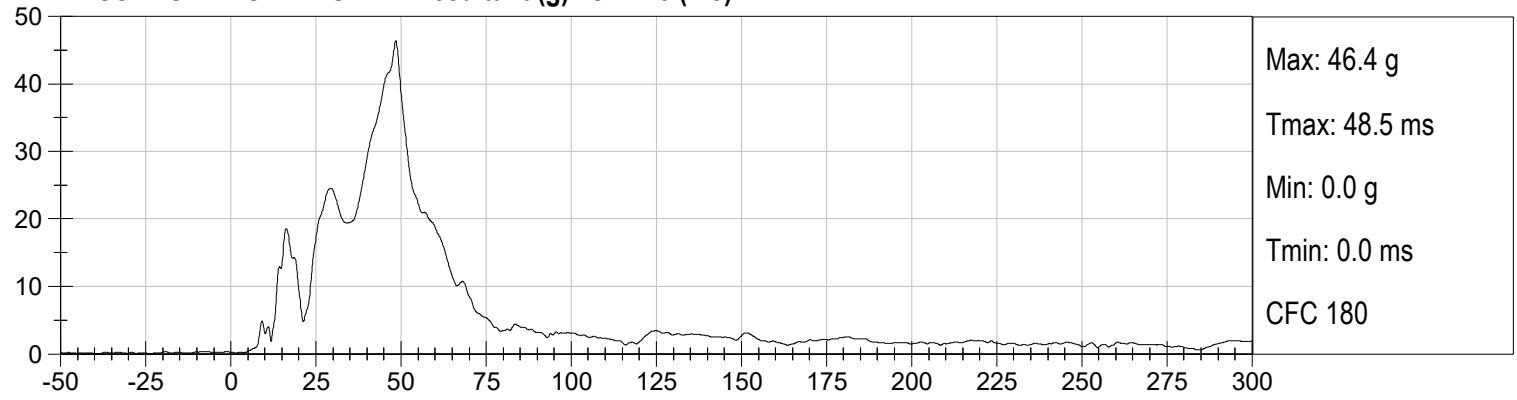
PASSENGER LOWER SPINE Y (g) vs Time (ms)



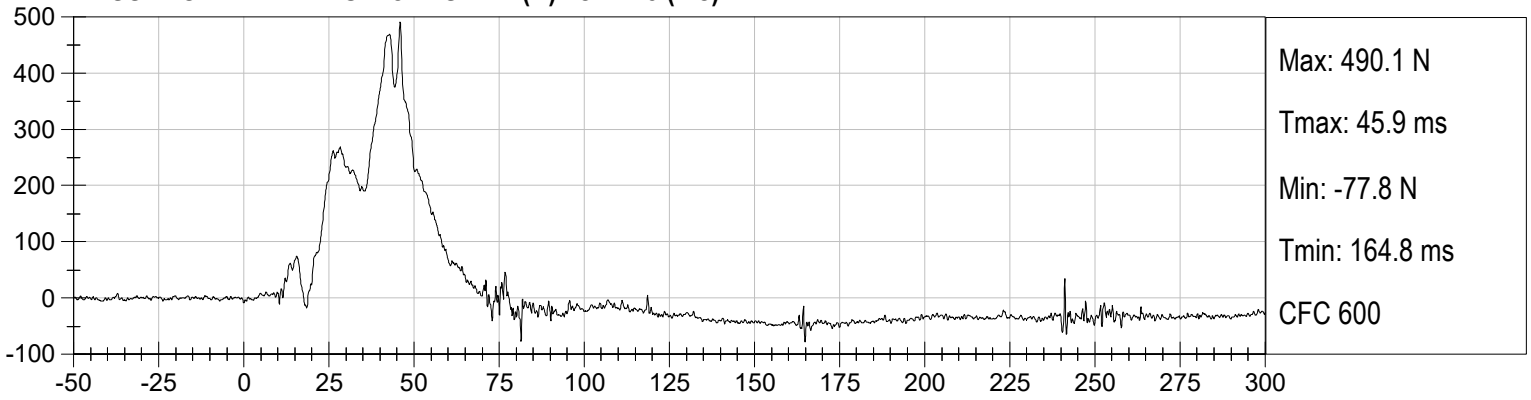
PASSENGER LOWER SPINE Z (g) vs Time (ms)



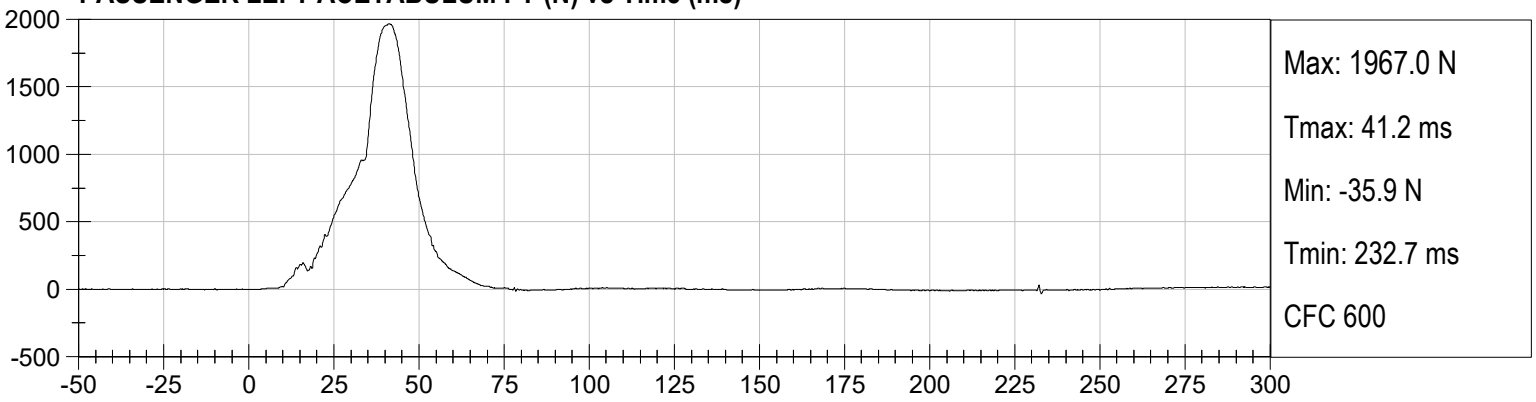
PASSENGER LOWER SPINE Resultant (g) vs Time (ms)



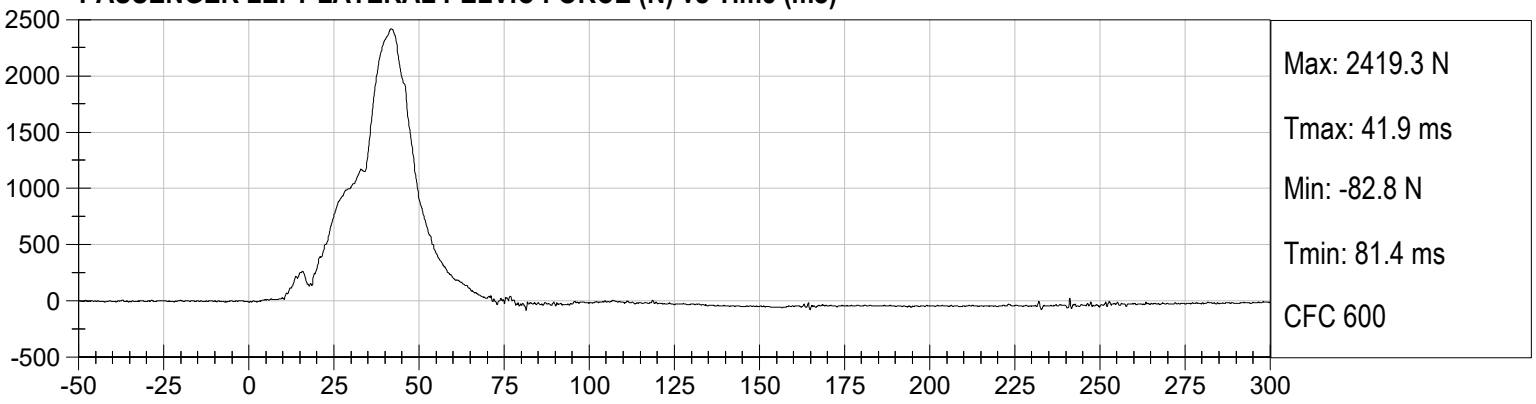
PASSENGER LEFT ILIUM CREST FY (N) vs Time (ms)



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: 032

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: 032 **Test ID:** D191591

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Peak Resultant Acceleration	G's	125 to 155	148	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	7.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Danielle Redenbaugh
Laboratory Technician

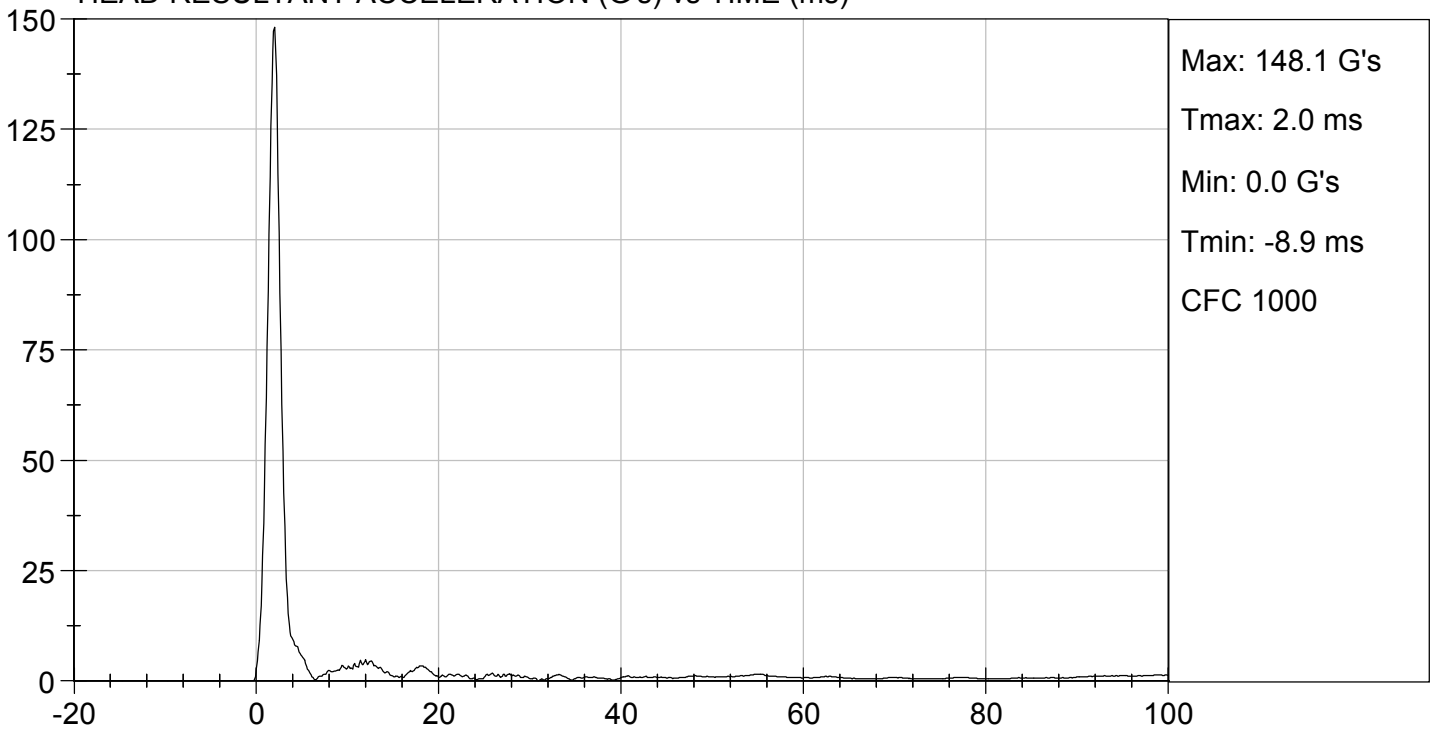
05/14/2019
Test Date

Approved By

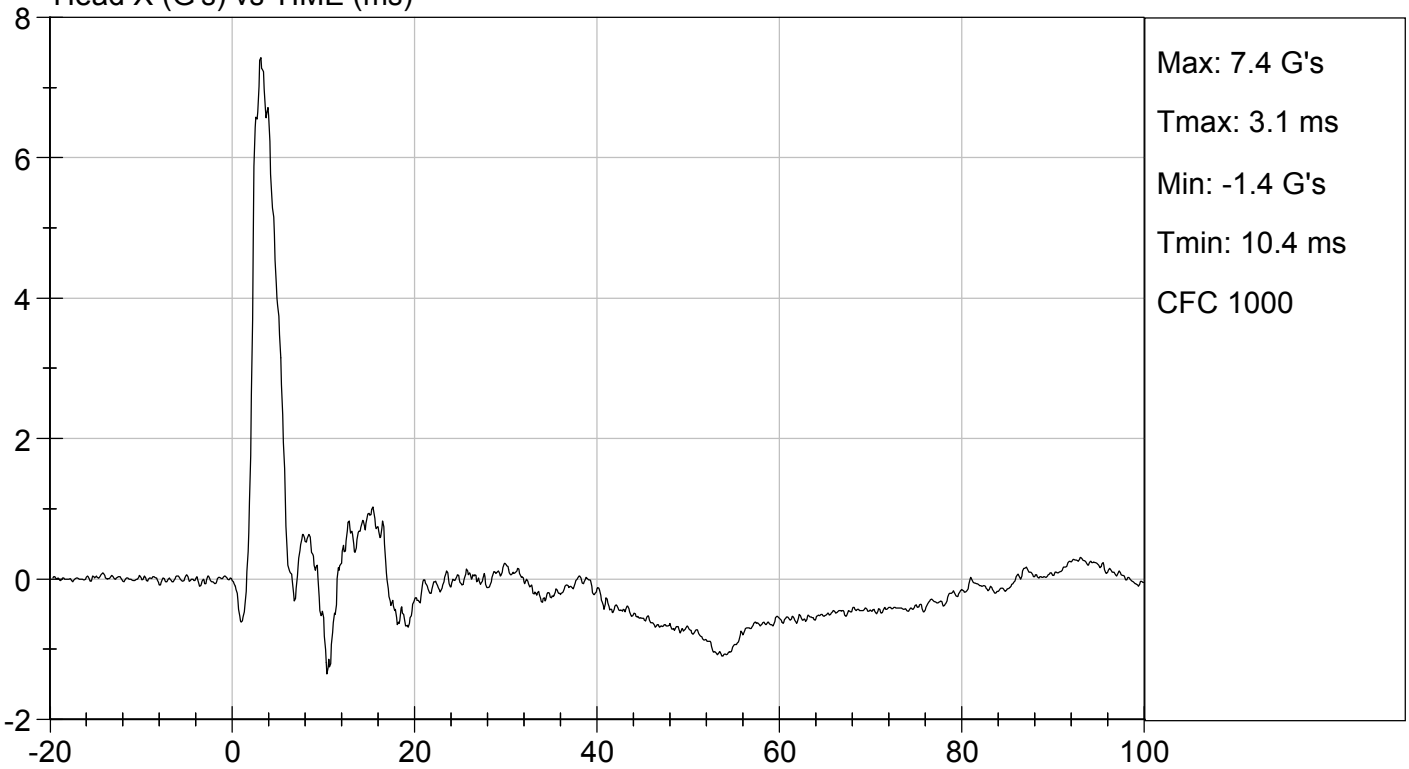
TEST DESC: HEAD DROP

TEST DATE: 05/14/2019
TEST #: D191591

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



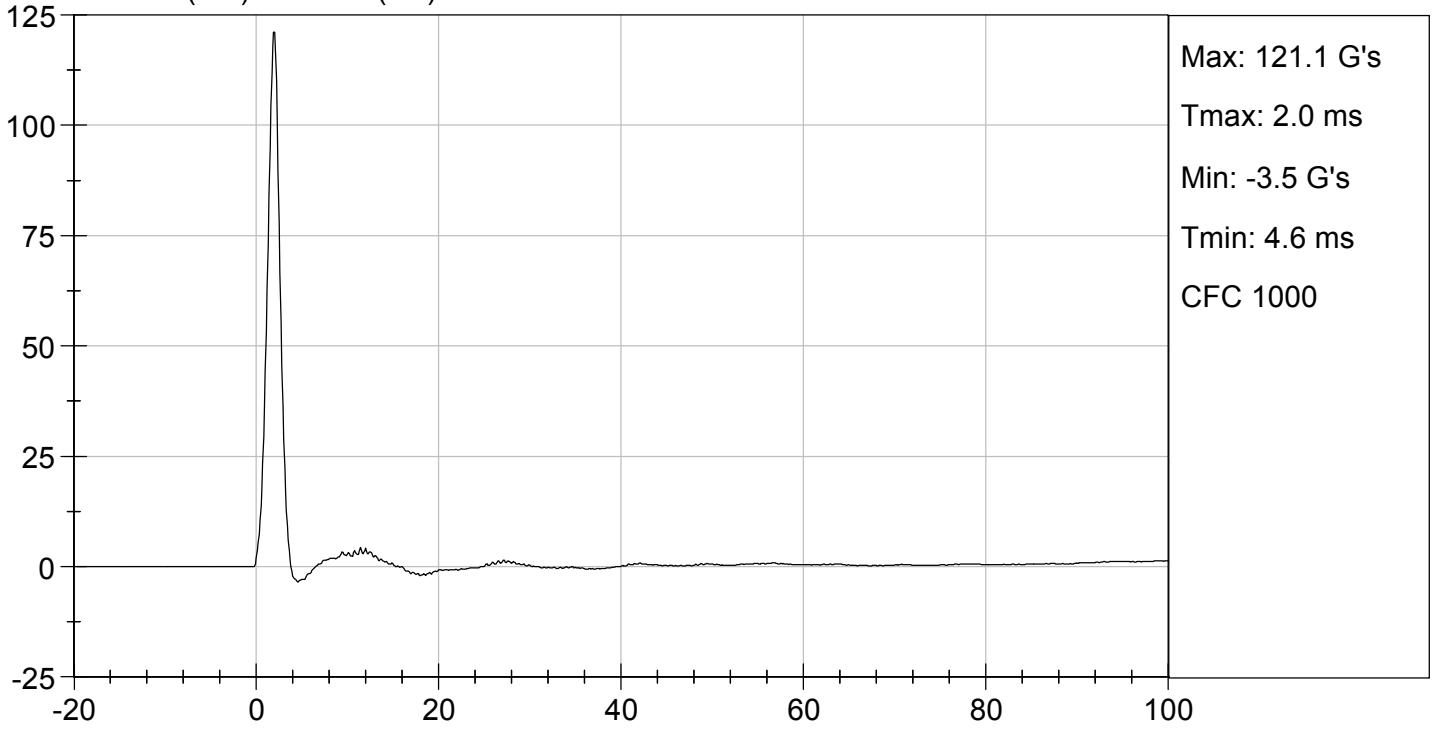
Head X (G's) vs TIME (ms)



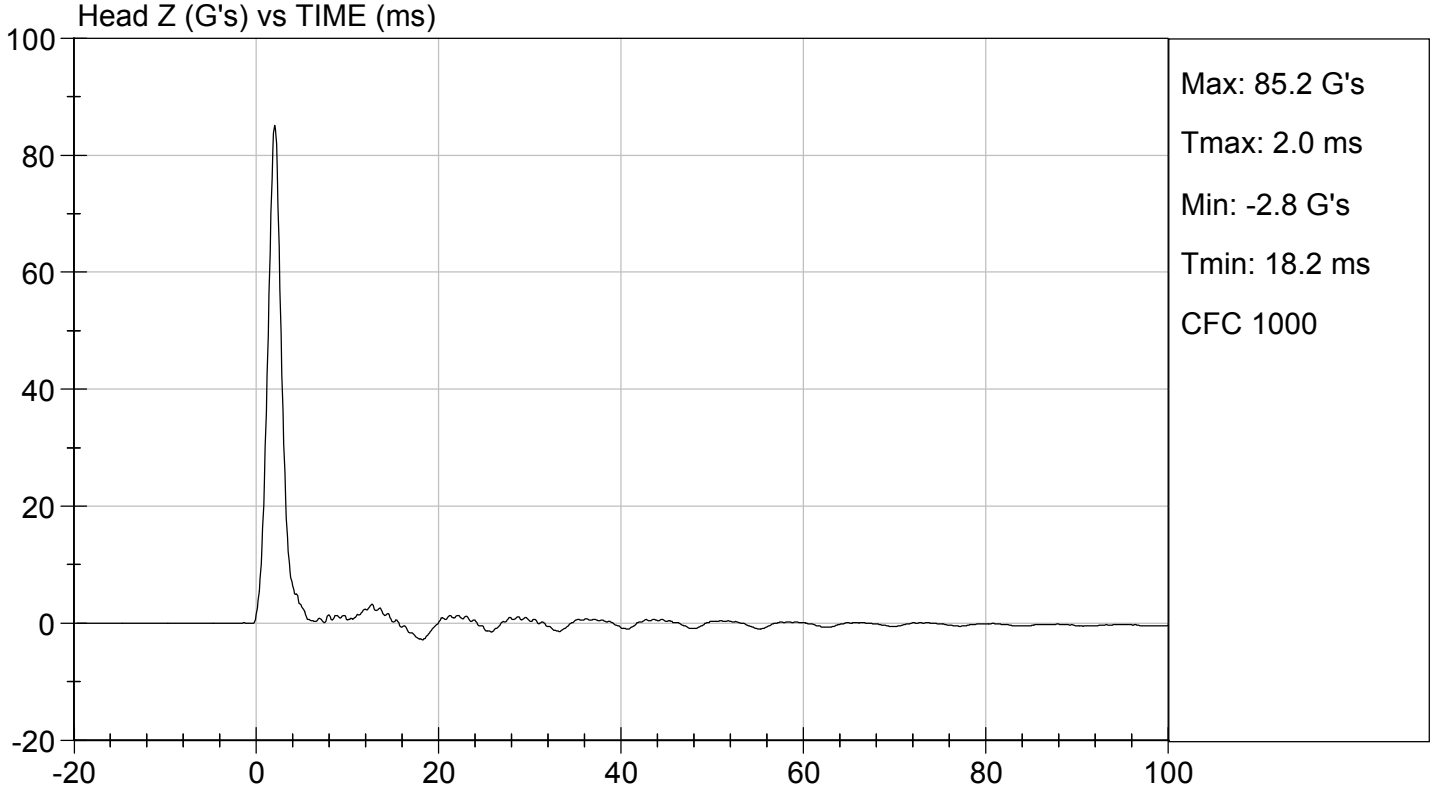
TEST DESC: HEAD DROP

TEST DATE: 05/14/2019
TEST #: D191591

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



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



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191592

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	33	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.32	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.36	Pass
	14 ms	m/s	-3.20 to -3.70	-3.55	Pass
	17 ms	m/s	>= -3.70	-3.31	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	49.2	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	59.2	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	59.2	Pass
			Overall Results		Pass

Danielle Redinbaugh
Laboratory Technician

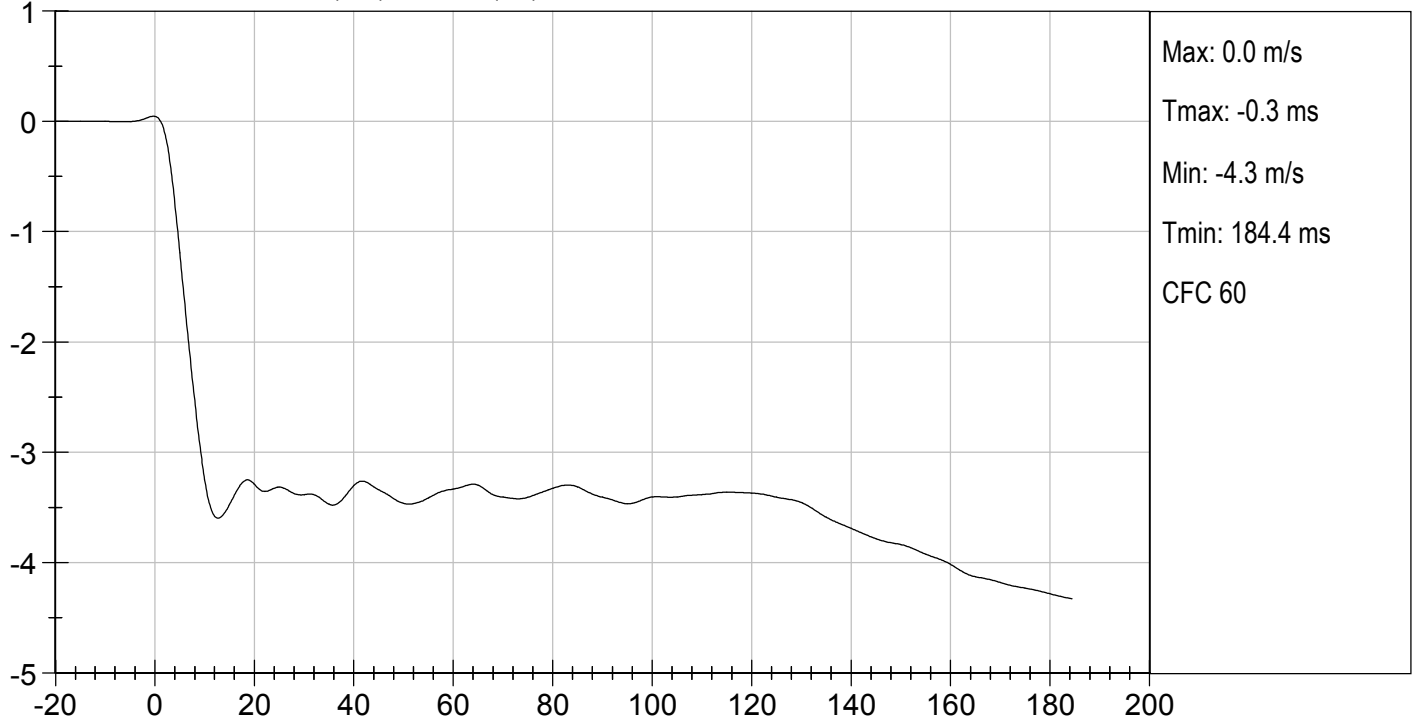
05/14/2019
Test Date

Approved By

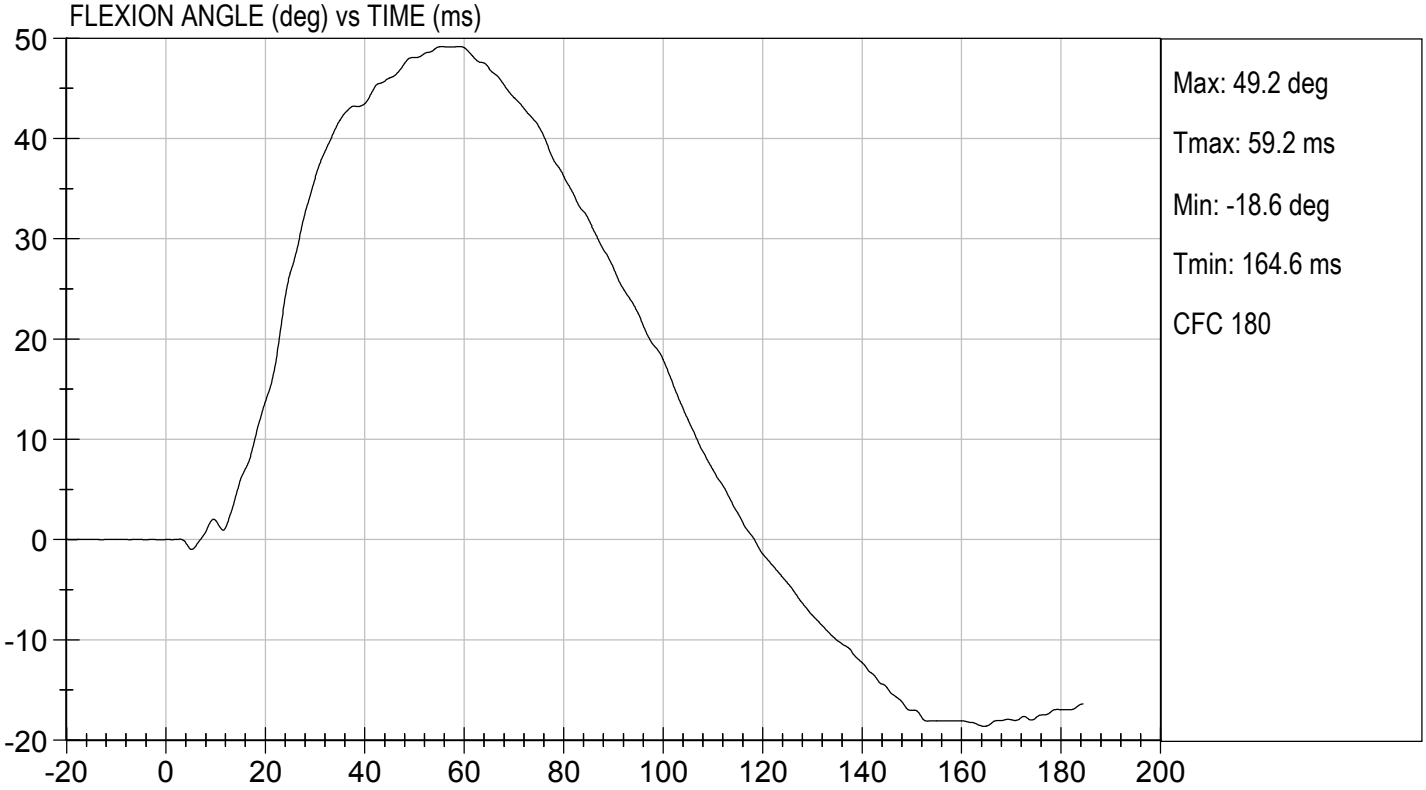
TEST DESC: NECK BENDING
VELOCITY: 10.90 ft/s, 3.32 m/s

TEST DATE: 05/14/2019
TEST #: D191592

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



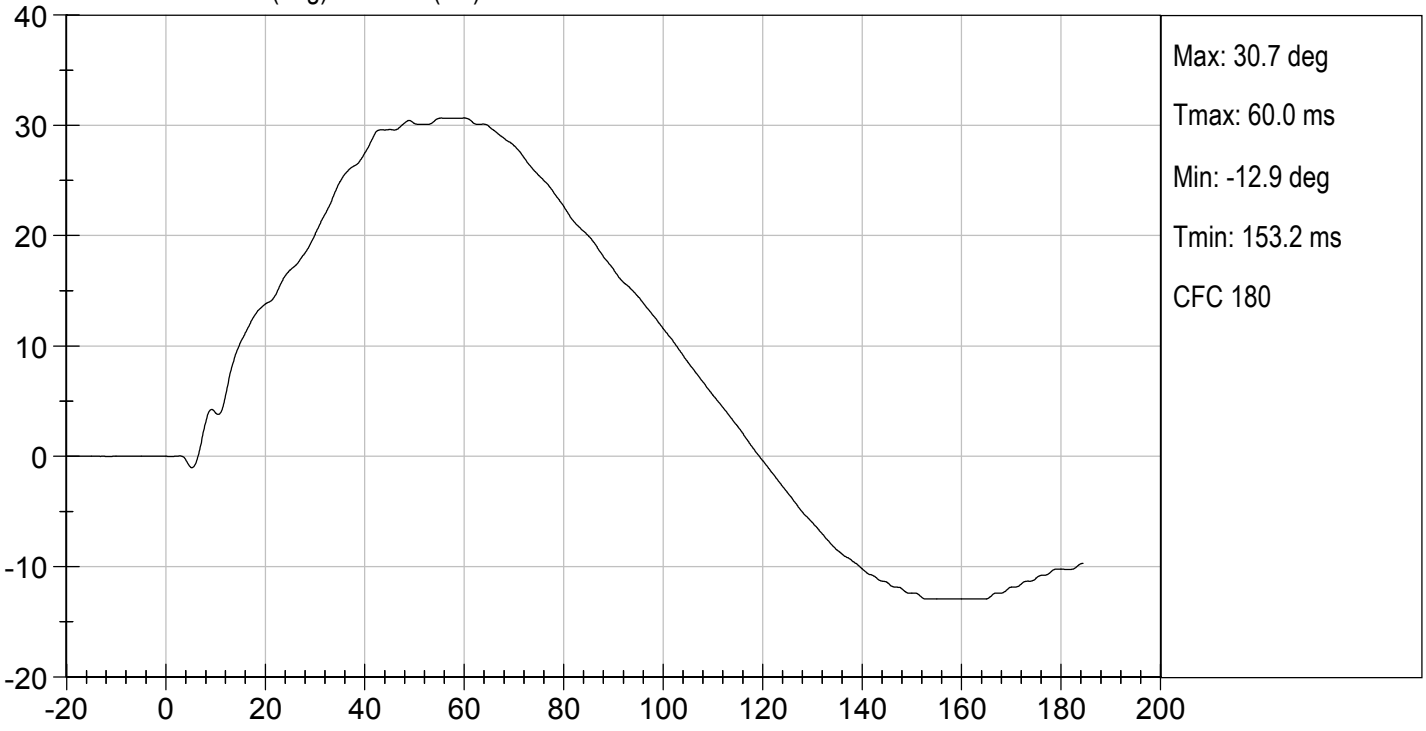
FLEXION ANGLE (deg) vs TIME (ms)



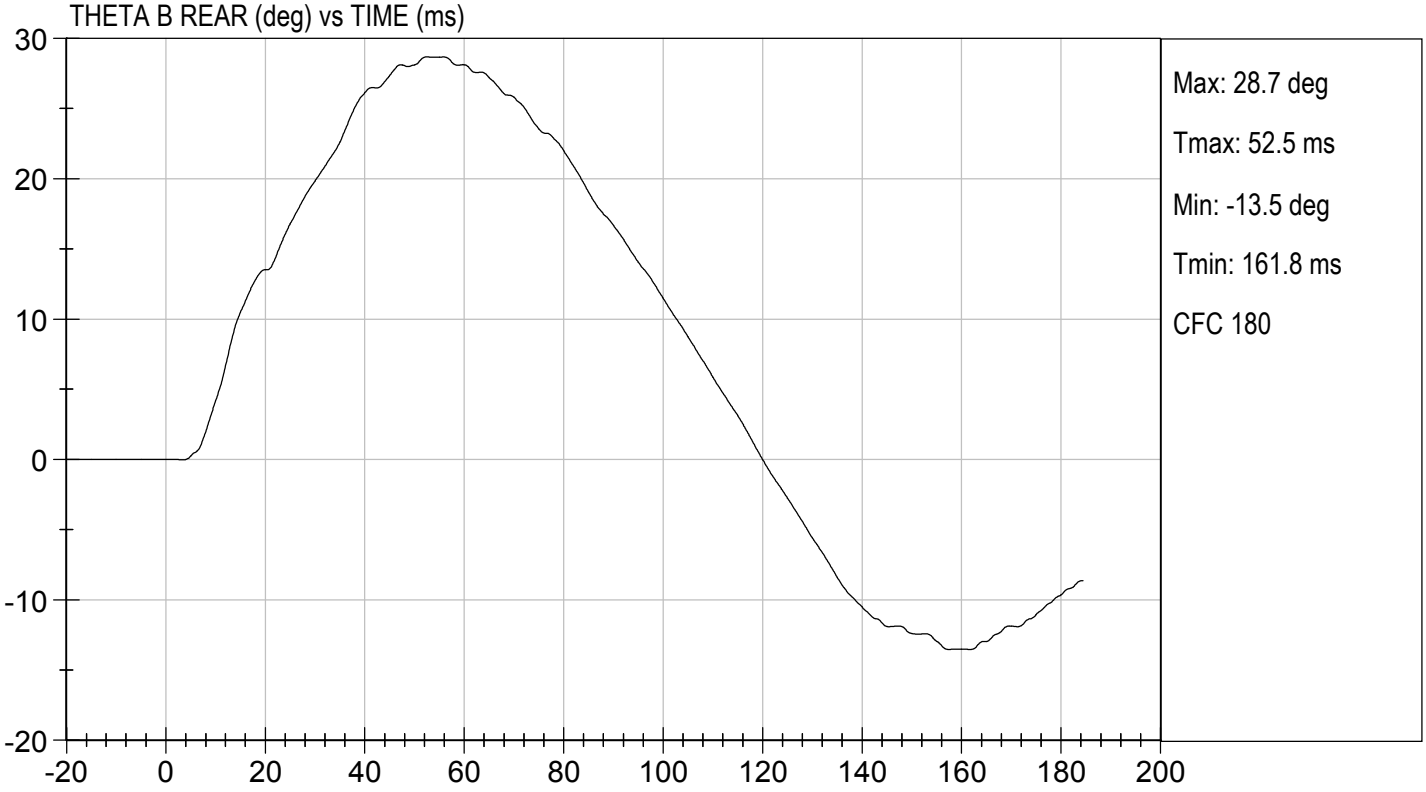
TEST DESC: NECK BENDING
VELOCITY: 10.90 ft/s, 3.32 m/s

TEST DATE: 05/14/2019
TEST #: D191592

THETA A FRONT (deg) vs TIME (ms)

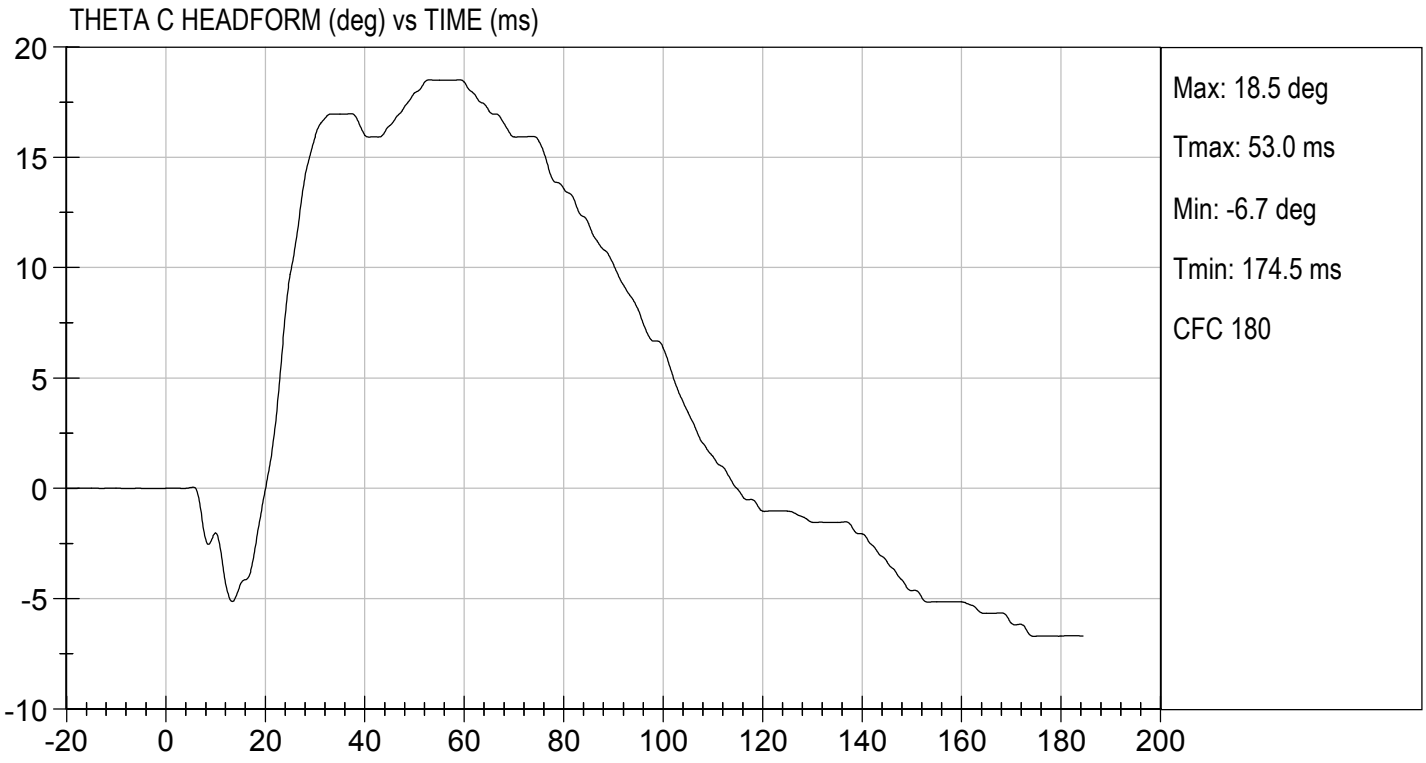


THETA B REAR (deg) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 10.90 ft/s, 3.32 m/s

TEST DATE: 05/14/2019
TEST #: D191592



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D19AP3

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	33	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.2	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	8.4	Pass
		Overall Test Results		Pass

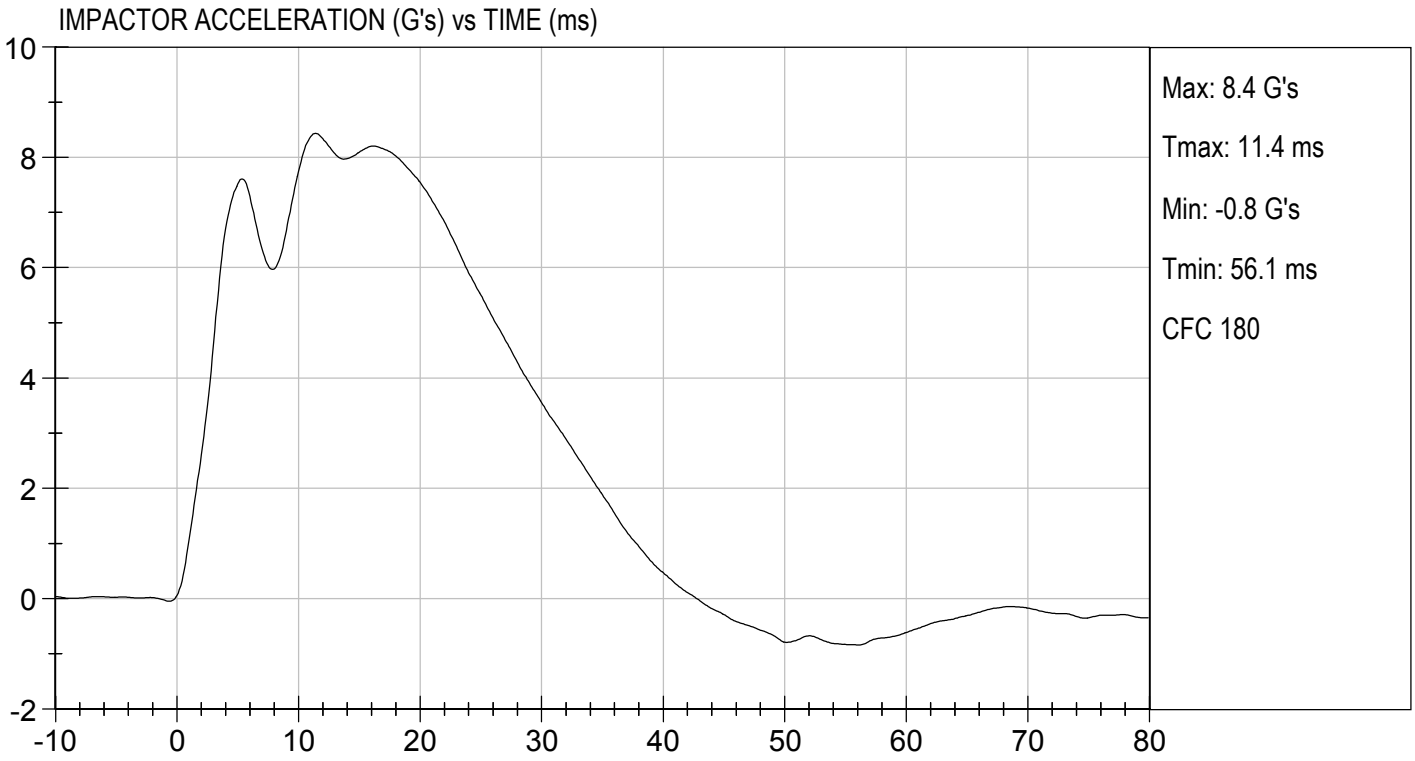
Danielle Redinbaugh
Laboratory Technician

05/15/2019
Test Date

Approved By

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

TEST DATE: 05/15/2019
TEST #: D19AP3



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D19AP4

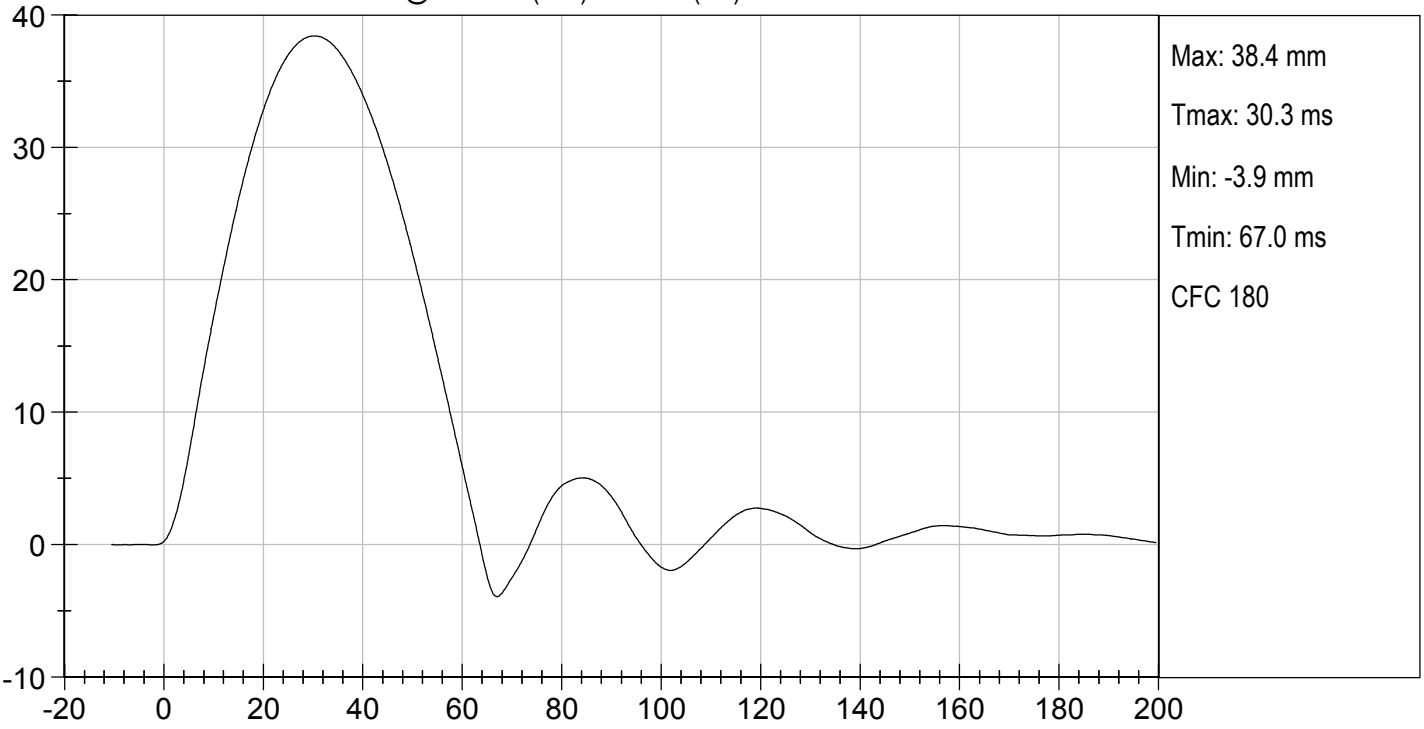
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	50.1	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

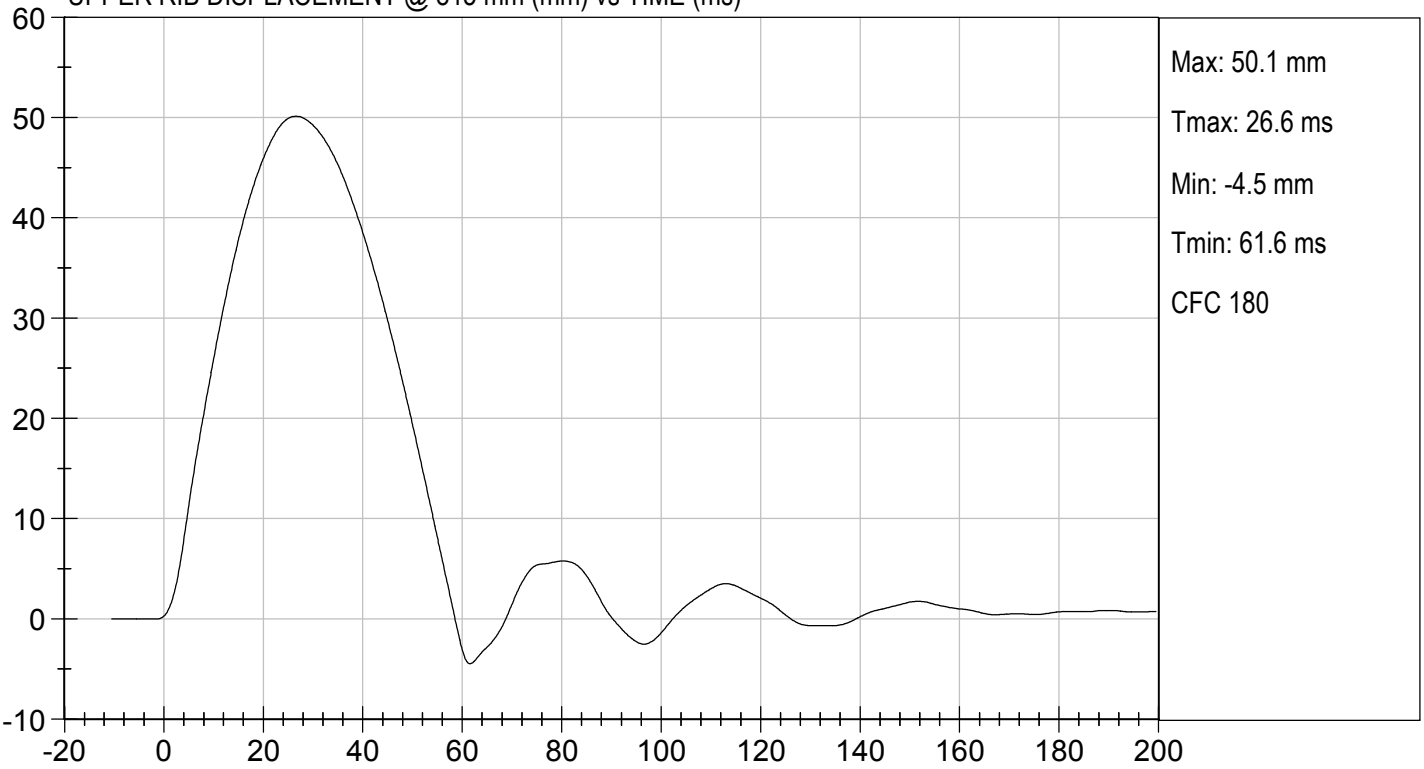
05/14/2019
Test Date

Approved By

UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D19AP5

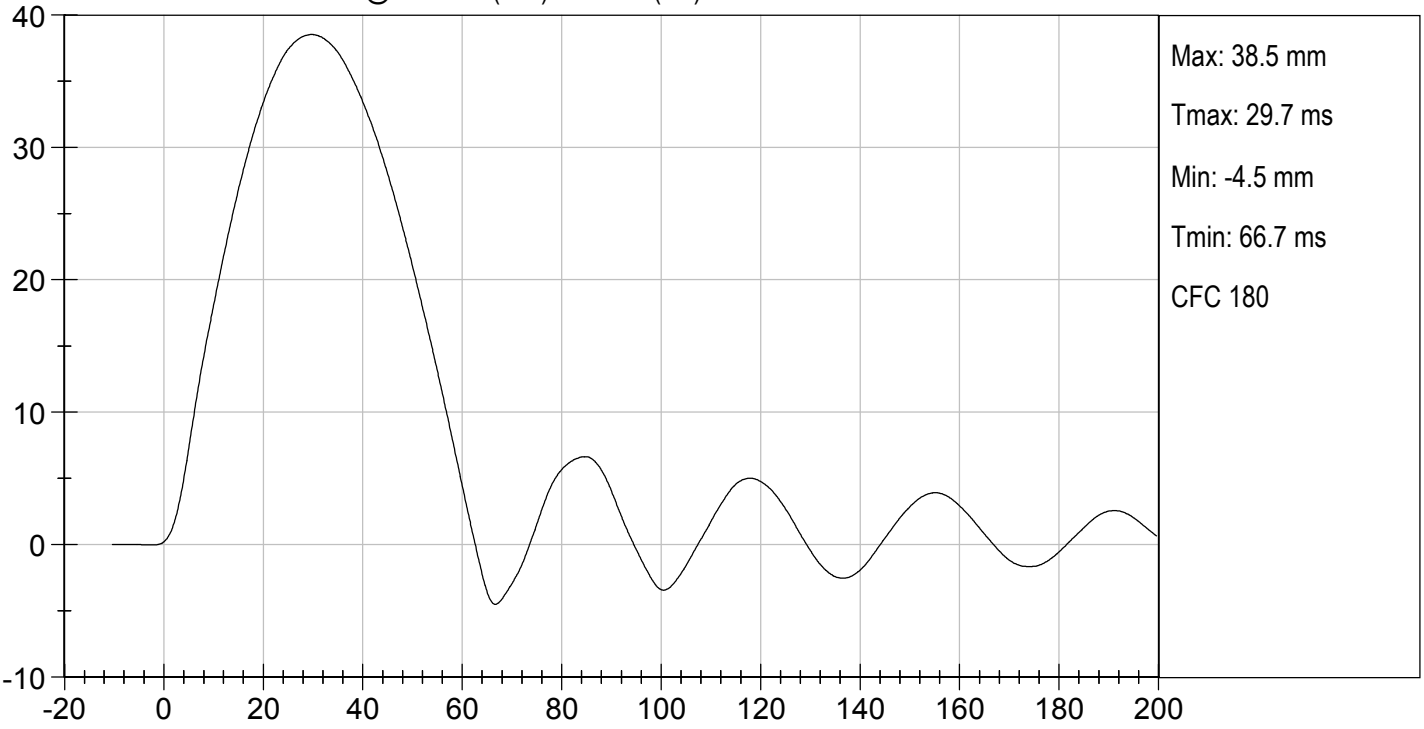
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.5	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.5	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

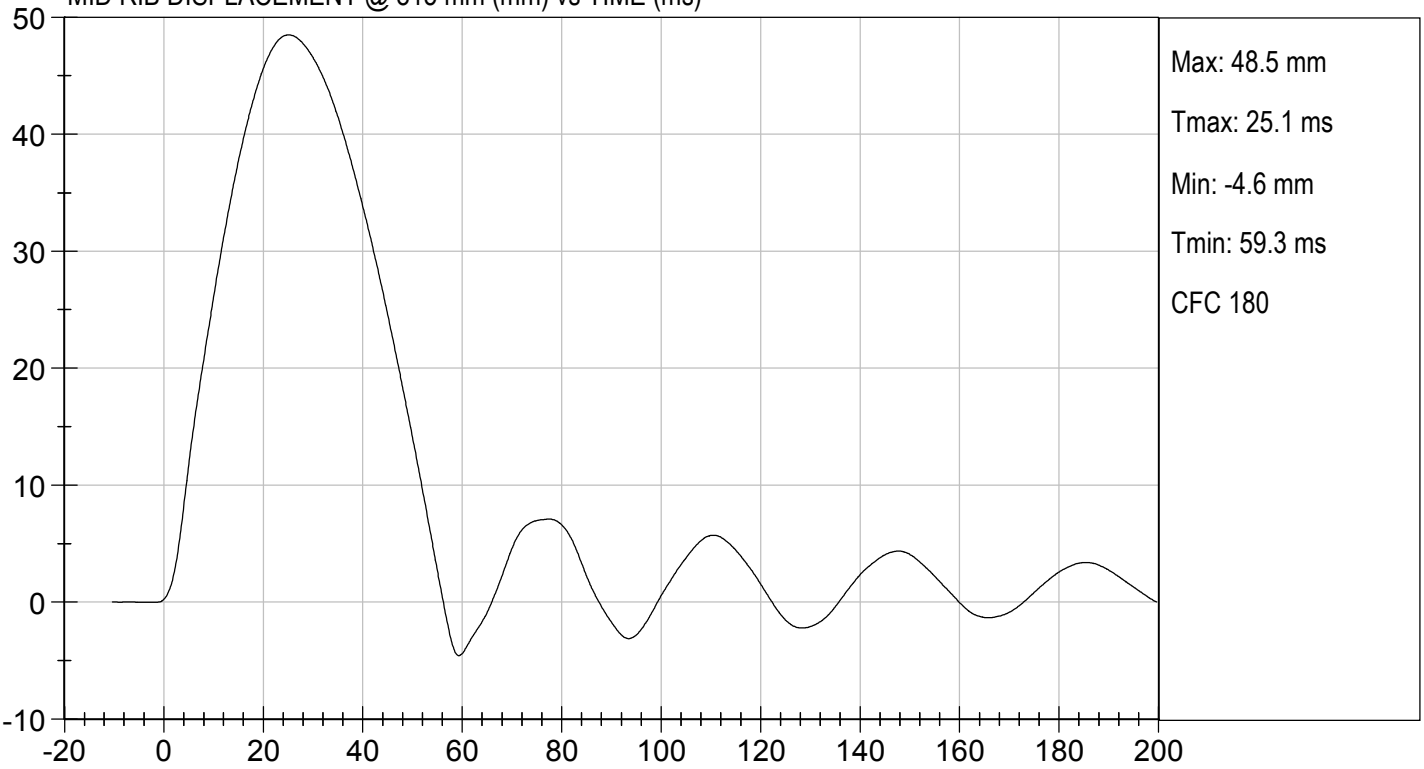
05/14/2019
Test Date

Approved By

MID RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



MID RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D19AP6

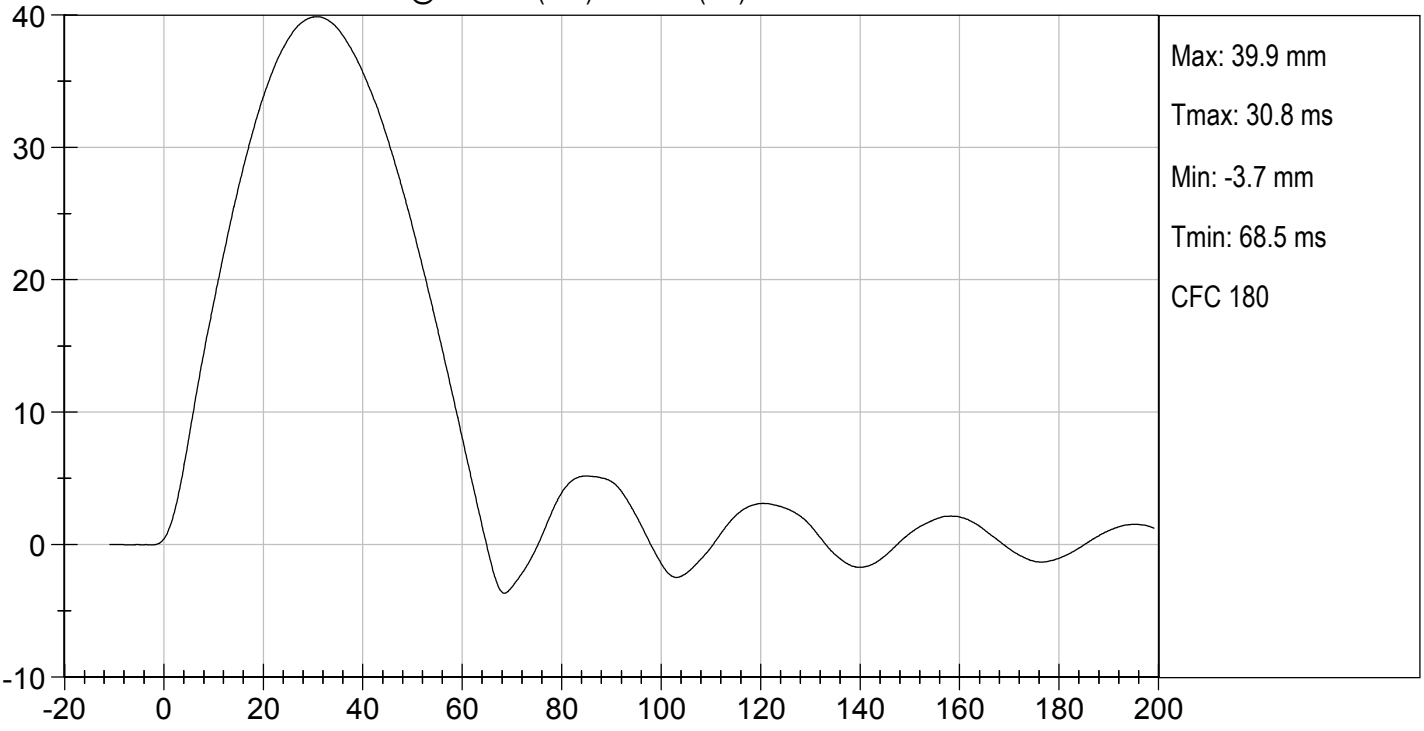
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.9	Pass
Displacement at 815 mm	mm	46.0 to 51.0	50.6	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

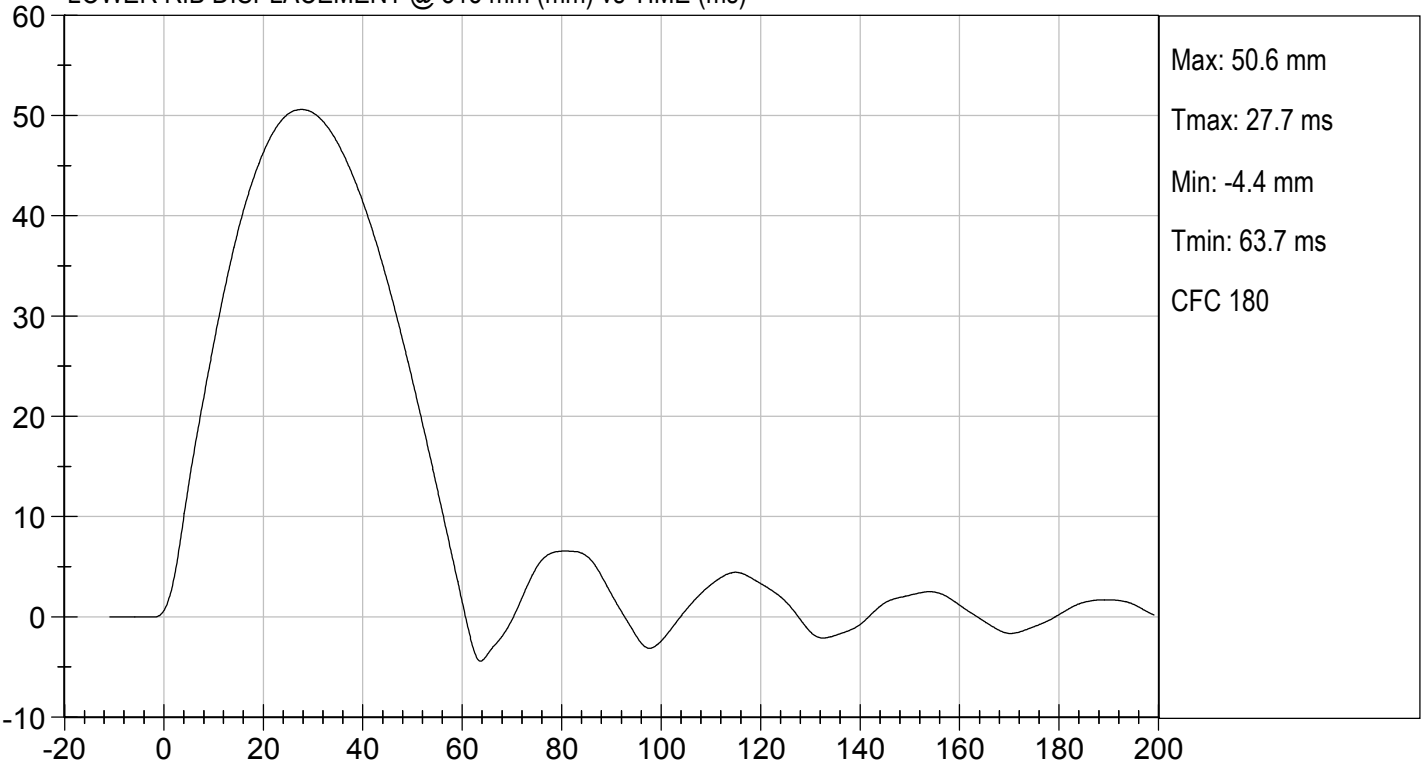
05/14/2019
Test Date

Approved By

LOWER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191597

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	32	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impactor Force	N	4000 to 4800	4295	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.5	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2292	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.5	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

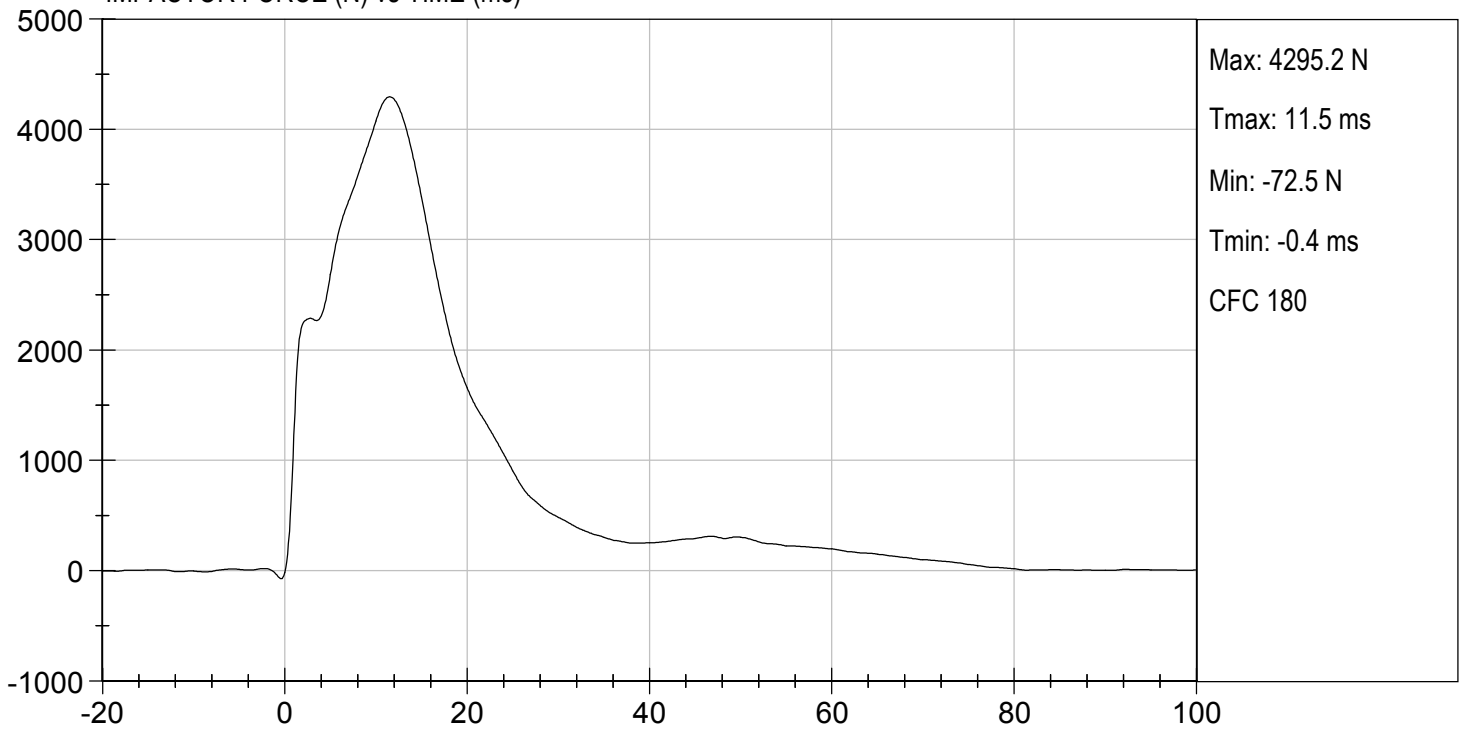
05/13/2019
Test Date

Approved By

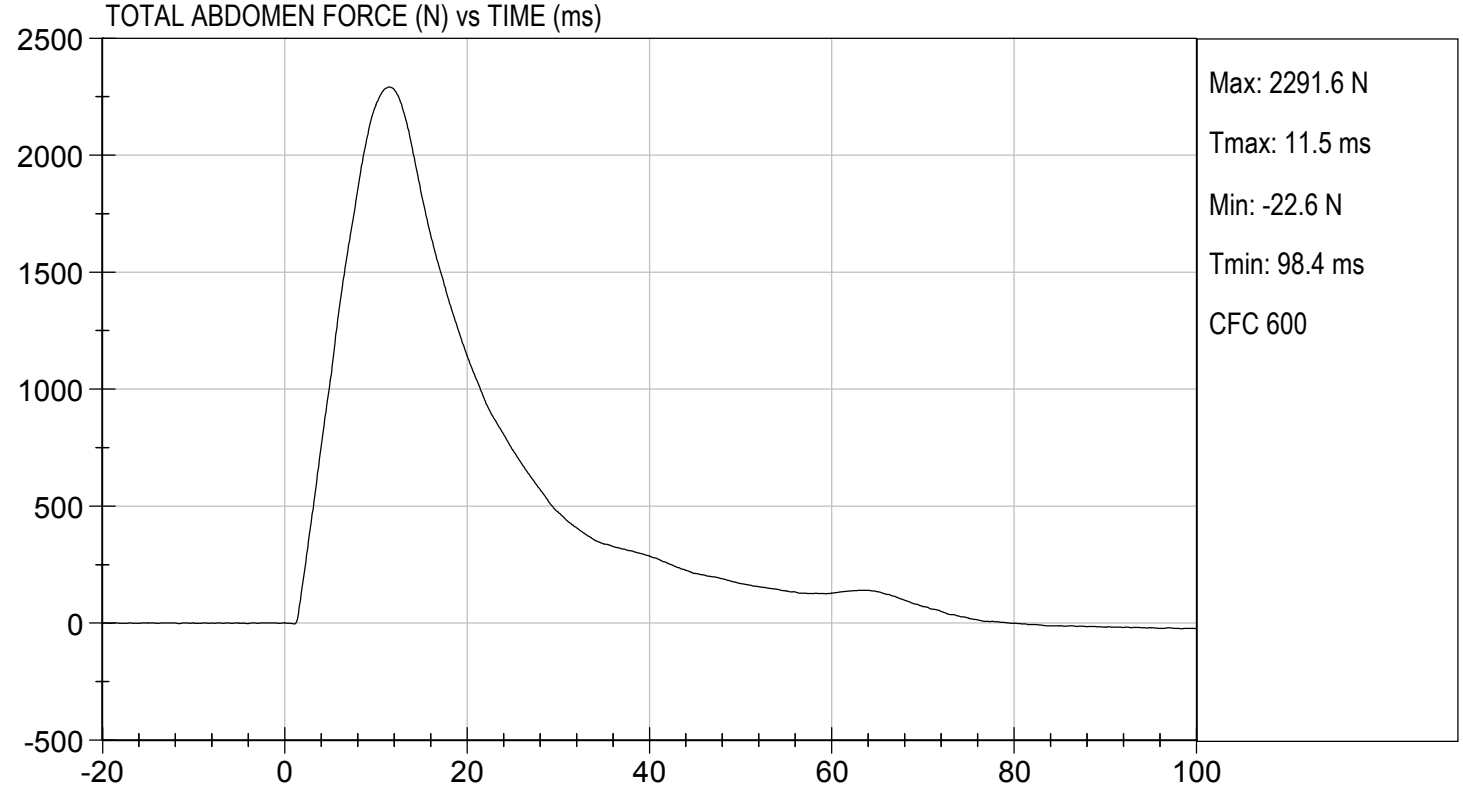
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 05/13/2019
TEST #: D191597

IMPACTOR FORCE (N) vs TIME (ms)



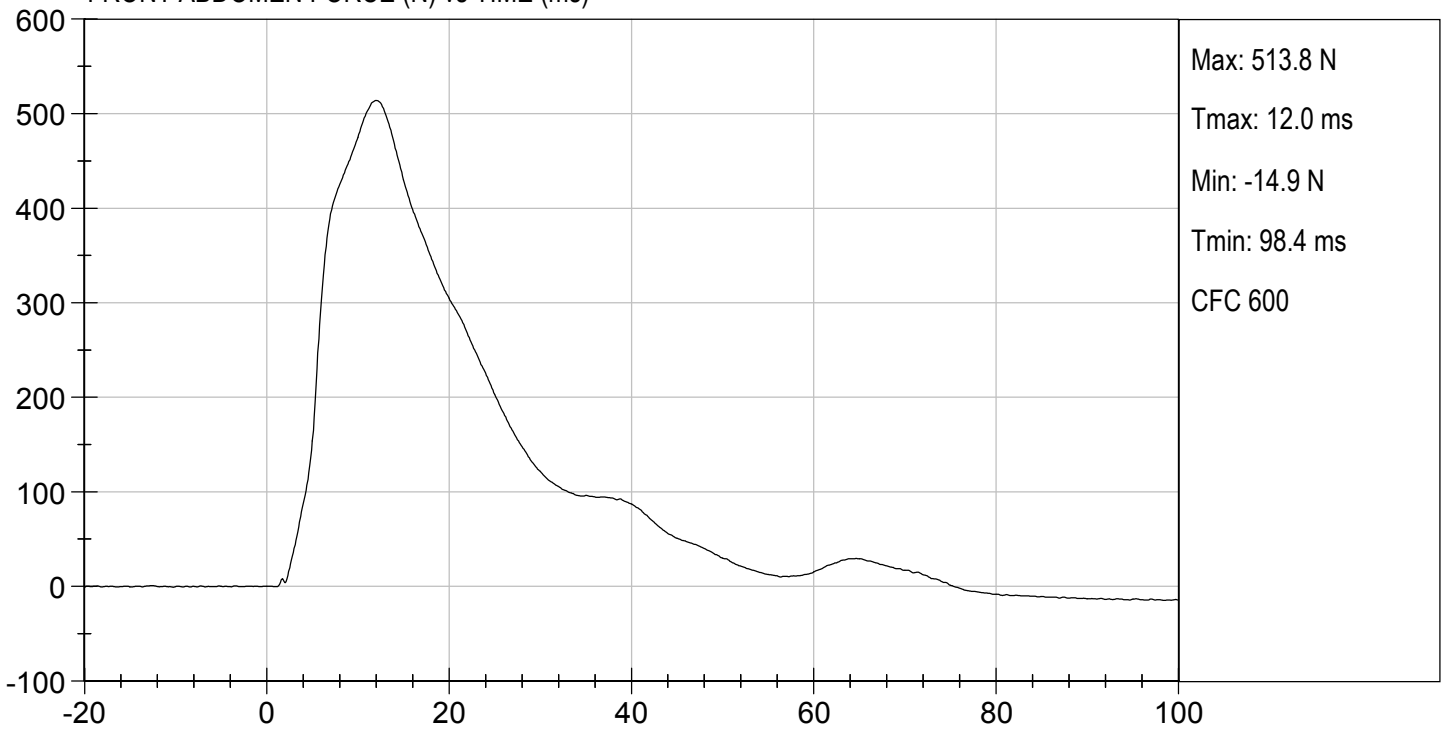
TOTAL ABDOMEN FORCE (N) vs TIME (ms)



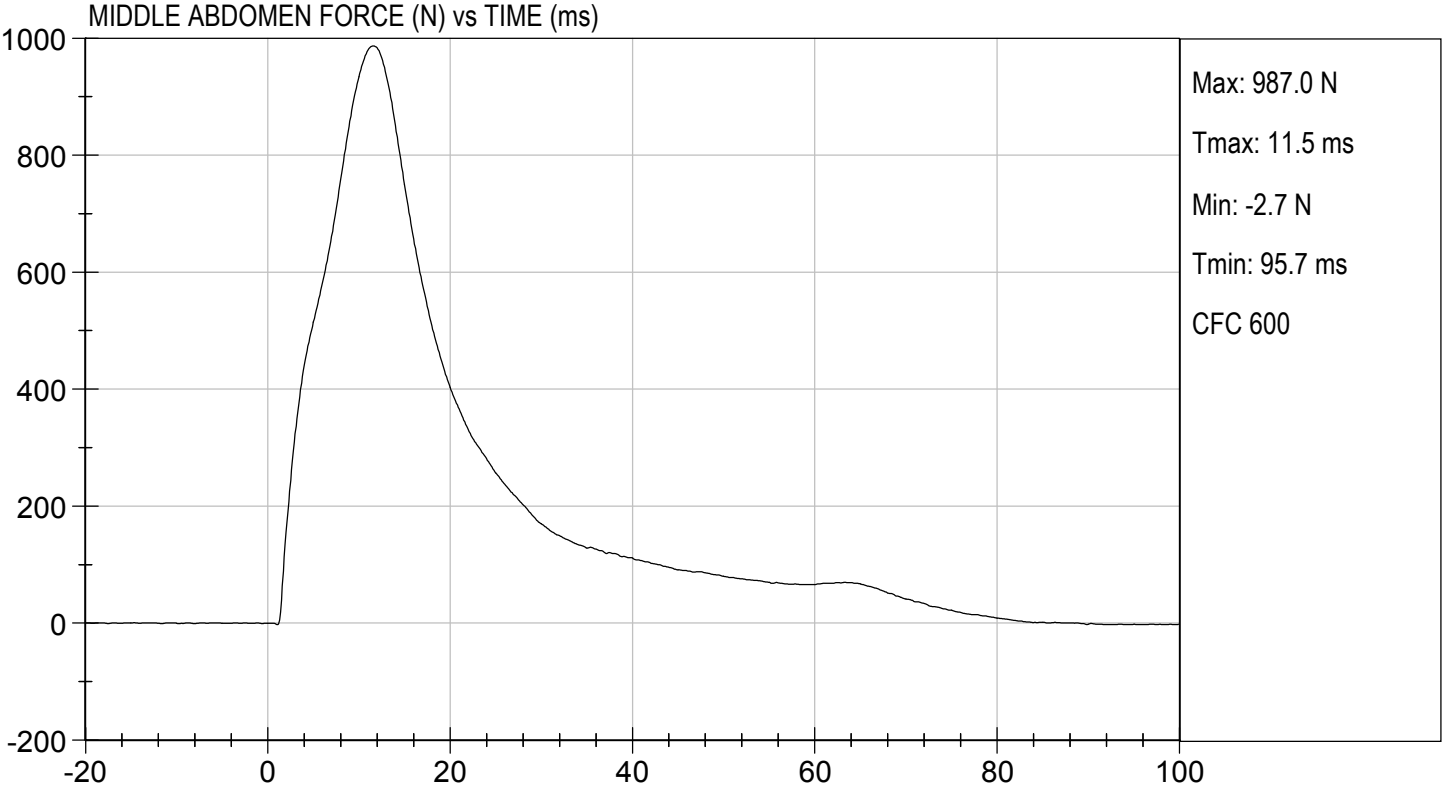
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 05/13/2019
TEST #: D191597

FRONT ABDOMEN FORCE (N) vs TIME (ms)

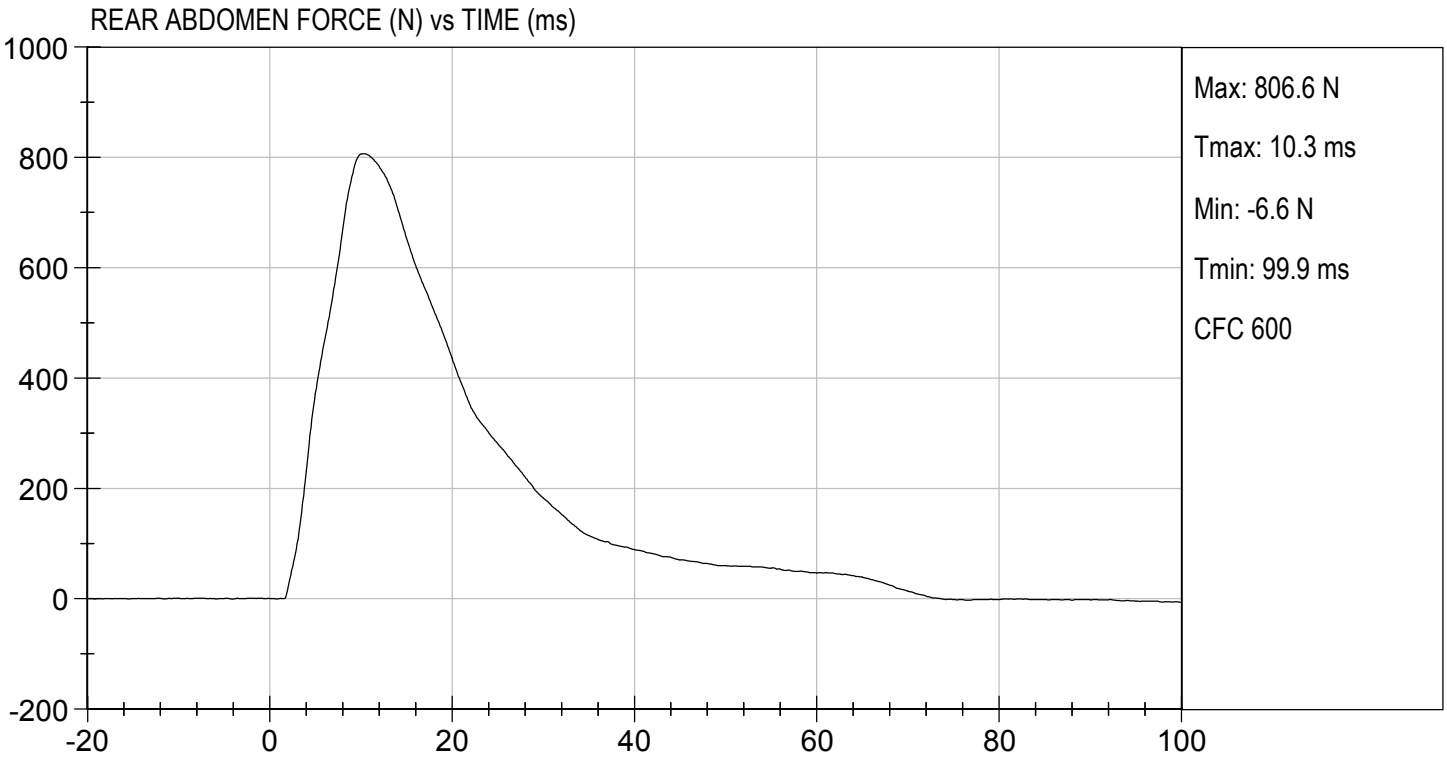


MIDDLE ABDOMEN FORCE (N) vs TIME (ms)



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

TEST DATE: 05/13/2019
TEST #: D191597



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191598

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	33	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.13	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.424	Pass
	27 ms	m/s	-6.50 to -5.80	-5.99	Pass
	30 ms	m/s	>= -6.50	-5.88	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.5	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	43.0	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	40	Pass
			Overall Results		Pass

Danielle Redinbaugh
Laboratory Technician

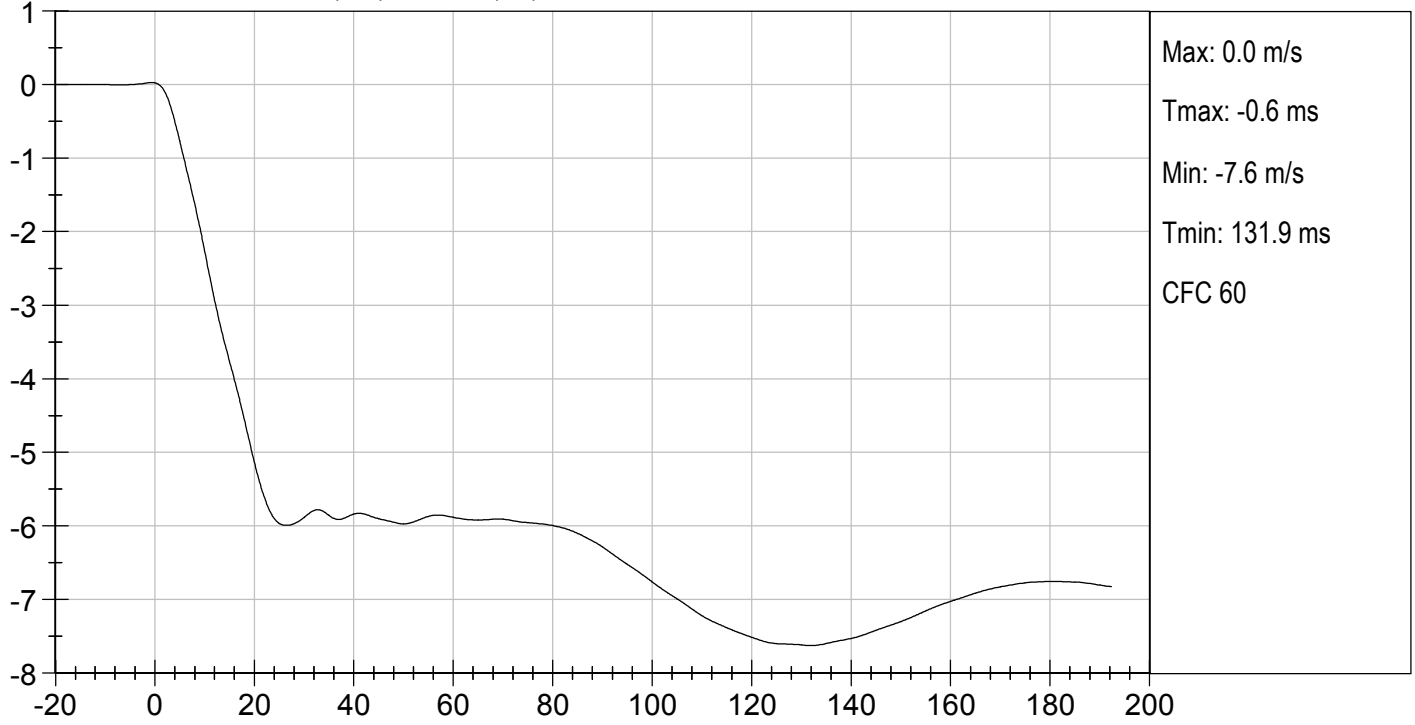
05/14/2019
Test Date

Approved By

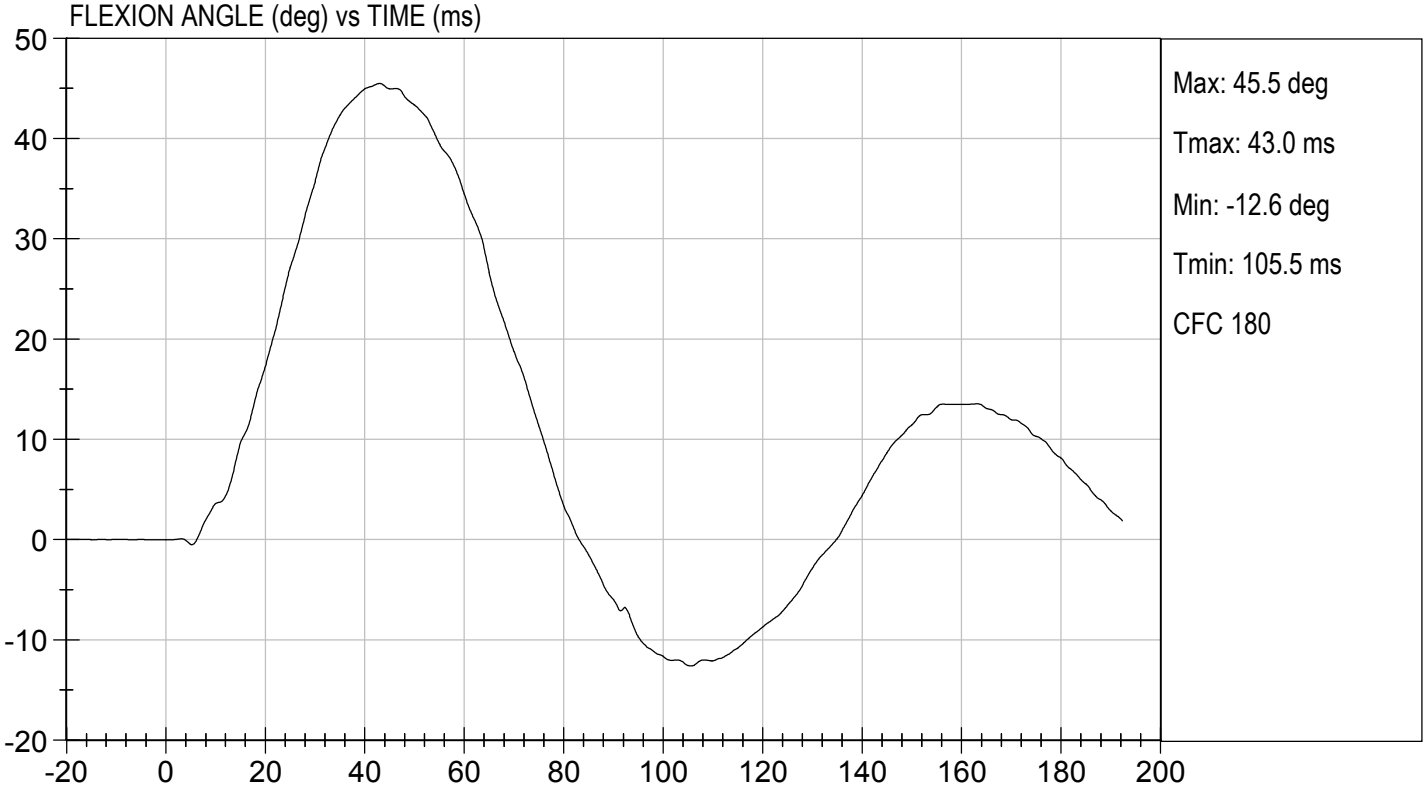
TEST DESC: LUMBAR BENDING
VELOCITY: 20.10 ft/s, 6.13 m/s

TEST DATE: 05/14/2019
TEST #: D191598

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



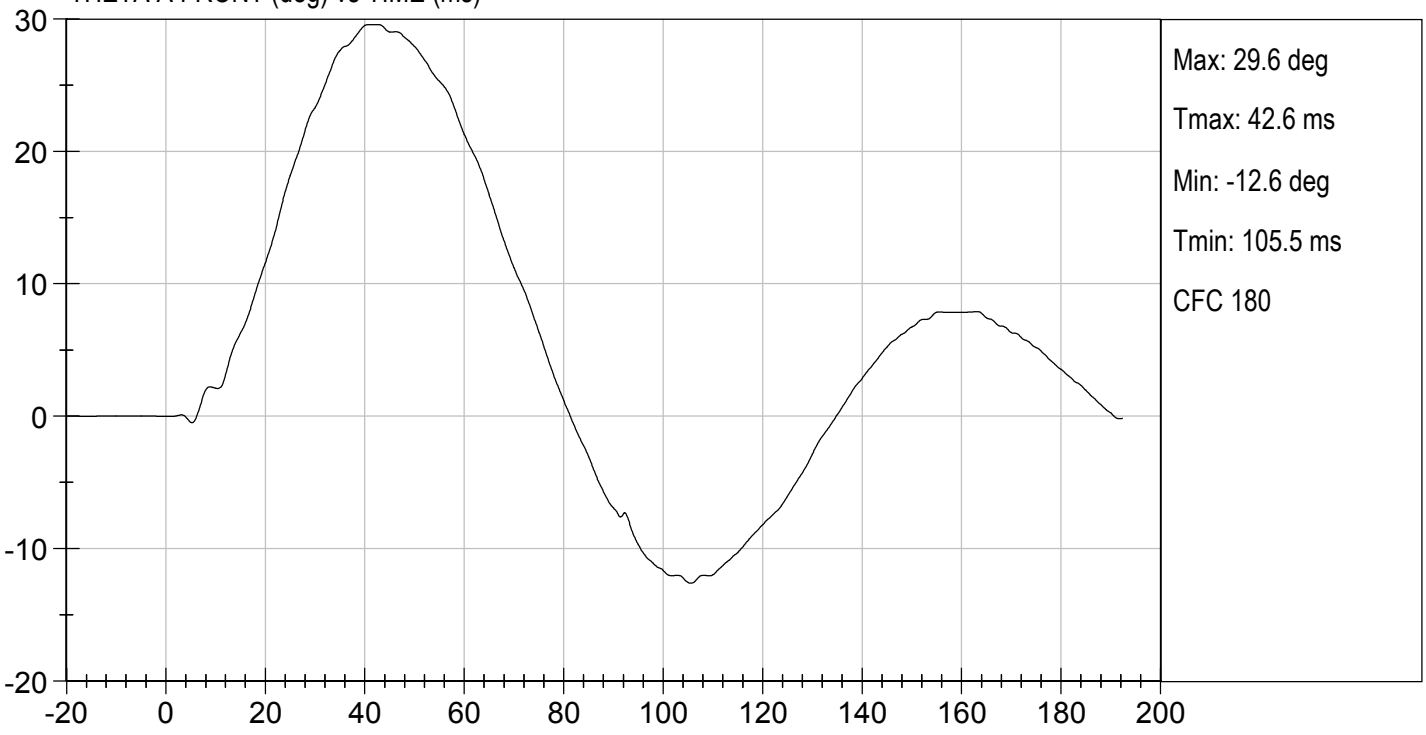
FLEXION ANGLE (deg) vs TIME (ms)



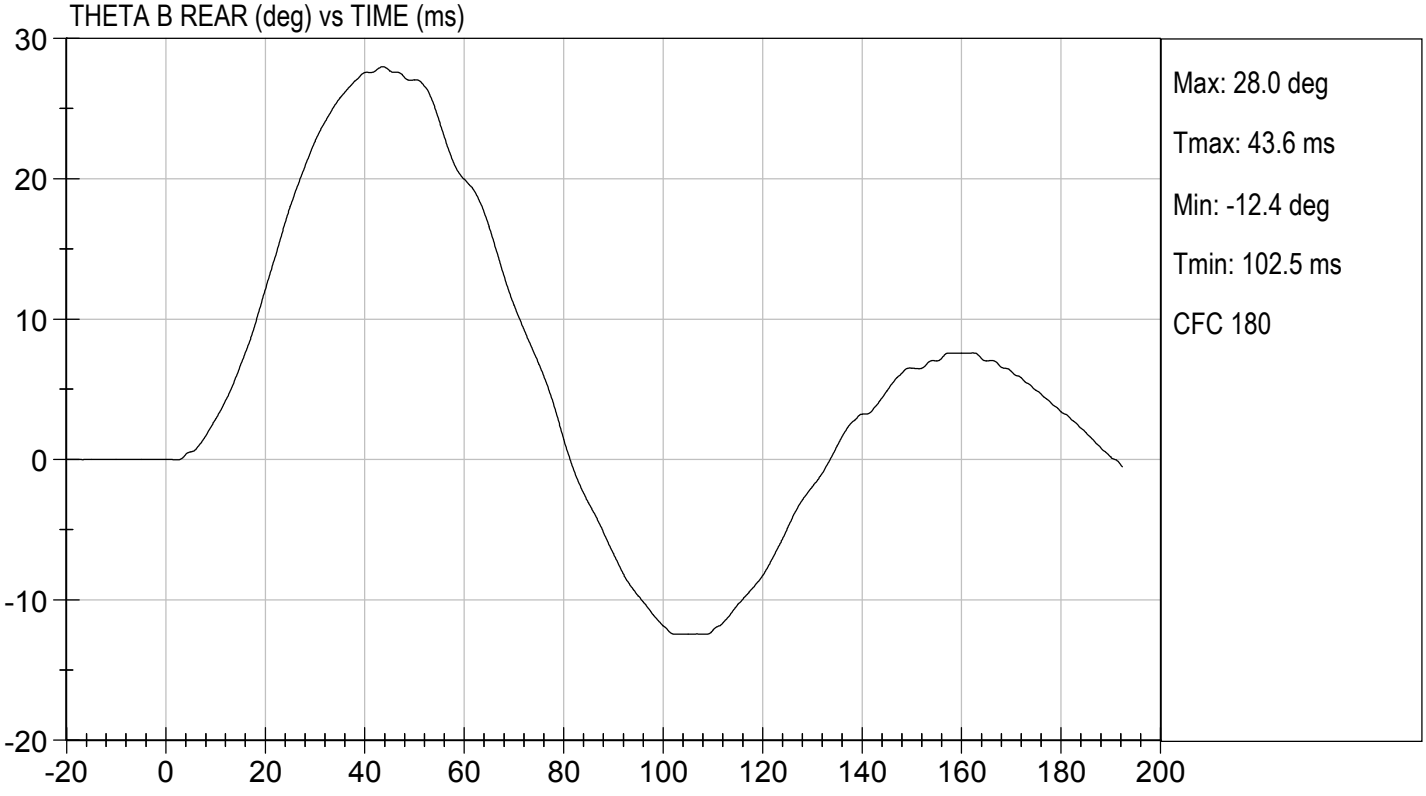
TEST DESC: LUMBAR BENDING
VELOCITY: 20.10 ft/s, 6.13 m/s

TEST DATE: 05/14/2019
TEST #: D191598

THETA A FRONT (deg) vs TIME (ms)

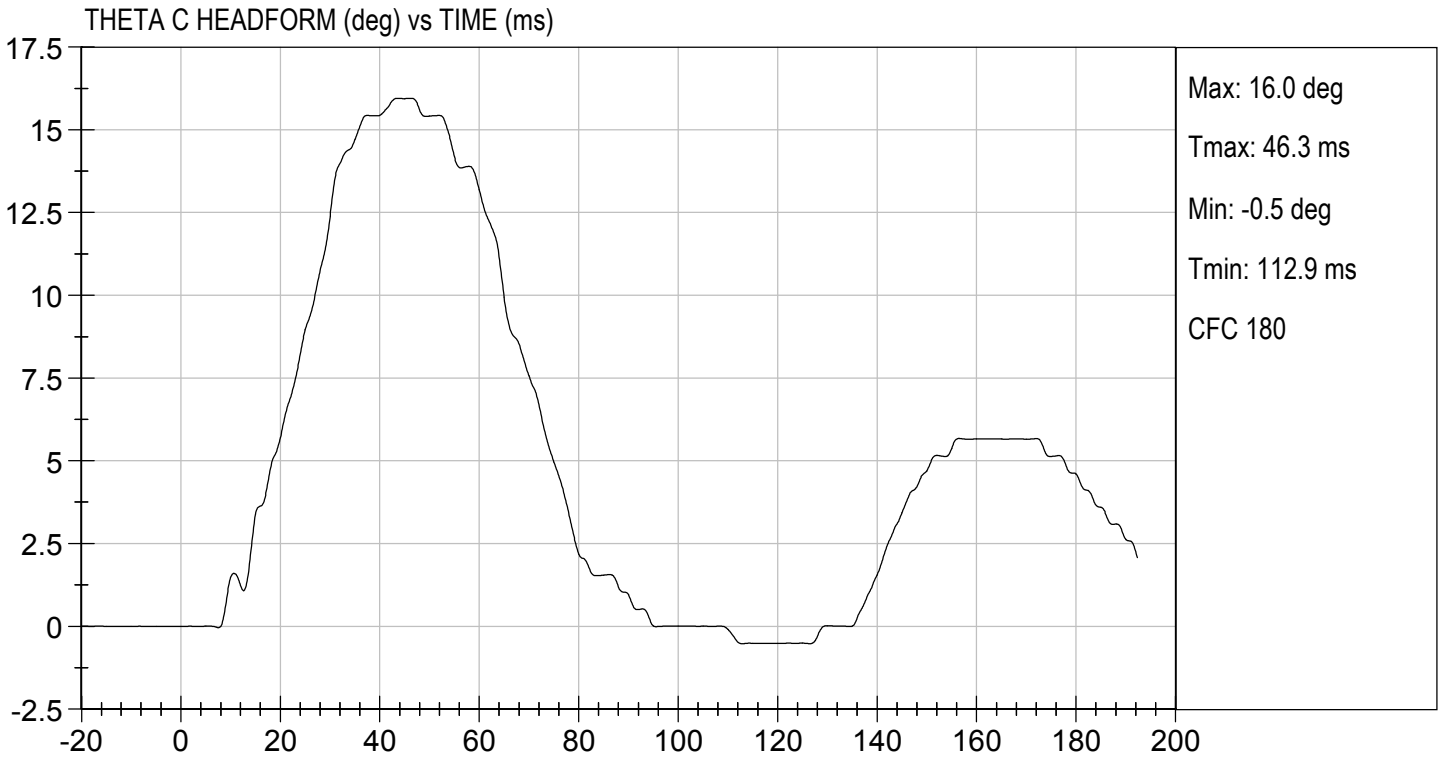


THETA B REAR (deg) vs TIME (ms)



TEST DESC: LUMBAR BENDING
VELOCITY: 20.10 ft/s, 6.13 m/s

TEST DATE: 05/14/2019
TEST #: D191598



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D19AP9

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	33	Pass
Probe Speed	m/s	4.20 to 4.40	4.39	Pass
Maximum Impactor Force	N	4700 to 5400	4994	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	12.9	Pass
Maximum Pubic Force	N	1230 to 1590	1291	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	12.2	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

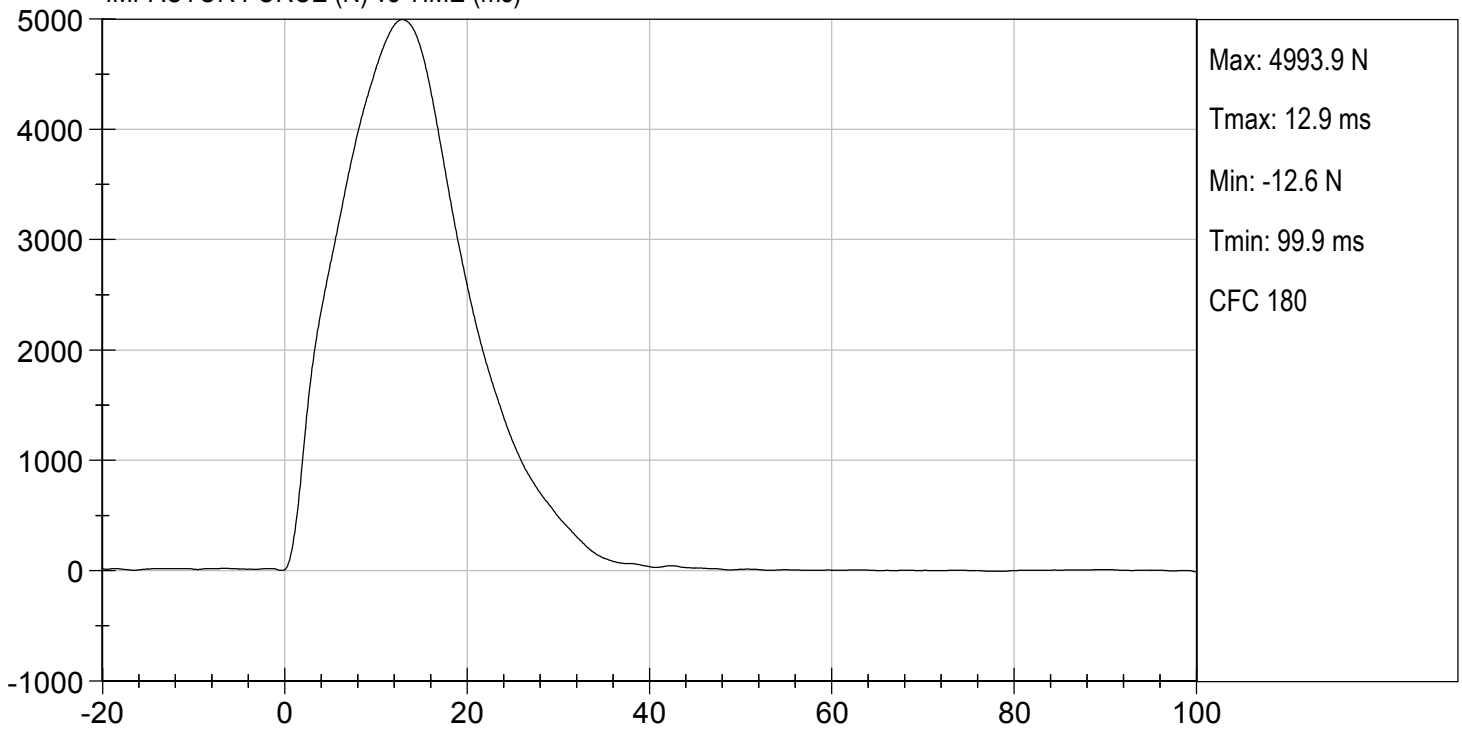
05/15/2019
Test Date

Approved By

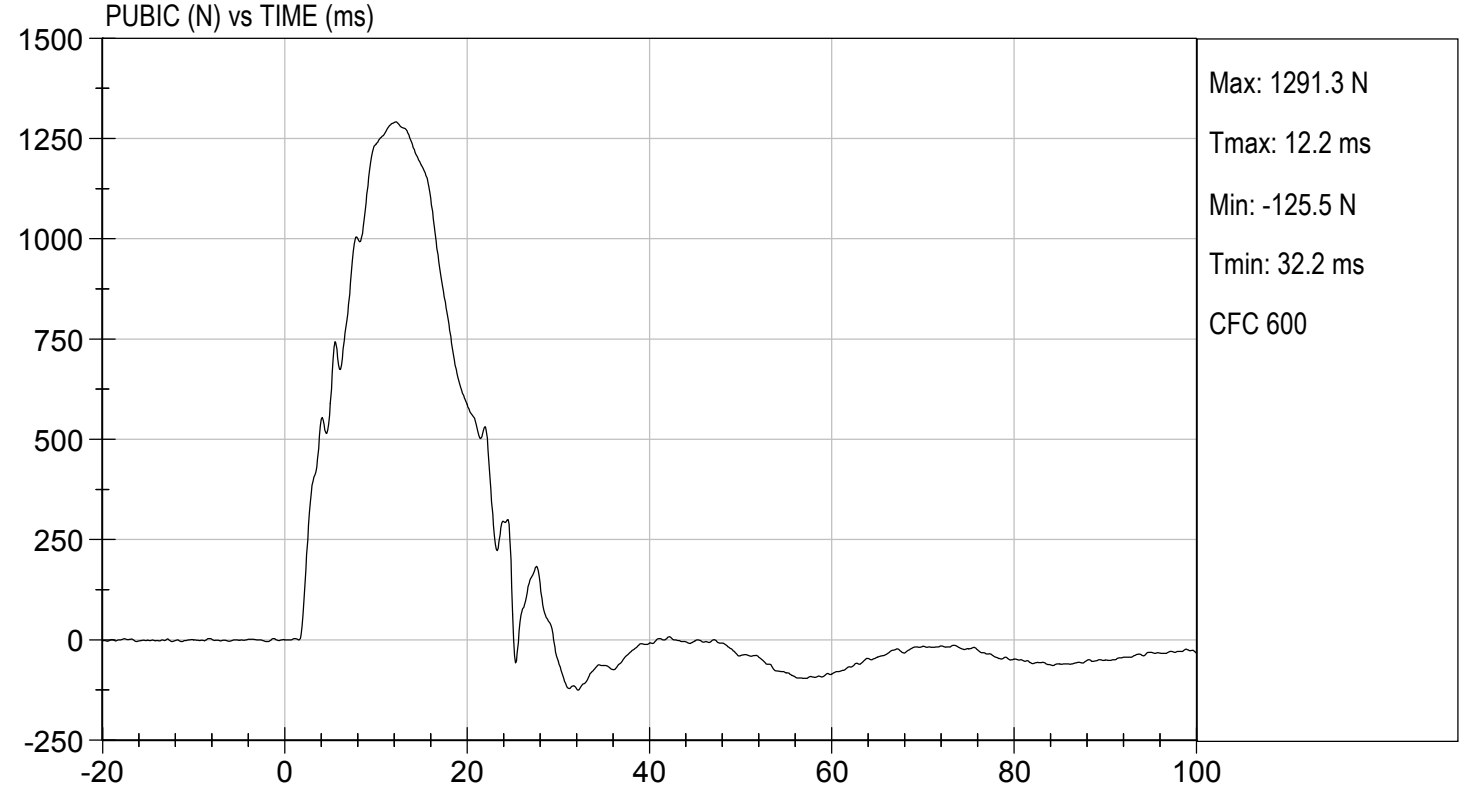
TEST DESC: PELVIS IMPACT
VELOCITY: 14.40 ft/s, 4.39 m/s

TEST DATE: 05/15/2019
TEST #: D19AP9

IMPACTOR FORCE (N) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D19AP0

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	33	Pass
Probe Speed	m/s	5.40 to 5.60	5.40	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5224	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.7	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.2	Pass
Lower Rib Displacement	mm	37.0 to 44.0	39.2	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

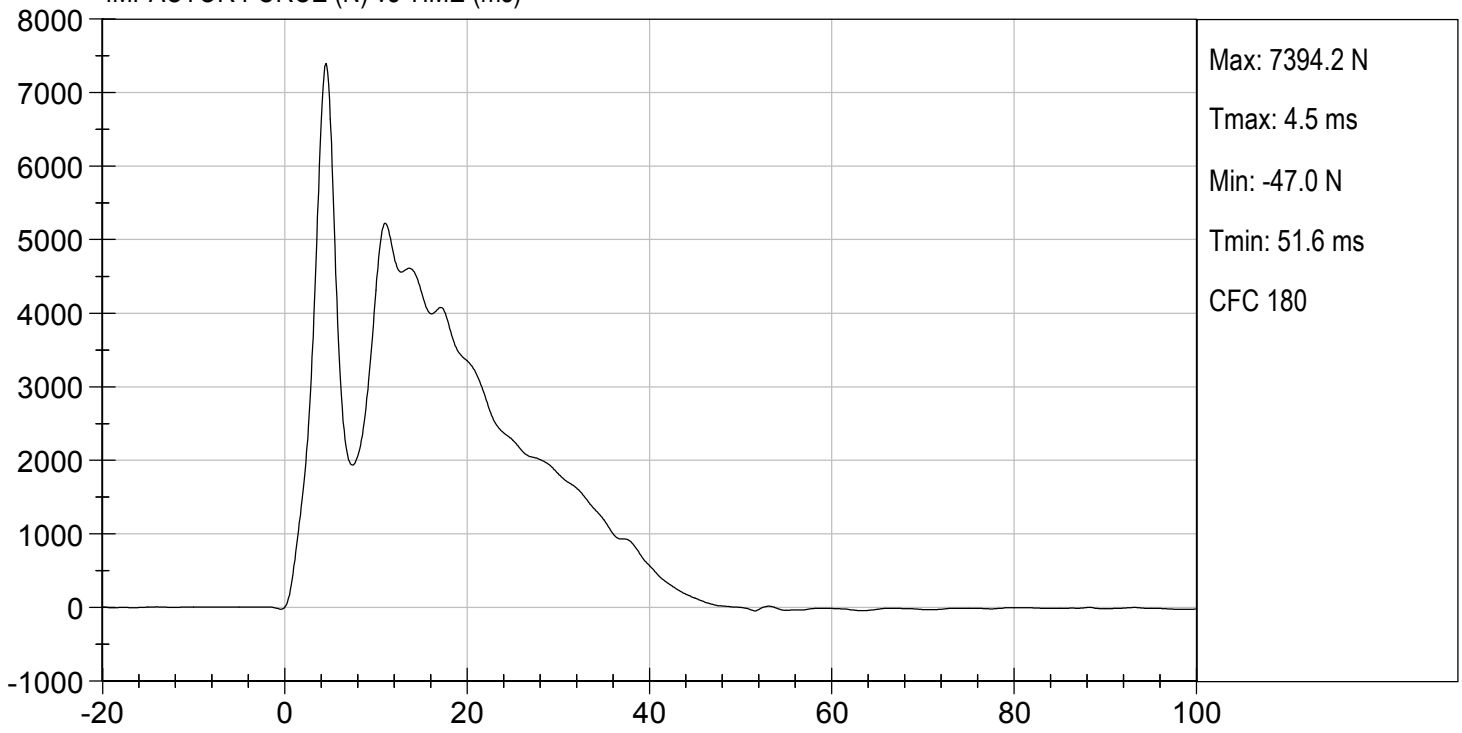
05/15/2019
Test Date

Approved By

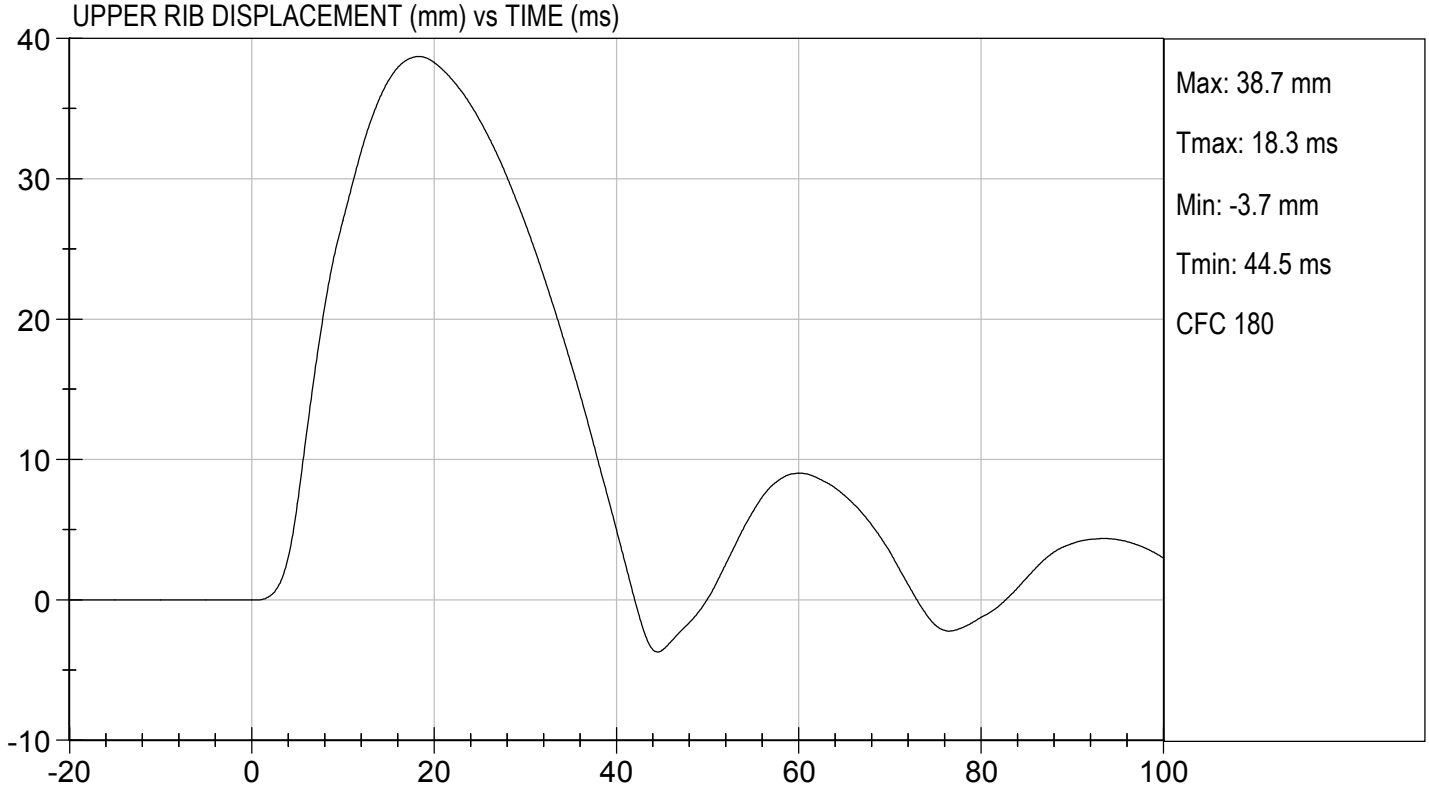
TEST DESC: THORAX IMPACT
VELOCITY: 17.73 ft/s, 5.40 m/s

TEST DATE: 05/15/2019
TEST #: D19AP0

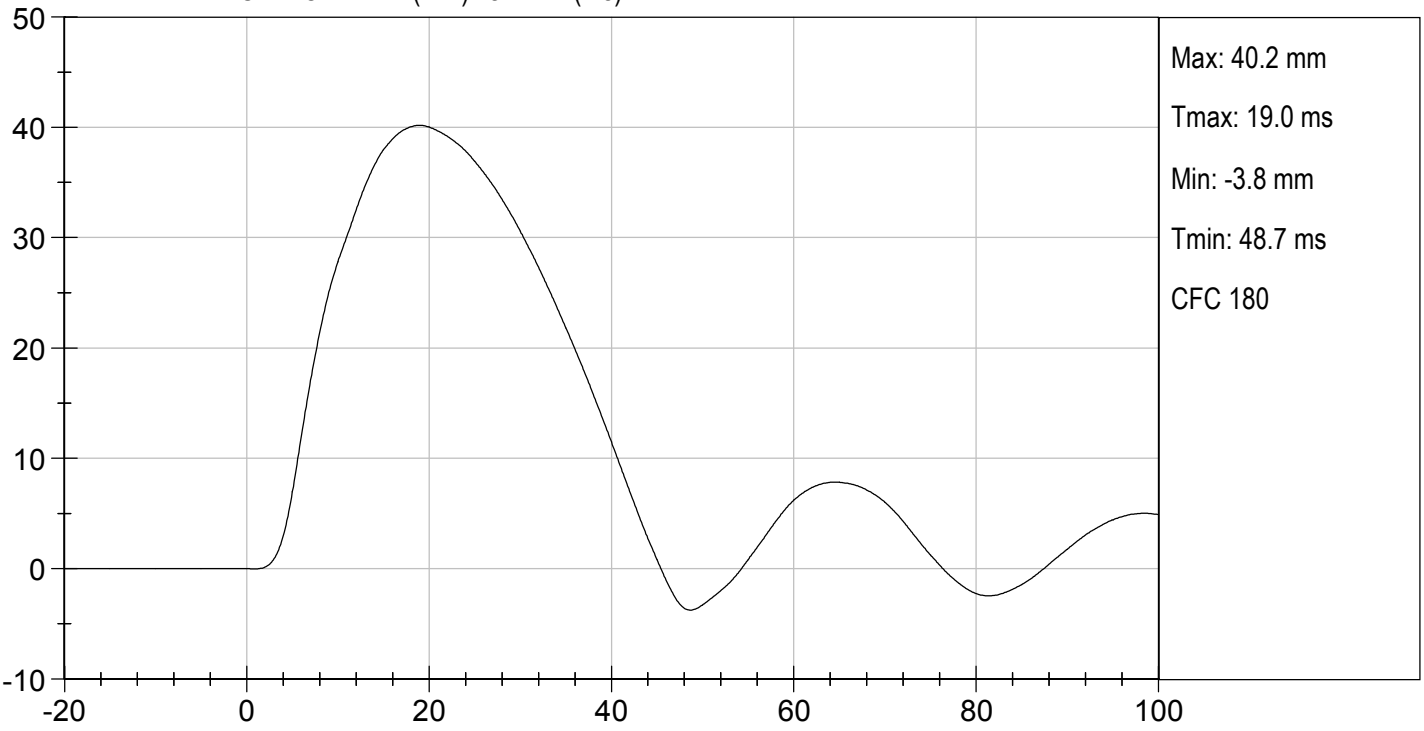
IMPACTOR FORCE (N) vs TIME (ms)



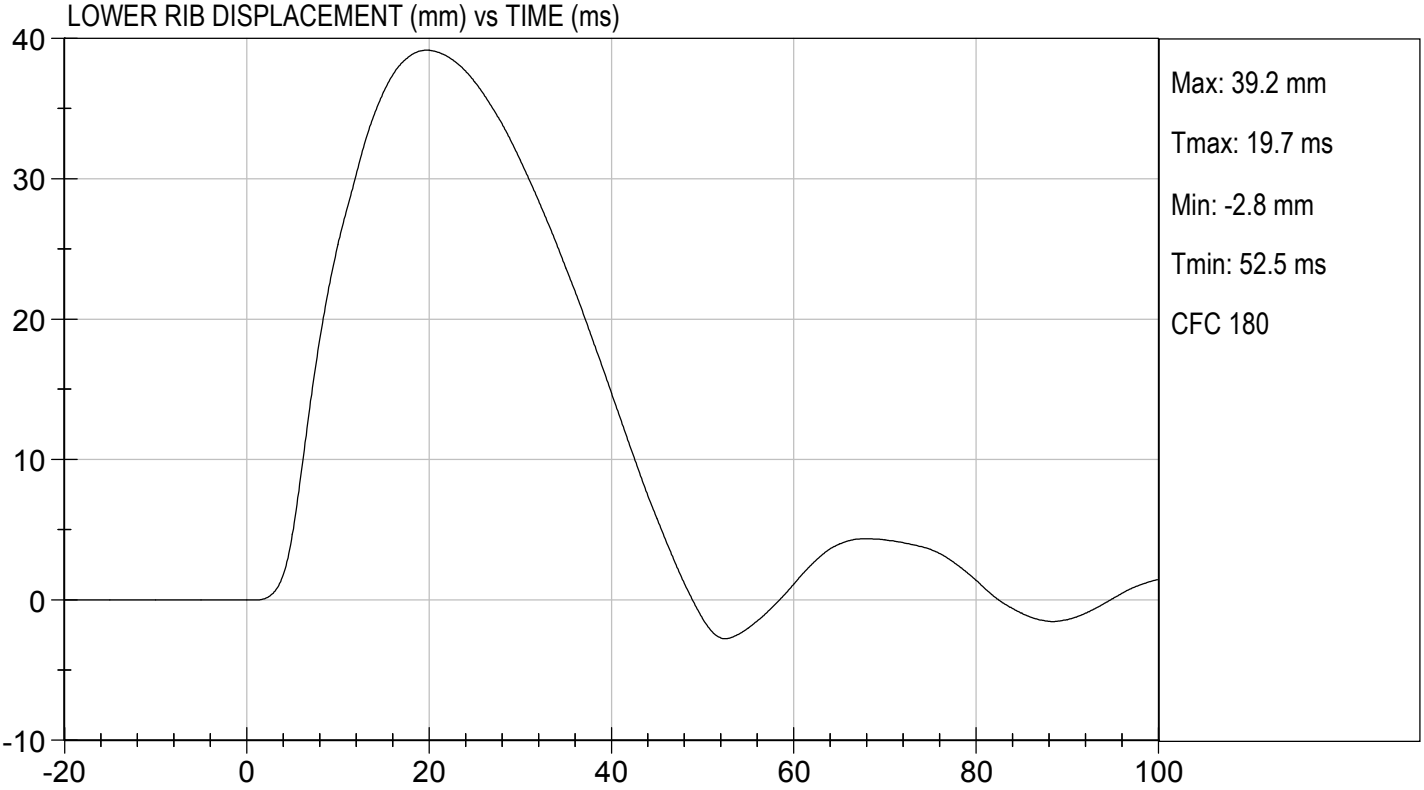
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



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: 032

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: 032 **Test ID:** D191681

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Peak Resultant Acceleration	G's	125 to 155	144	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	8.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Danielle Redenbaugh
Laboratory Technician

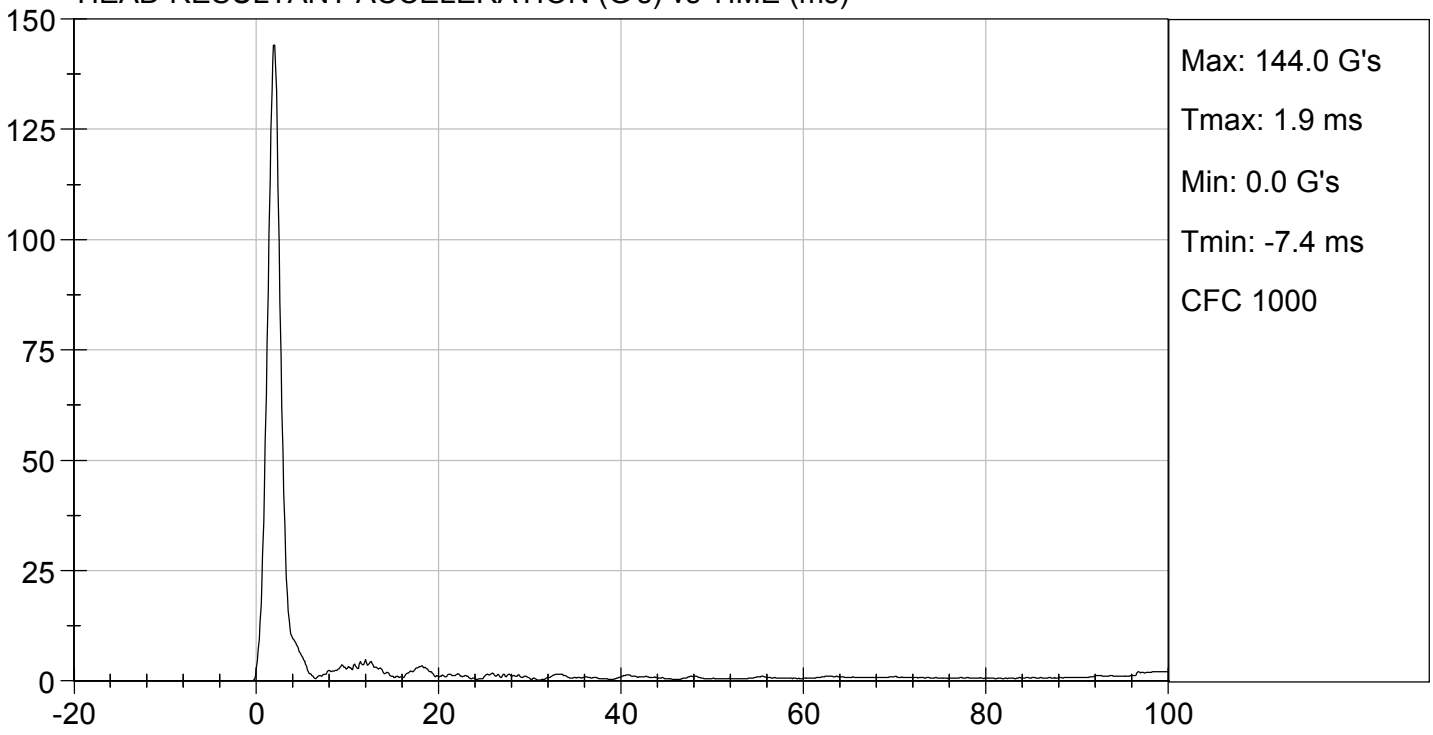
05/30/2019
Test Date

Approved By

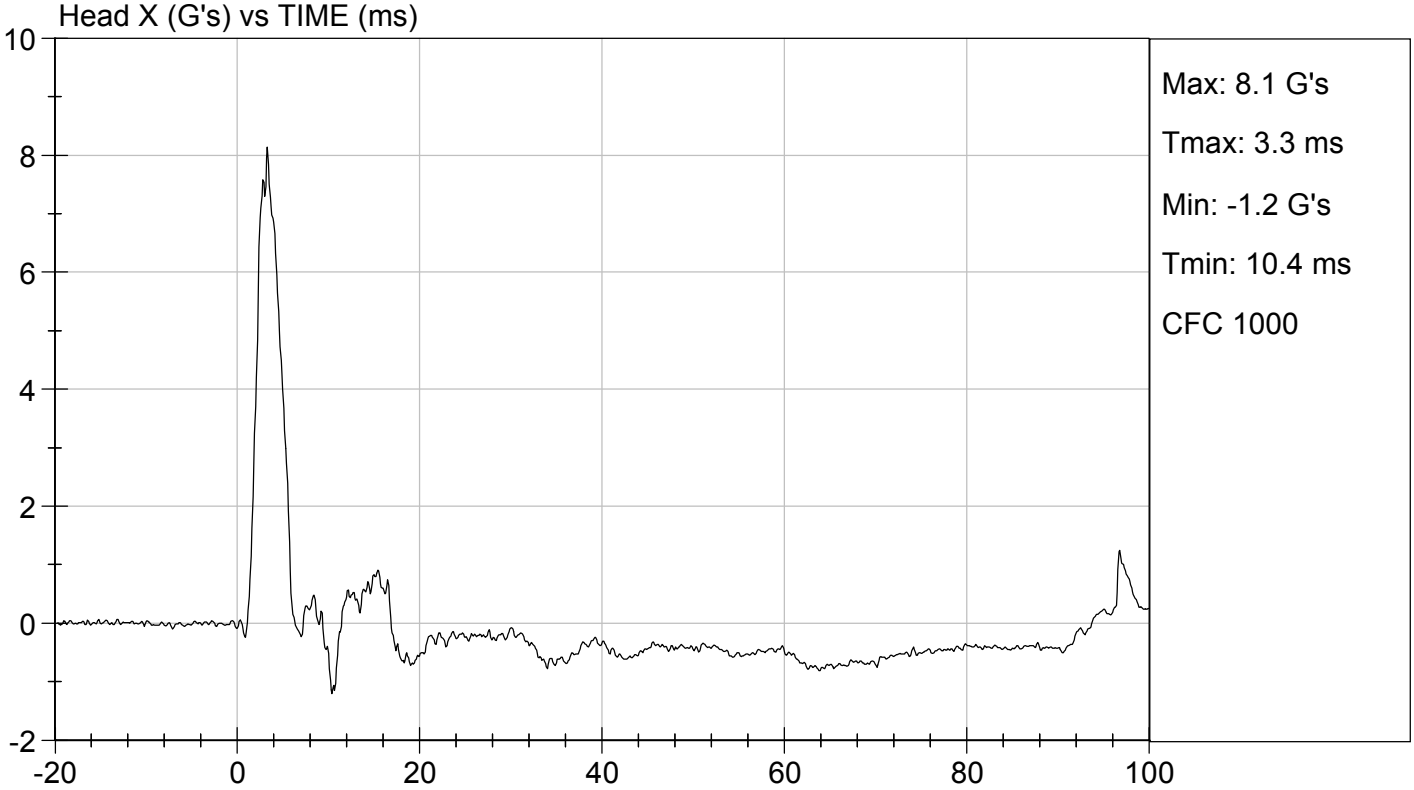
TEST DESC: HEAD DROP

TEST DATE: 05/30/2019
TEST #: D191681

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

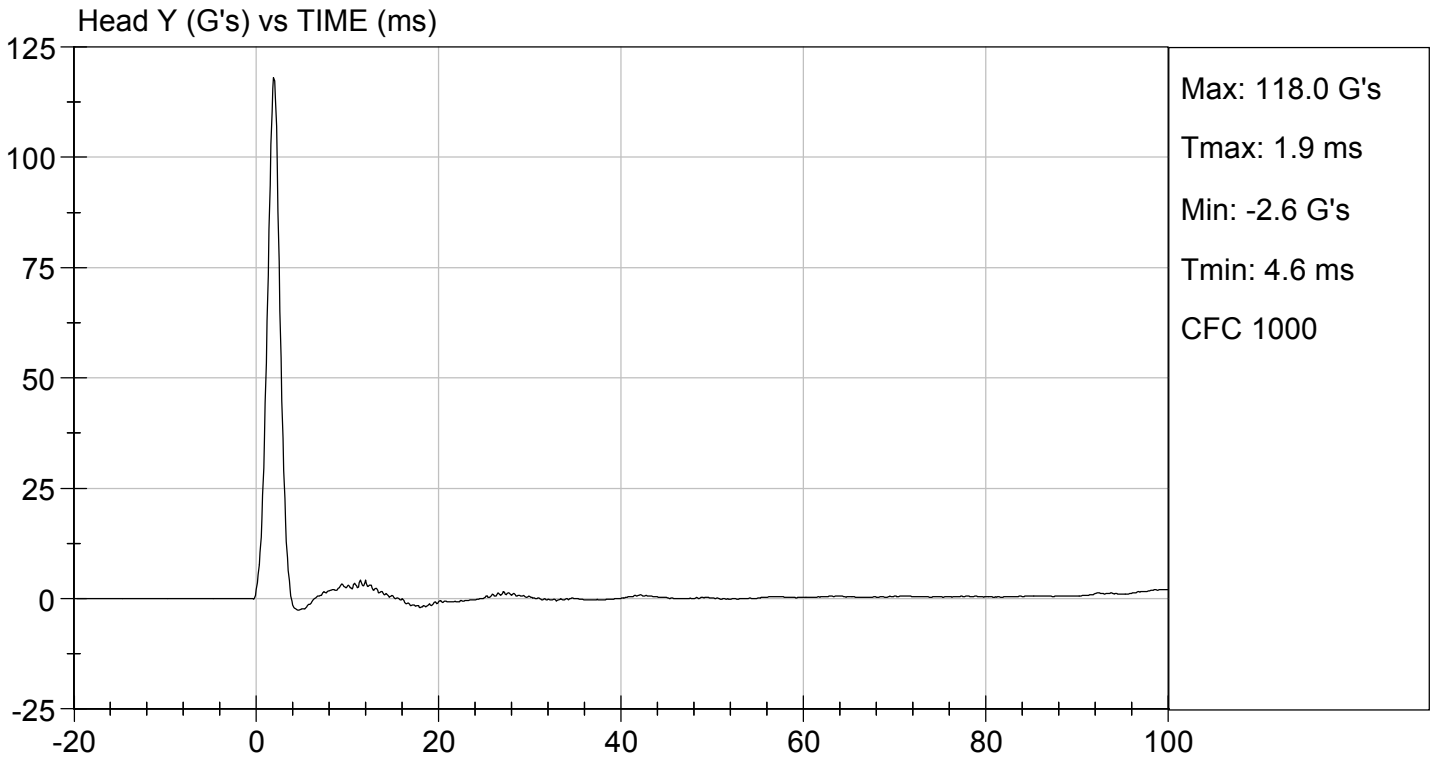


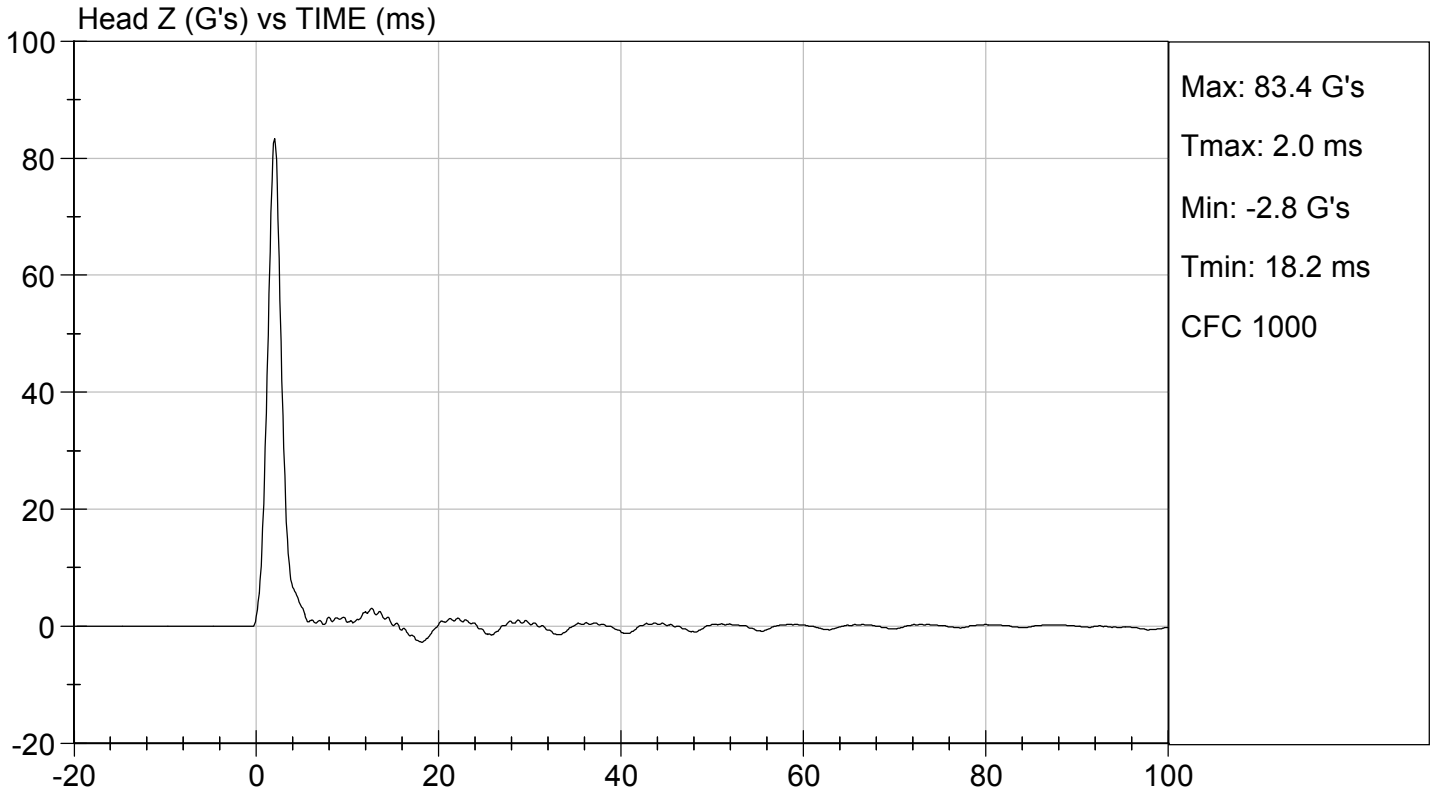
Head X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 05/30/2019
TEST #: D191681





MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191682

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	48	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.44	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	-3.55	Pass
	17 ms	m/s	>= -3.70	-3.32	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	50.2	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	55.7	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	61.5	Pass
			Overall Results		Pass

Danielle Redenbaugh
Laboratory Technician

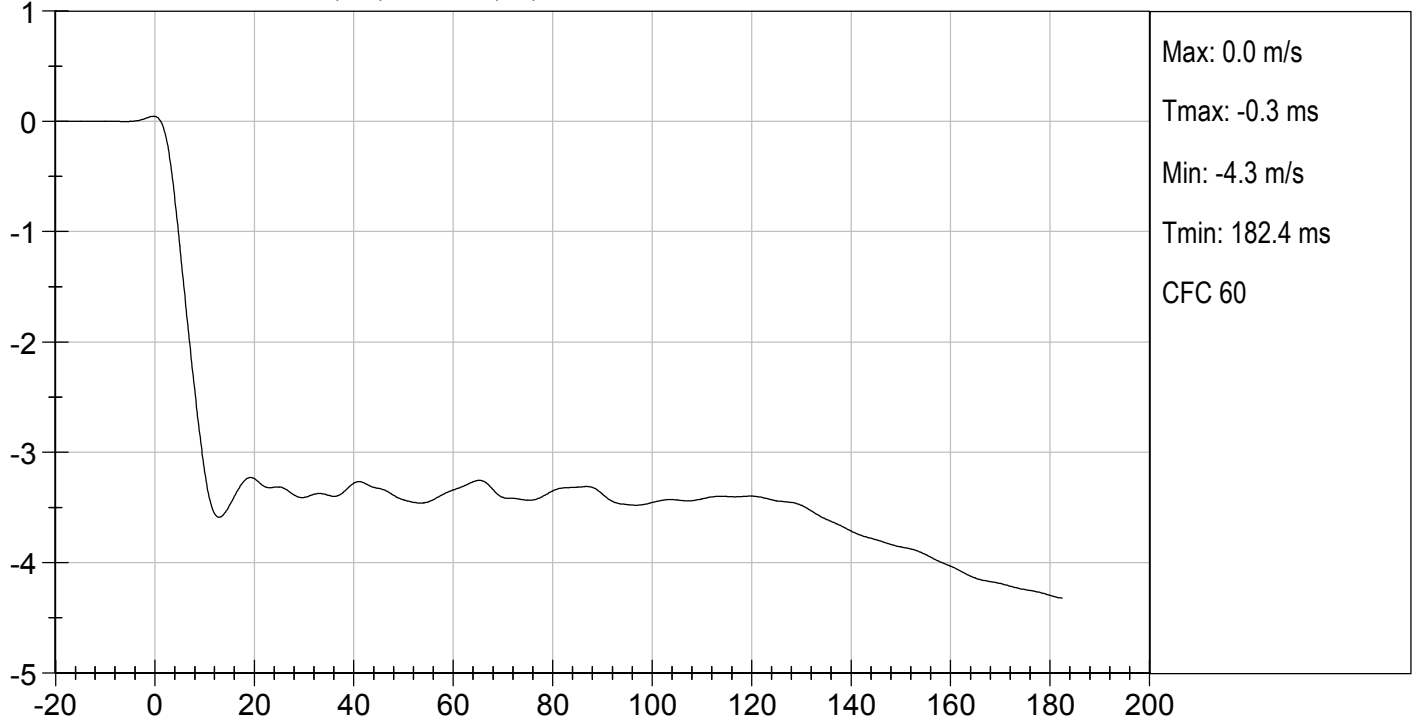
05/30/2019
Test Date

Approved By

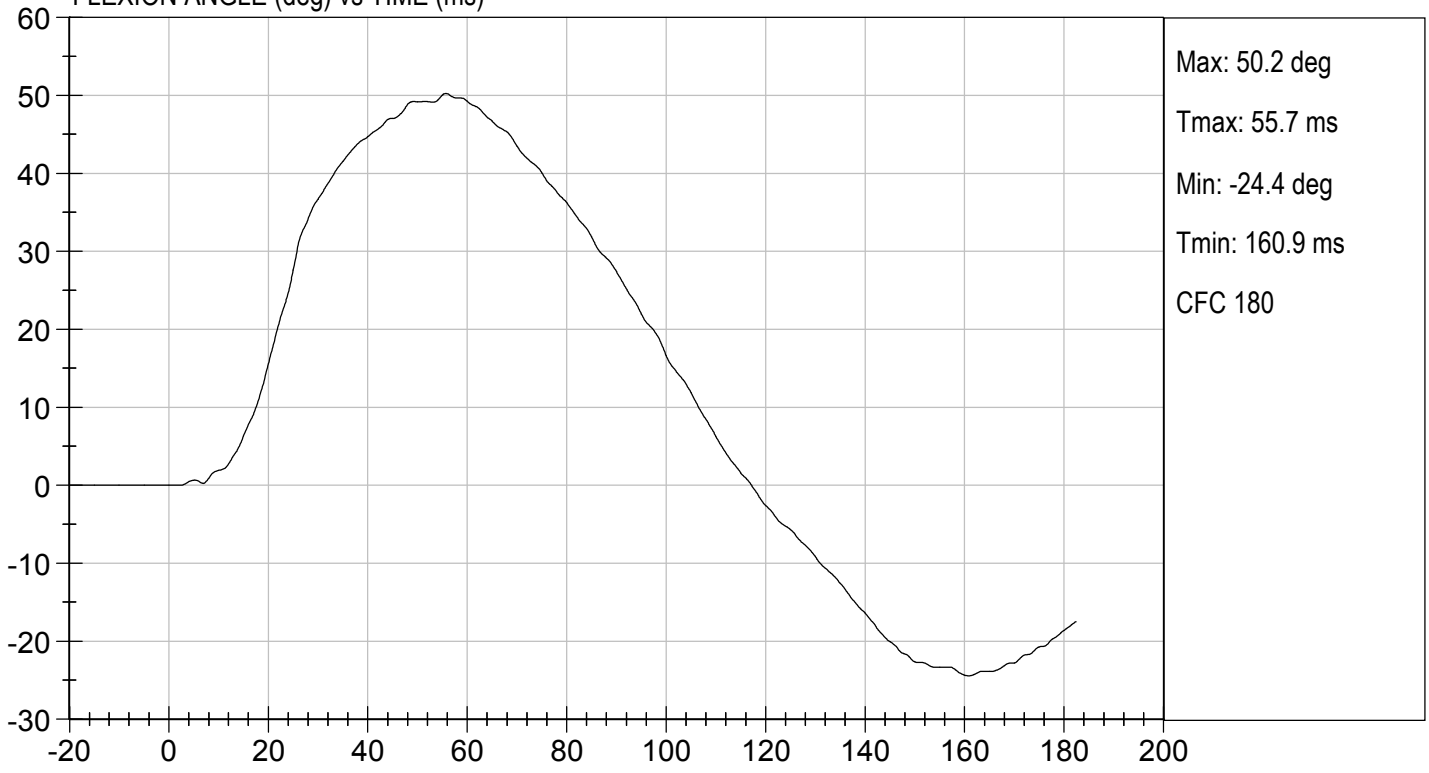
TEST DESC: NECK BENDING
VELOCITY: 11.30 ft/s, 3.44 m/s

TEST DATE: 05/30/2019
TEST #: D191682

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



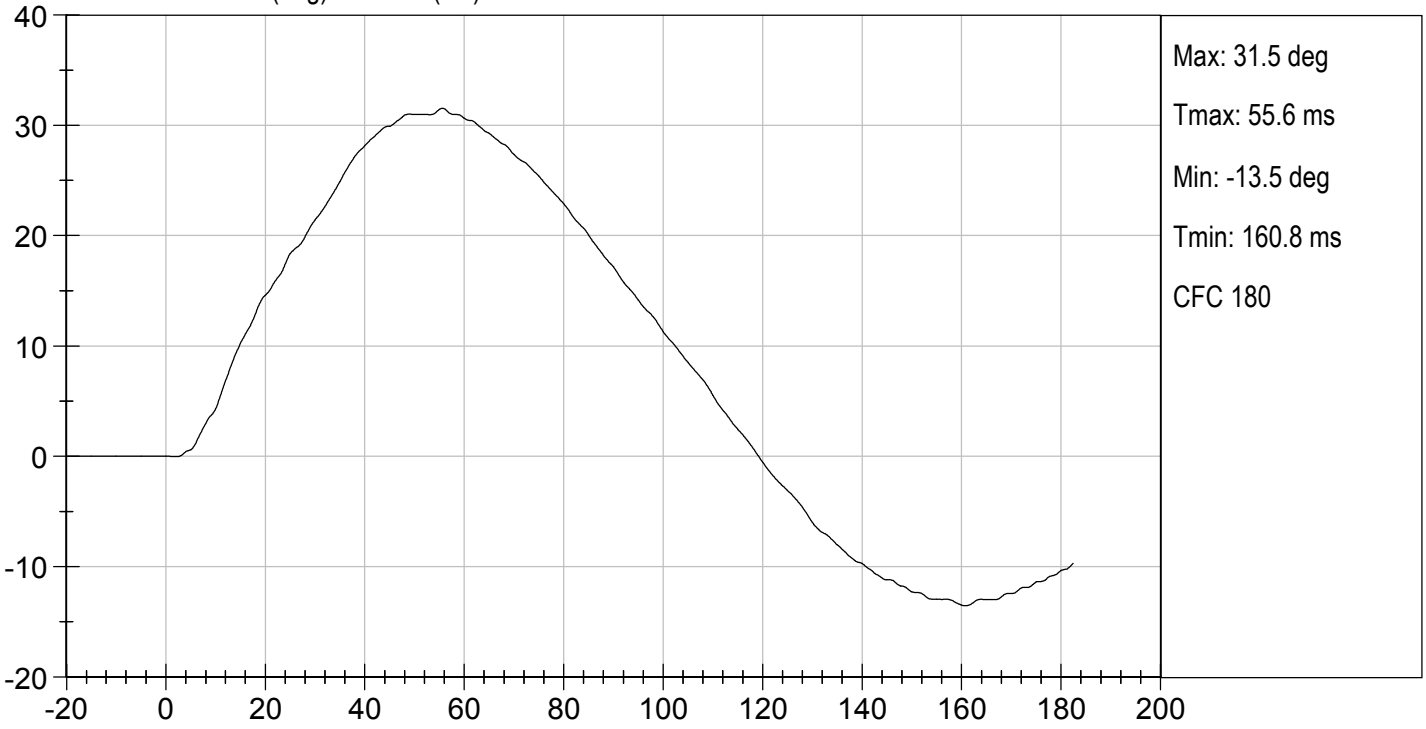
FLEXION ANGLE (deg) vs TIME (ms)



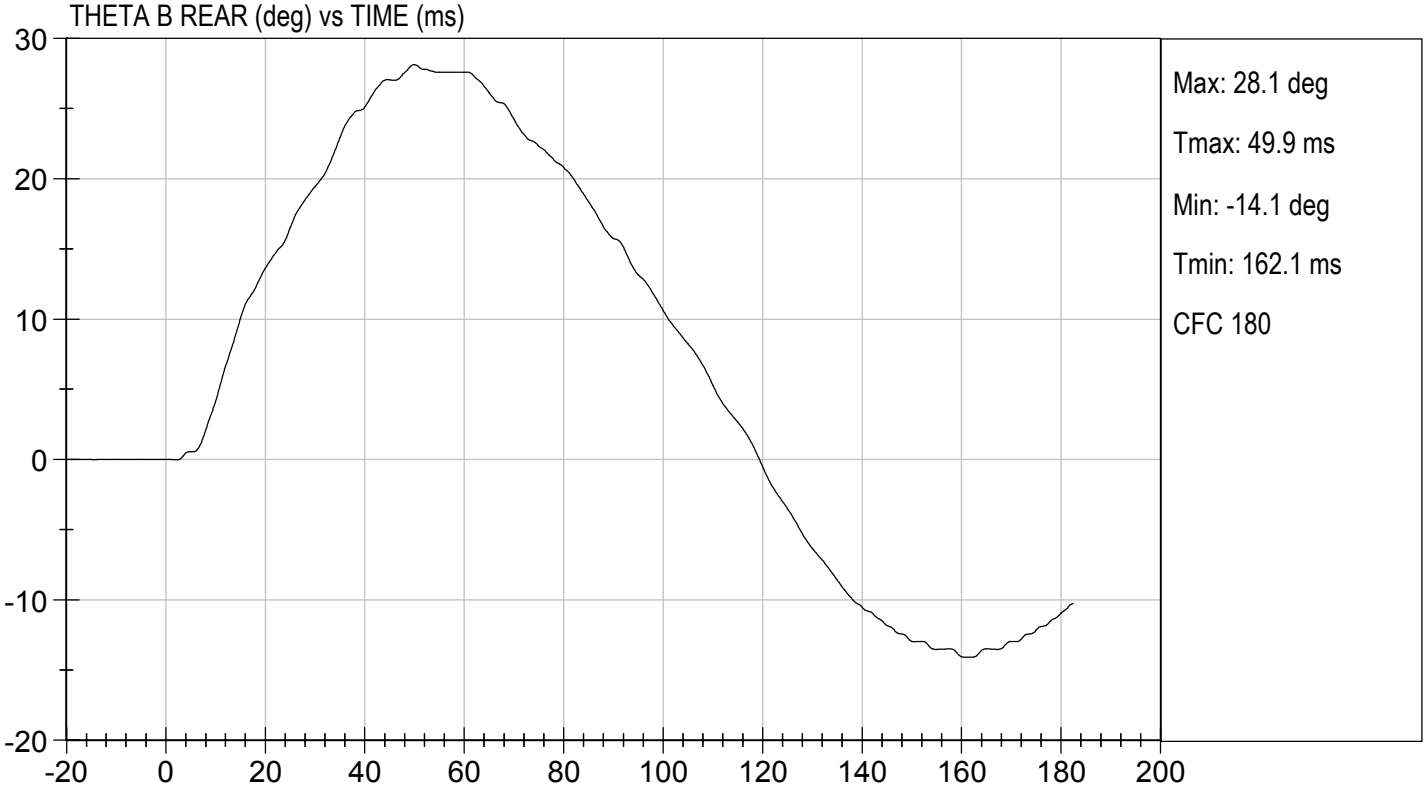
TEST DESC: NECK BENDING
VELOCITY: 11.30 ft/s, 3.44 m/s

TEST DATE: 05/30/2019
TEST #: D191682

THETA A FRONT (deg) vs TIME (ms)

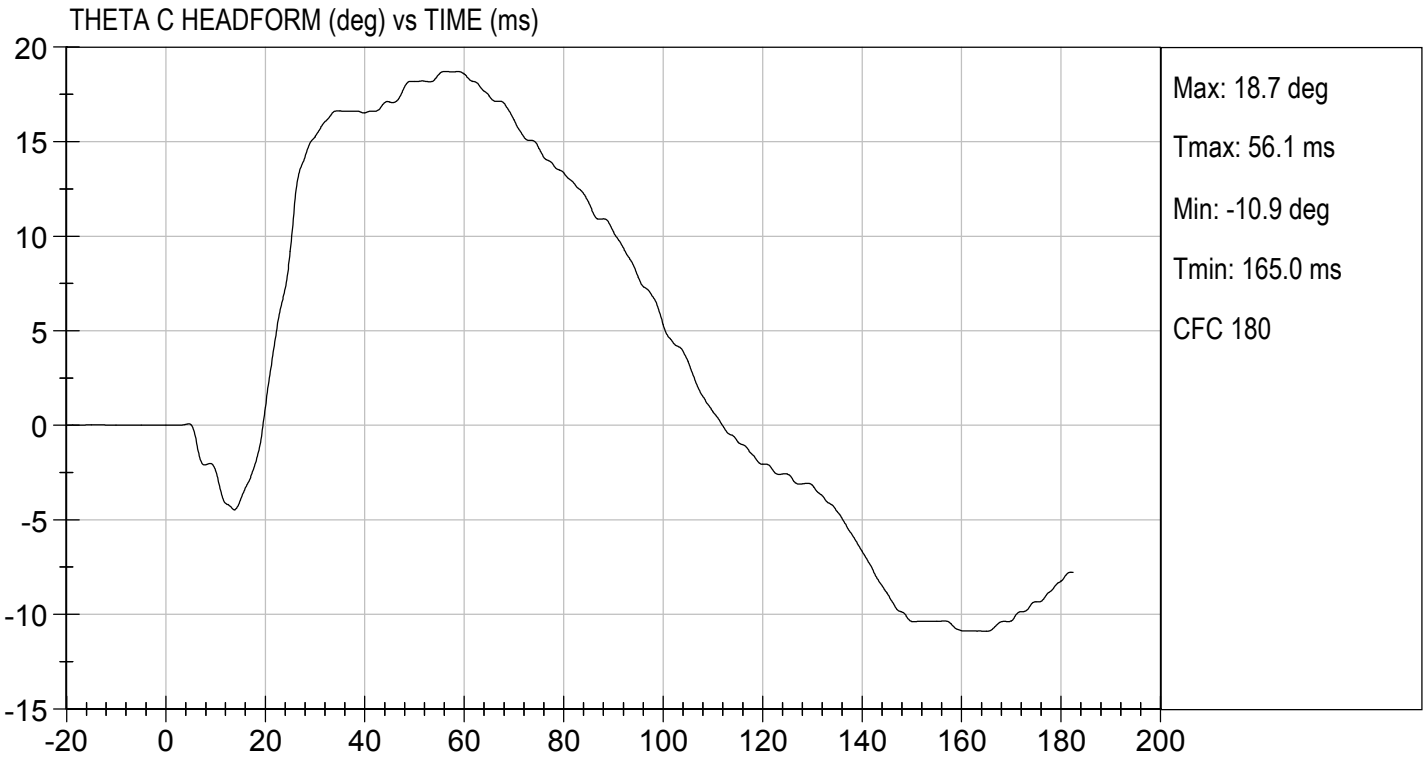


THETA B REAR (deg) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 11.30 ft/s, 3.44 m/s

TEST DATE: 05/30/2019
TEST #: D191682



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191683

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	51	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	8.2	Pass
		Overall Test Results		Pass

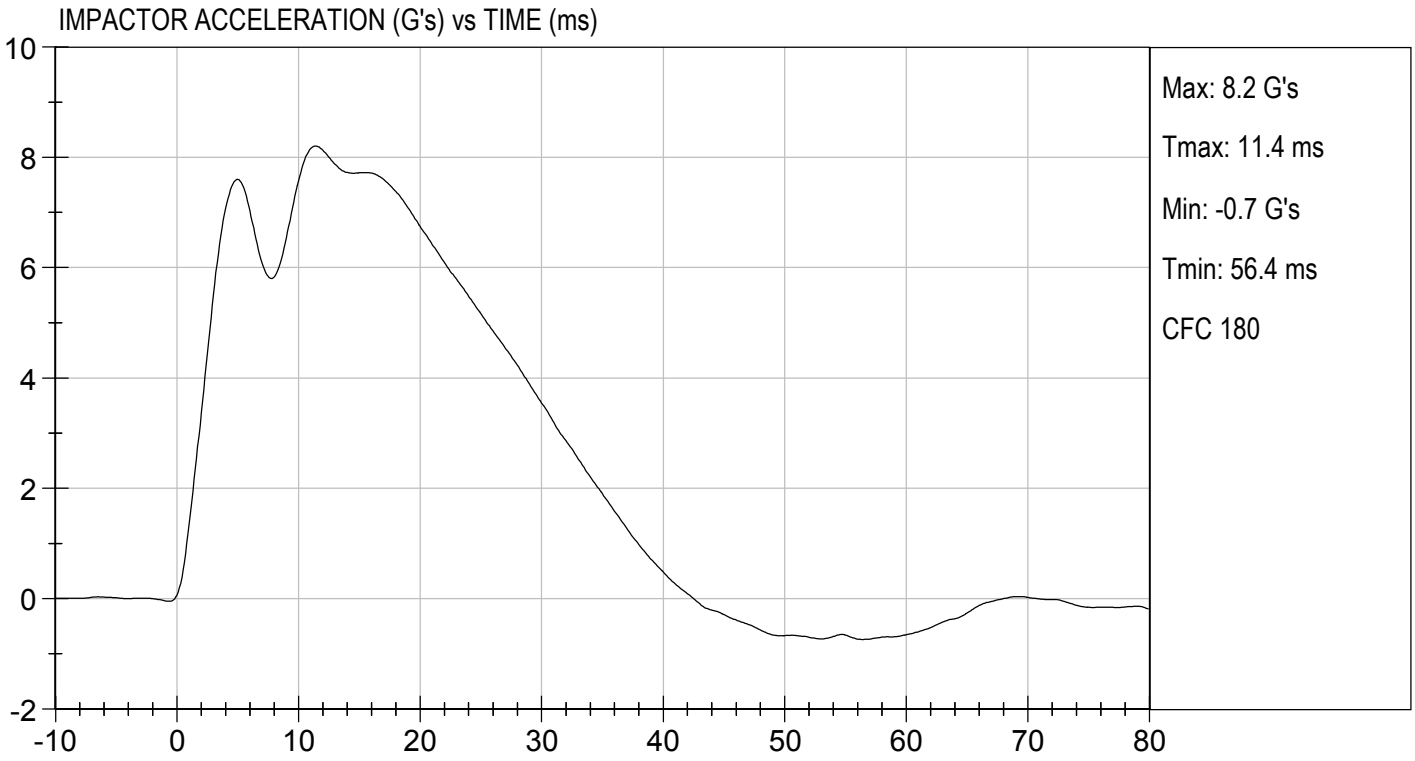
Jacob D Taylor
Laboratory Technician

05/31/2019
Test Date

Approved By

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

TEST DATE: 05/31/2019
TEST #: D191683



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191684

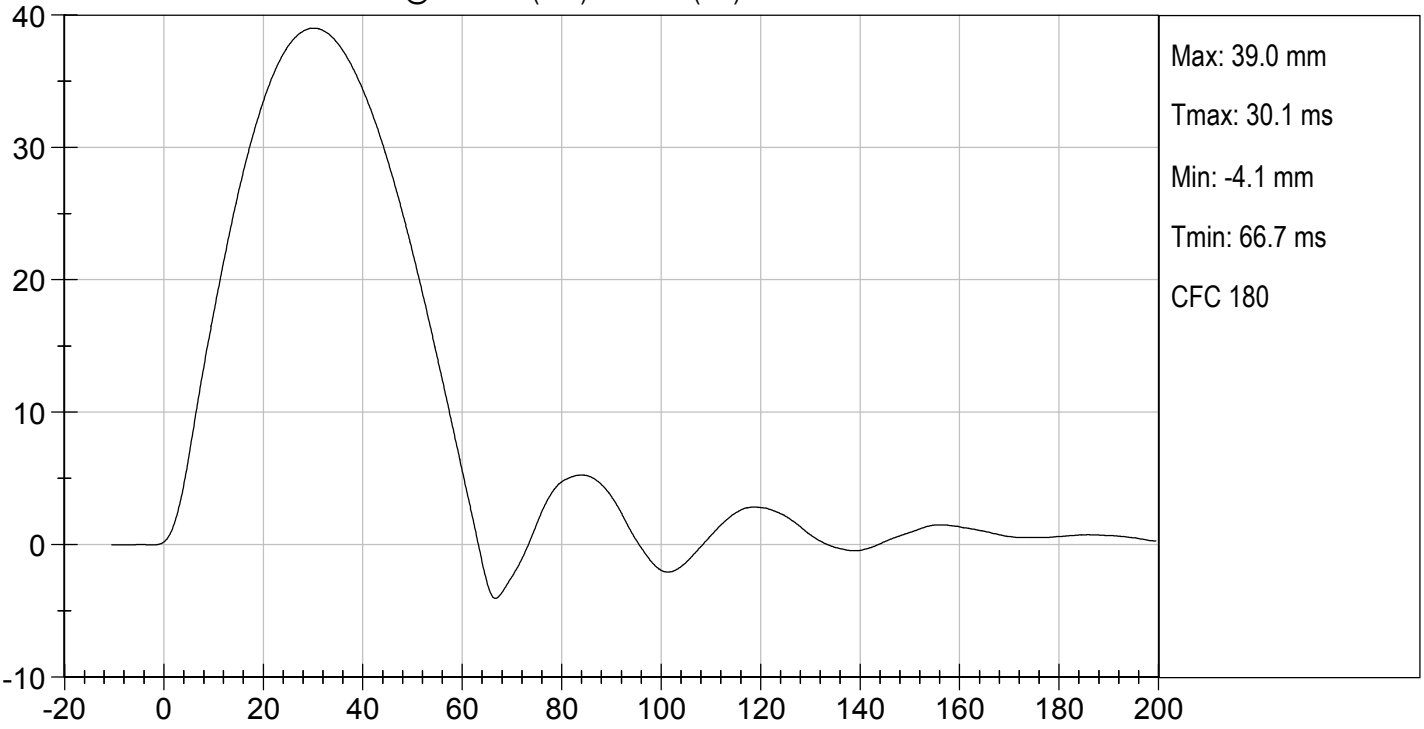
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.0	Pass
Displacement at 815 mm	mm	46.0 to 51.0	50.5	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

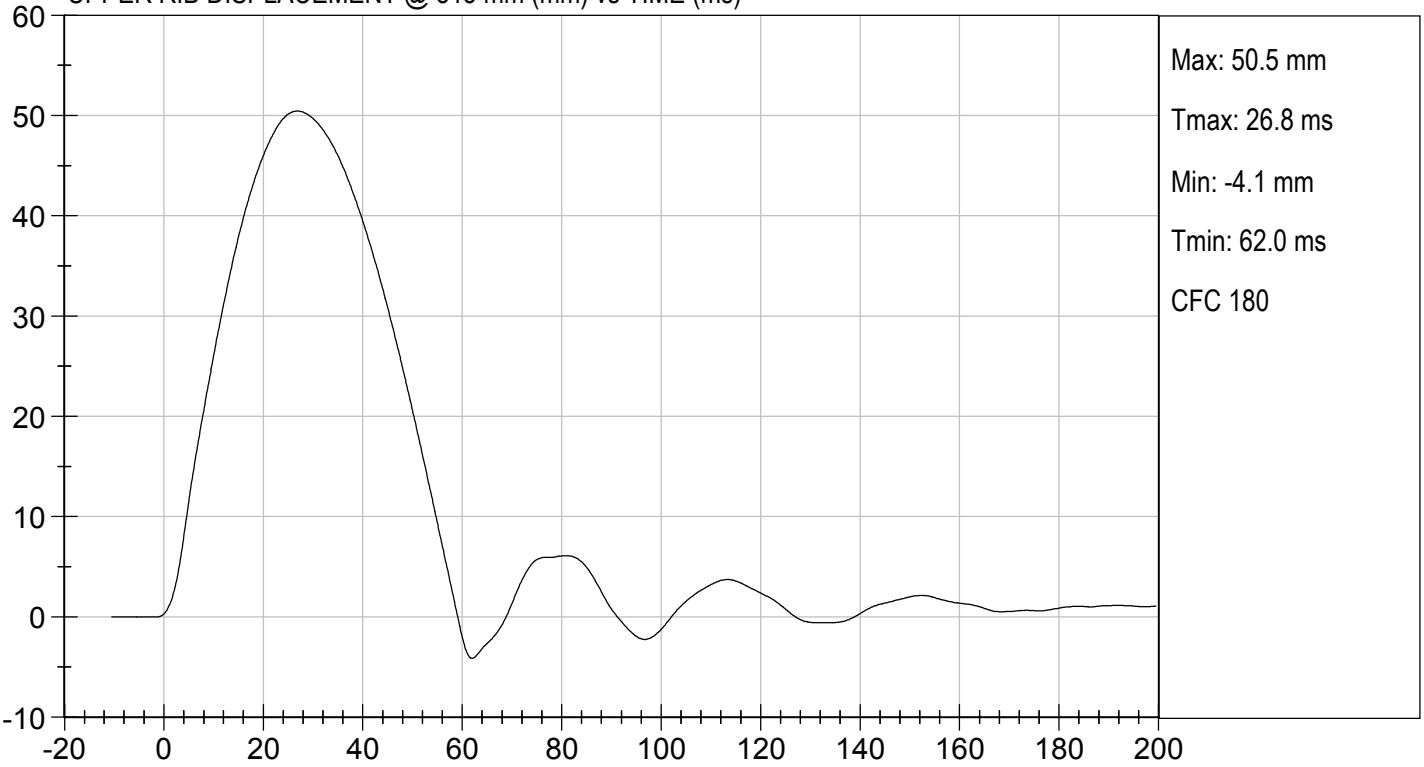
05/30/2019
Test Date

Approved By

UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191685

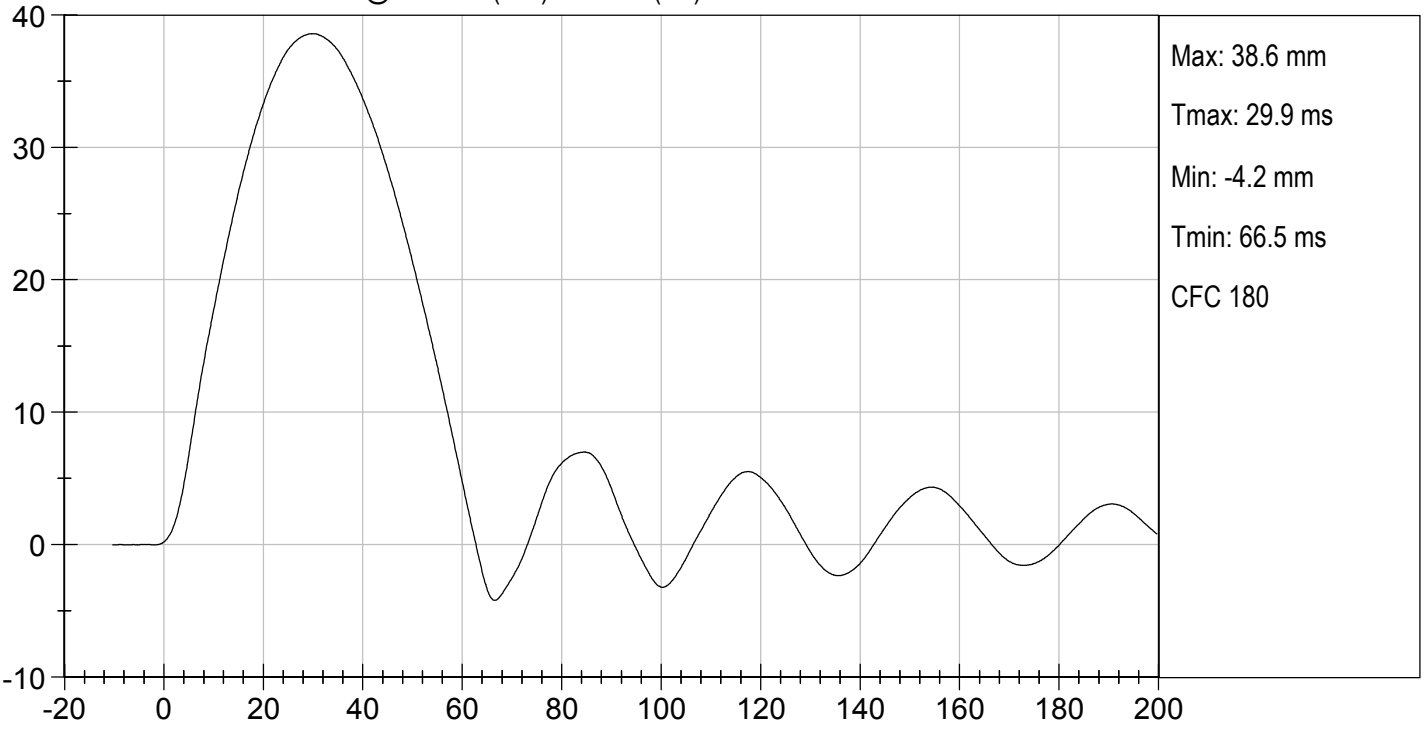
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.5	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

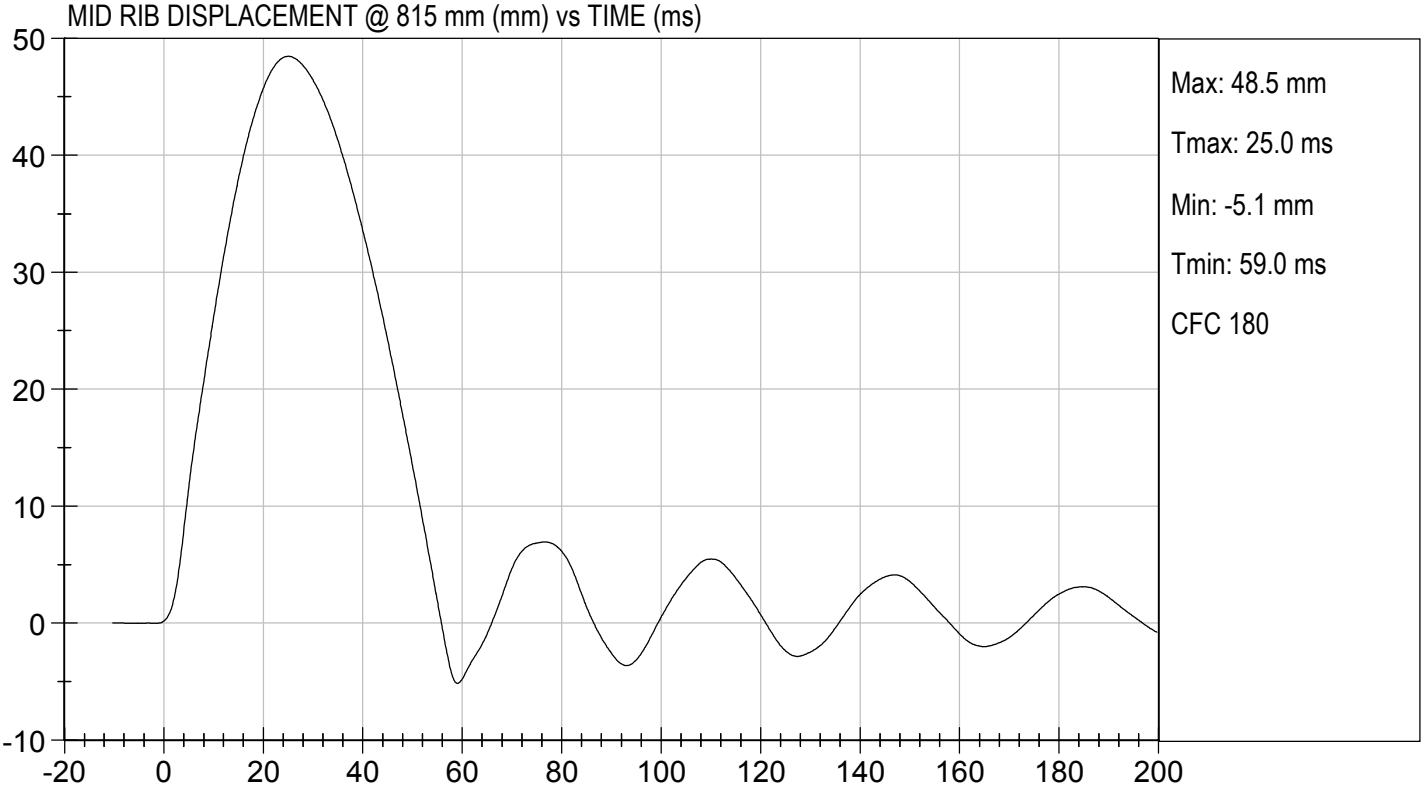
05/30/2019
Test Date

Approved By

MID RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



MID RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191686

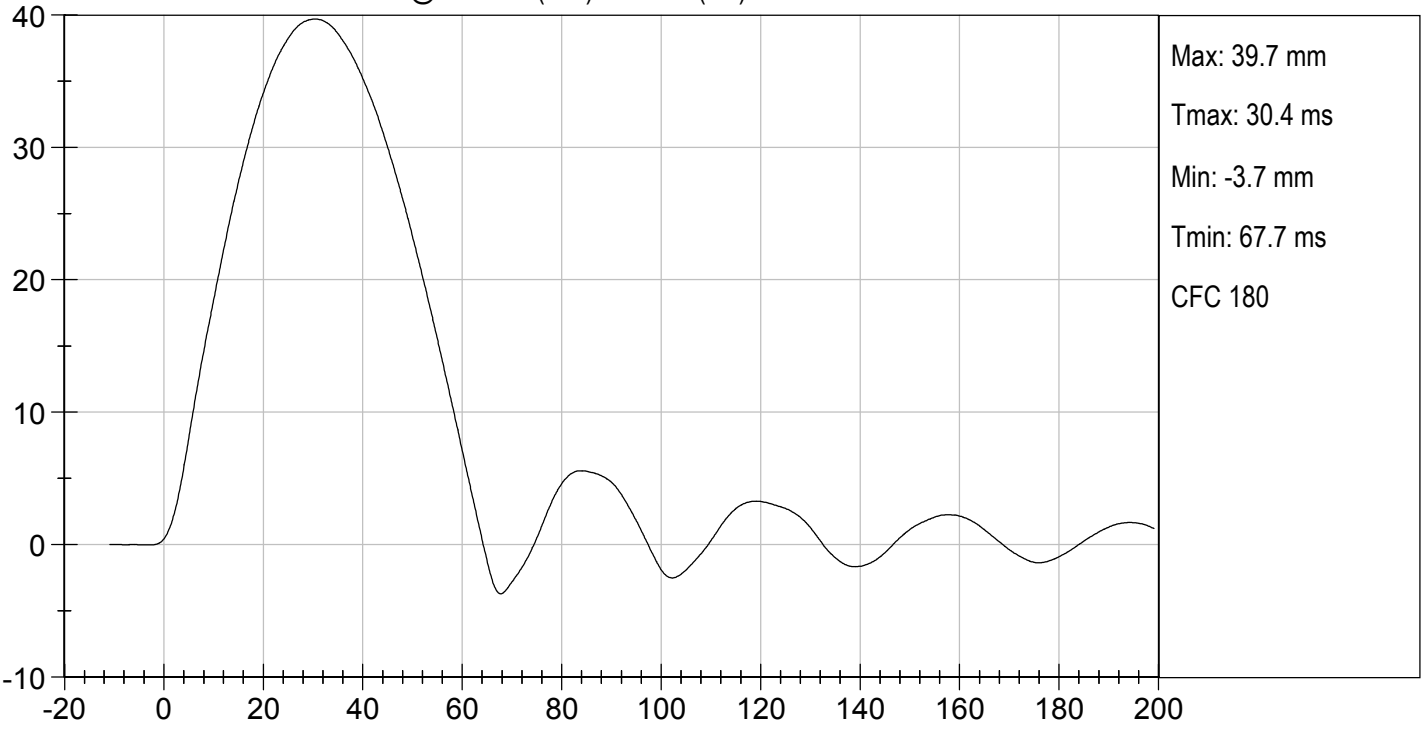
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.7	Pass
Displacement at 815 mm	mm	46.0 to 51.0	50.9	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

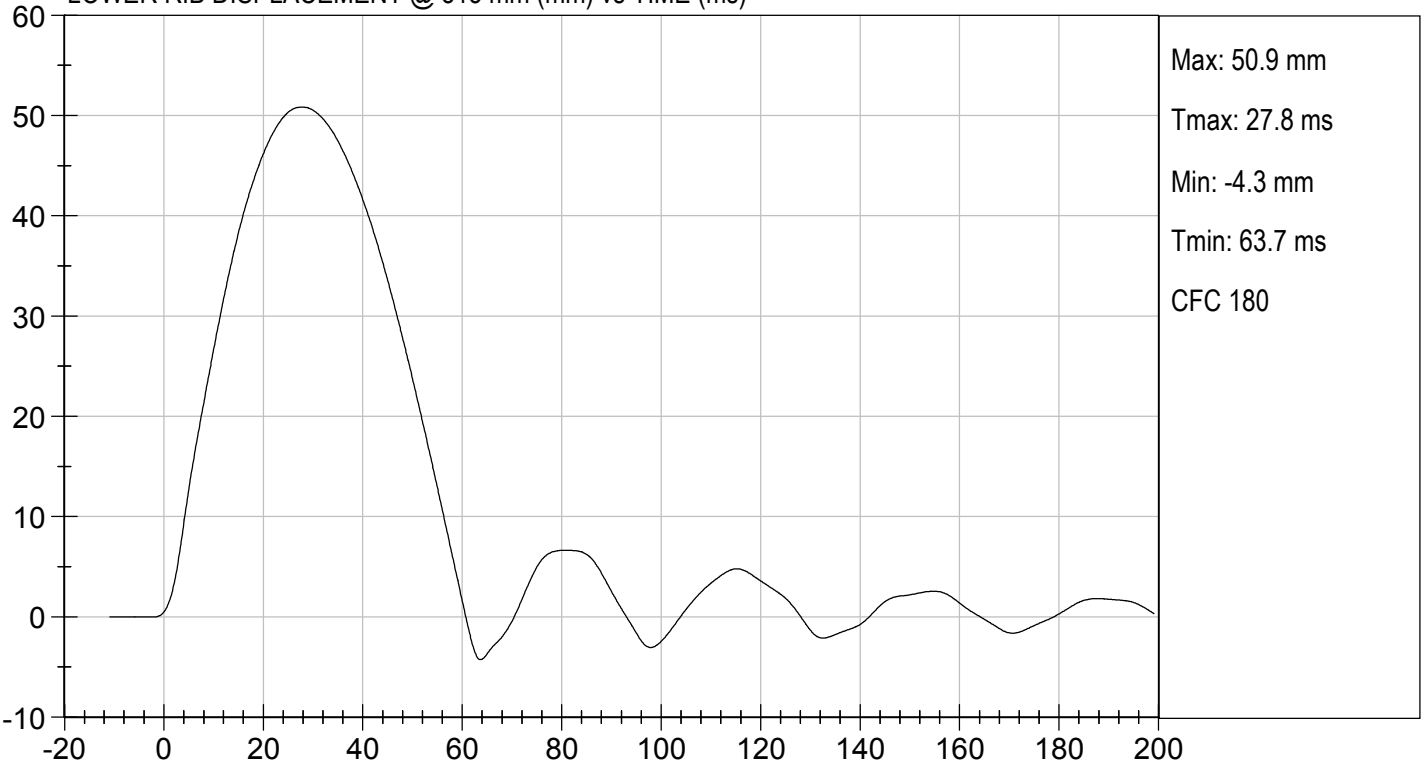
05/30/2019
Test Date

Approved By

LOWER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191687

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	51	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impactor Force	N	4000 to 4800	4180	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.6	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2303	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.8	Pass
		Overall Test Results		Pass

Jacob D Taylor
Laboratory Technician

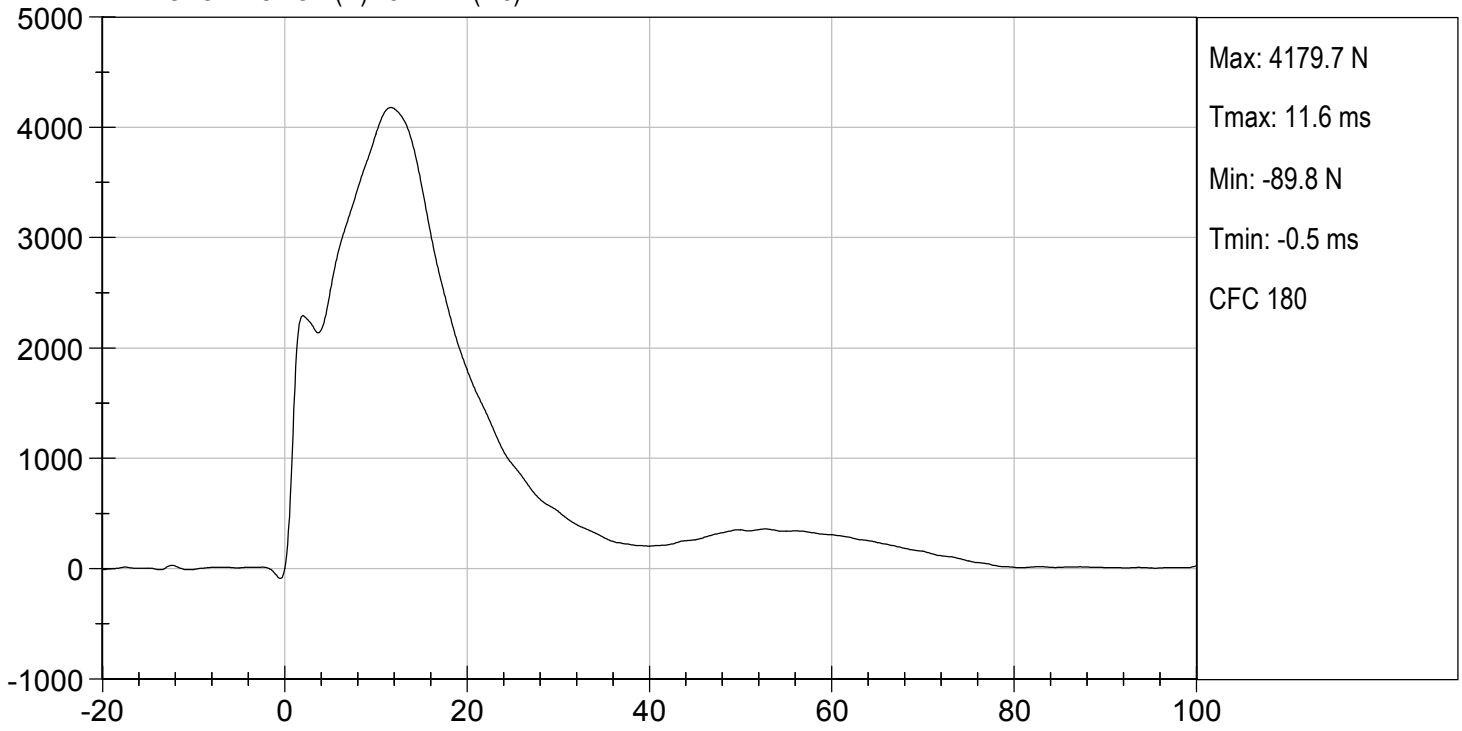
05/31/2019
Test Date

Approved By

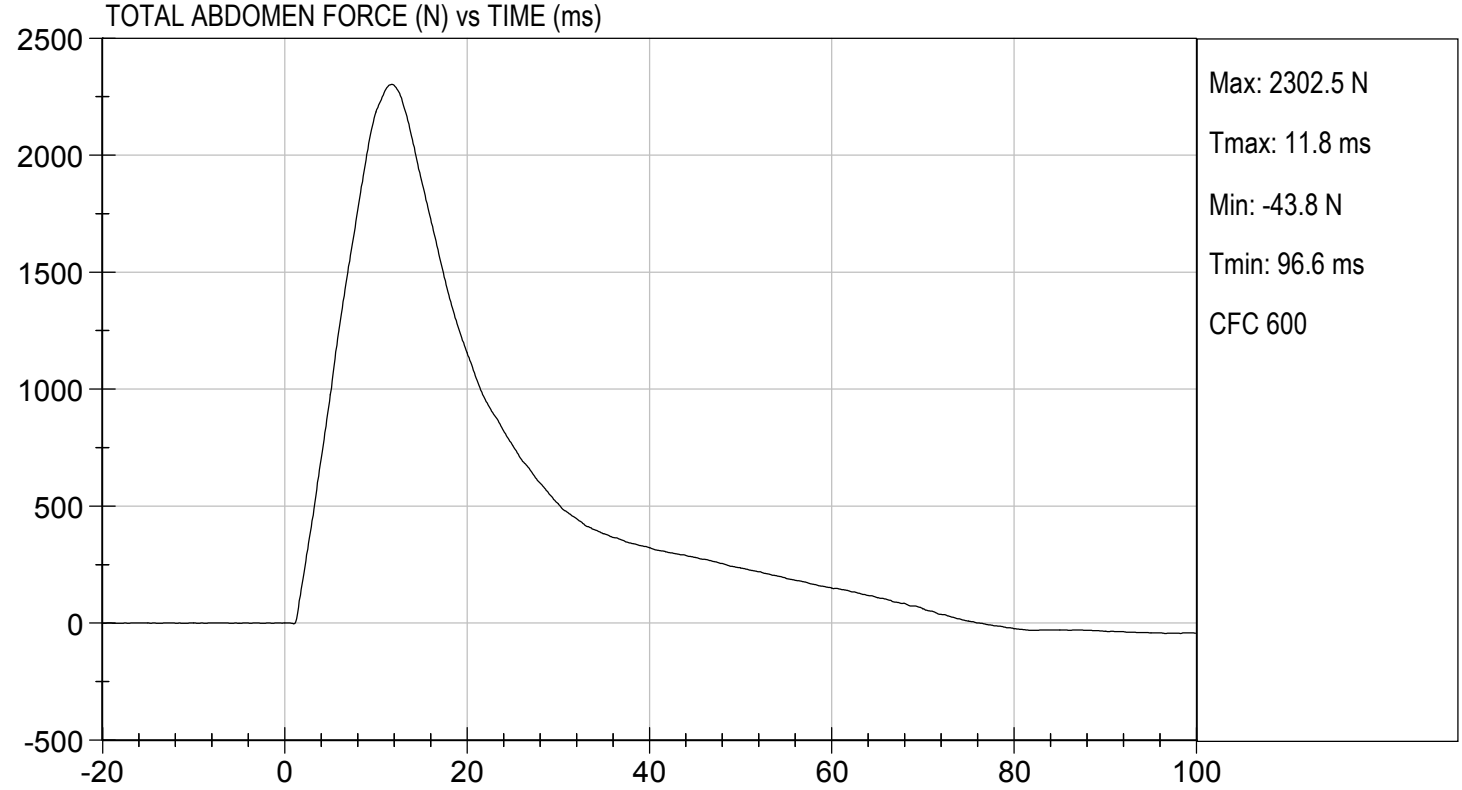
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 05/31/2019
TEST #: D191687

IMPACTOR FORCE (N) vs TIME (ms)



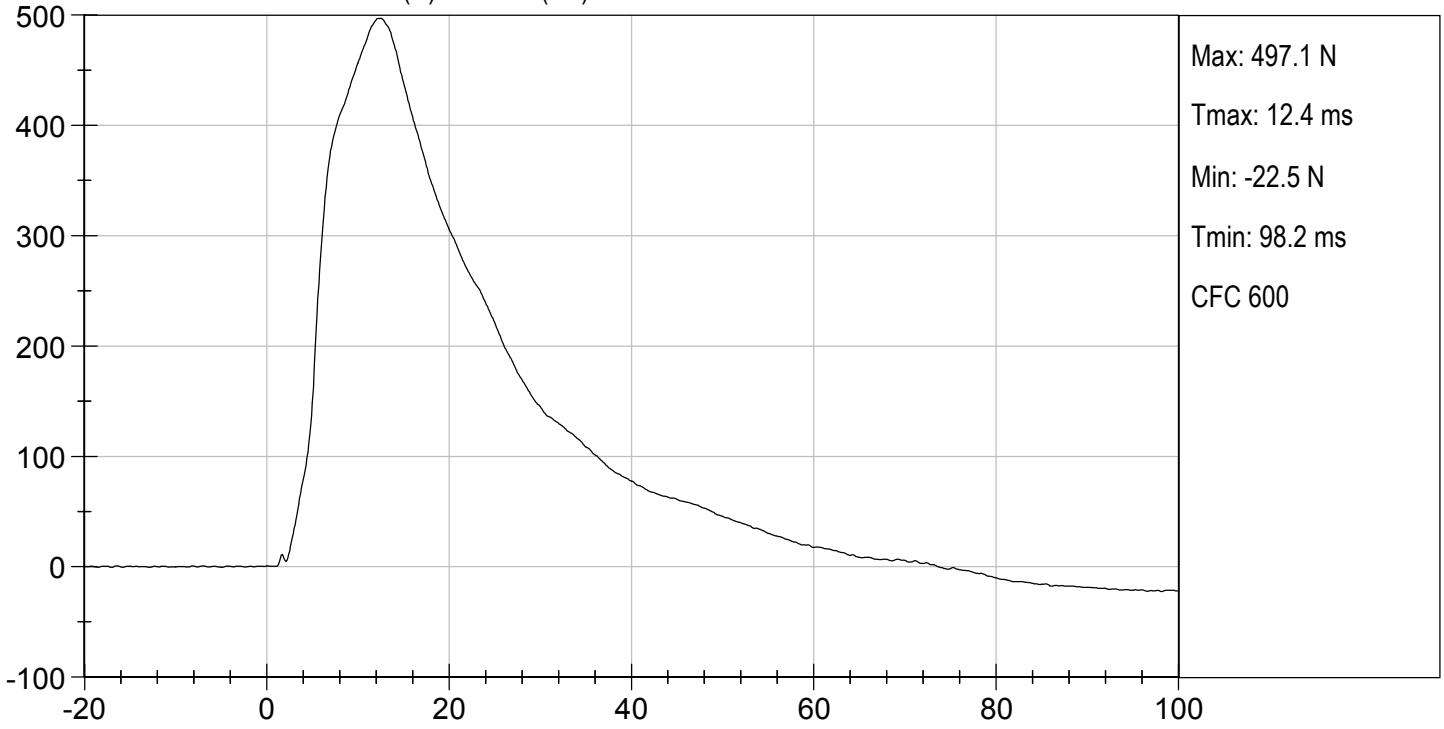
TOTAL ABDOMEN FORCE (N) vs TIME (ms)



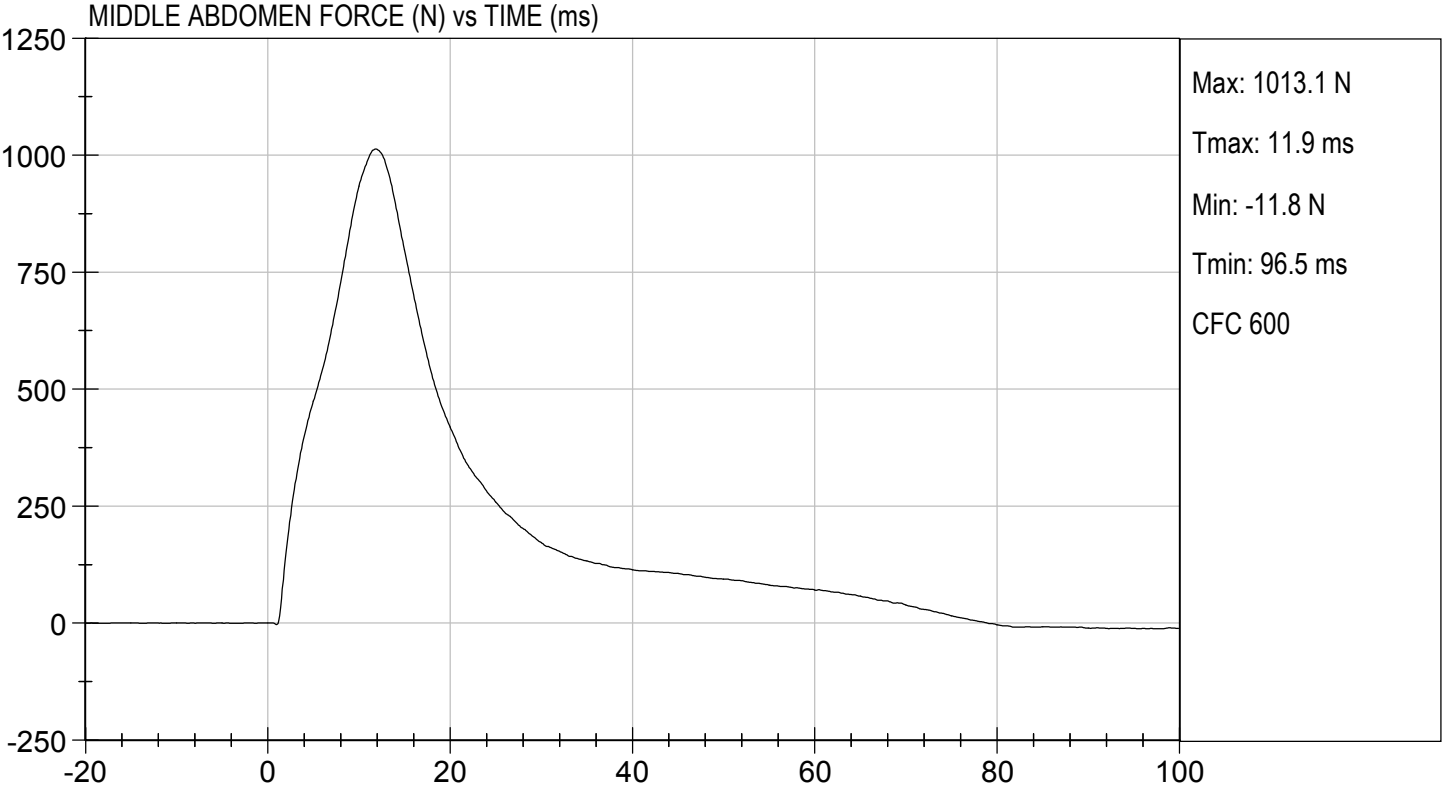
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 05/31/2019
TEST #: D191687

FRONT ABDOMEN FORCE (N) vs TIME (ms)



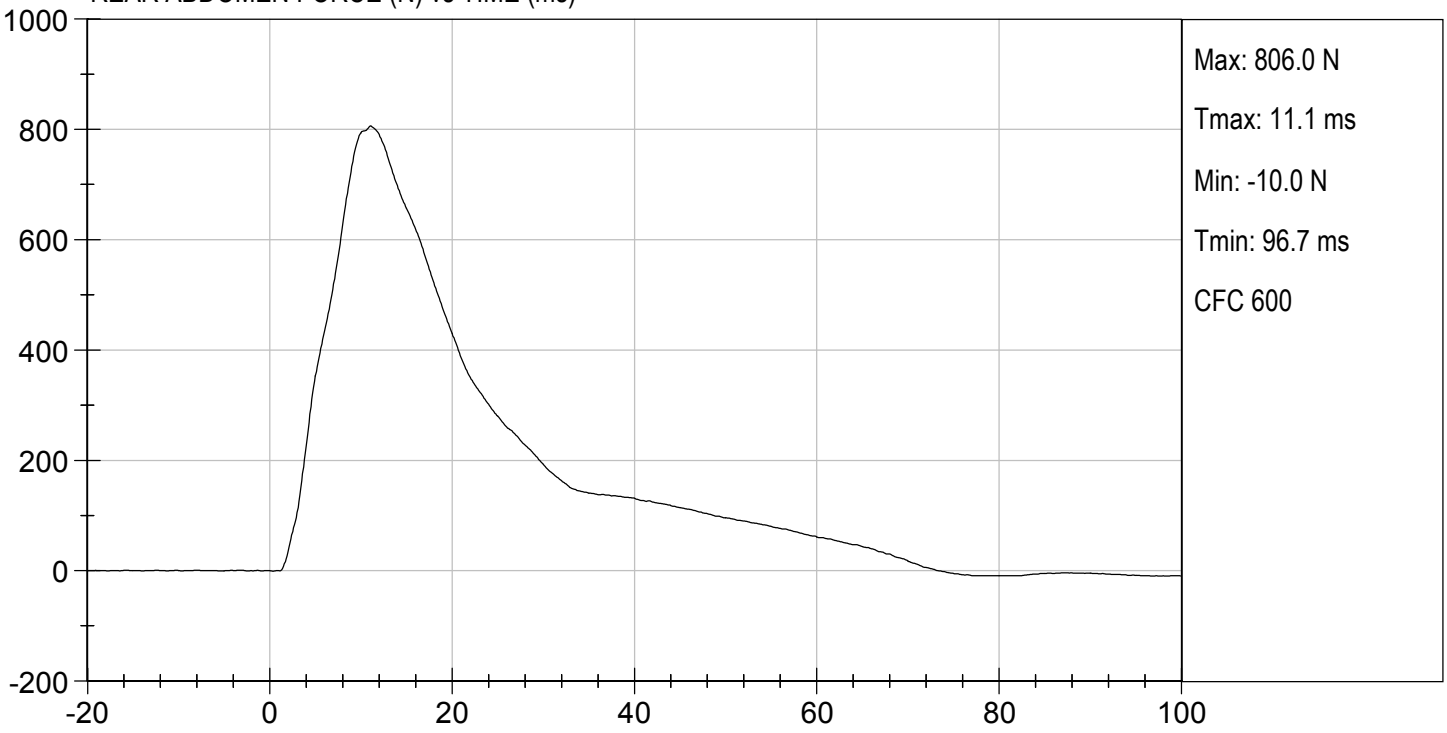
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)



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

TEST DATE: 05/31/2019
TEST #: D191687

REAR ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191688

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	48	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.05	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.411	Pass
	27 ms	m/s	-6.50 to -5.80	-5.93	Pass
	30 ms	m/s	>= -6.50	-5.80	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	47.6	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	43.0	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	40	Pass
			Overall Results		Pass

Laboratory Technician

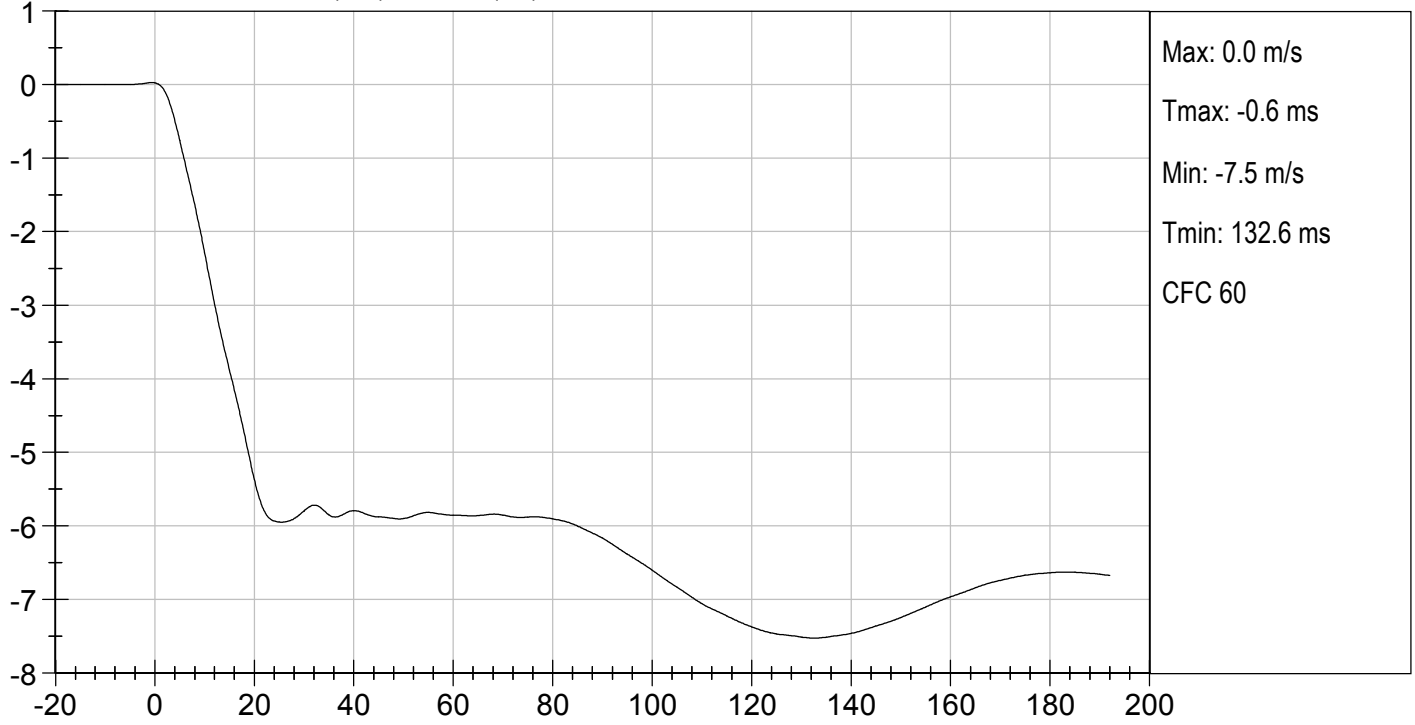
05/29/2019
Test Date

Approved By

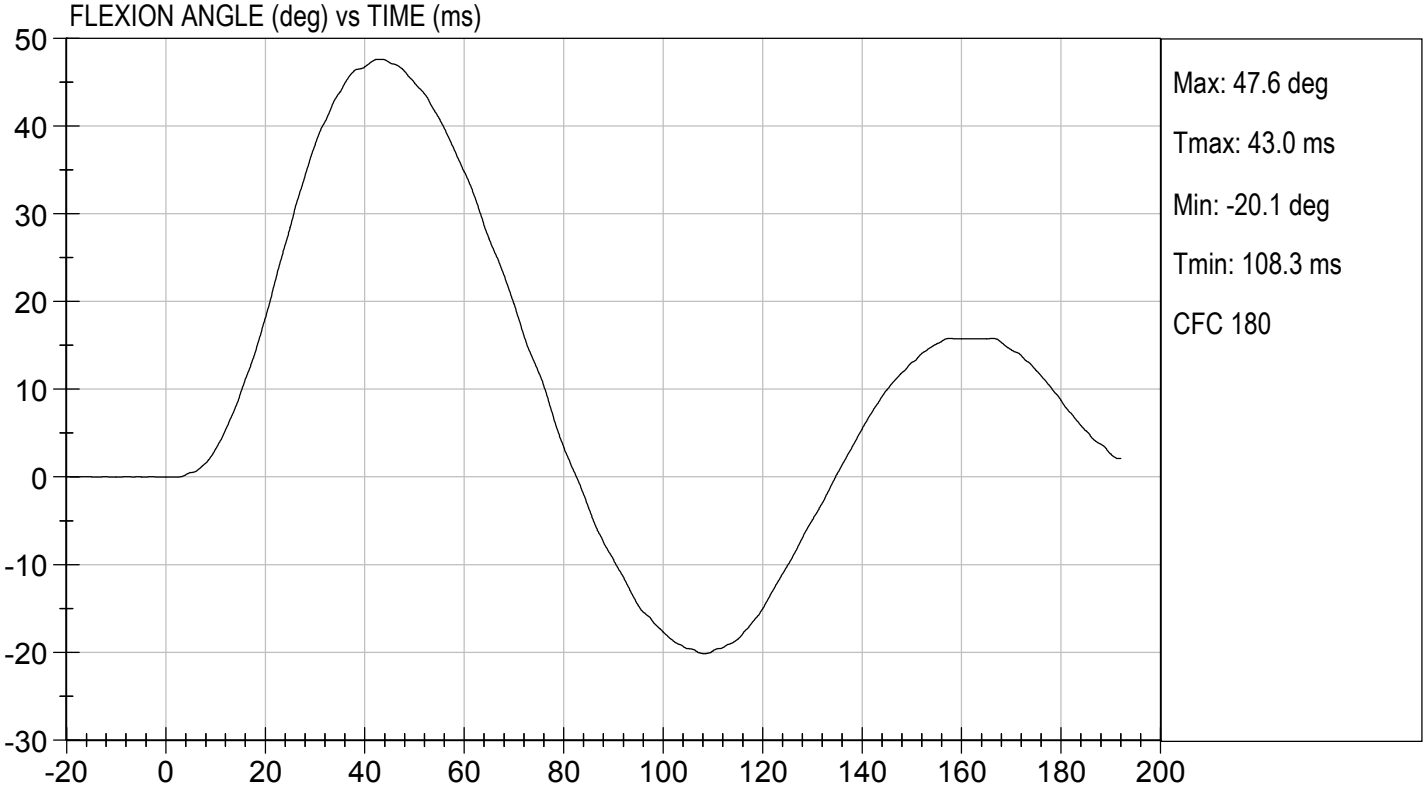
TEST DESC: LUMBAR BENDING
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 05/29/2019
TEST #: D191688

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



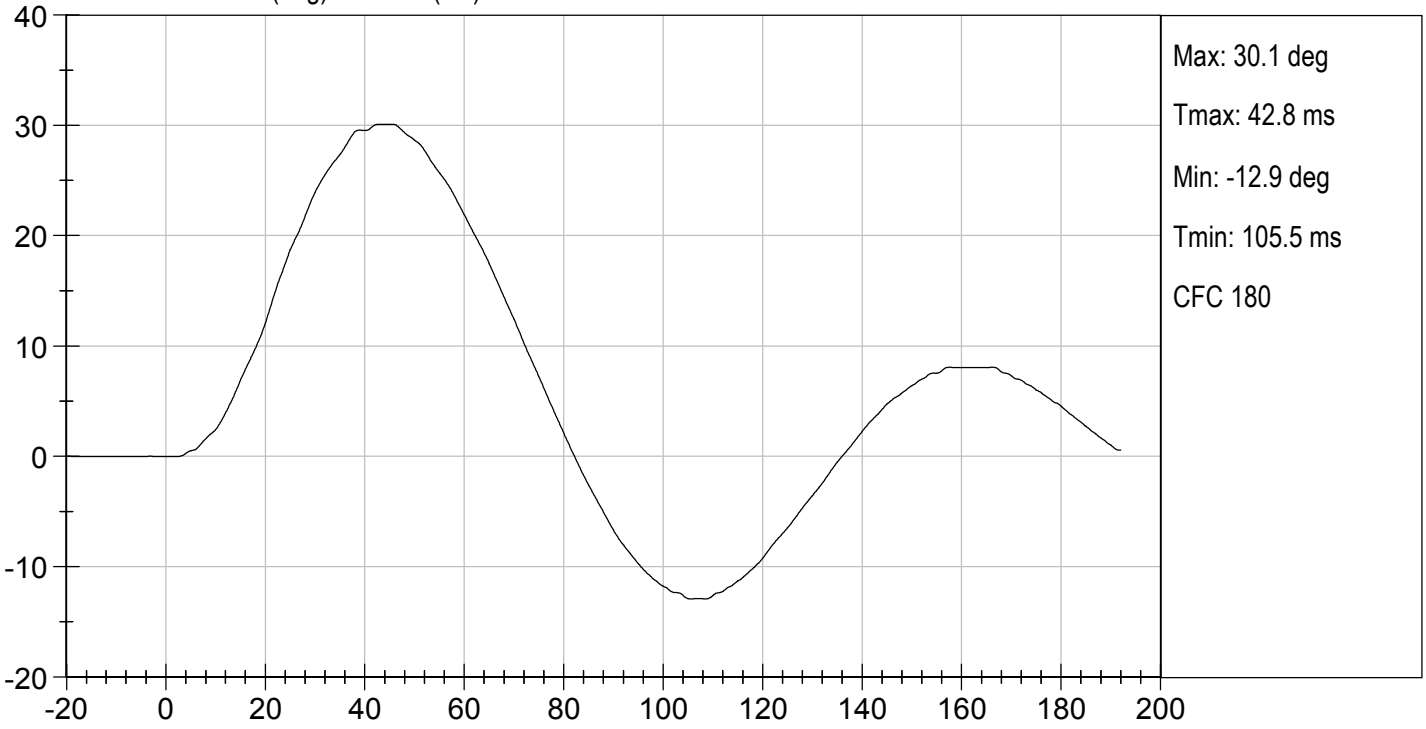
FLEXION ANGLE (deg) vs TIME (ms)



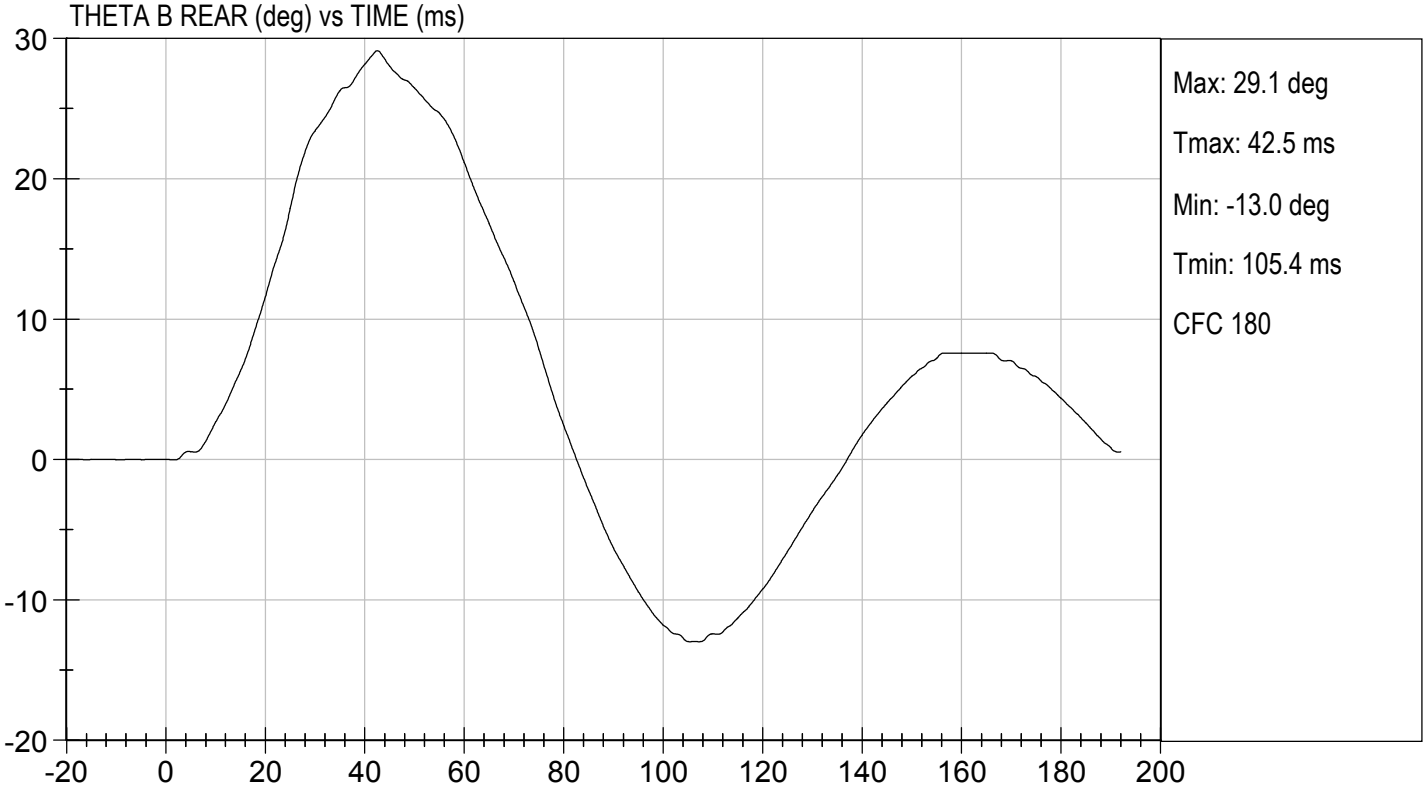
TEST DESC: LUMBAR BENDING
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 05/29/2019
TEST #: D191688

THETA A FRONT (deg) vs TIME (ms)

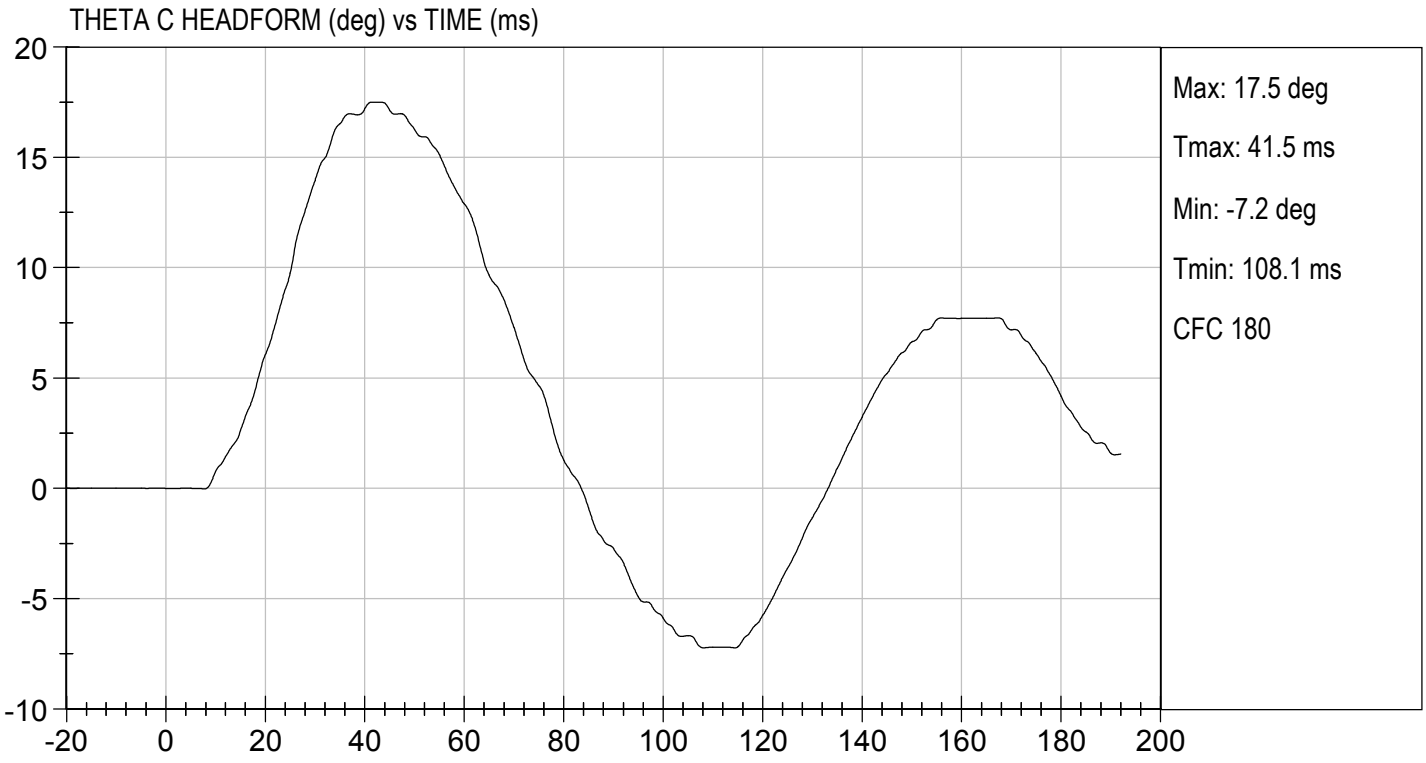


THETA B REAR (deg) vs TIME (ms)



TEST DESC: LUMBAR BENDING
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 05/29/2019
TEST #: D191688



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191689

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	51	Pass
Probe Speed	m/s	4.20 to 4.40	4.39	Pass
Maximum Impactor Force	N	4700 to 5400	5076	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	12.6	Pass
Maximum Pubic Force	N	1230 to 1590	1297	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	12.2	Pass
		Overall Test Results		Pass

Jacob D Taylor
Laboratory Technician

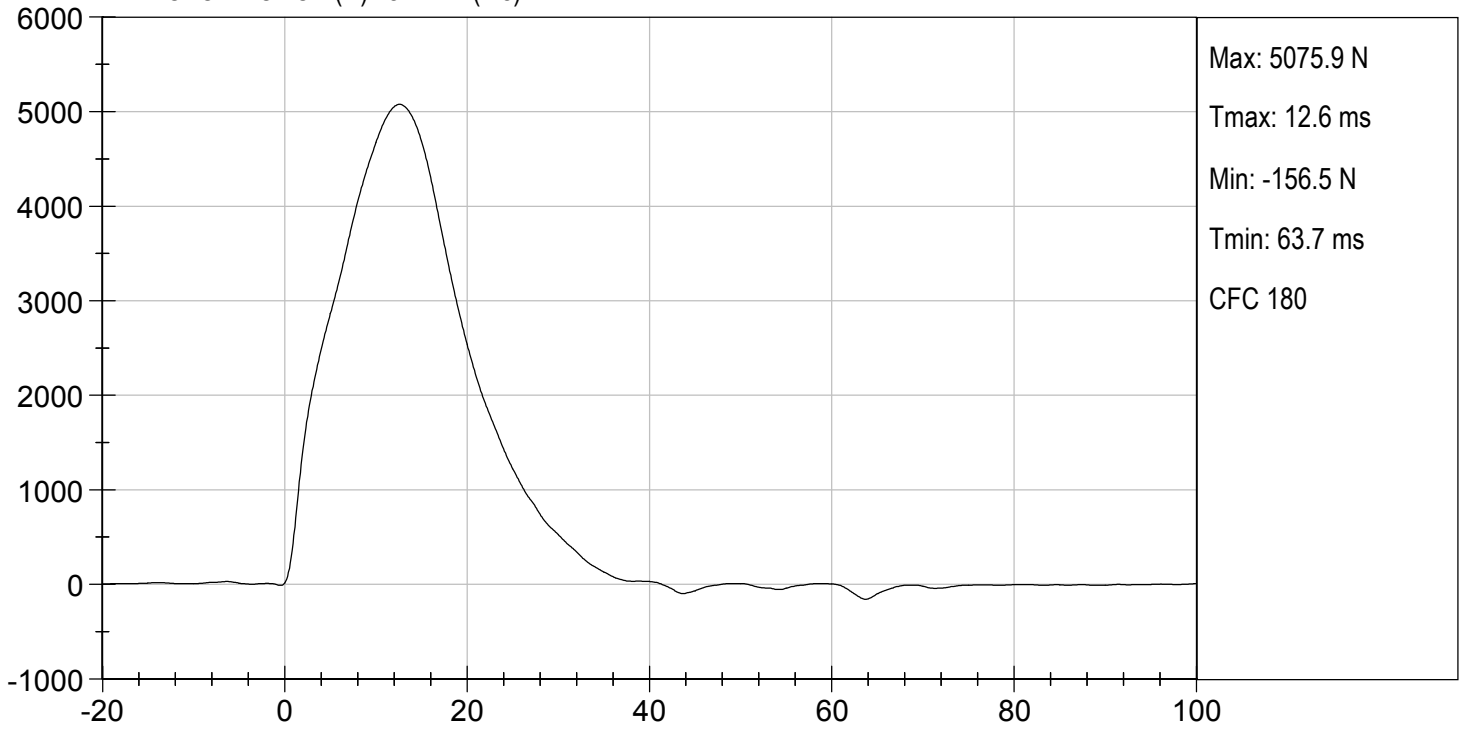
05/31/2019
Test Date

Approved By

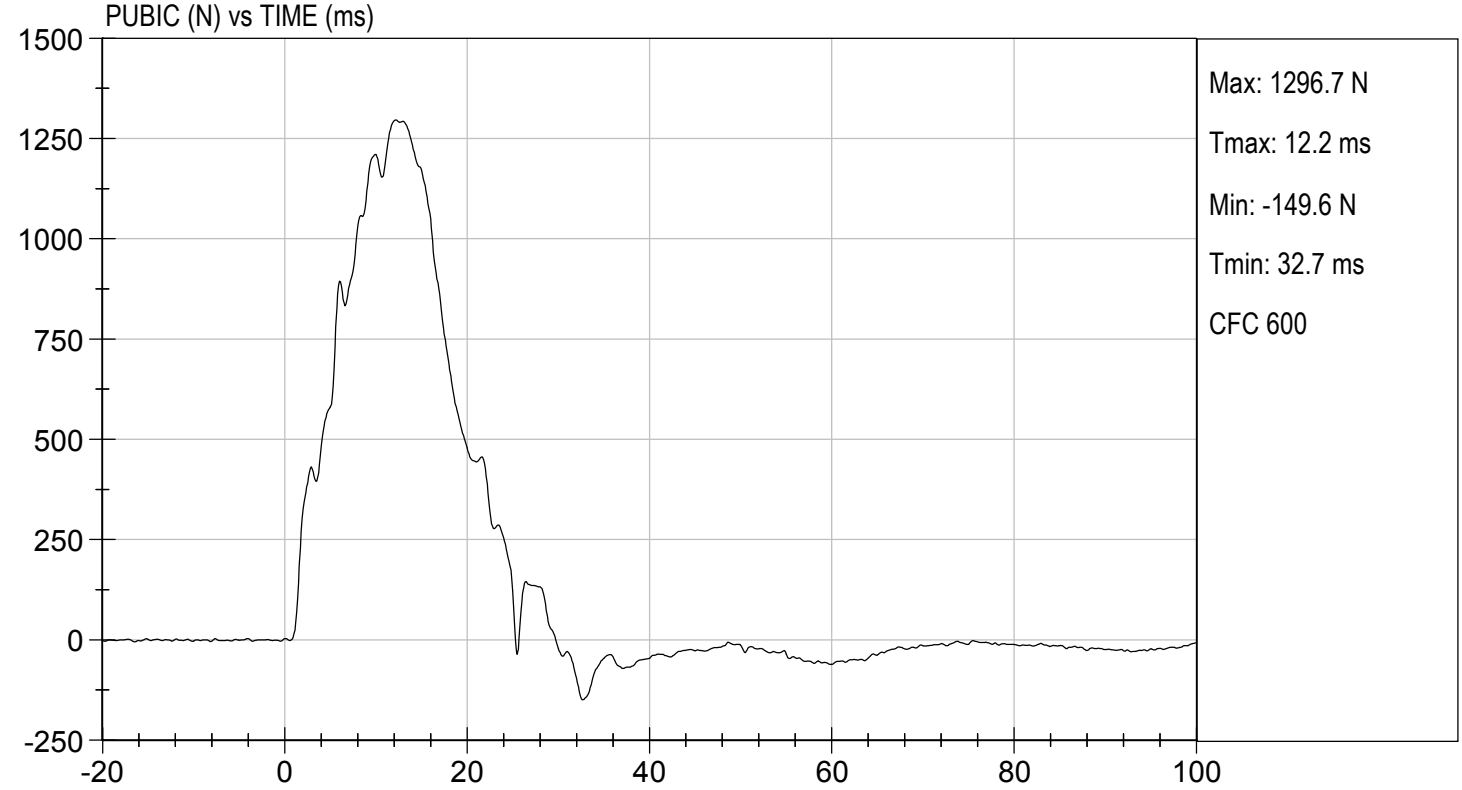
TEST DESC: PELVIS IMPACT
VELOCITY: 14.40 ft/s, 4.39 m/s

TEST DATE: 05/31/2019
TEST #: D191689

IMPACTOR FORCE (N) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D191680

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	51	Pass
Probe Speed	m/s	5.40 to 5.60	5.41	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5404	Pass
Upper Rib Displacement	mm	34.0 to 41.0	36.6	Pass
Middle Rib Displacement	mm	37.0 to 45.0	38.9	Pass
Lower Rib Displacement	mm	37.0 to 44.0	39.5	Pass
		Overall Test Results		Pass

Jacob D Taylor
Laboratory Technician

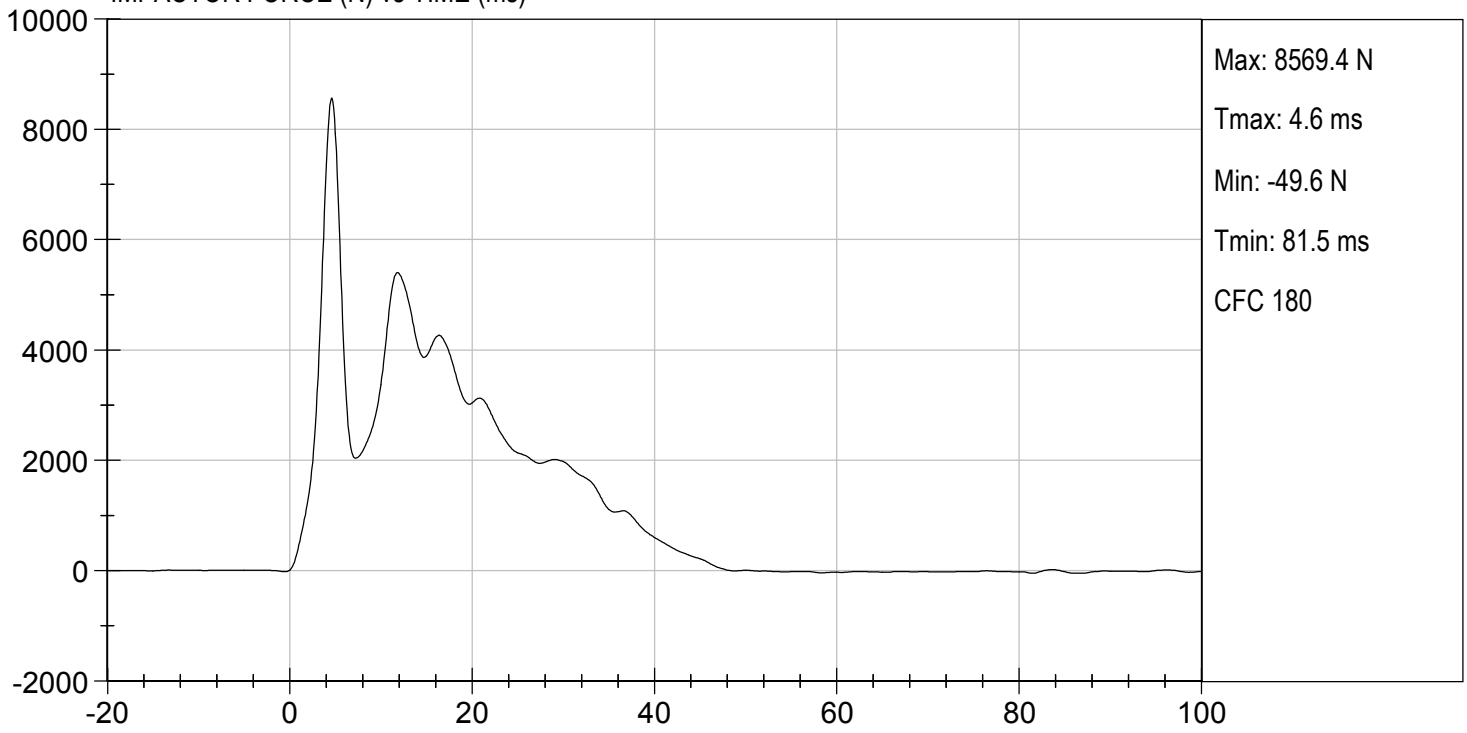
05/31/2019
Test Date

Approved By

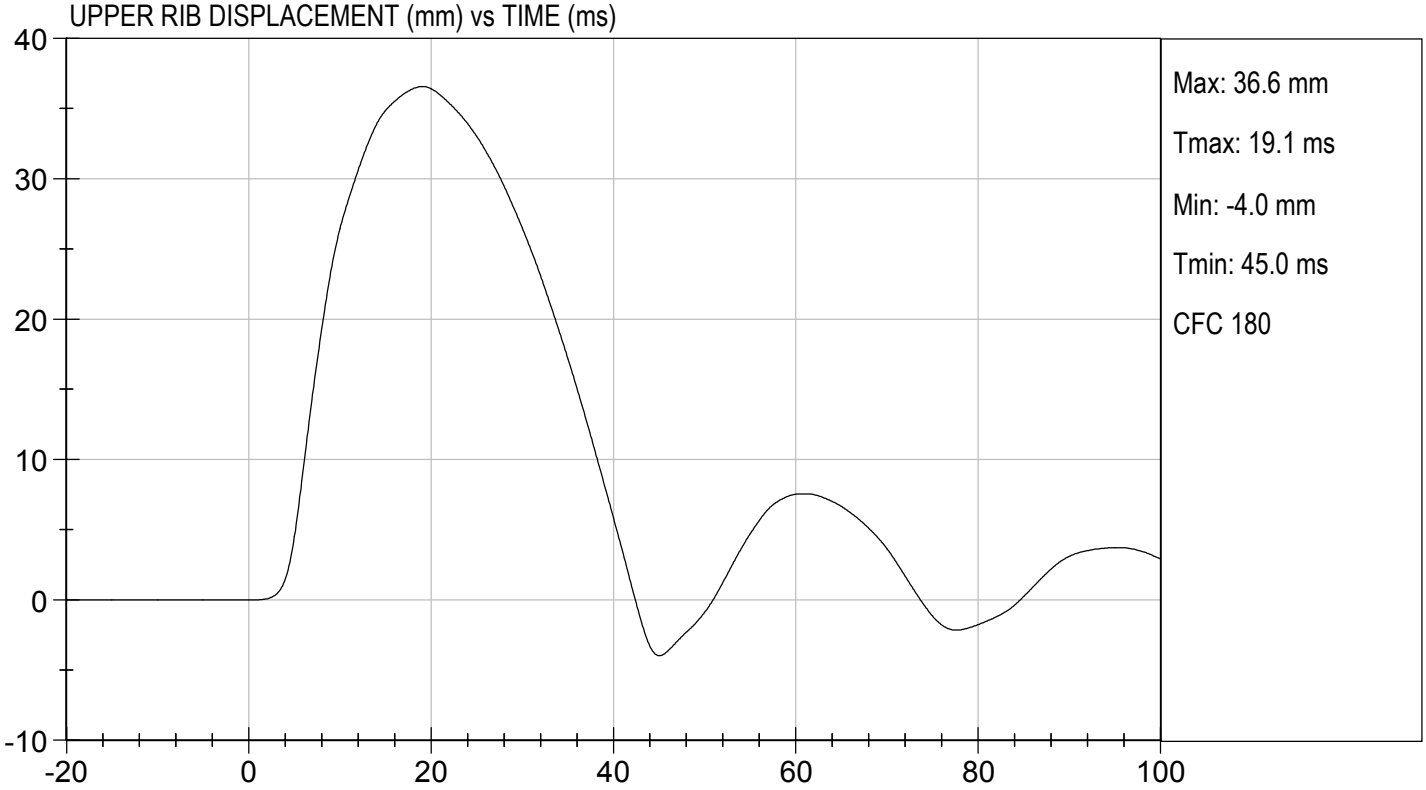
TEST DESC: THORAX IMPACT
VELOCITY: 17.75 ft/s, 5.41 m/s

TEST DATE: 05/31/2019
TEST #: D191680

IMPACTOR FORCE (N) vs TIME (ms)



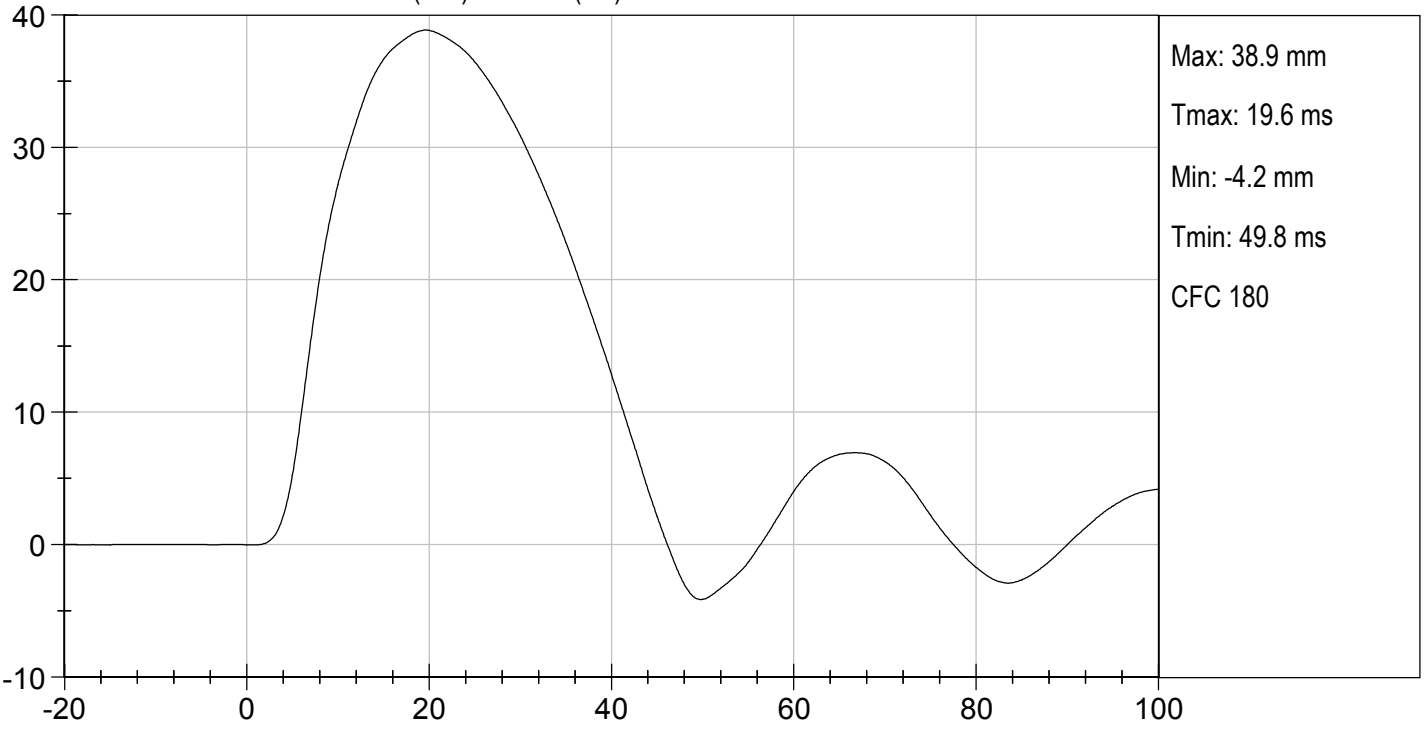
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



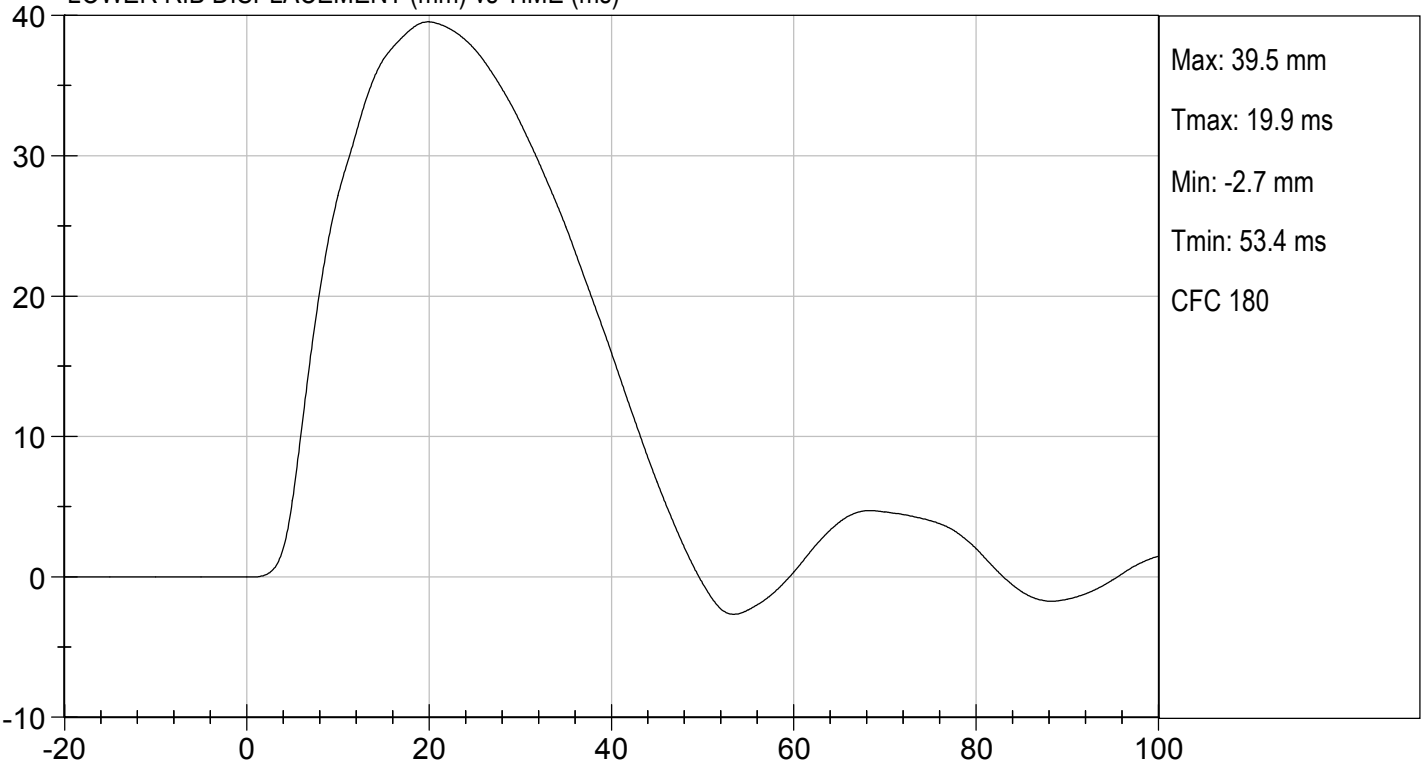
TEST DESC: THORAX IMPACT
VELOCITY: 17.75 ft/s, 5.41 m/s

TEST DATE: 05/31/2019
TEST #: D191680

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: 306

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

MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D191601

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	32	Pass
Peak Resultant Acceleration	G's	115 to 137	120	Pass
Peak Longitudinal Acceleration	G's	+/- 15	8.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/13/2019

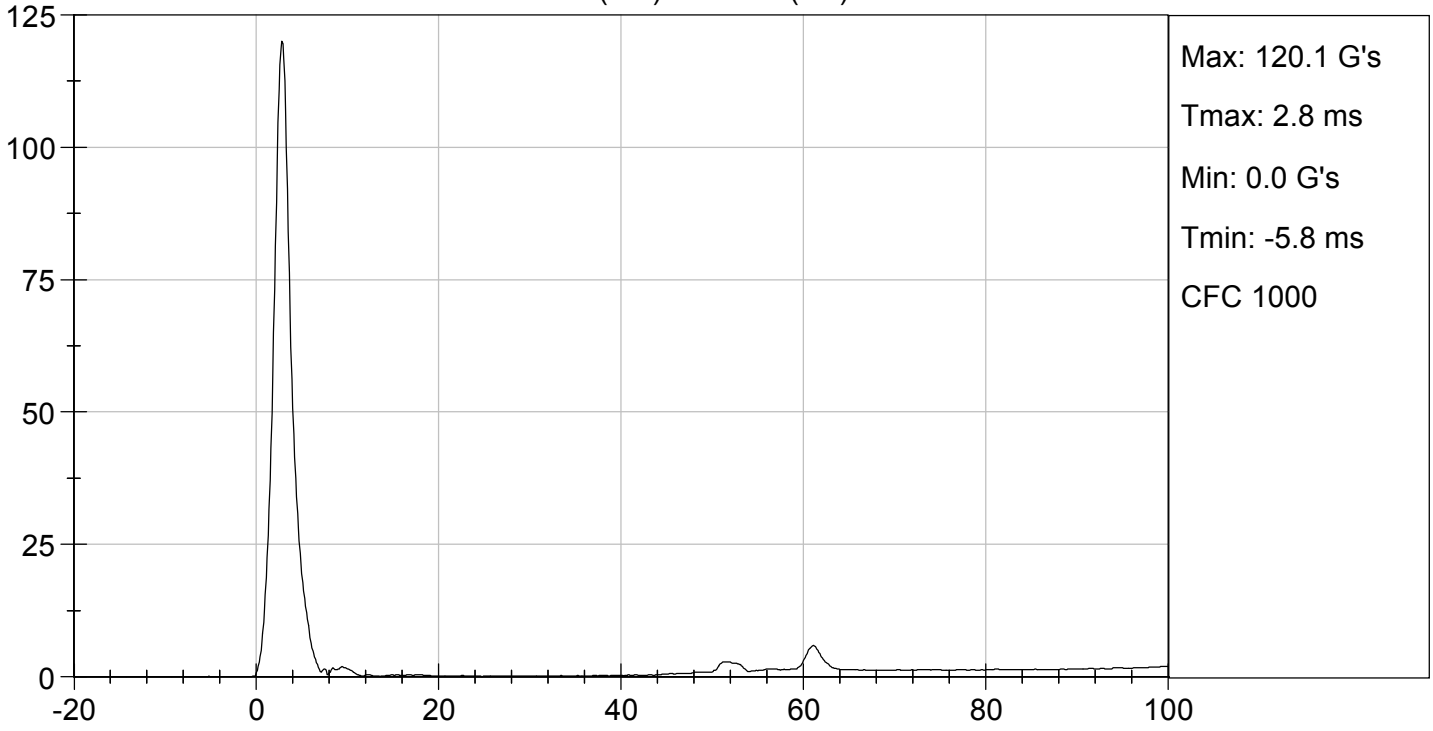
Test Date

Approved By

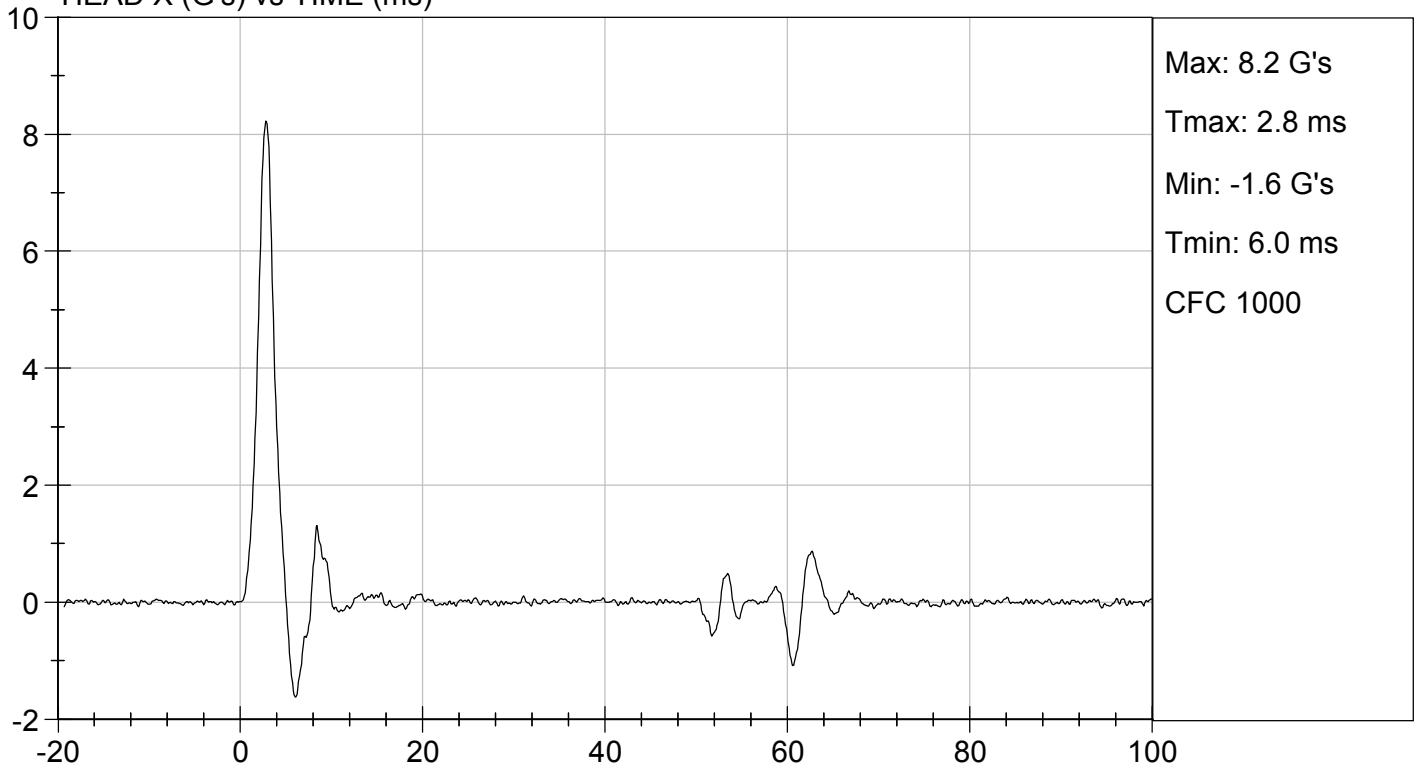
TEST DESC: HEAD DROP

TEST DATE: 05/13/2019
TEST #: D191601

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

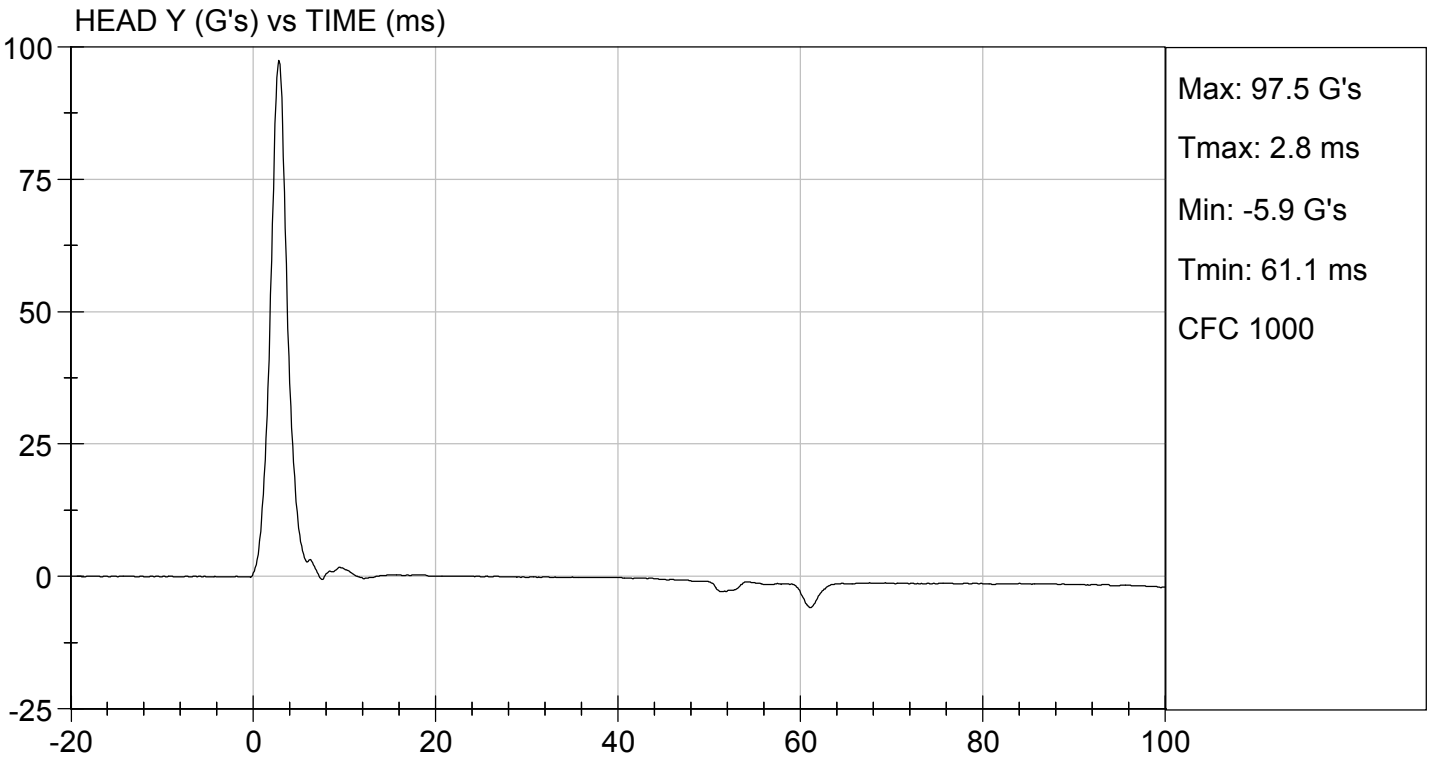


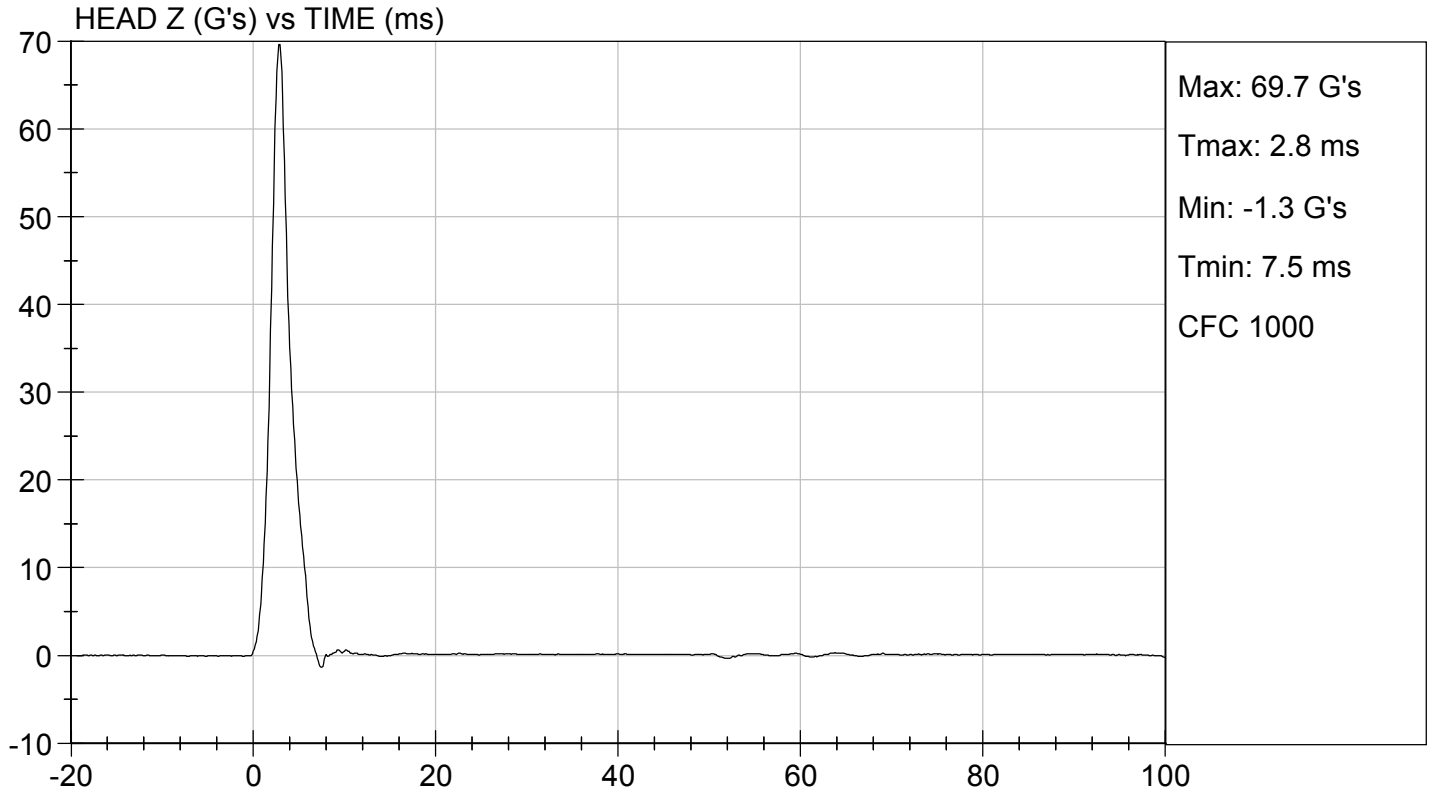
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 05/13/2019
TEST #: D191601





MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D191602

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.7	Pass
Humidity		%	10 to 70	32	Pass
Impact Velocity		m/s	5.51 to 5.63	5.62	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.27	Pass
	15 ms	m/s	3.30 to 4.10	3.35	Pass
	20 ms	m/s	4.40 to 5.40	4.68	Pass
	25 ms	m/s	5.40 to 6.10	5.62	Pass
	25-100 ms	m/s	5.50 to 6.20	5.64	Pass
Maximum D-Plane Rotation		deg	71 to 81	73	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	63	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-37	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	119	Pass
			Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/13/2019

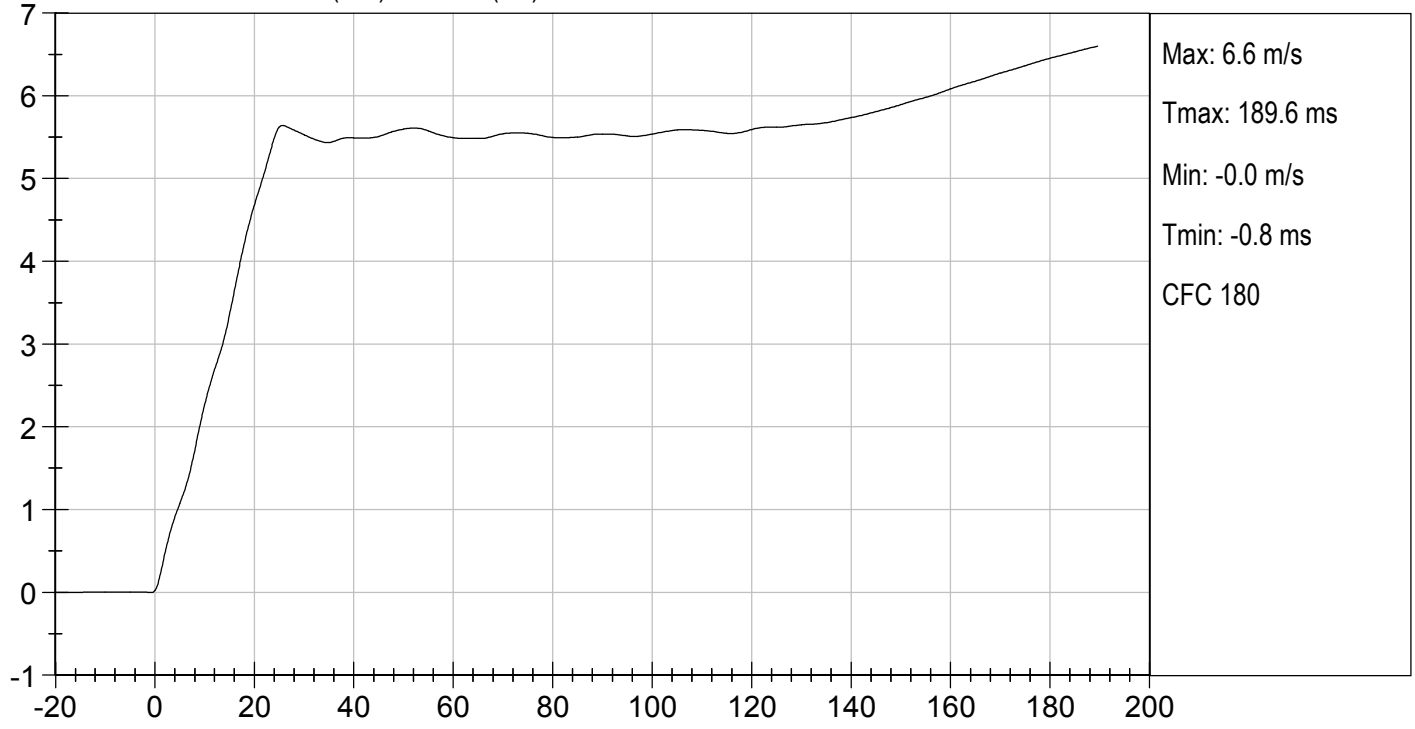
Test Date

Approved By

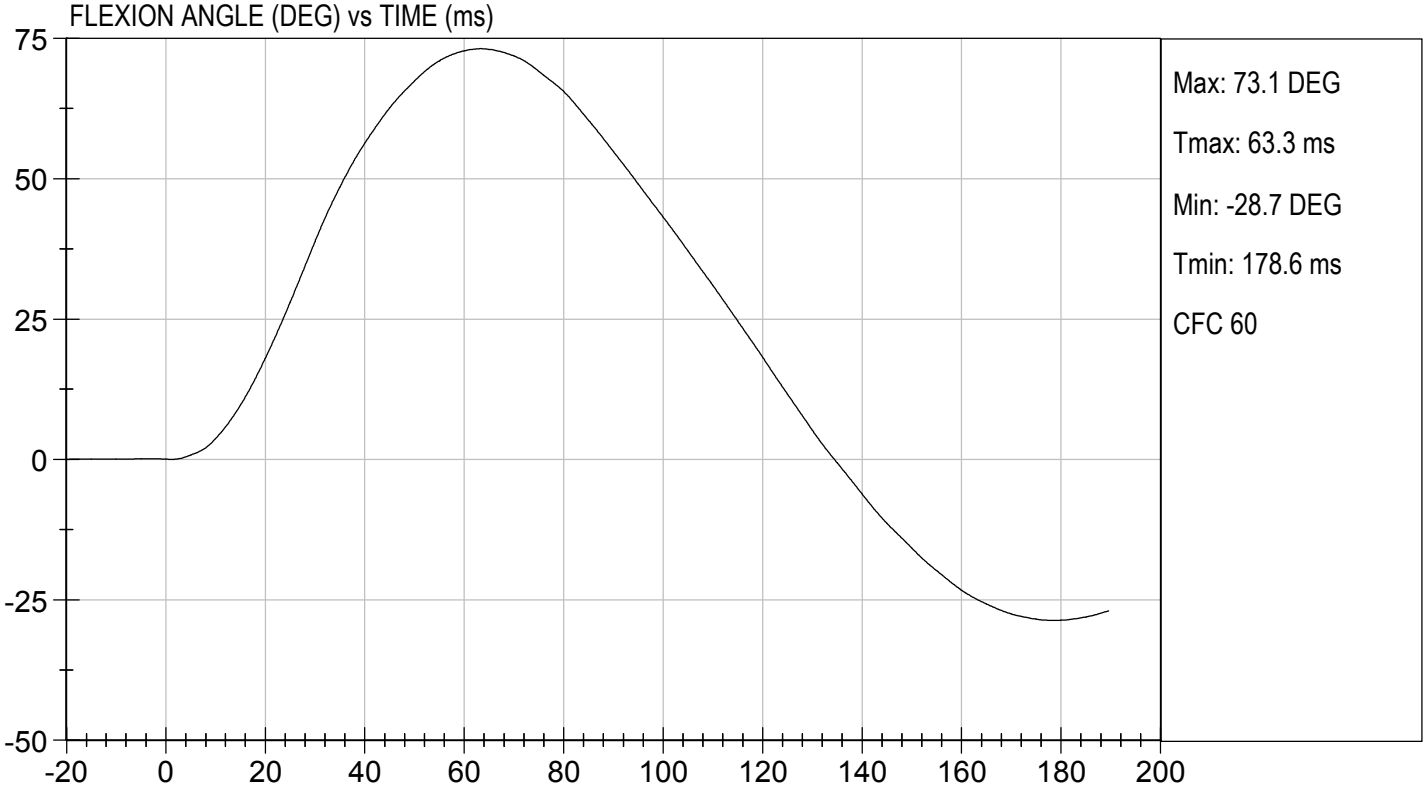
TEST DESC: NECK BENDING
VELOCITY: 18.45 ft/s, 5.62 m/s

TEST DATE: 05/13/2019
TEST #: D191602

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

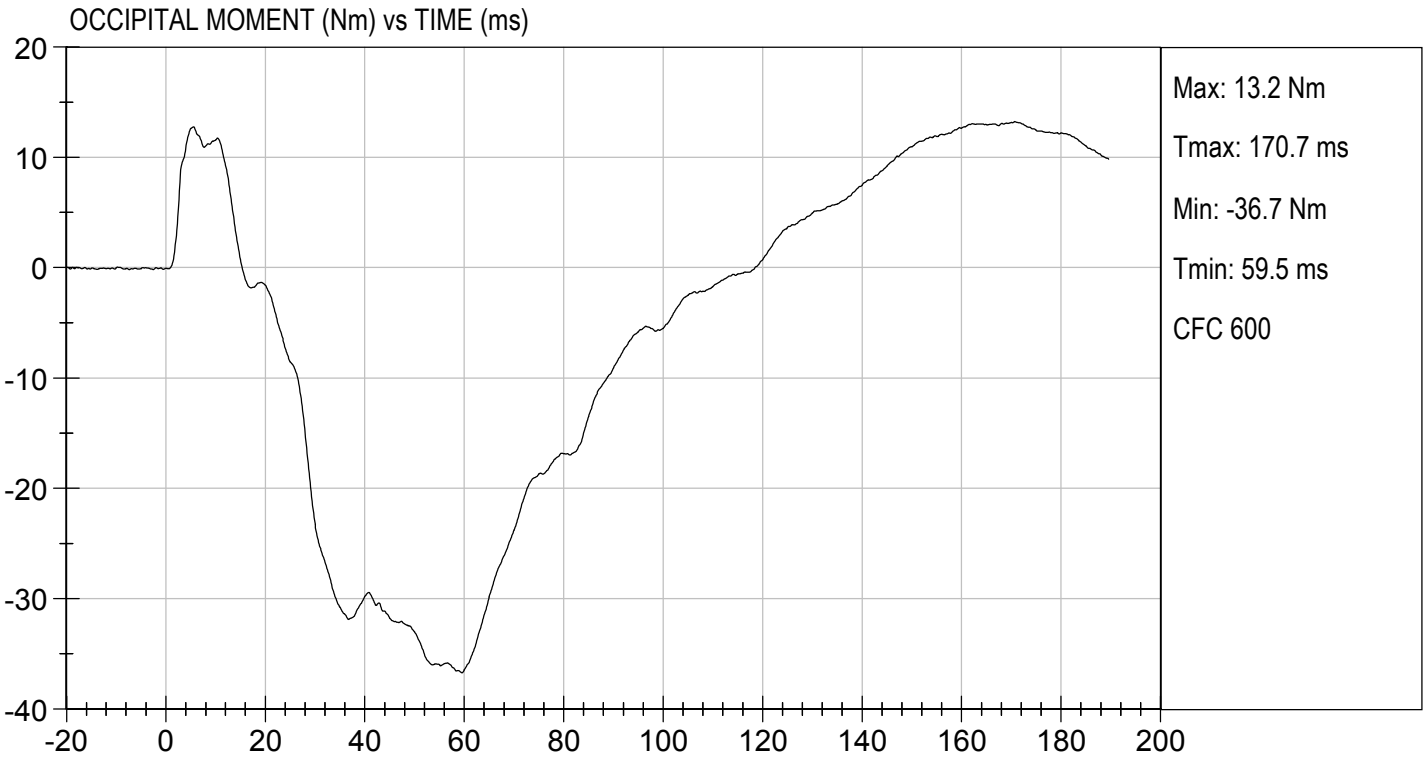


FLEXION ANGLE (DEG) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 18.45 ft/s, 5.62 m/s

TEST DATE: 05/13/2019
TEST #: D191602



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D191603

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	29	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

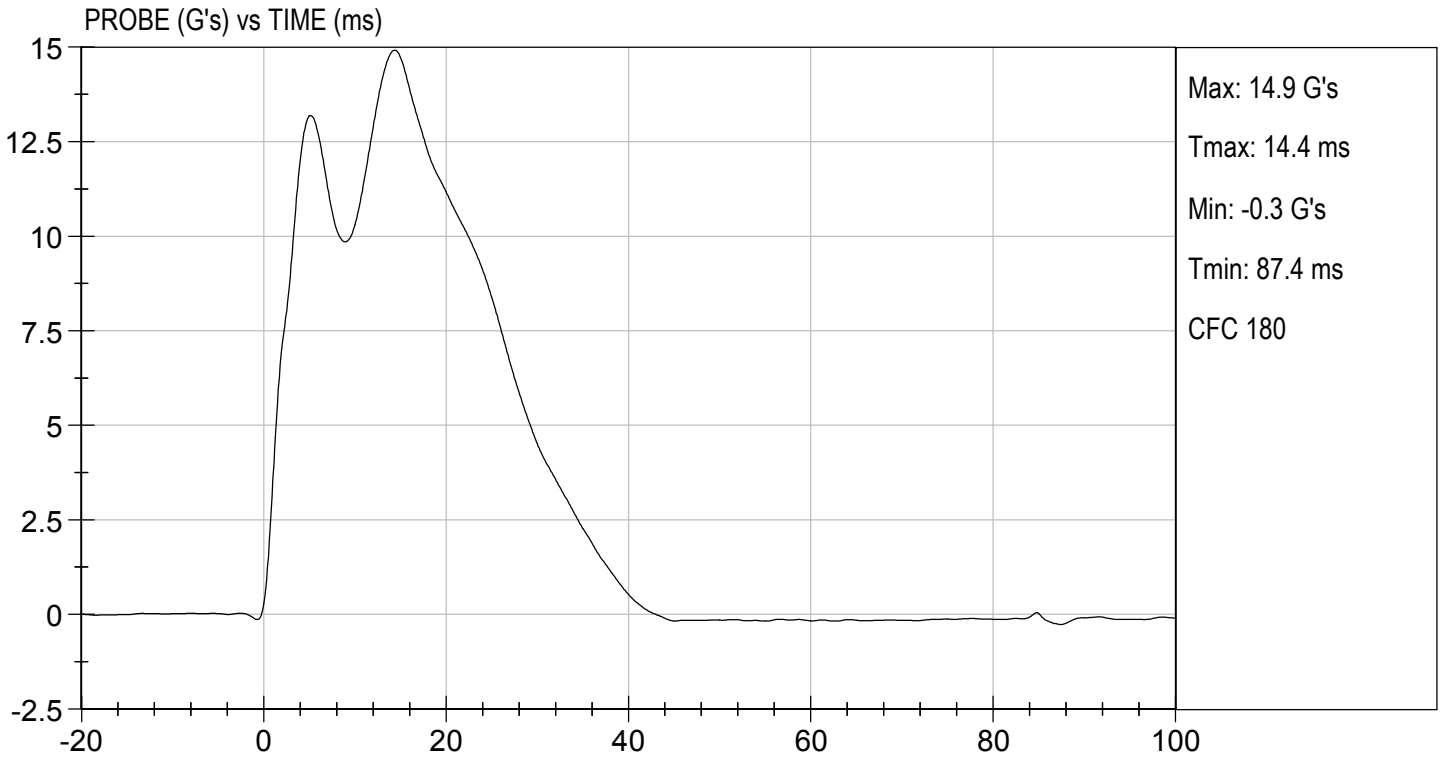
05/14/2019

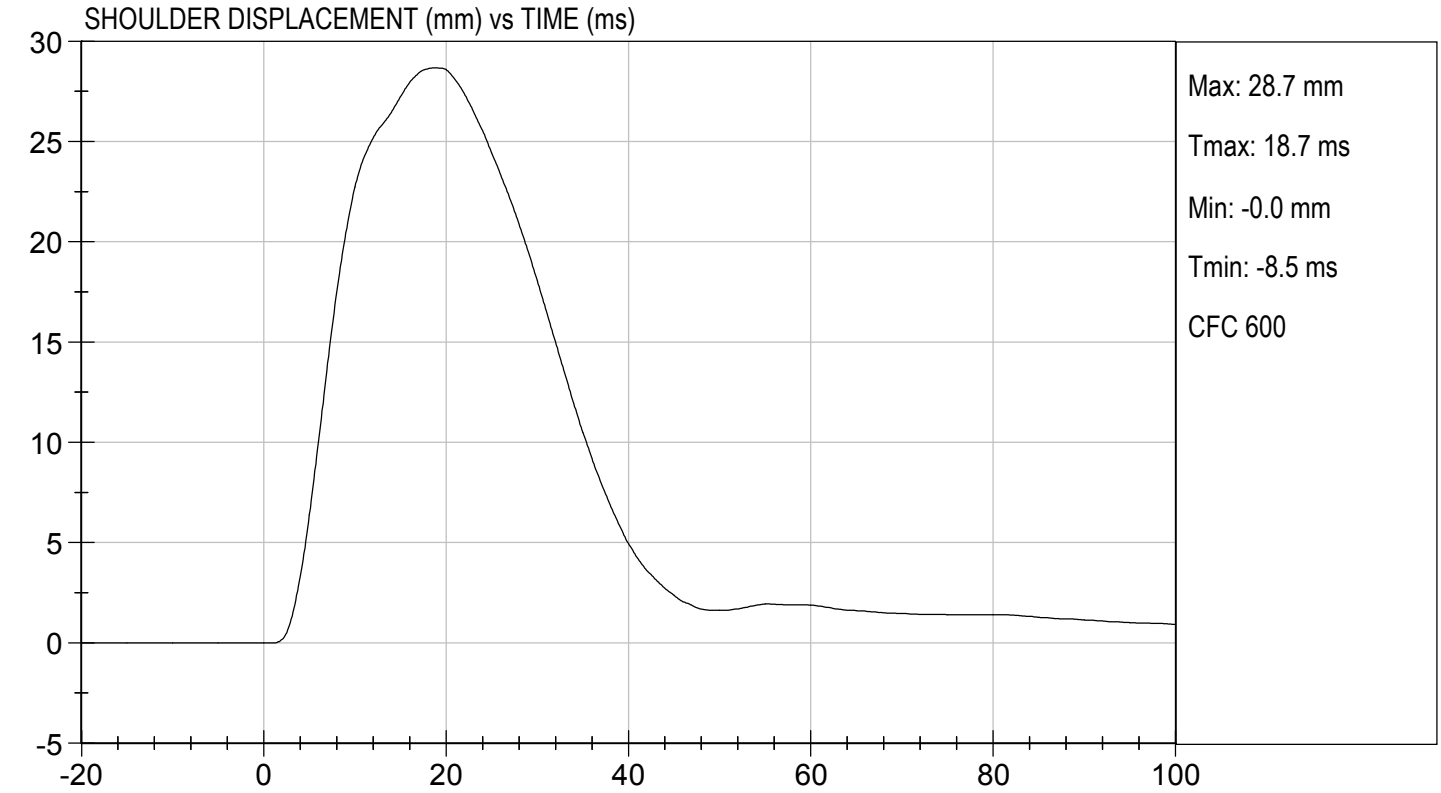
Test Date

Approved By

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

TEST DATE: 05/14/2019
TEST #: D191603

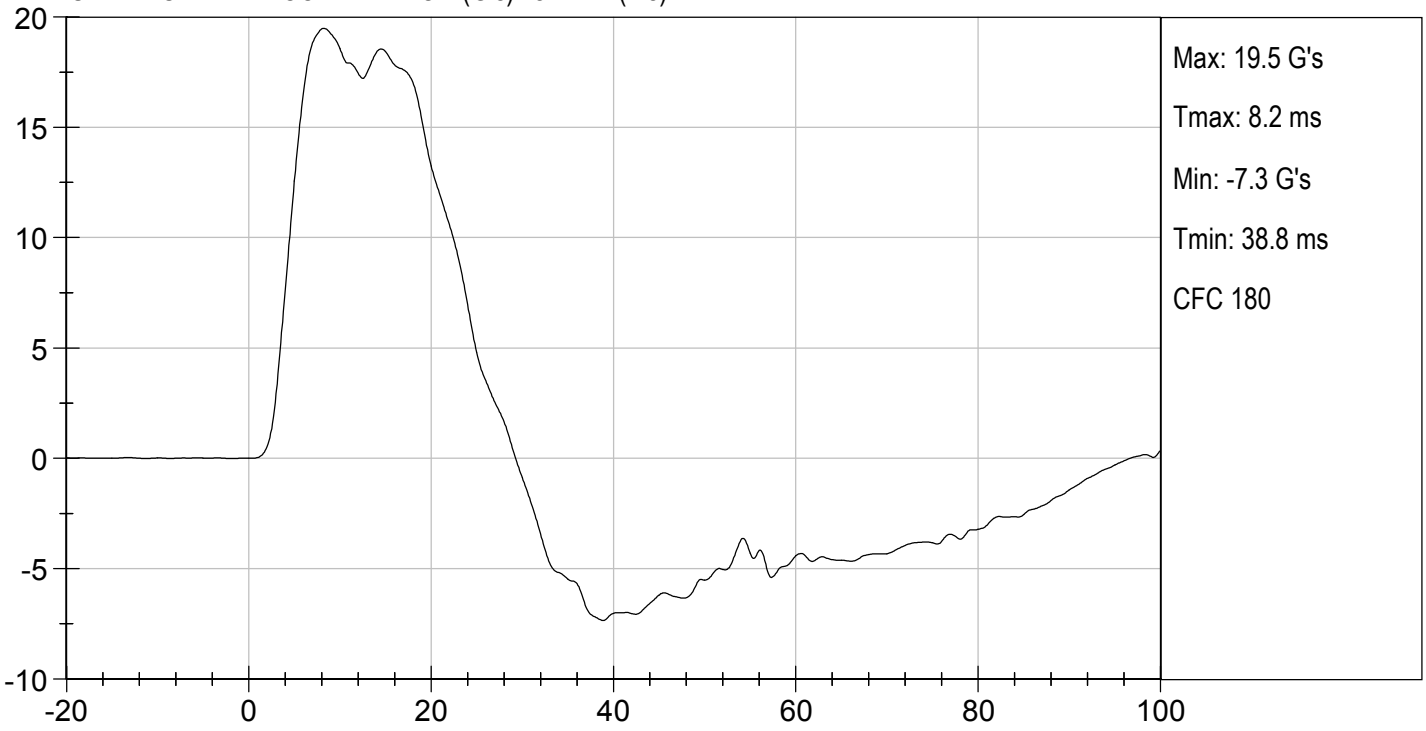




TEST DESC: SHOULDER IMPACT
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 05/14/2019
TEST #: D191603

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



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D19AQ4

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	32	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	40	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/14/2019

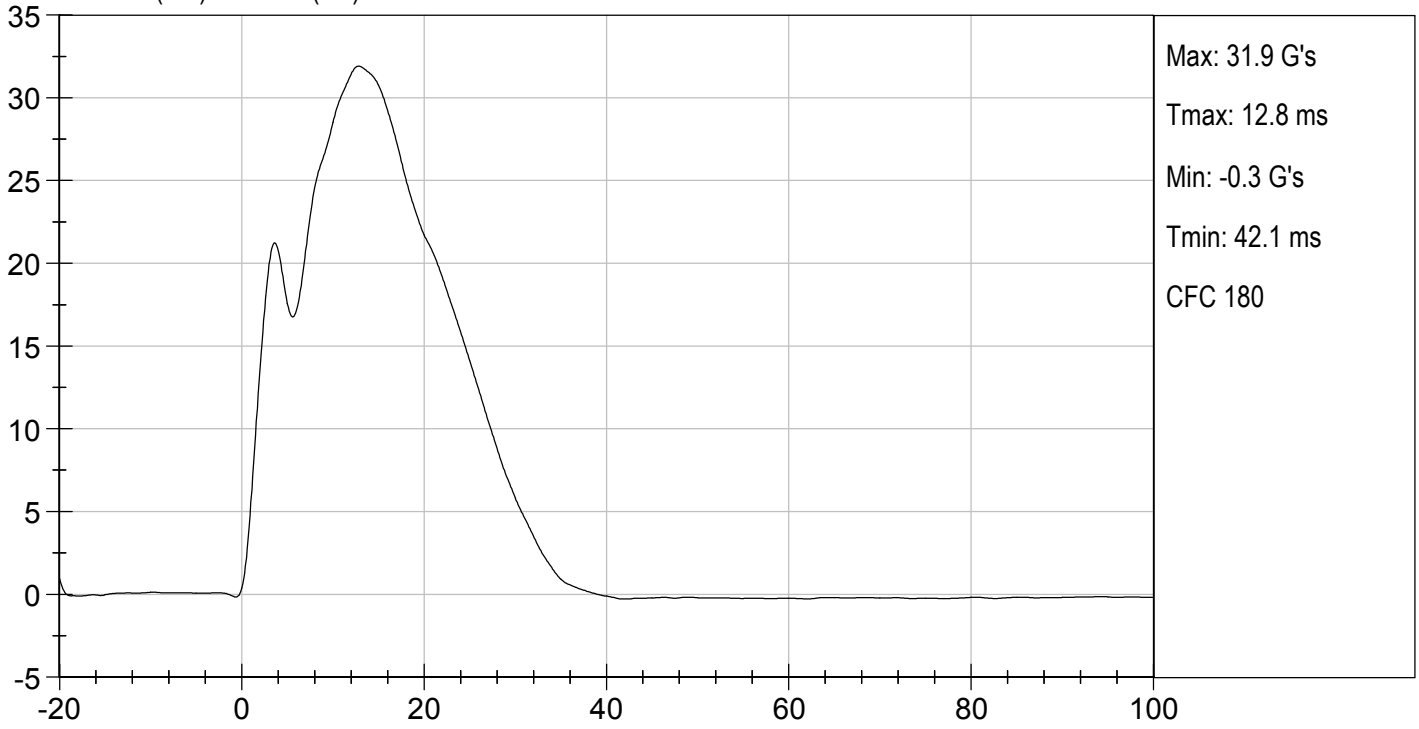
Test Date

Approved By

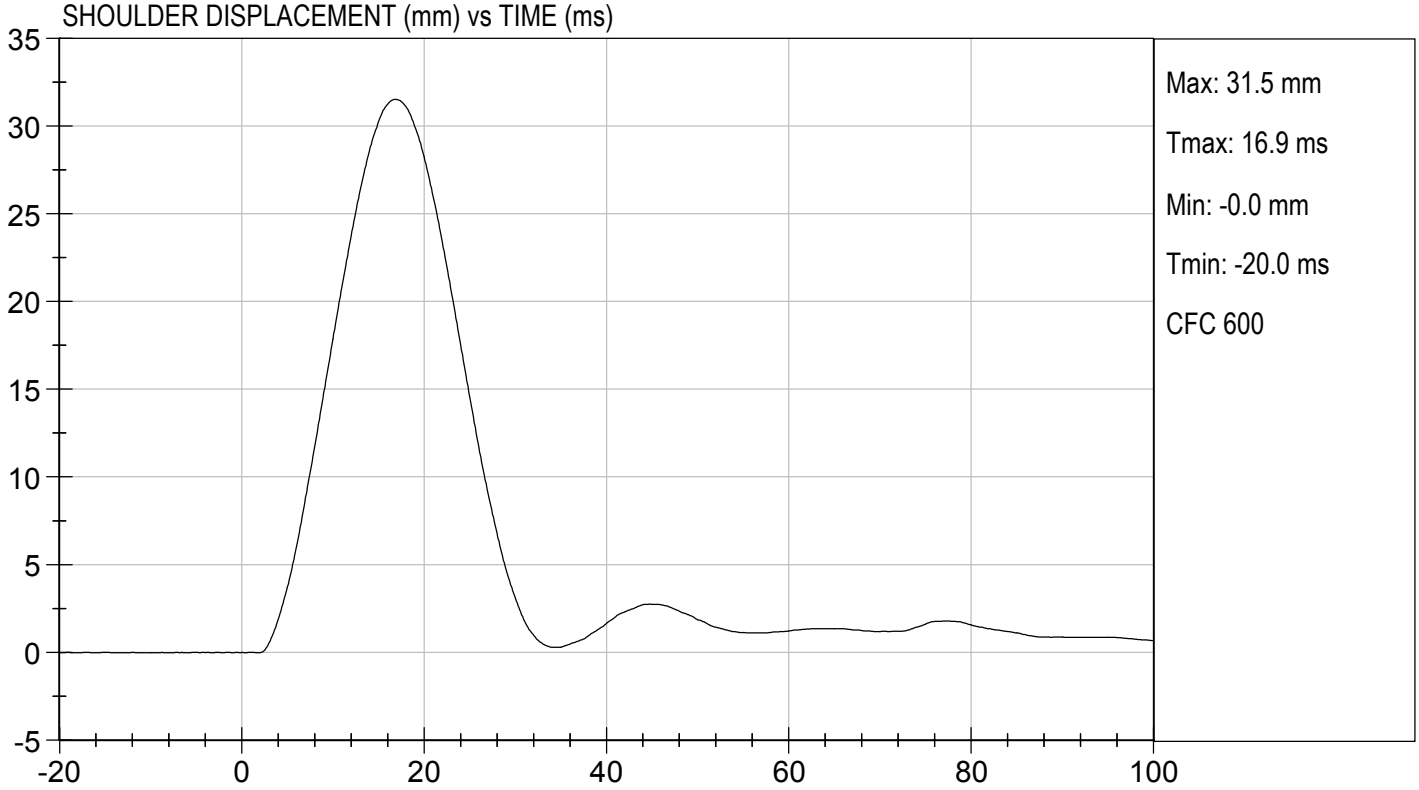
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 05/14/2019
TEST #: D19AQ4

PROBE (G's) vs TIME (ms)



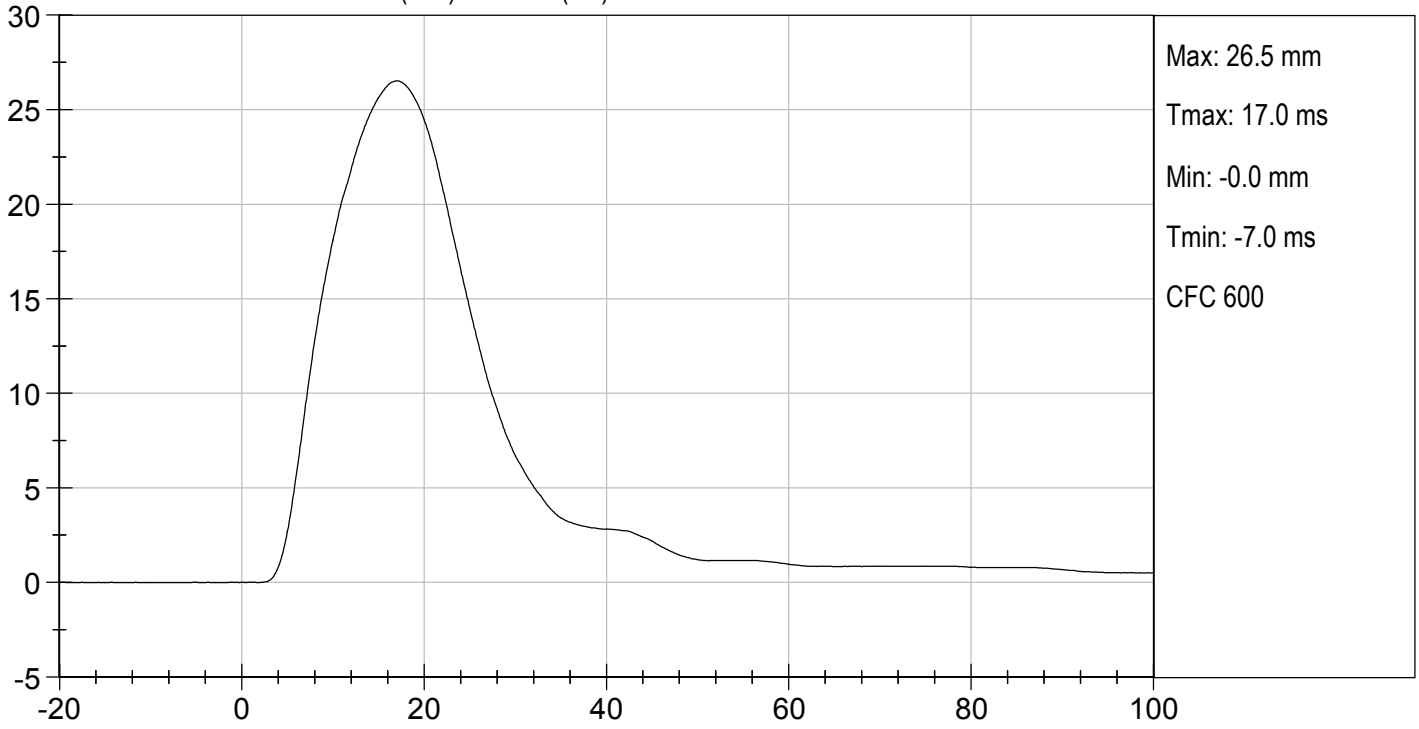
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



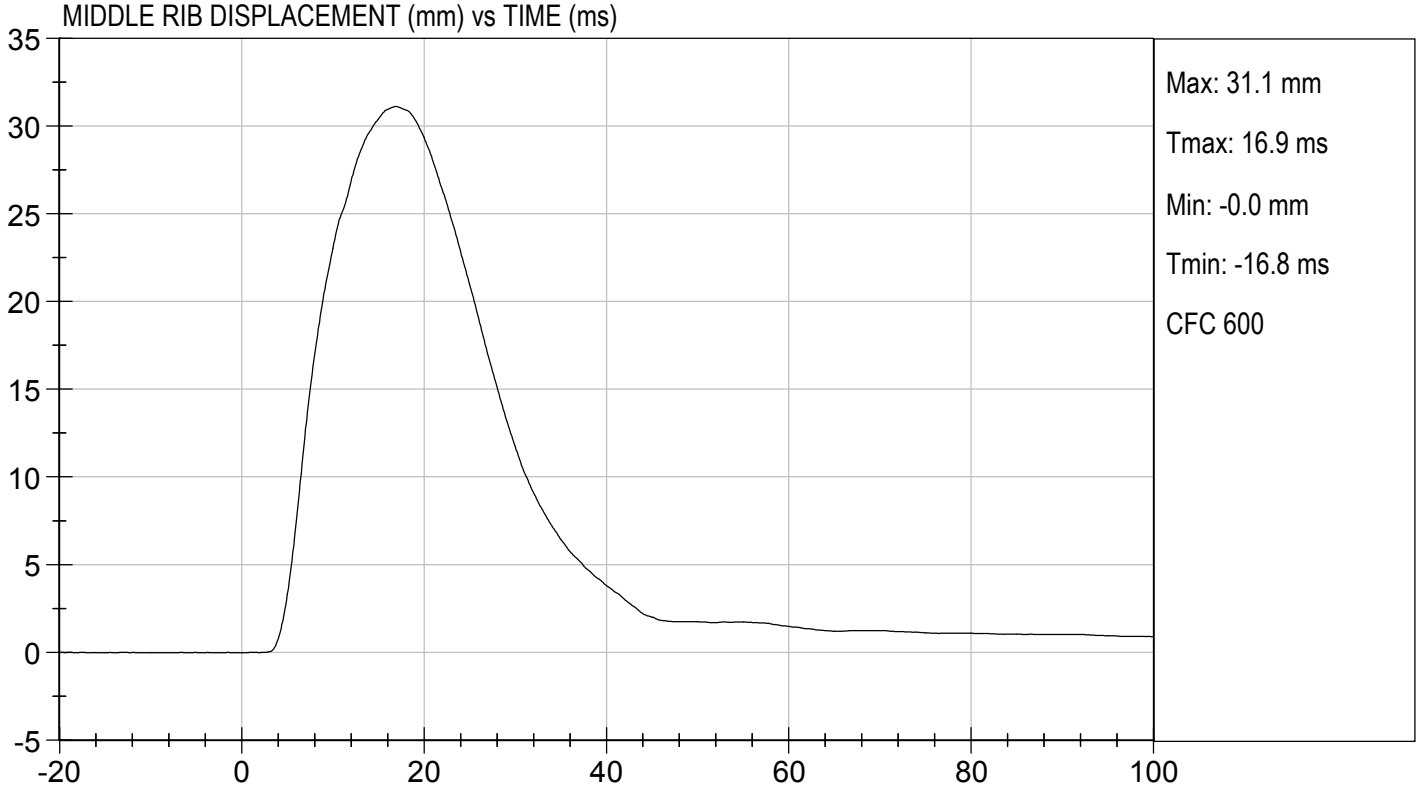
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 05/14/2019
TEST #: D19AQ4

UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



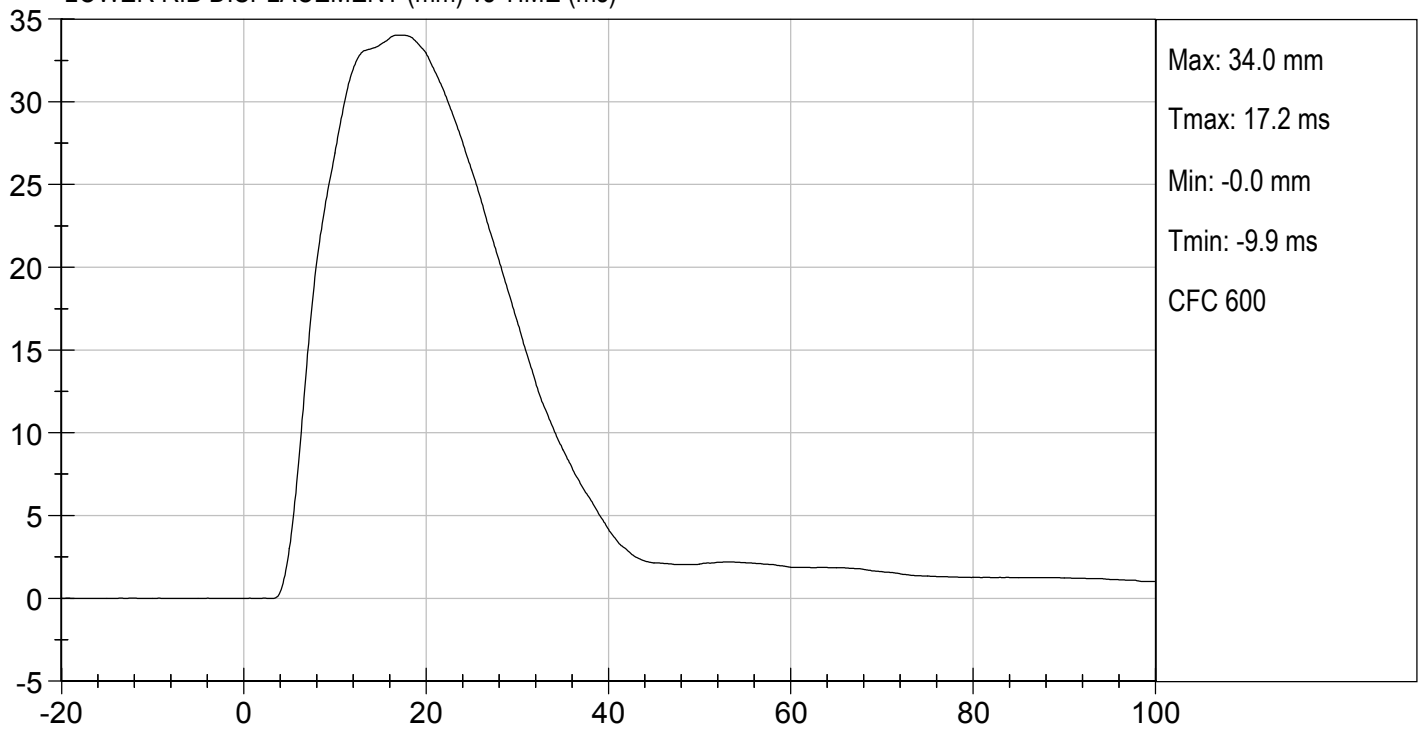
MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



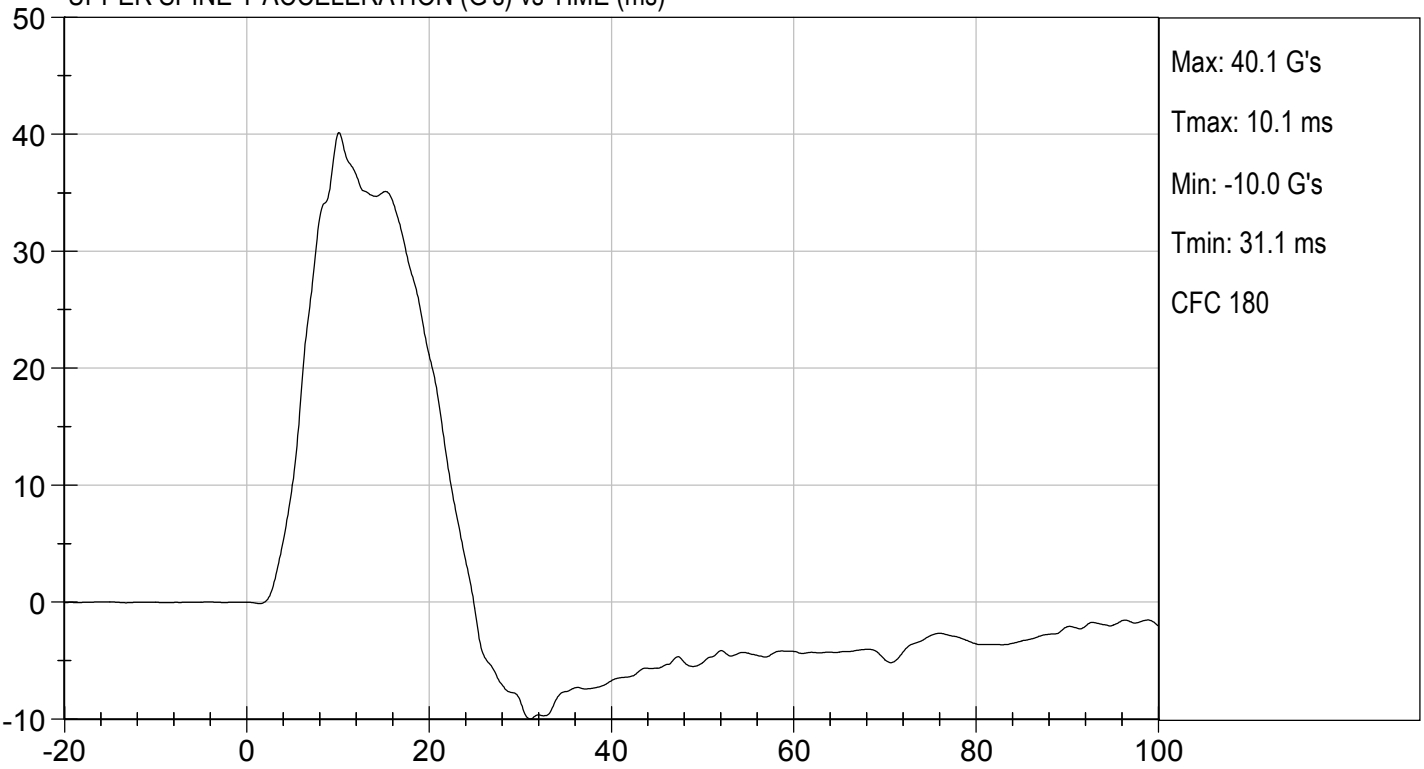
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 05/14/2019
TEST #: D19AQ4

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



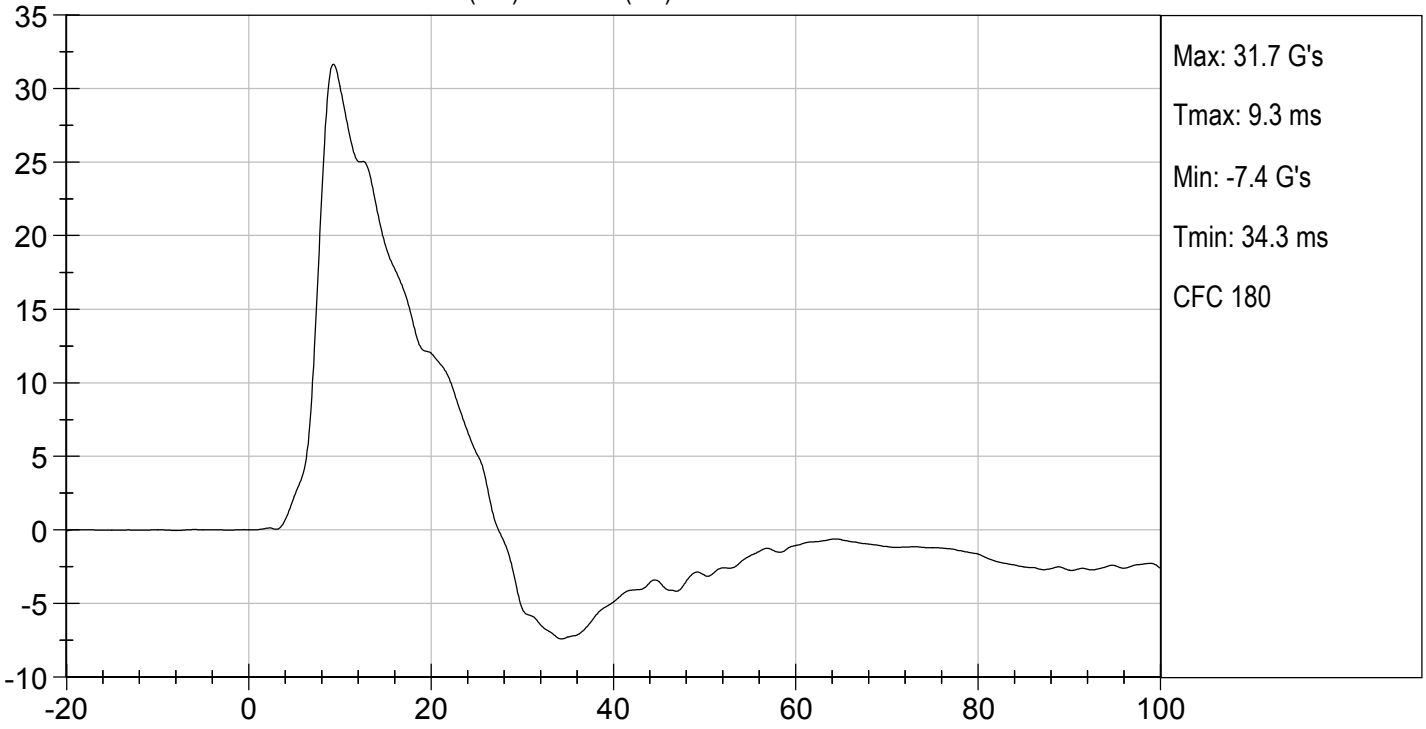
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



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

TEST DATE: 05/14/2019
TEST #: D19AQ4

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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D19AQ5

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	36	Pass
Middle Rib Displacement	mm	39 to 45	40	Pass
Lower Rib Displacement	mm	35 to 43	37	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

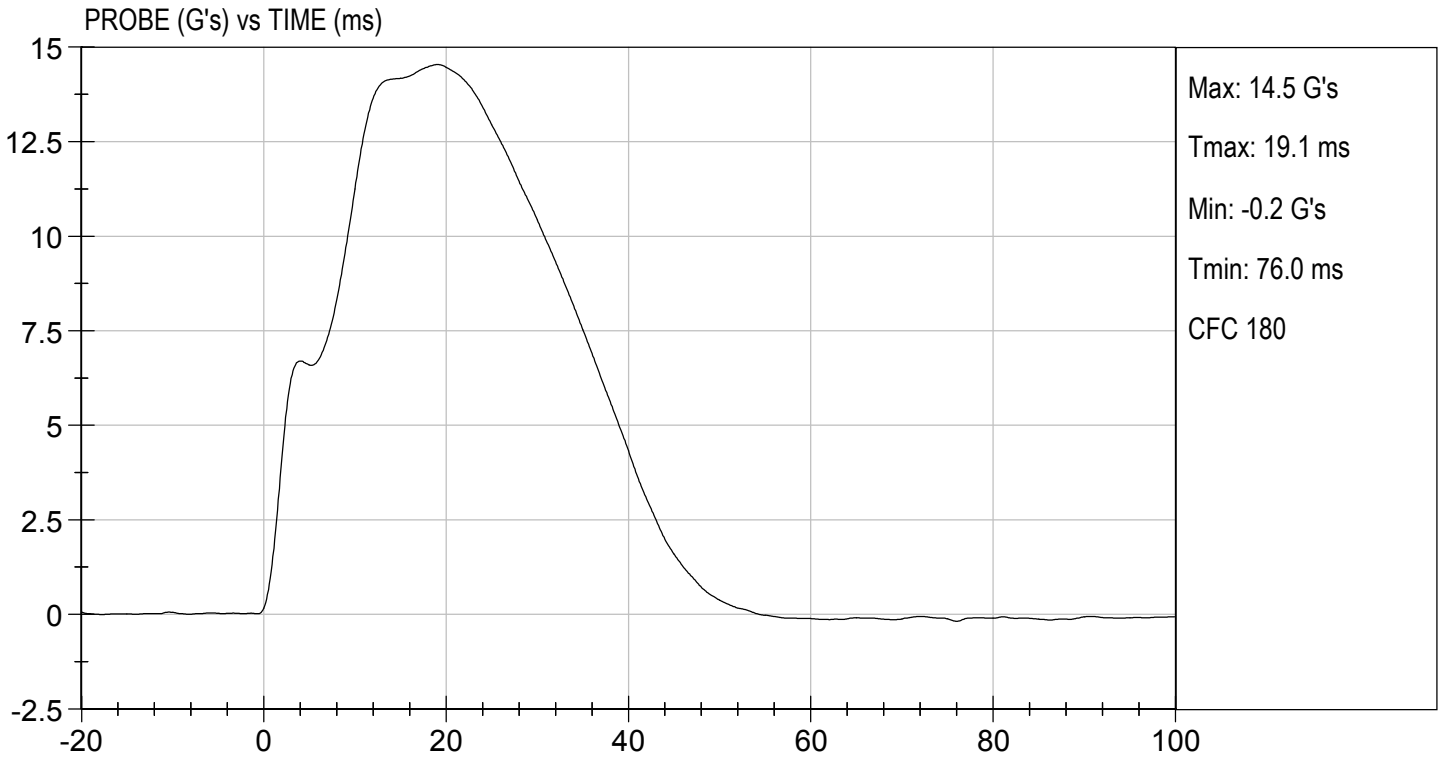
Jacob D Taylor
Laboratory Technician

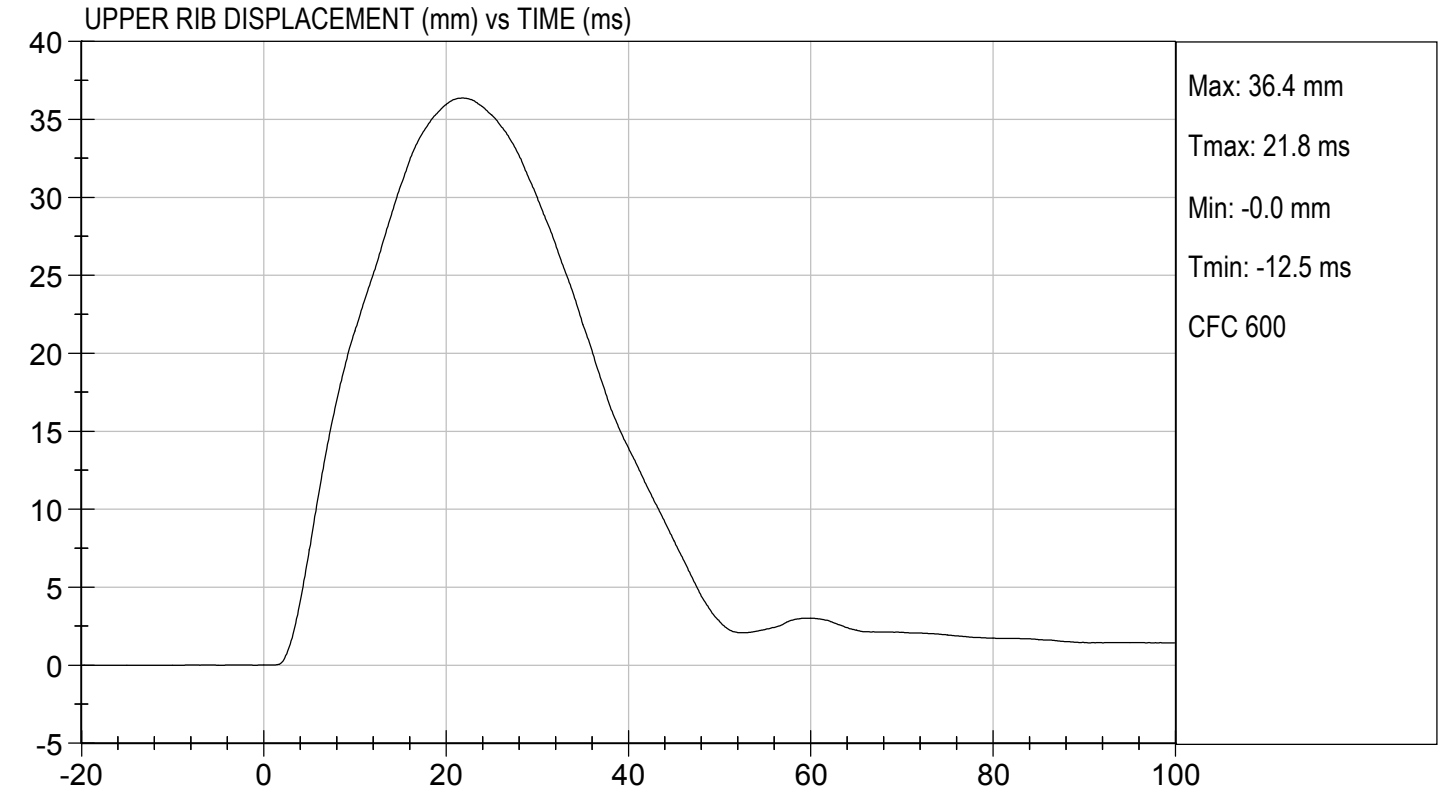
05/14/2019
Test Date

Approved By

TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 05/14/2019
TEST #: D19AQ5

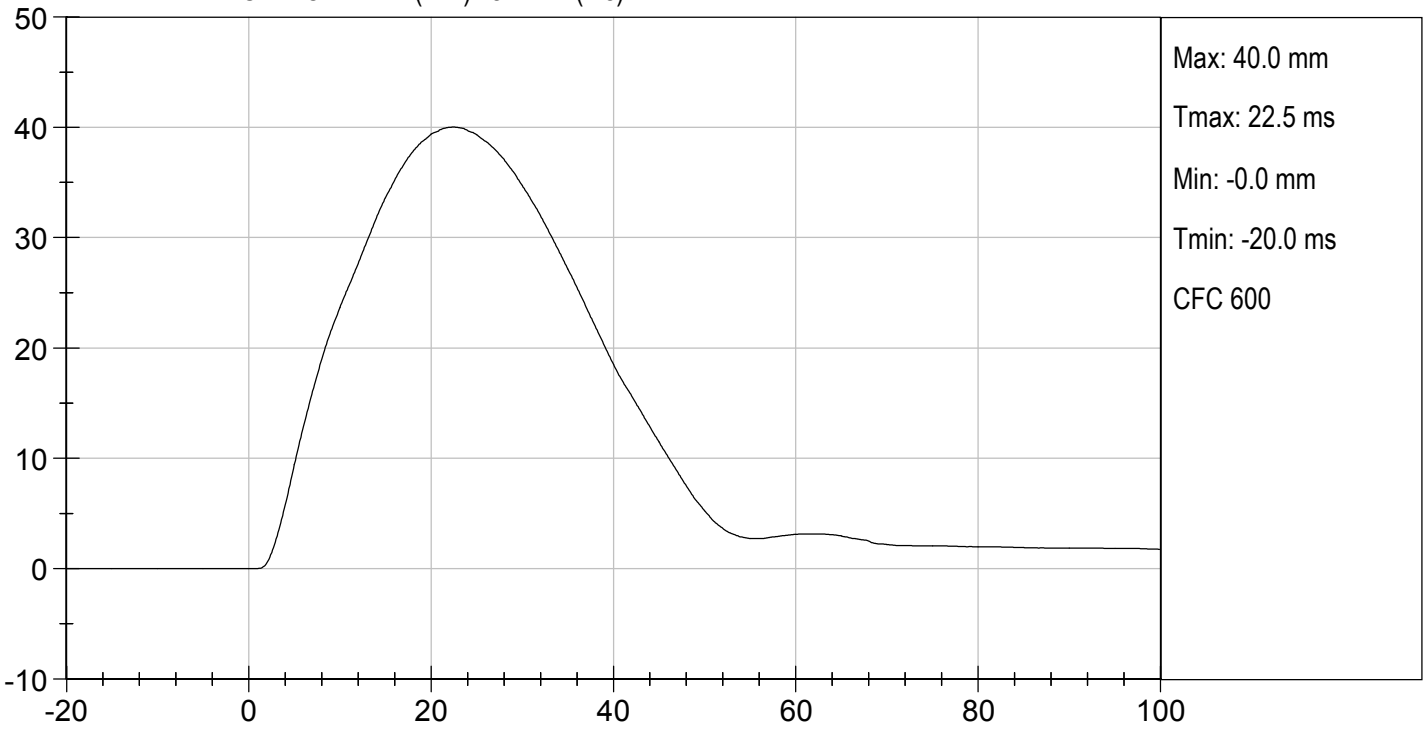




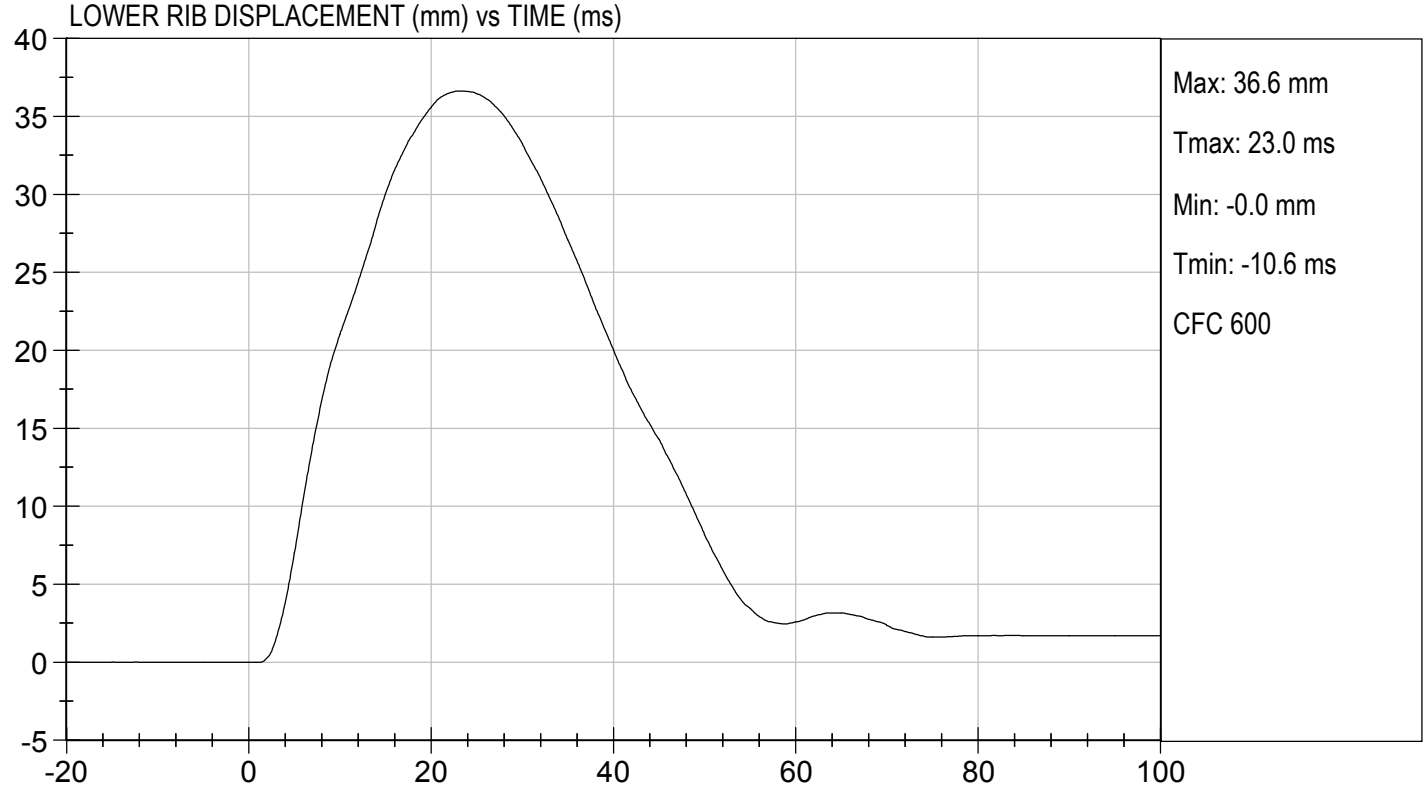
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 05/14/2019
TEST #: D19AQ5

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



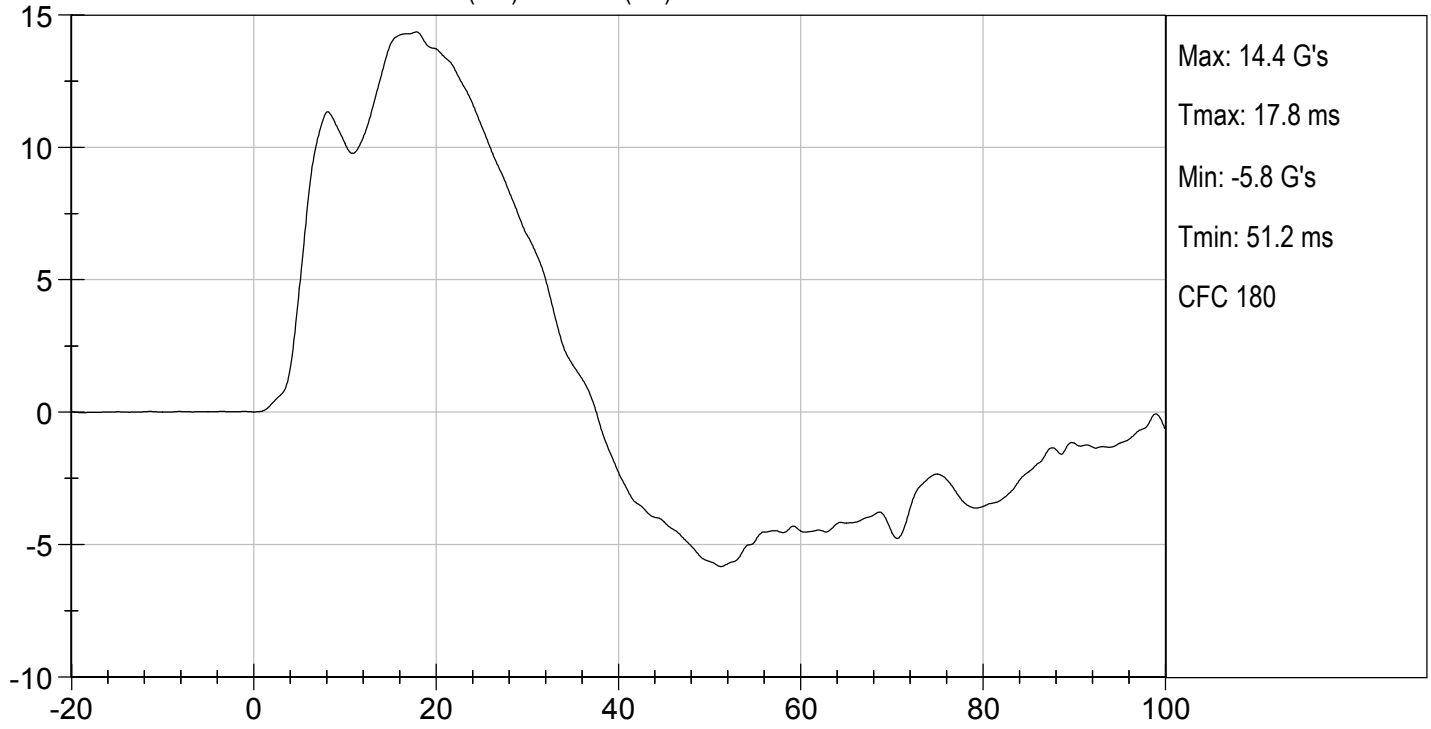
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



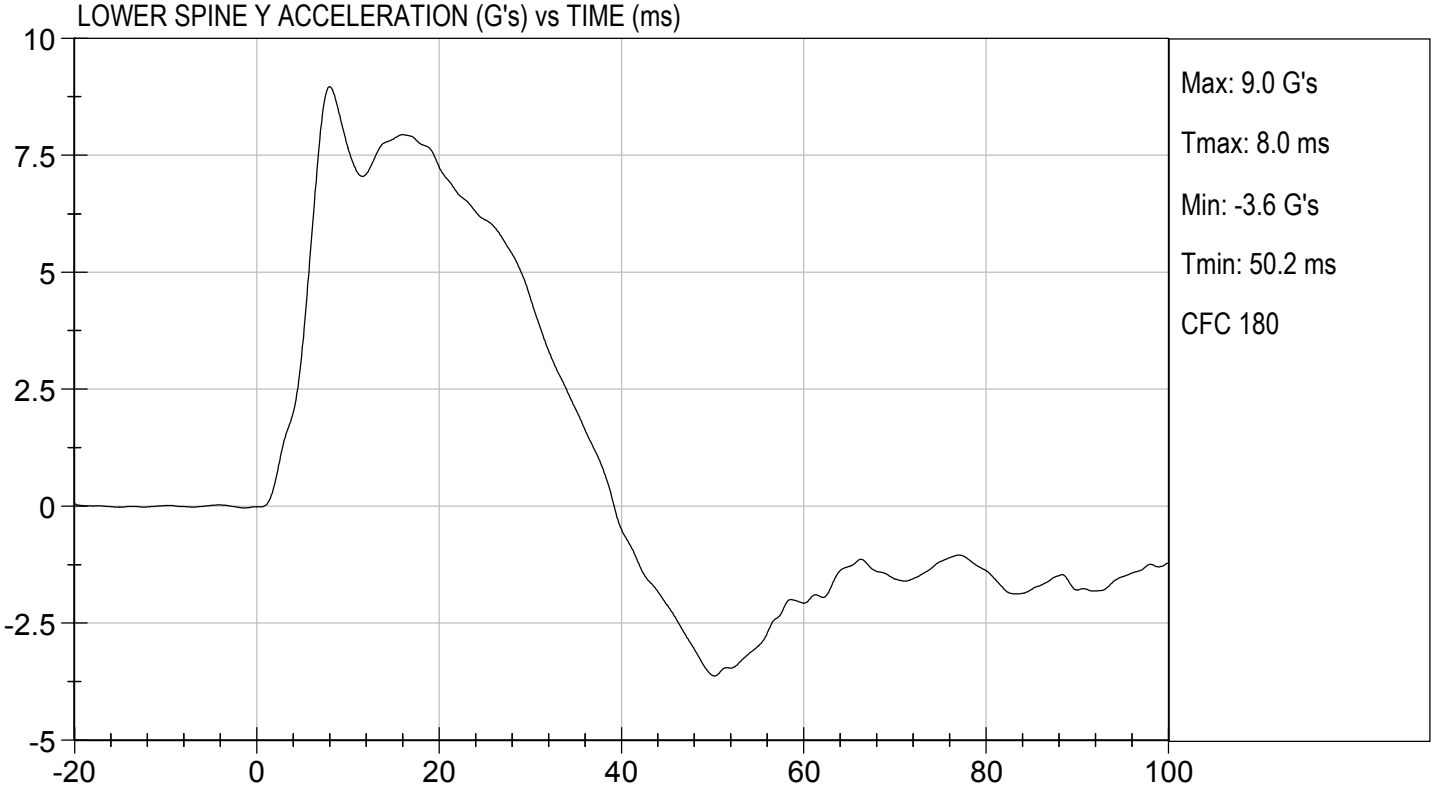
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 05/14/2019
TEST #: D19AQ5

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: 306 **Test I.D:** D19AQ6

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	41	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	37	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	12	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/14/2019

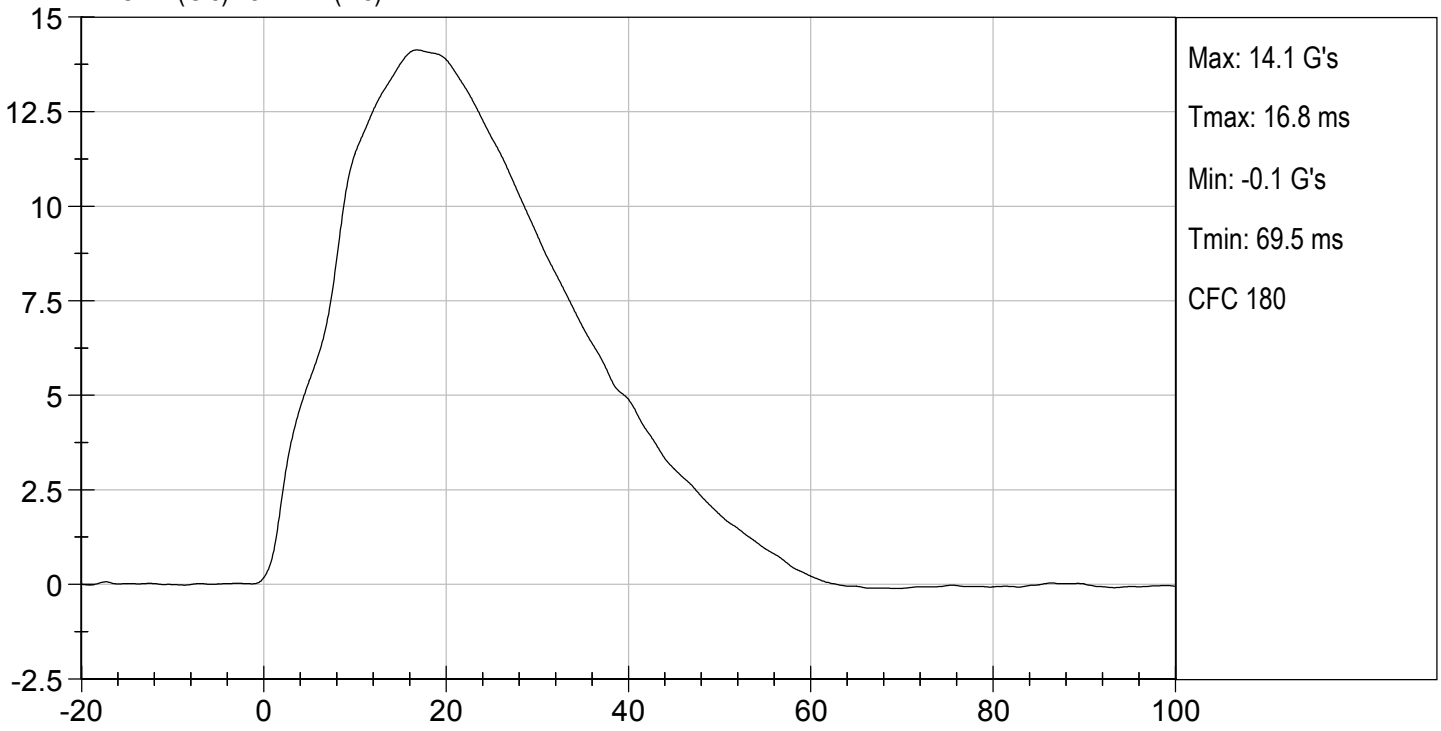
Test Date

Approved By

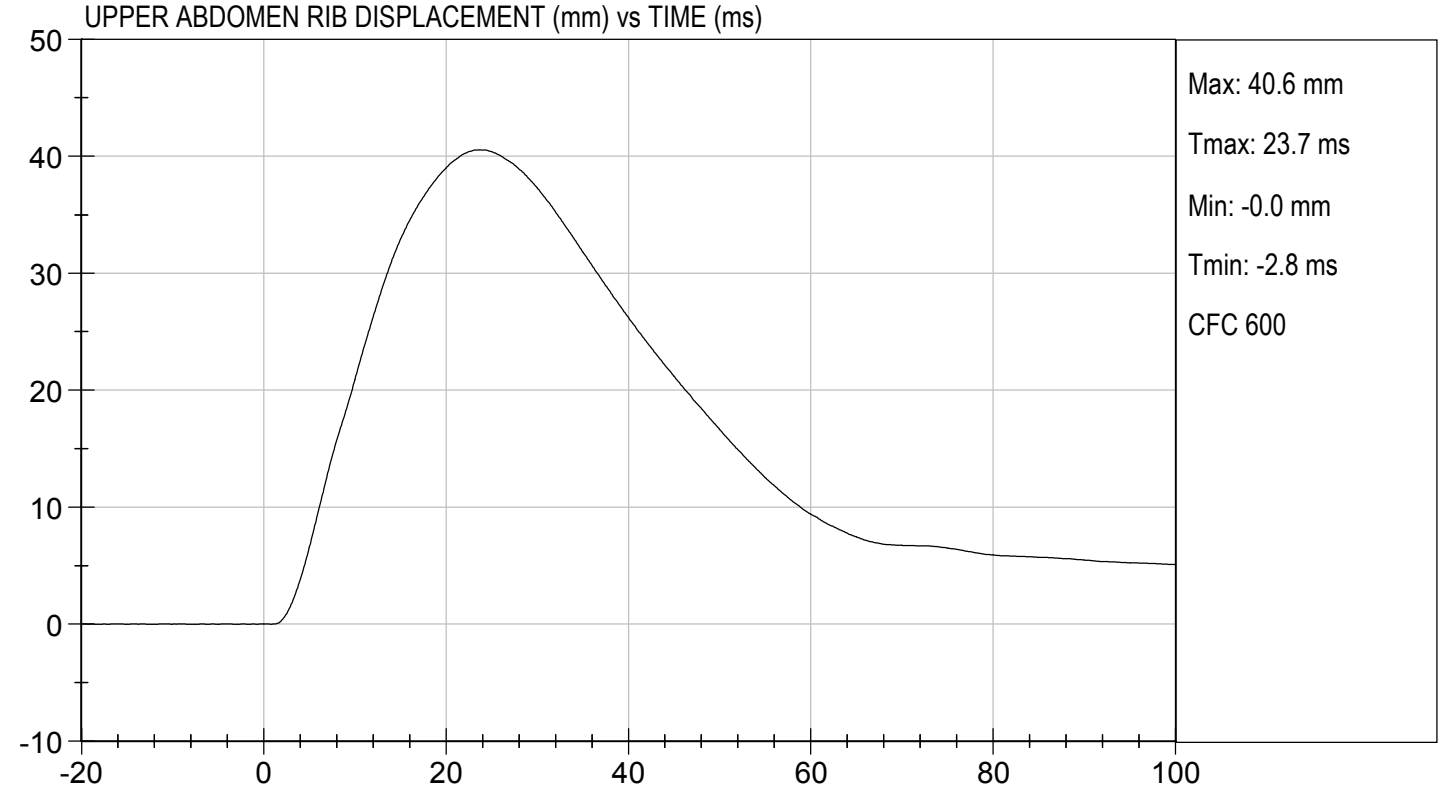
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 05/14/2019
TEST #: D19AQ6

PROBE (G's) vs TIME (ms)



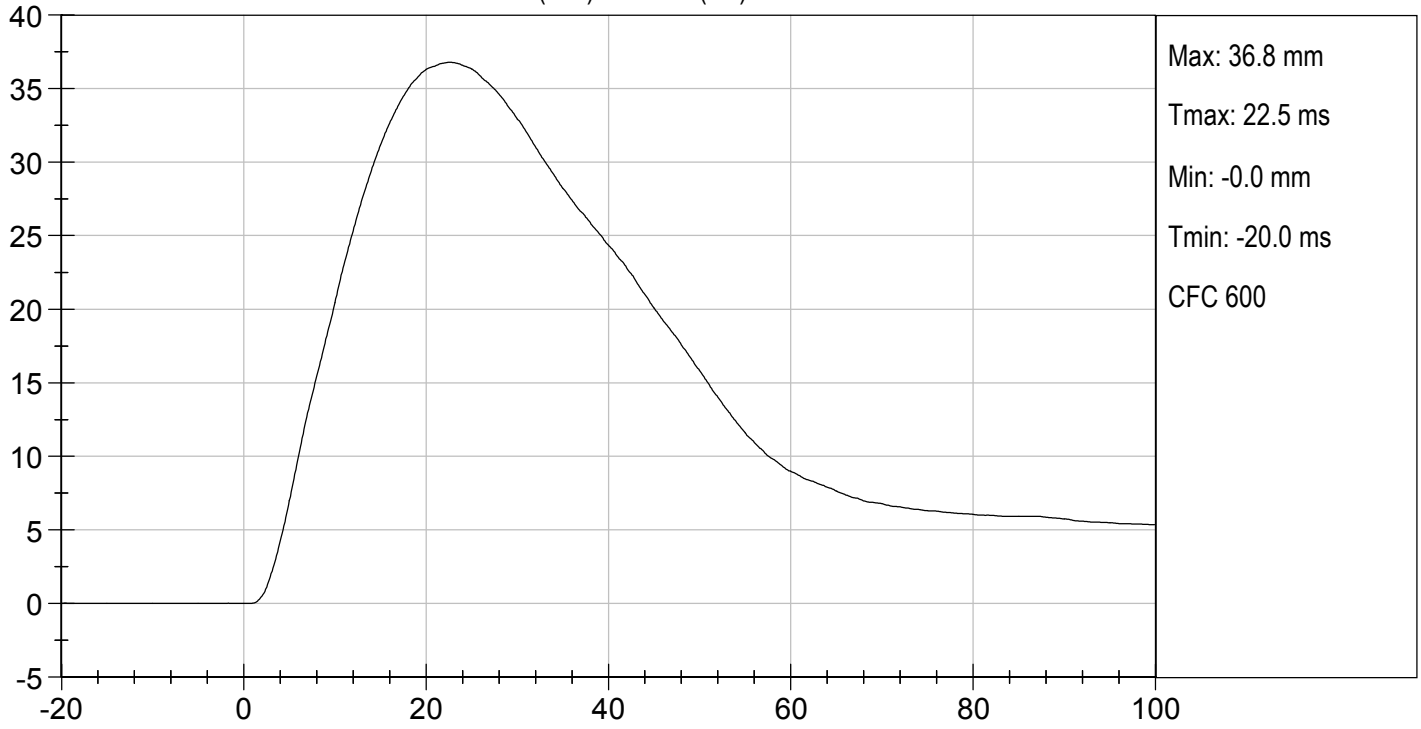
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



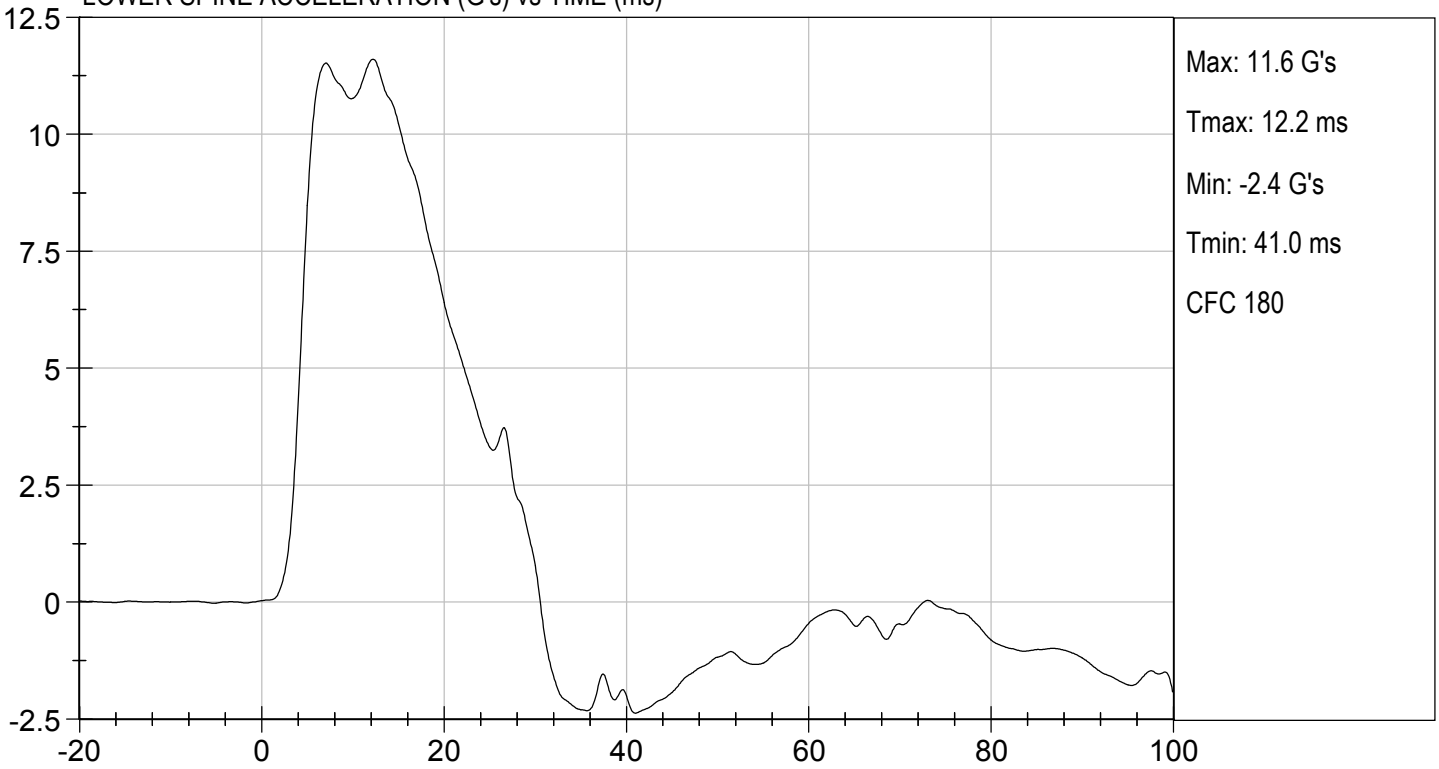
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 05/14/2019
TEST #: D19AQ6

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: 306 **Test I.D:** D191607

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	38 to 47	43	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	39	Pass
Peak Acetabulum Force	N	3600 to 4300	4,228	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/14/2019

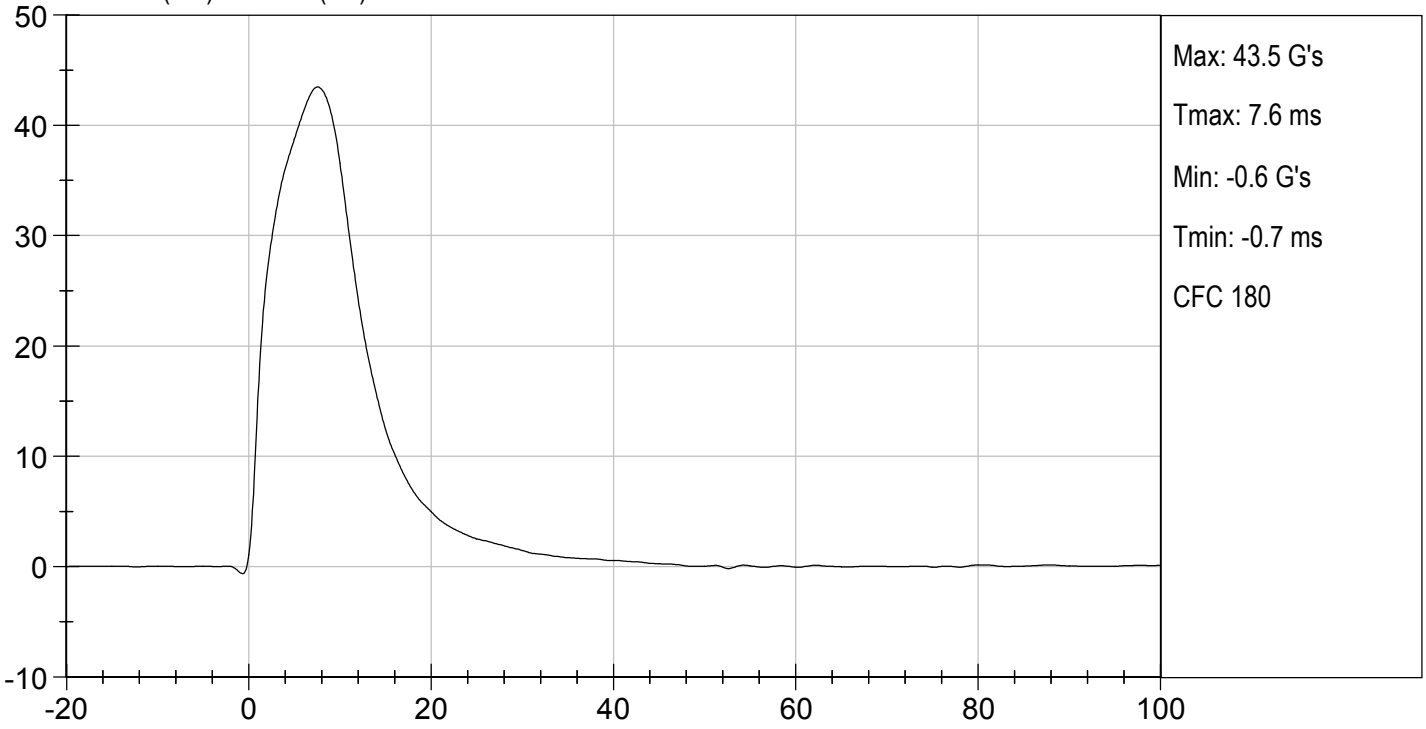
Test Date

Approved By

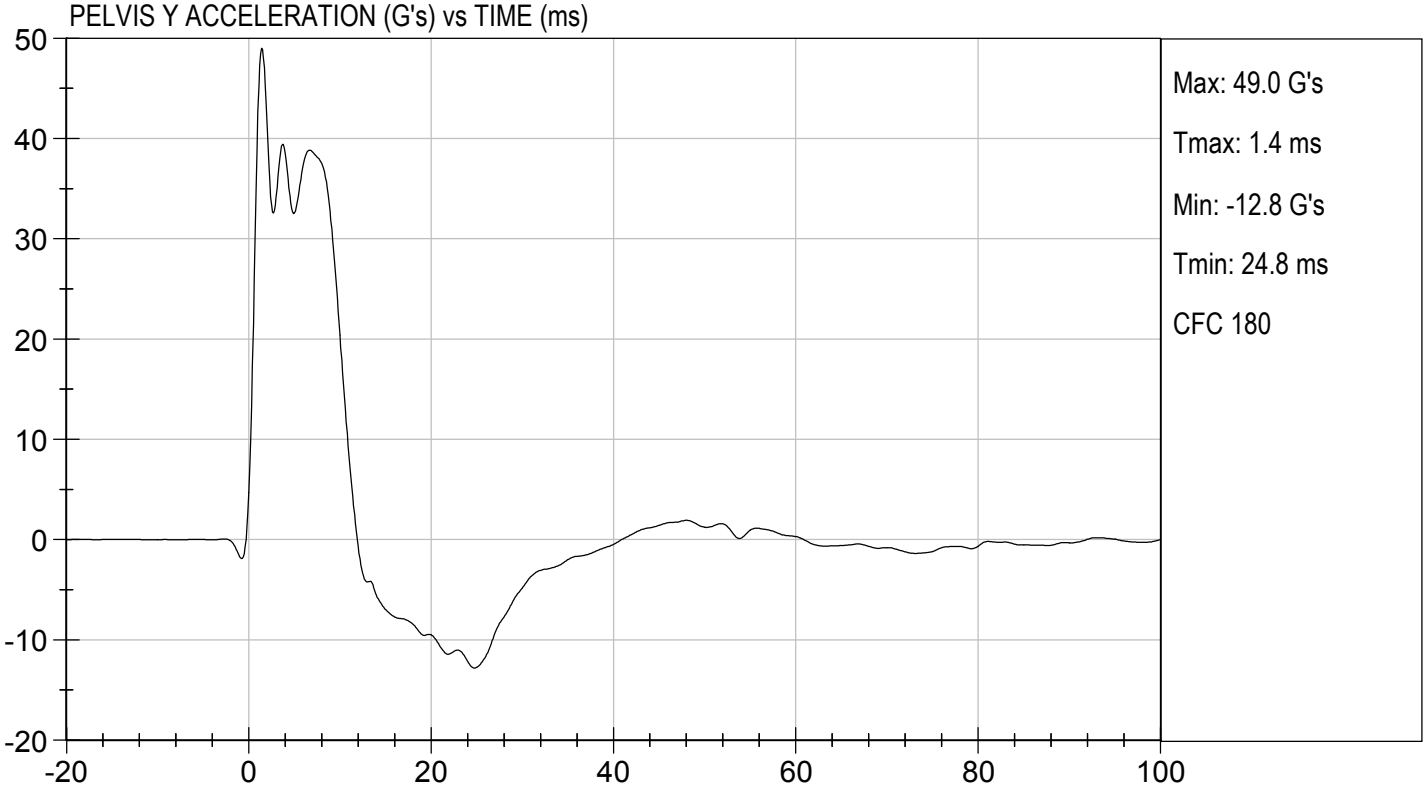
TEST DESC: PELVIS IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 05/14/2019
TEST #: D191607

PROBE (G's) vs TIME (ms)

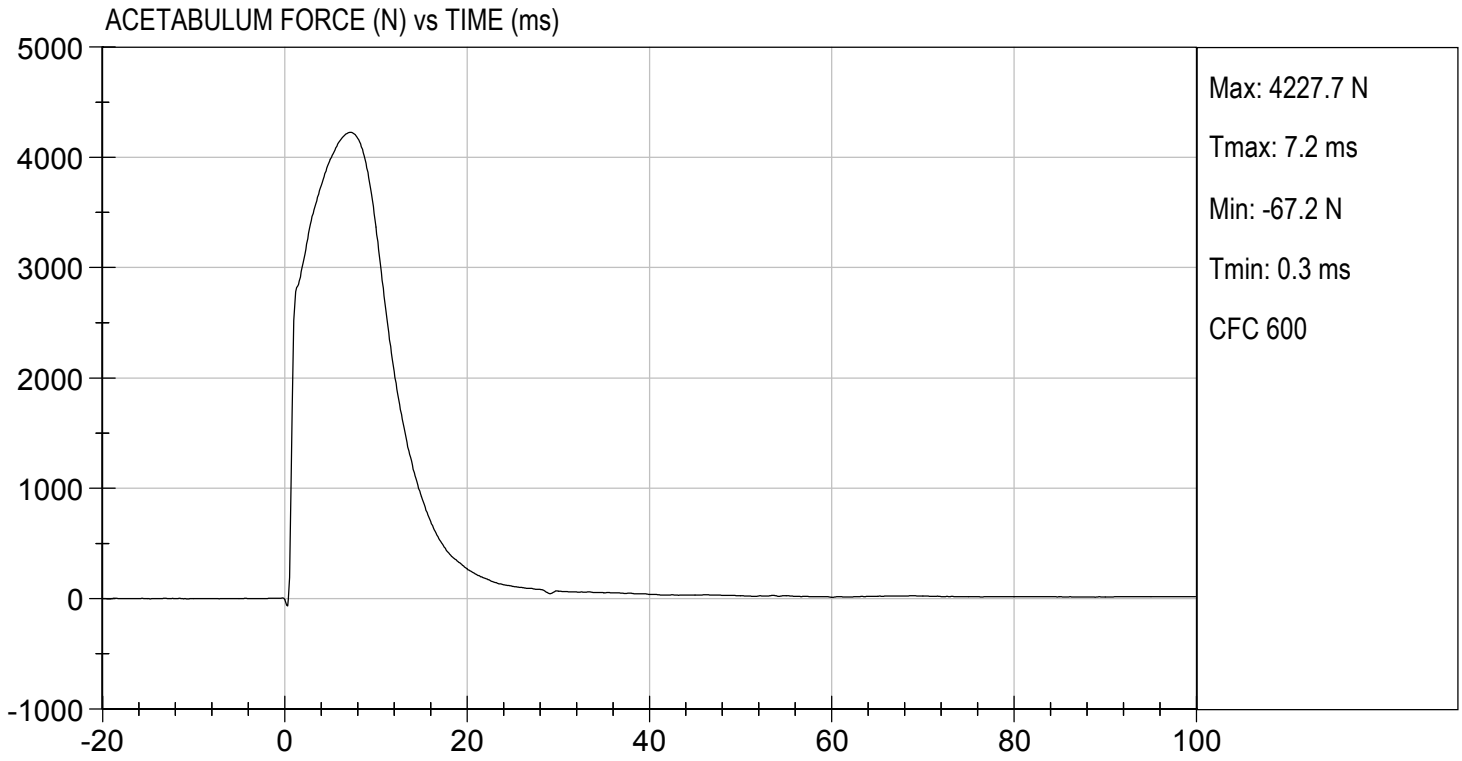


PELVIS Y ACCELERATION (G's) vs TIME (ms)



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

TEST DATE: 05/14/2019
TEST #: D191607



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D191608

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	4.20 to 4.40	4.21	Pass
Maximum Probe Acceleration	G's	36 to 45	43	Pass
Pelvis Y Acceleration	G's	28 to 39	36	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,819	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/14/2019

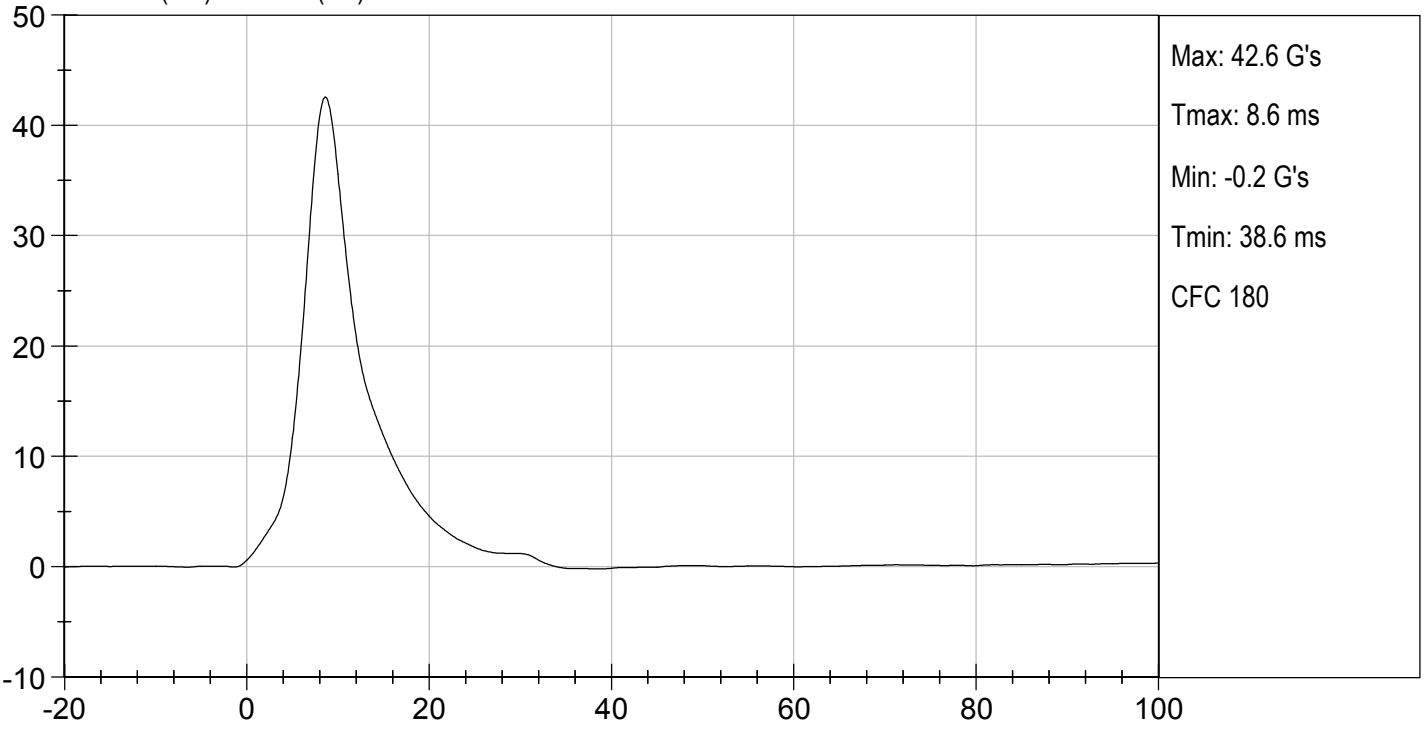
Test Date

Approved By

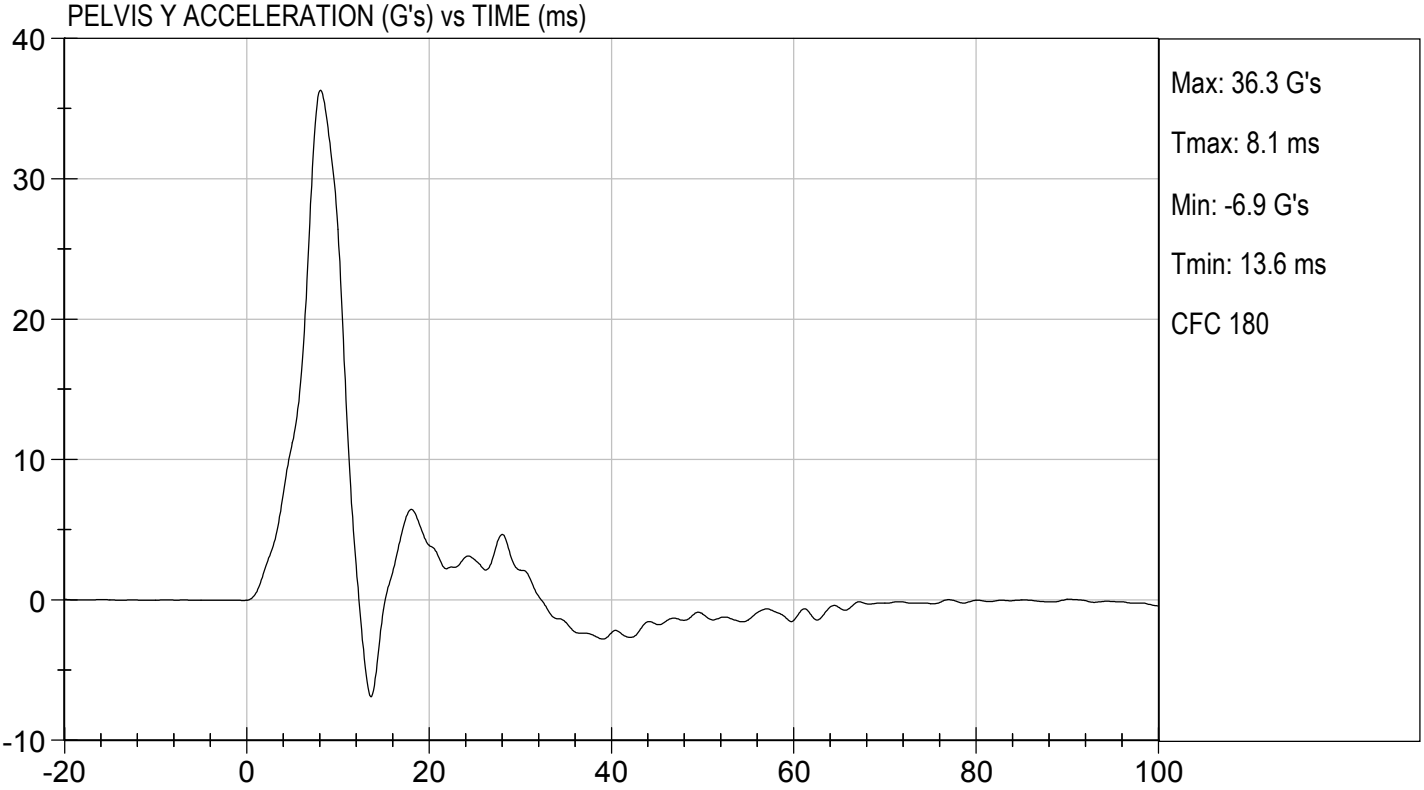
TEST DESC: ILLIAC
VELOCITY: 13.80 ft/s, 4.21 m/s

TEST DATE: 05/14/2019
TEST #: D191608

PROBE (G's) vs TIME (ms)

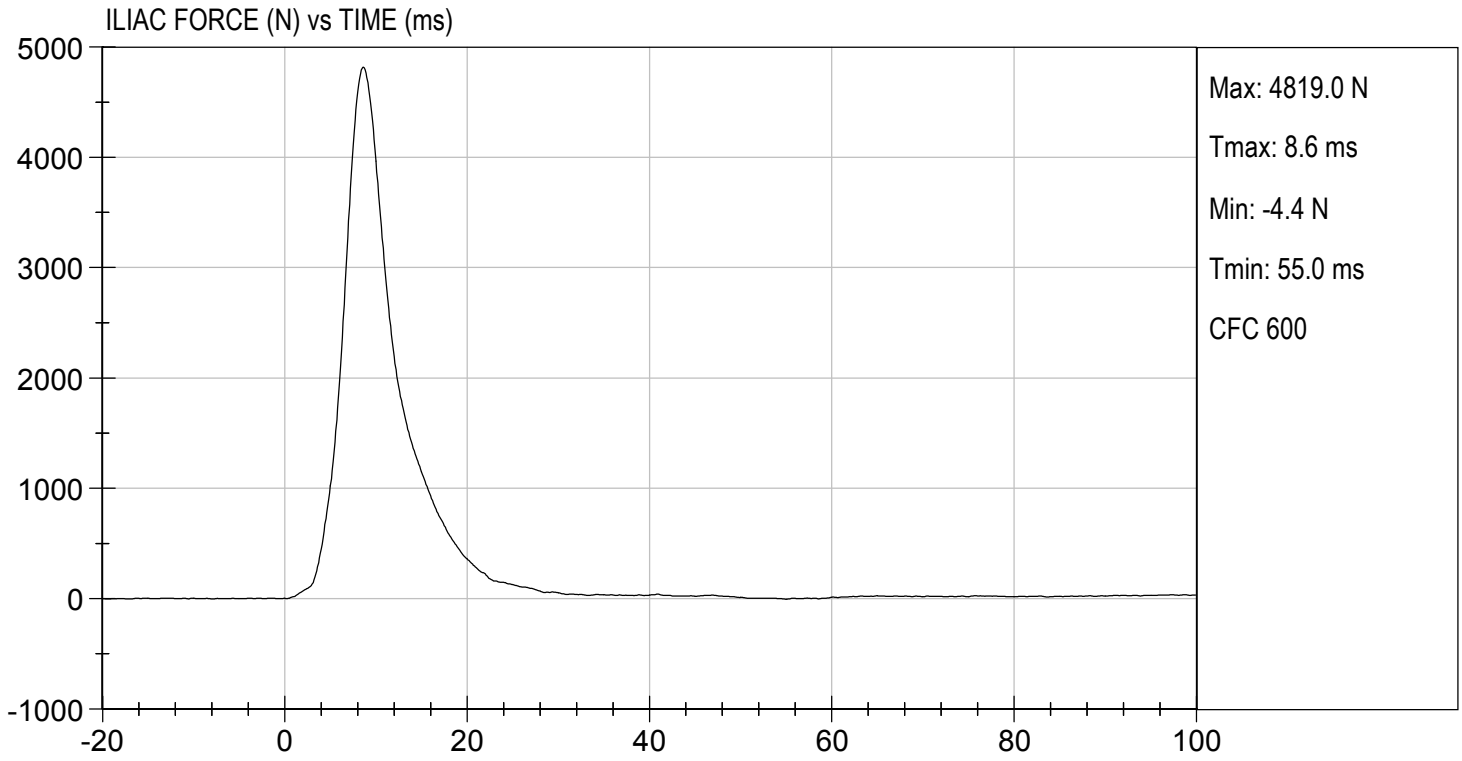


PELVIS Y ACCELERATION (G's) vs TIME (ms)



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

TEST DATE: 05/14/2019
TEST #: D191608



CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SID-IIsD External Measurements
SN: 306

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

MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D191691

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Peak Resultant Acceleration	G's	115 to 137	130	Pass
Peak Longitudinal Acceleration	G's	+/- 15	2.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

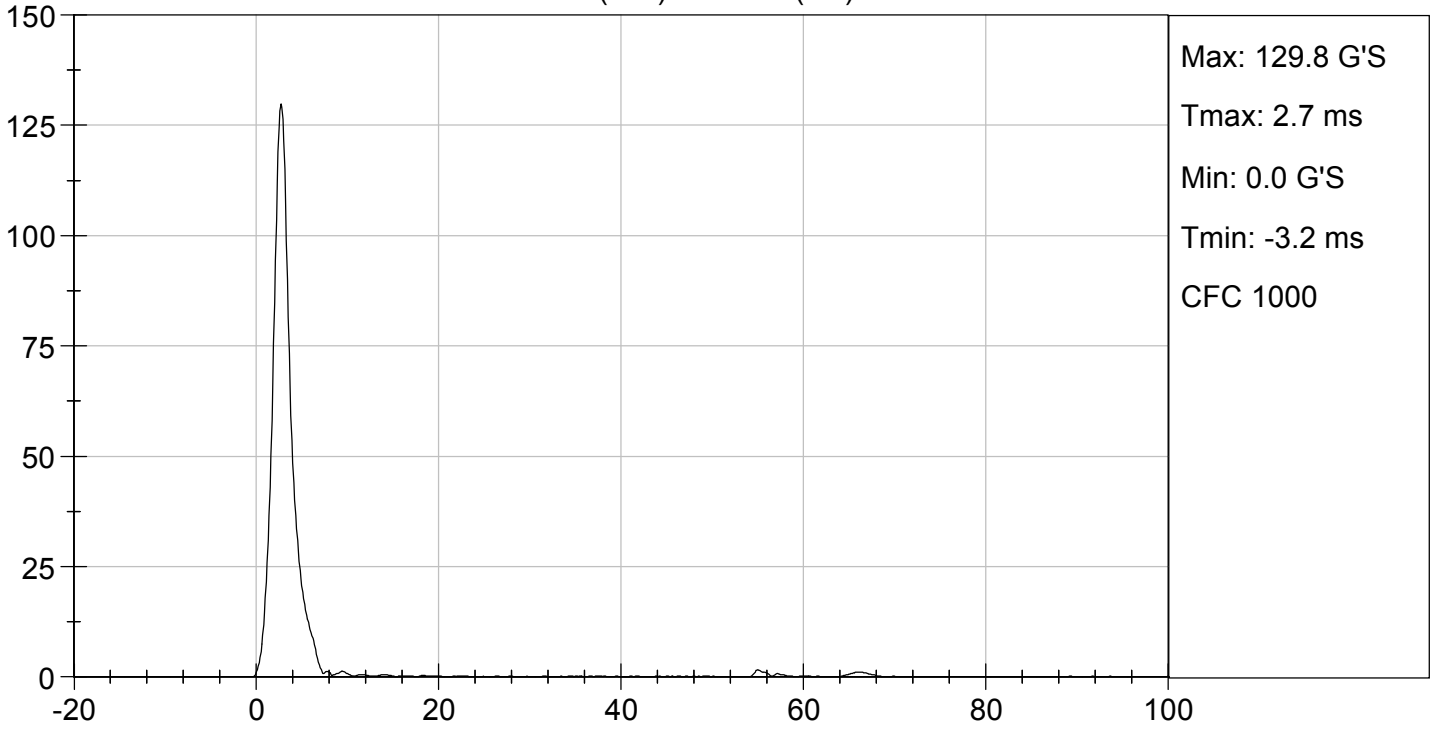
05/31/2019
Test Date

Approved By

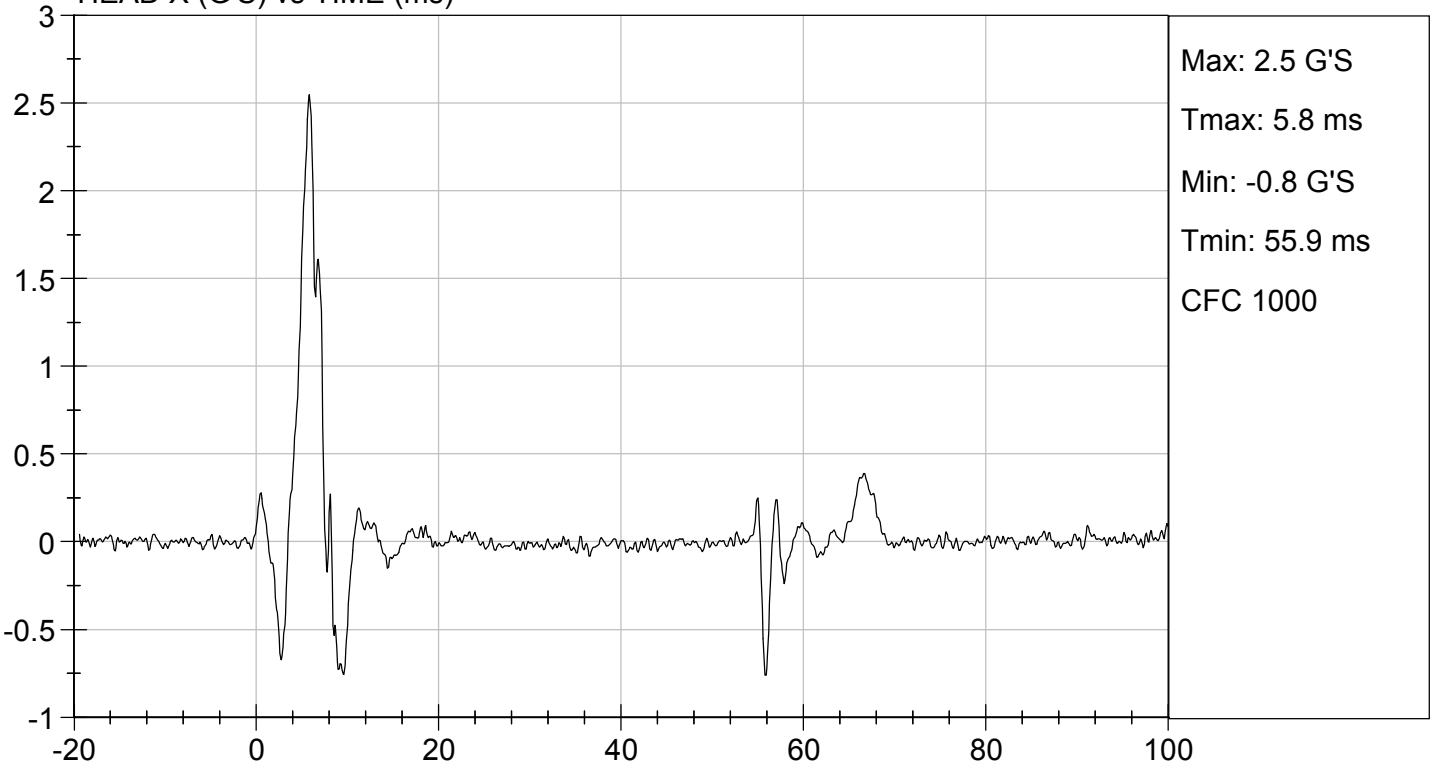
TEST DESC: HEAD DROP

TEST DATE: 05/31/2019
TEST #: D191691

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

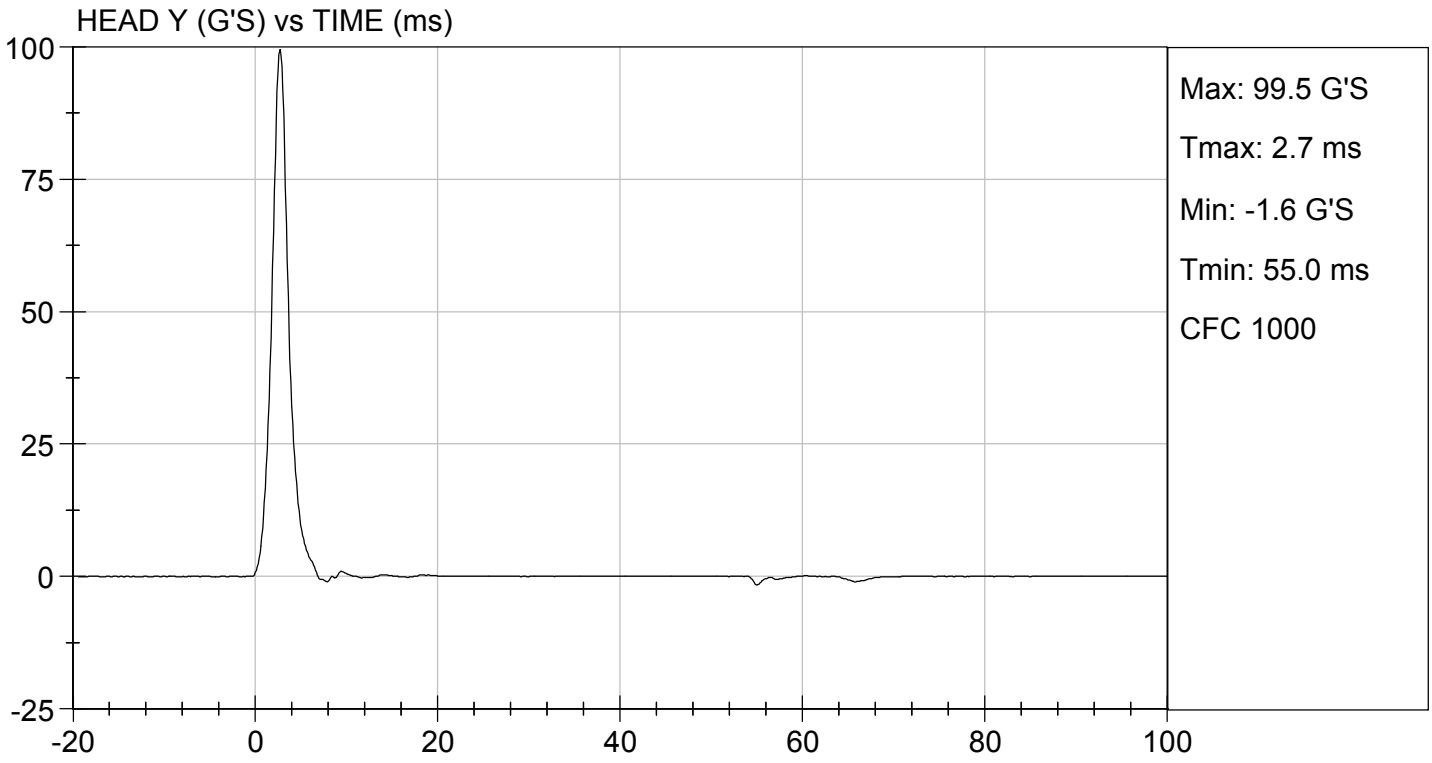


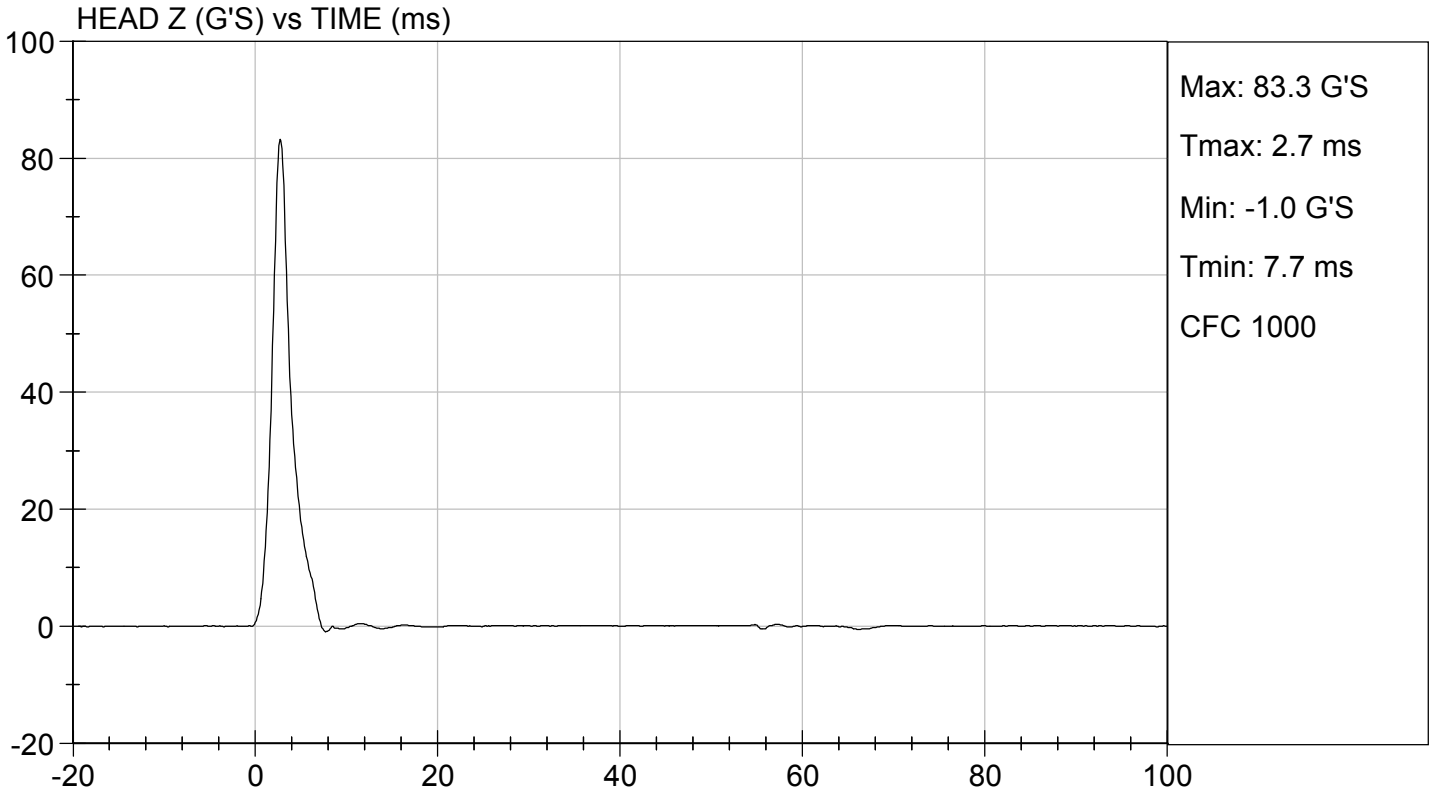
HEAD X (G'S) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 05/31/2019
TEST #: D191691





MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D191692

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.6	Pass
Humidity		%	10 to 70	52	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.38	Pass
	15 ms	m/s	3.30 to 4.10	3.47	Pass
	20 ms	m/s	4.40 to 5.40	4.82	Pass
	25 ms	m/s	5.40 to 6.10	5.90	Pass
	25-100 ms	m/s	5.50 to 6.20	5.96	Pass
Maximum D-Plane Rotation		deg	71 to 81	78	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	64	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	120	Pass
			Overall Test Results		Pass

Danielle Redinbaugh

Laboratory Technician

05/31/2019

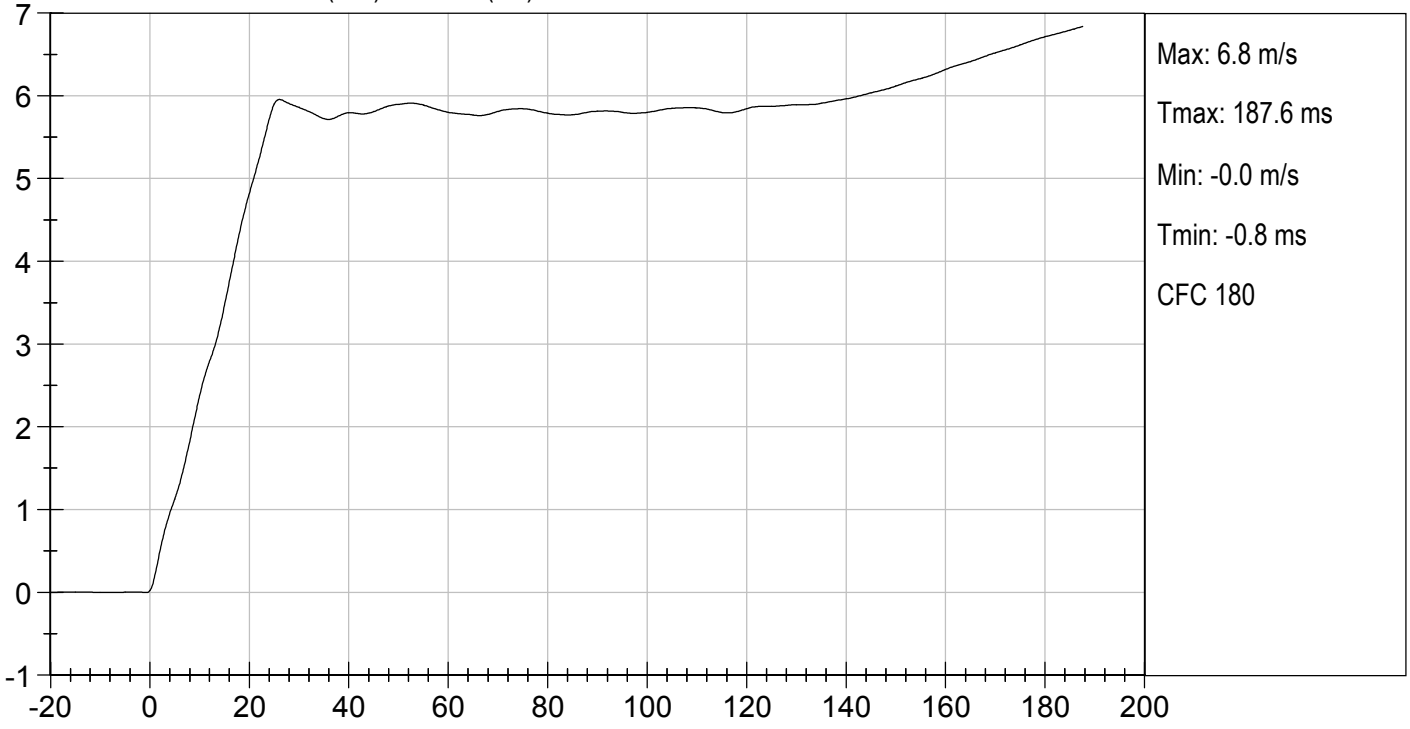
Test Date

Approved By

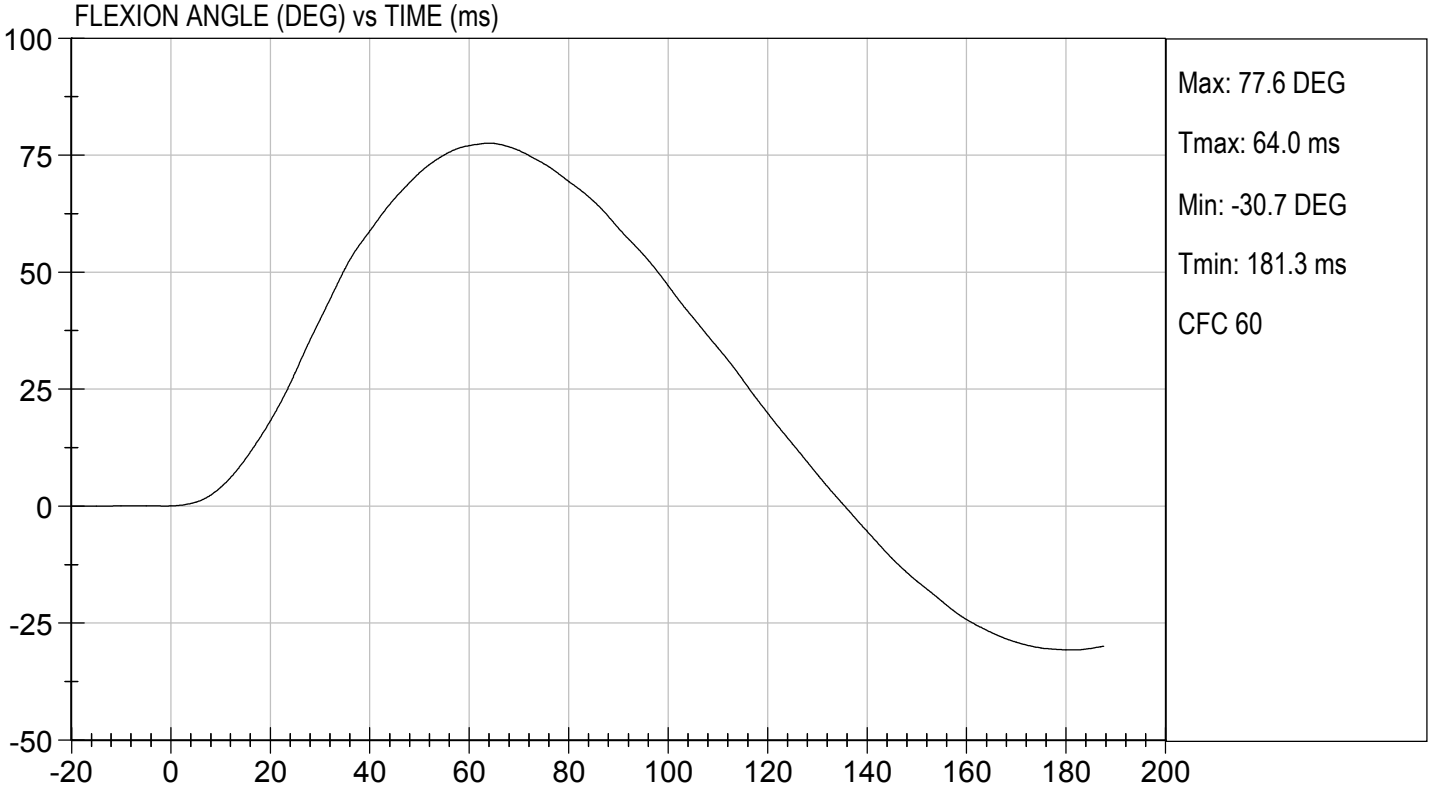
TEST DESC: NECK BENDING
VELOCITY: 18.30 ft/s, 5.58 m/s

TEST DATE: 05/31/2019
TEST #: D191692

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

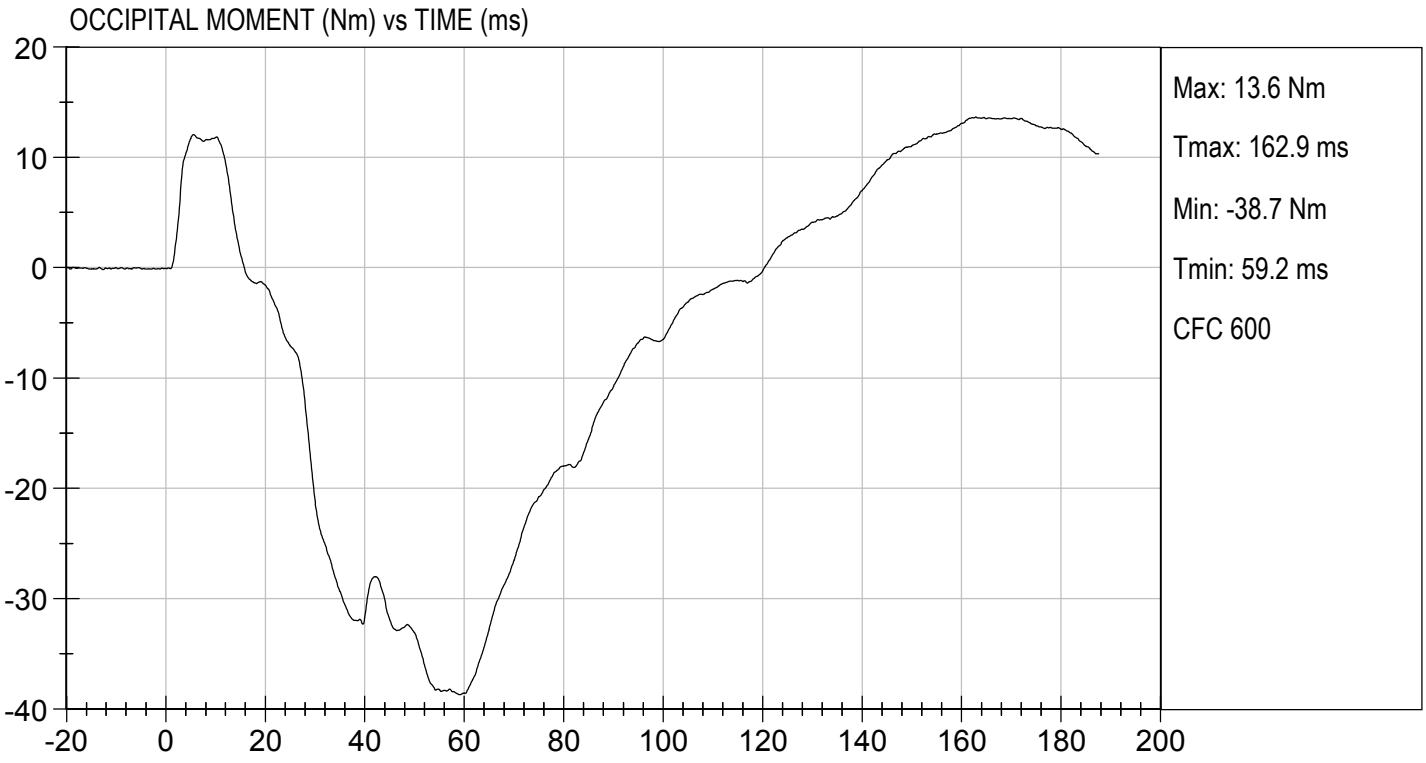


FLEXION ANGLE (DEG) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 18.30 ft/s, 5.58 m/s

TEST DATE: 05/31/2019
TEST #: D191692



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D191693

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	48	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	28	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

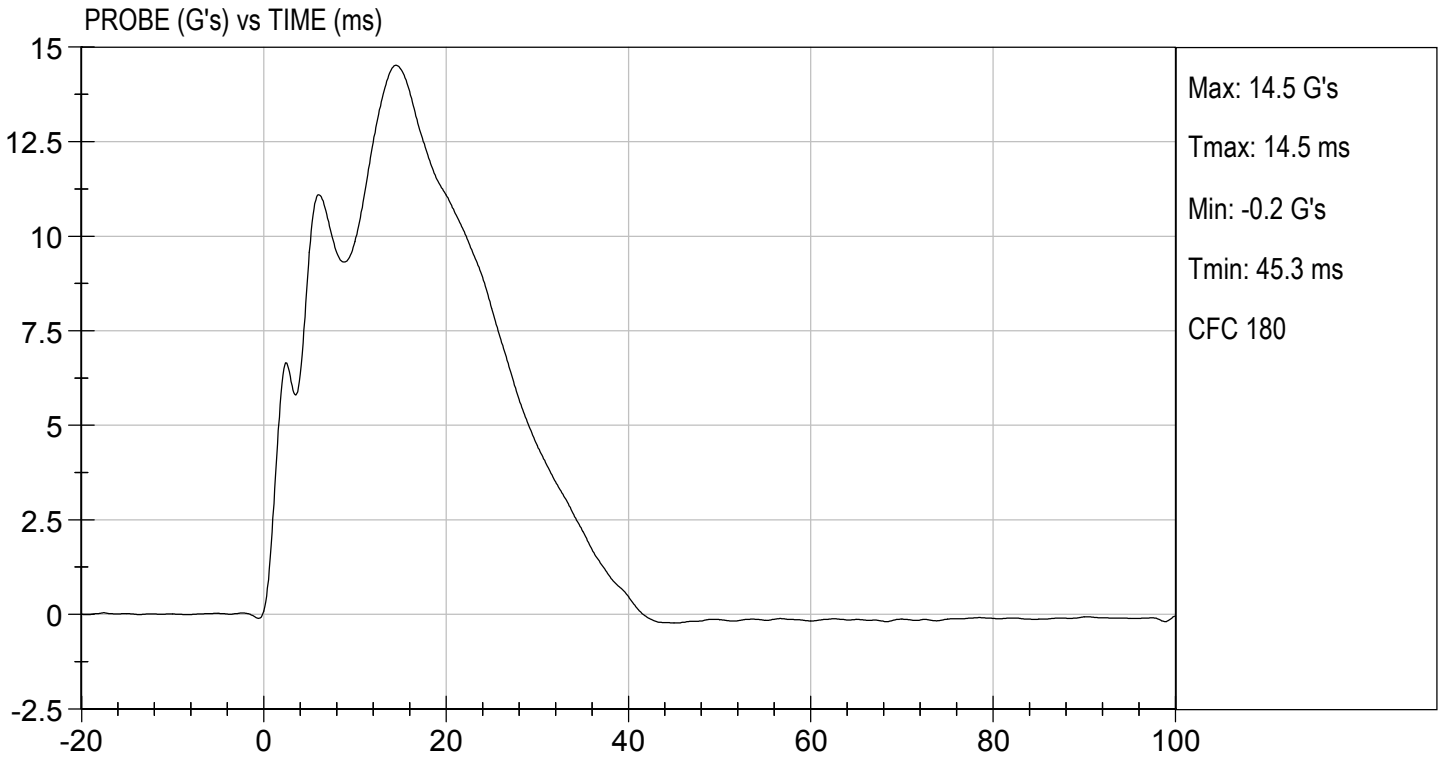
05/30/2019

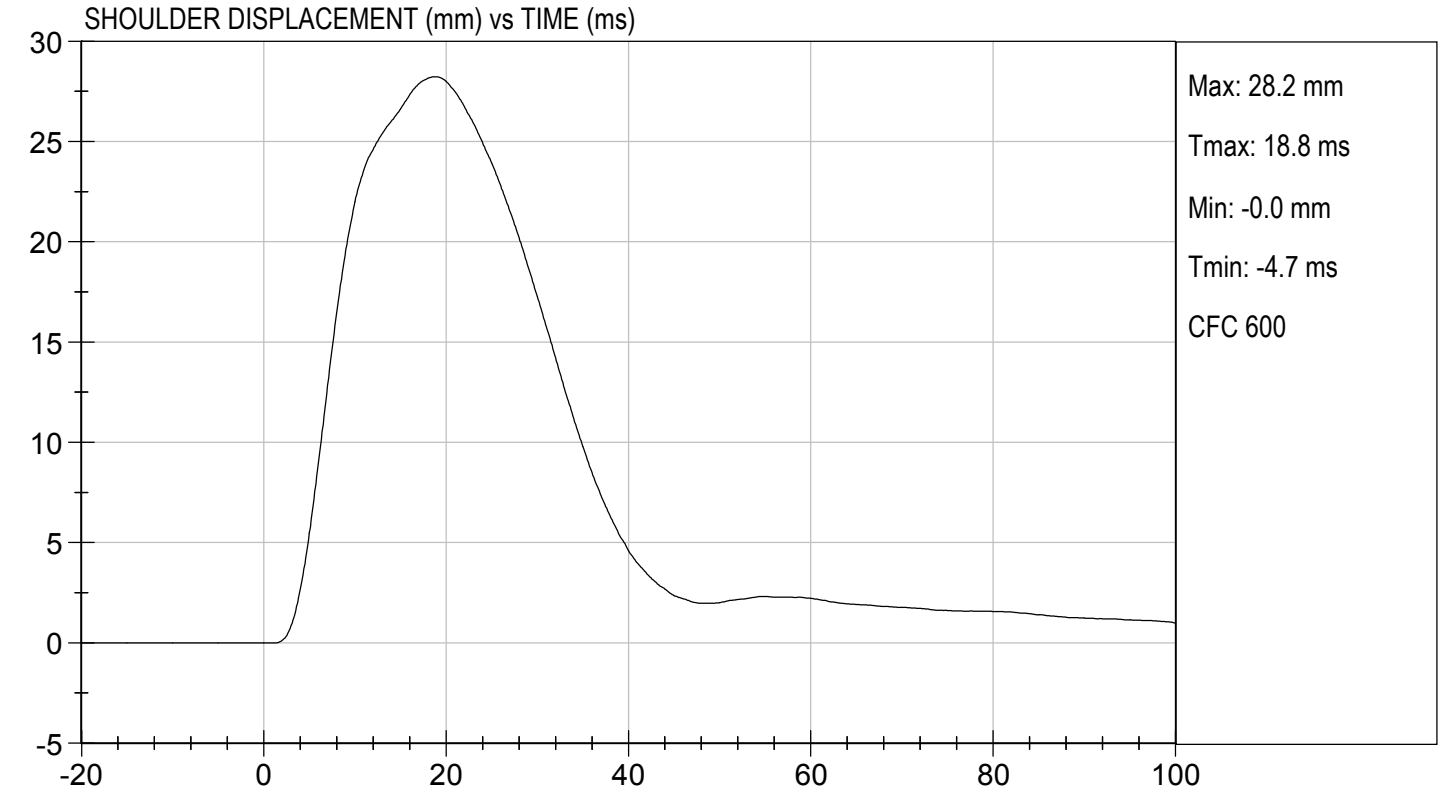
Test Date

Approved By

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

TEST DATE: 05/30/2019
TEST #: D191693

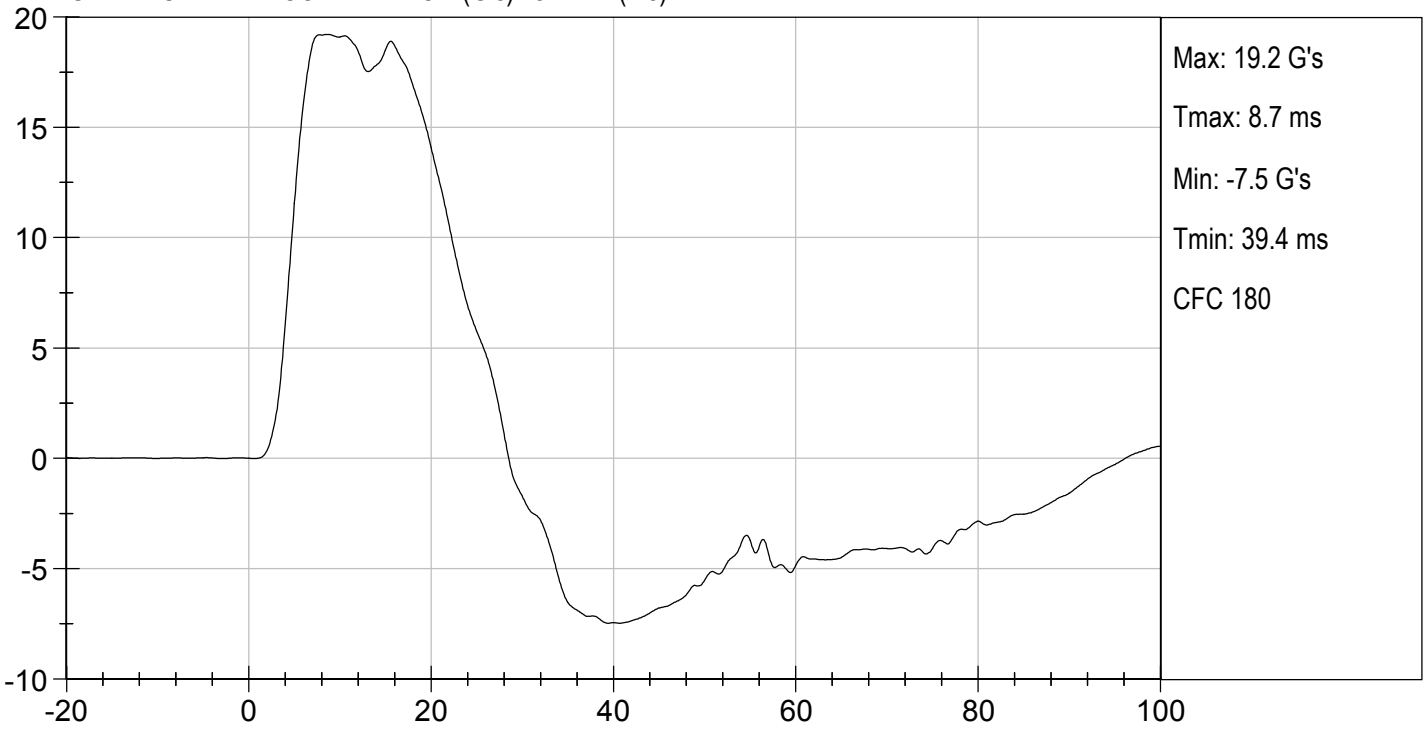




TEST DESC: SHOULDER IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 05/30/2019
TEST #: D191693

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



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D191694

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	6.60 to 6.80	6.80	Pass
Maximum Probe Acceleration	G's	30 to 36	33	Pass
Shoulder Displacement	mm	31 to 40	33	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	41	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	33	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/30/2019

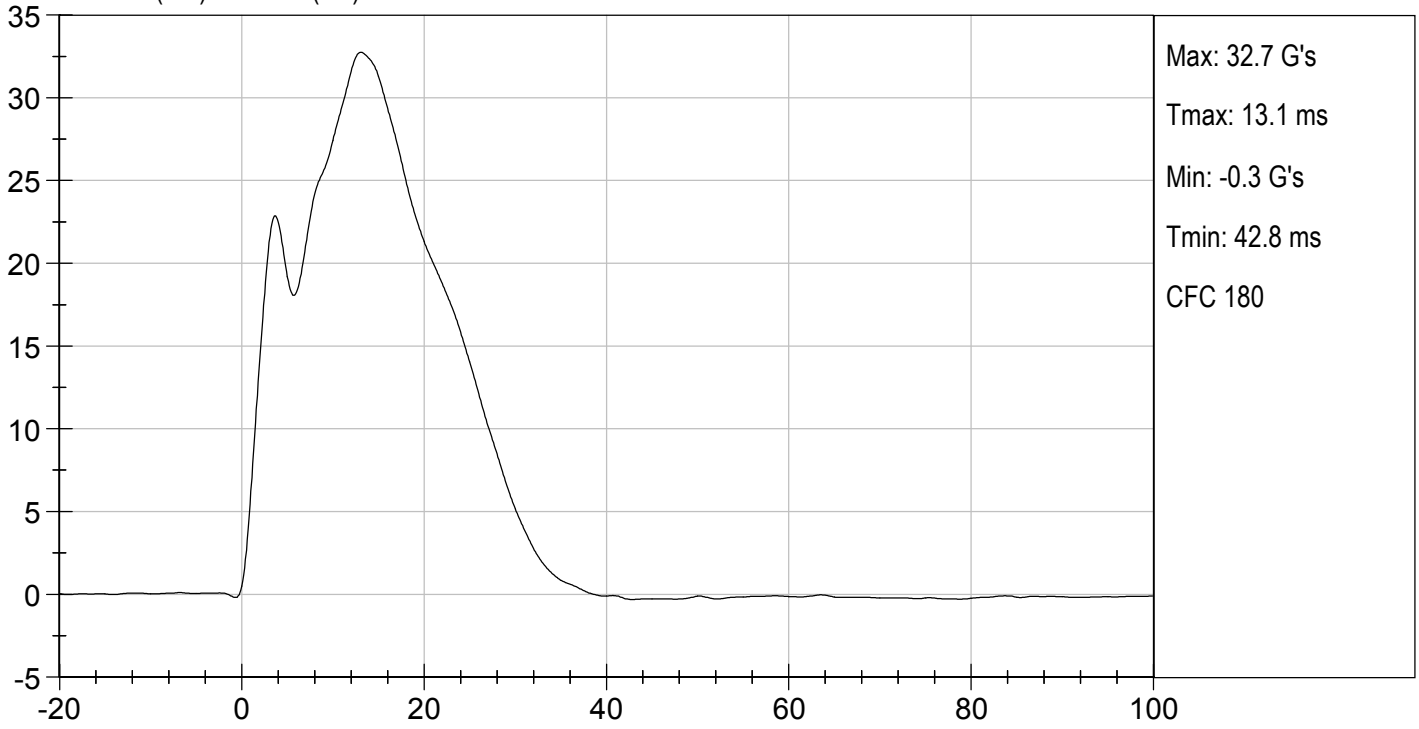
Test Date

Approved By

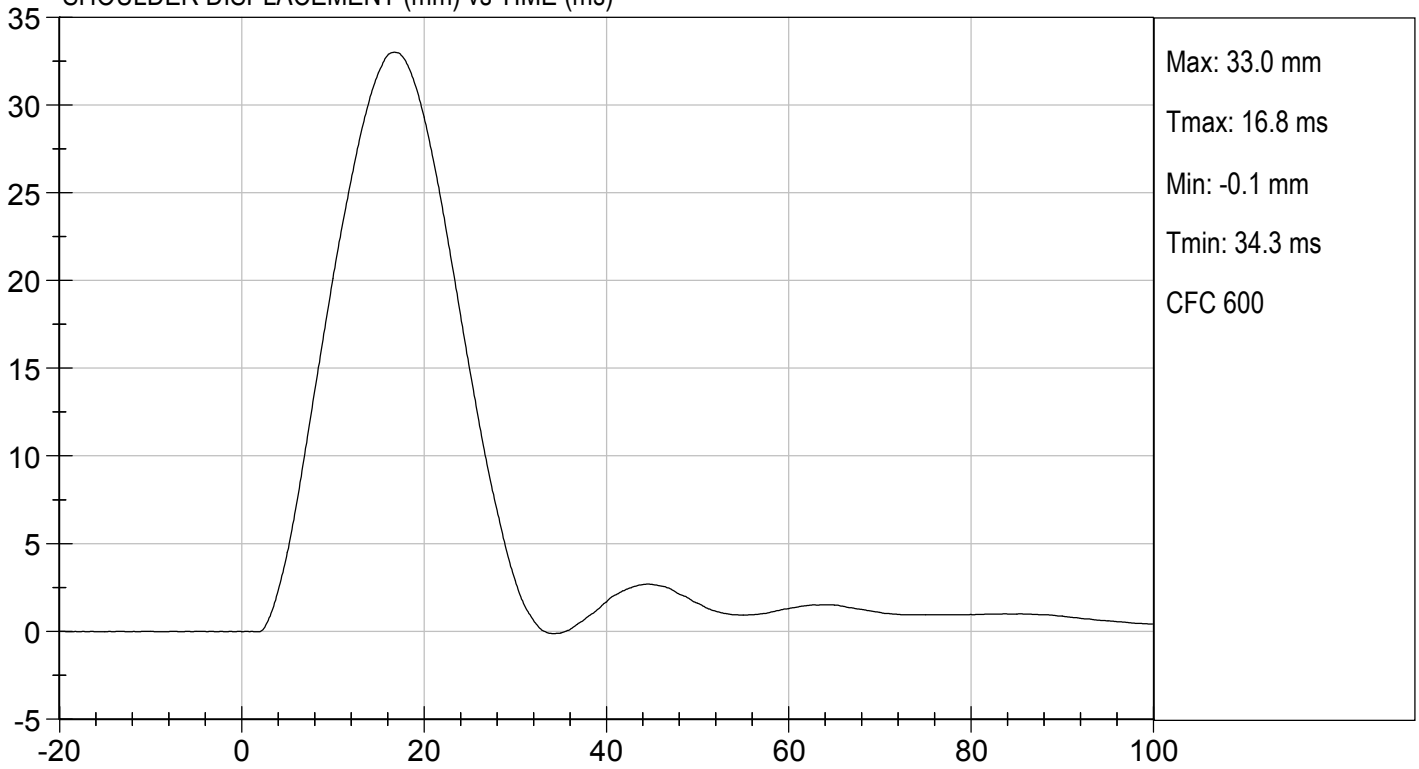
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.30 ft/s, 6.80 m/s

TEST DATE: 05/30/2019
TEST #: D191694

PROBE (G's) vs TIME (ms)



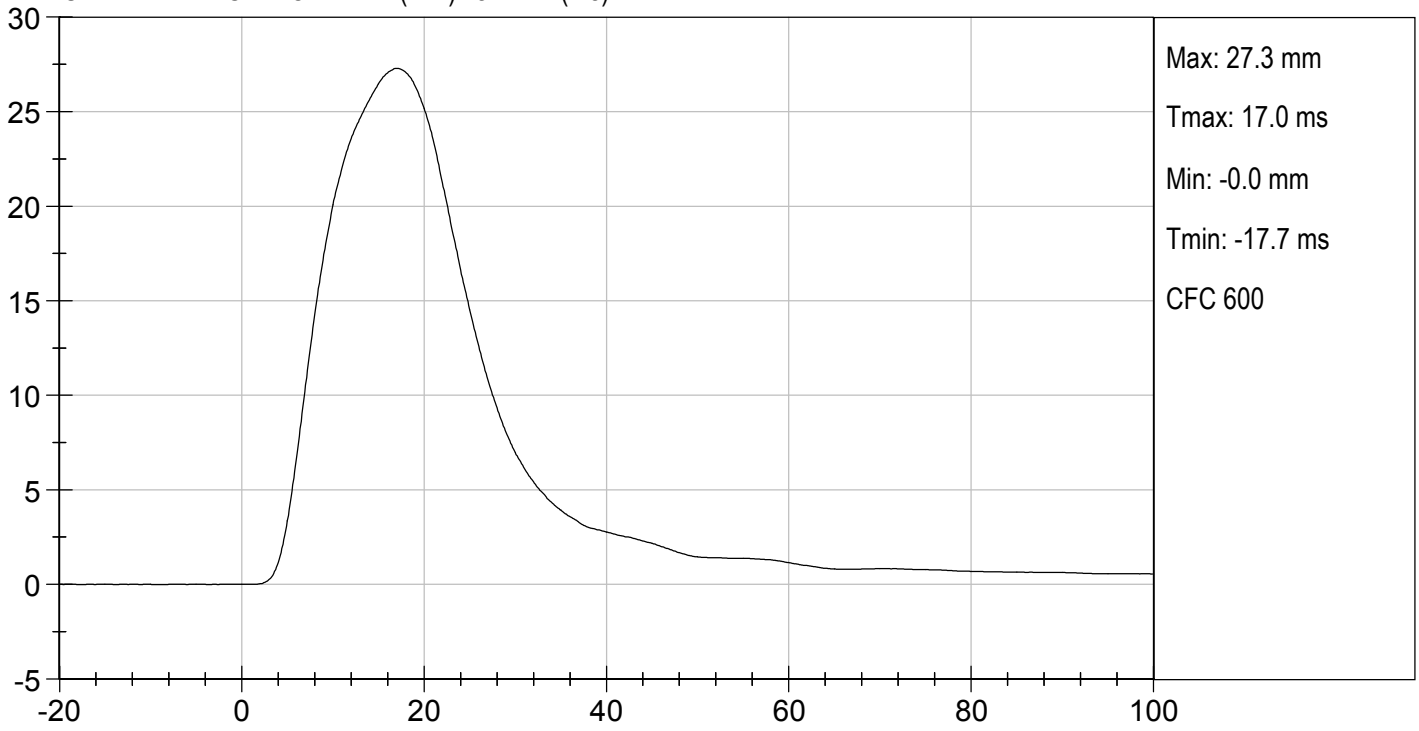
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



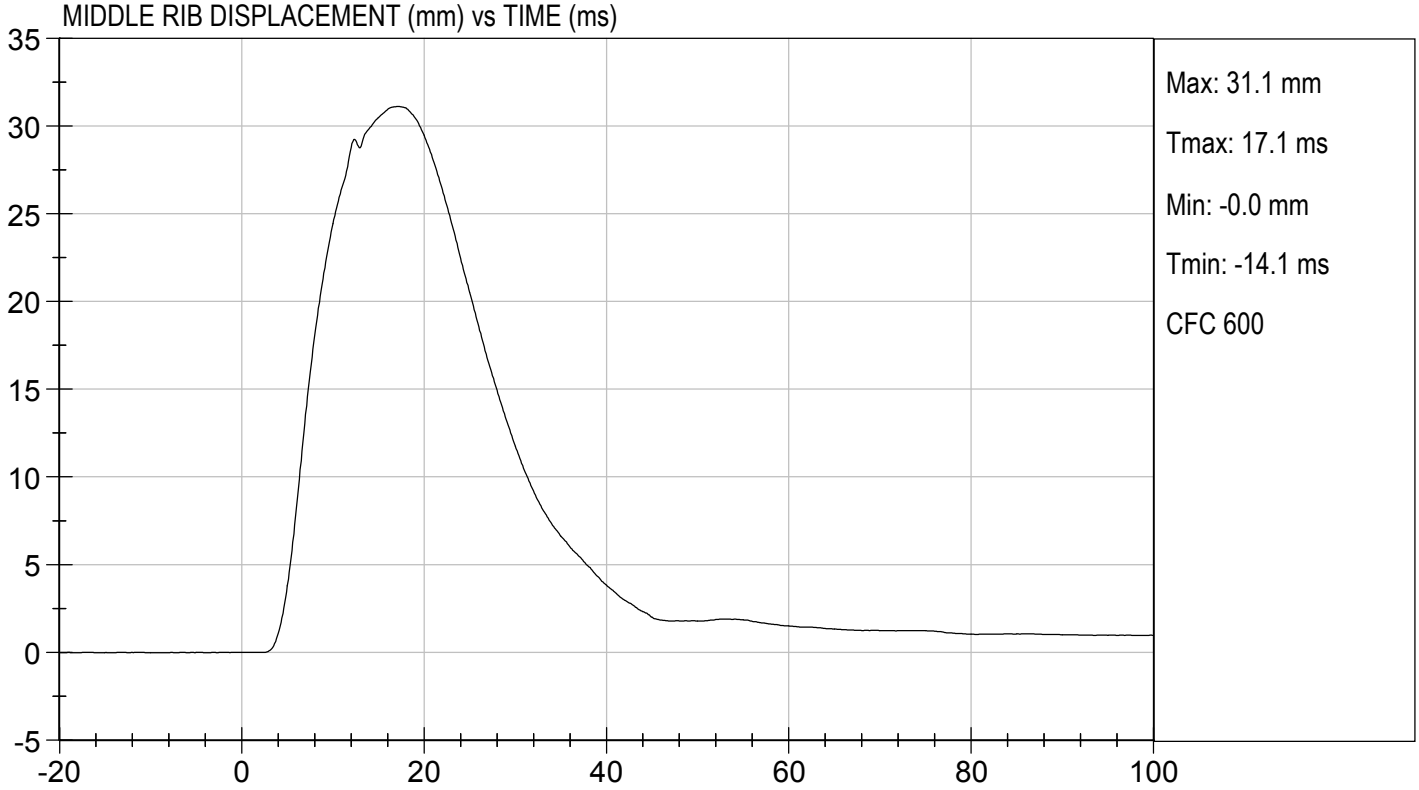
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.30 ft/s, 6.80 m/s

TEST DATE: 05/30/2019
TEST #: D191694

UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



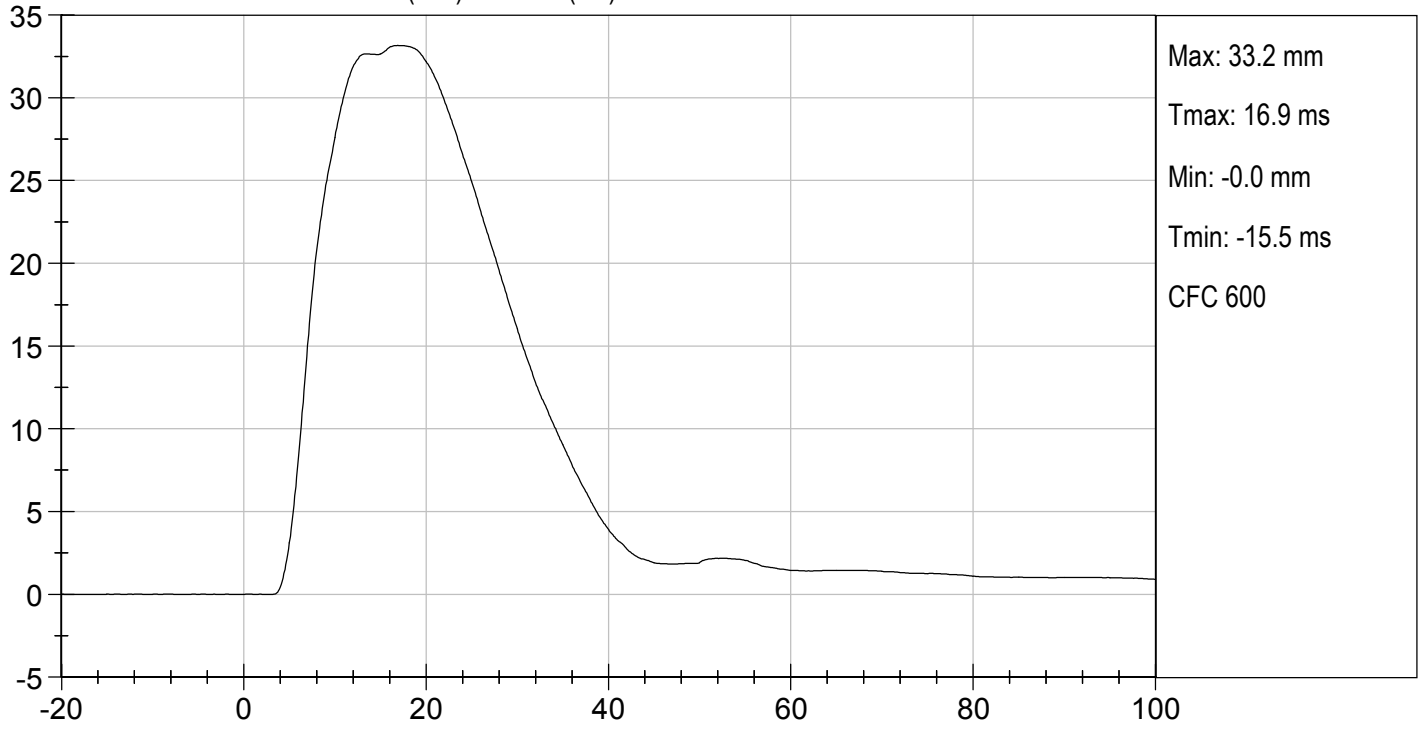
MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



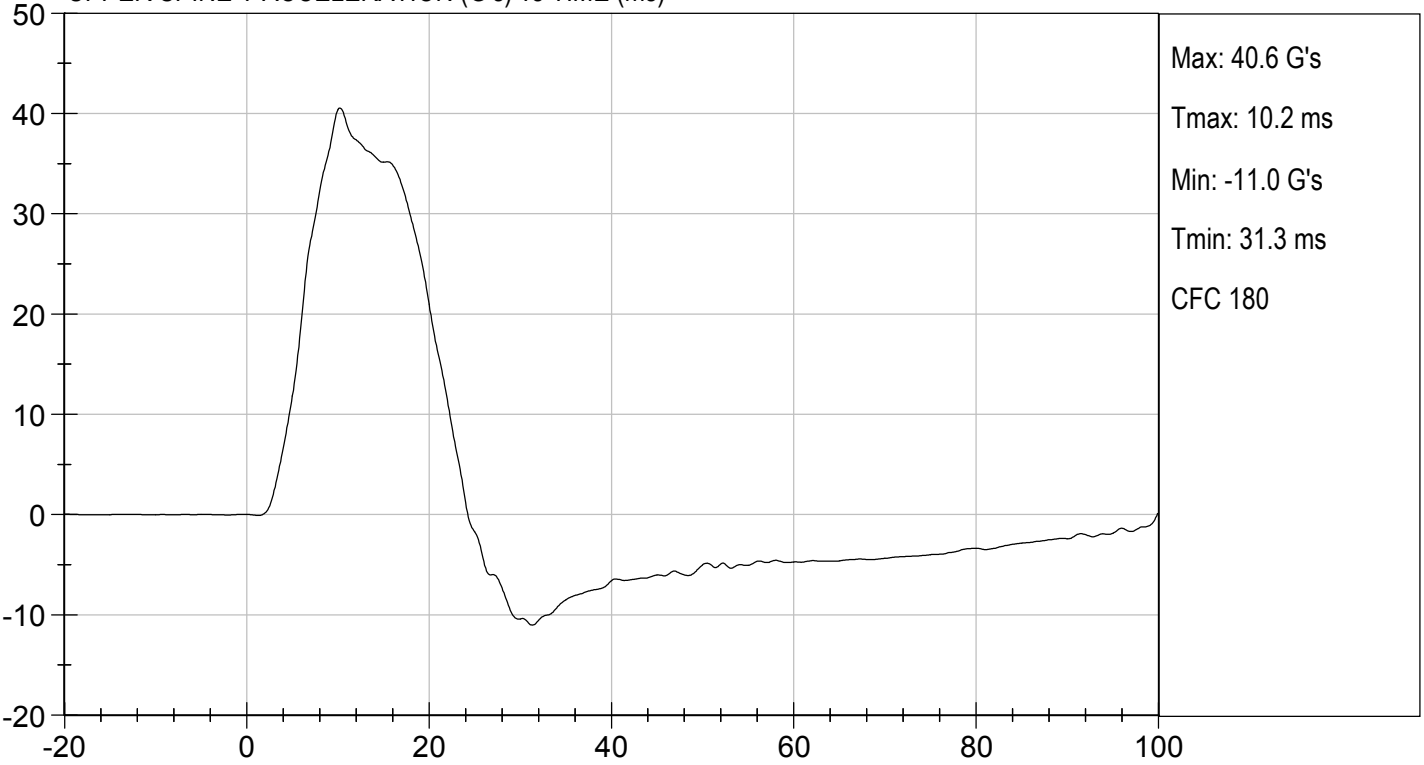
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.30 ft/s, 6.80 m/s

TEST DATE: 05/30/2019
TEST #: D191694

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



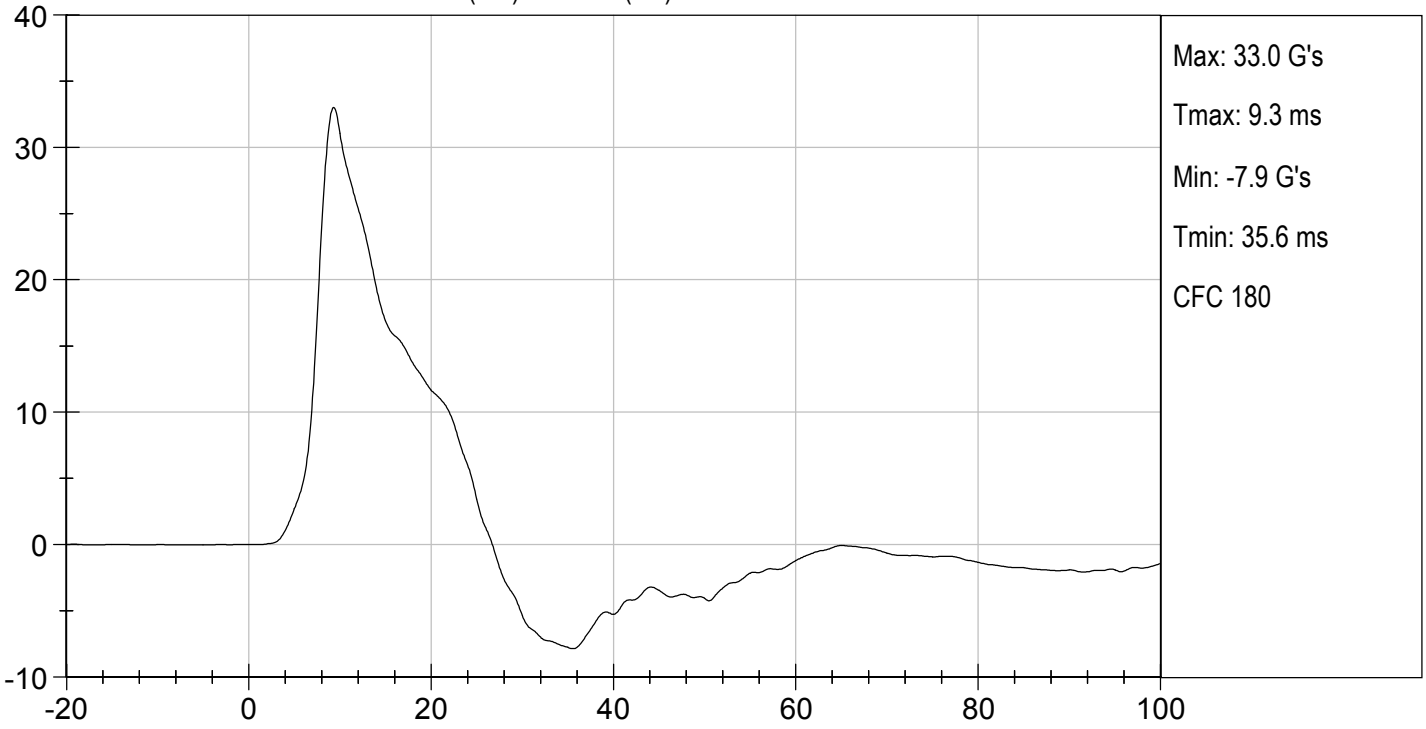
UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.30 ft/s, 6.80 m/s

TEST DATE: 05/30/2019
TEST #: D191694

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



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D191695

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	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	41	Pass
Lower Rib Displacement	mm	35 to 43	37	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

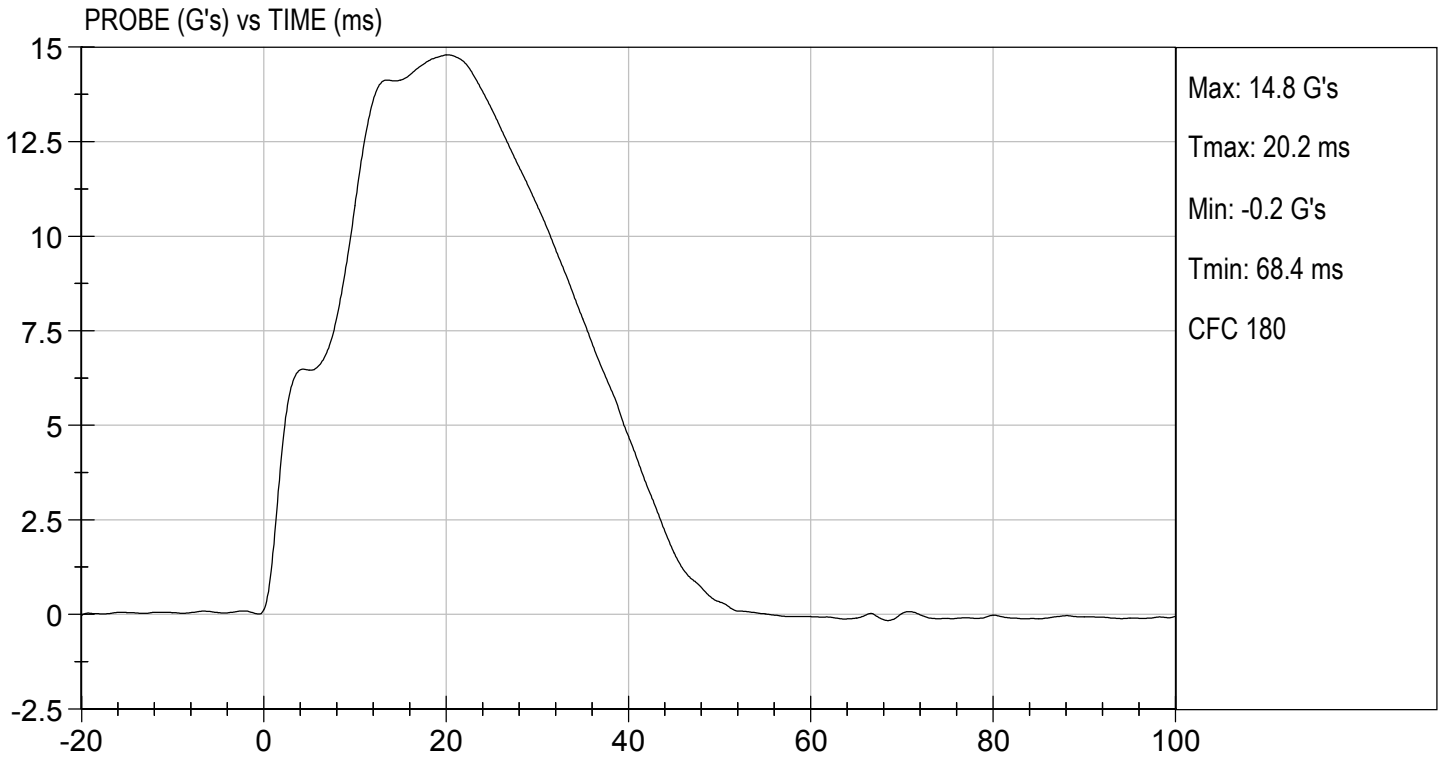
Jacob D Taylor
Laboratory Technician

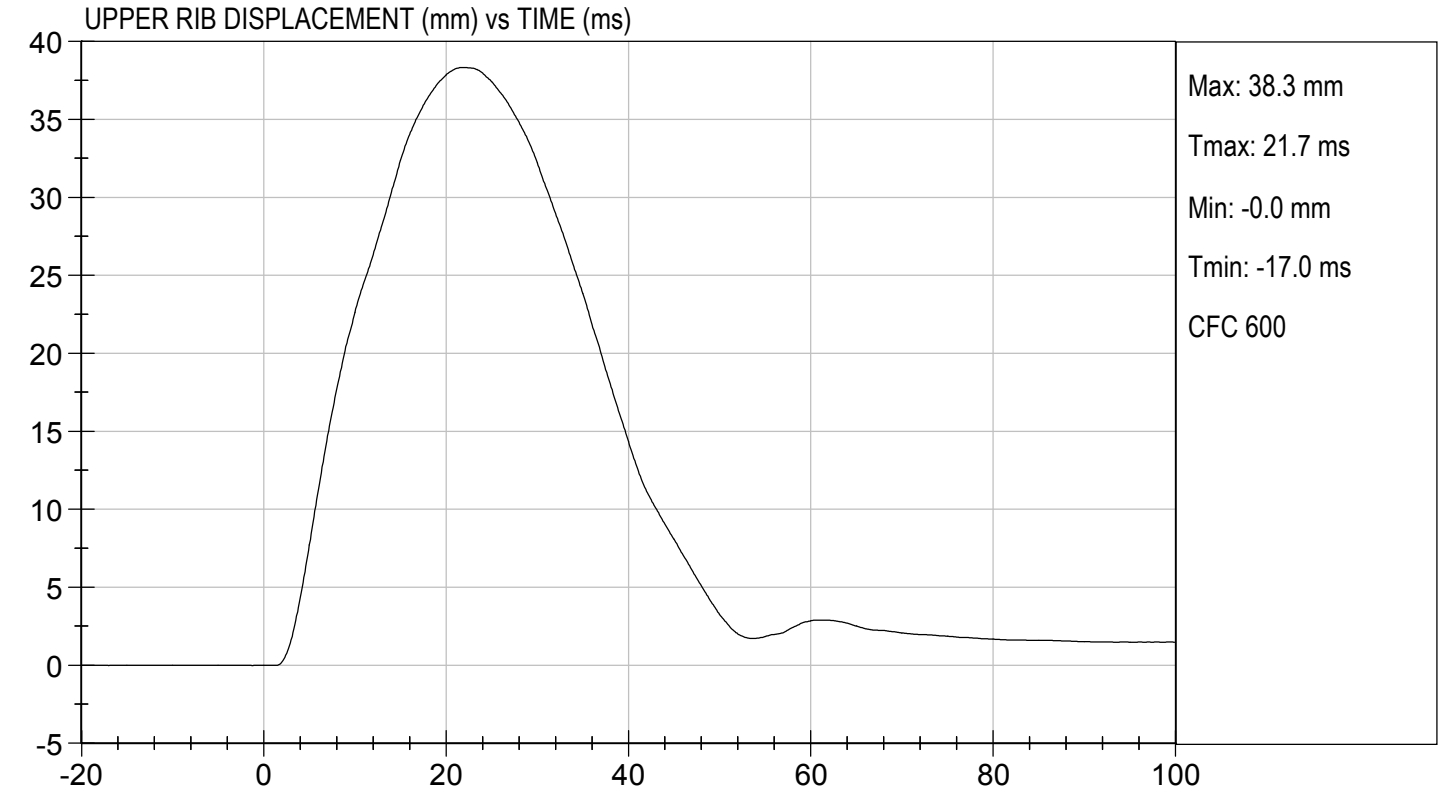
05/30/2019
Test Date

Approved By

TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 05/30/2019
TEST #: D191695

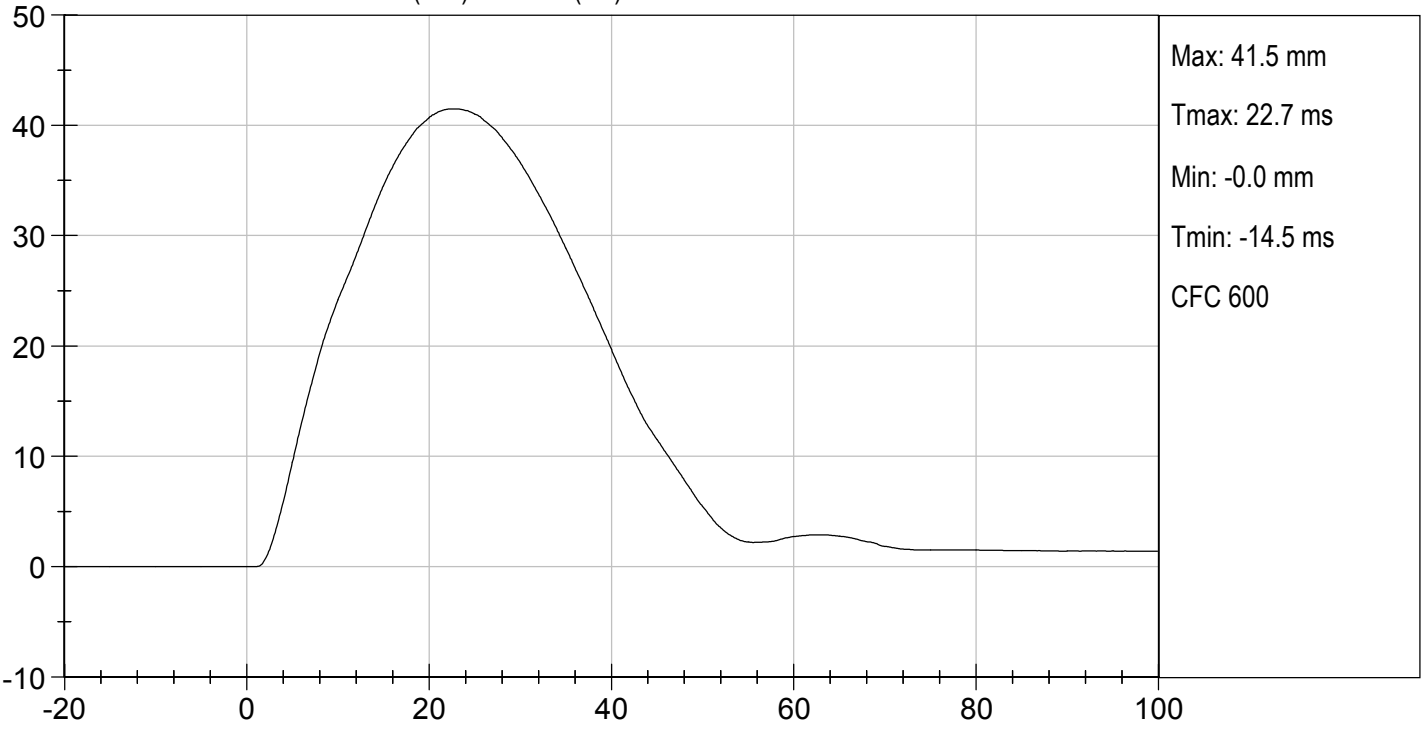




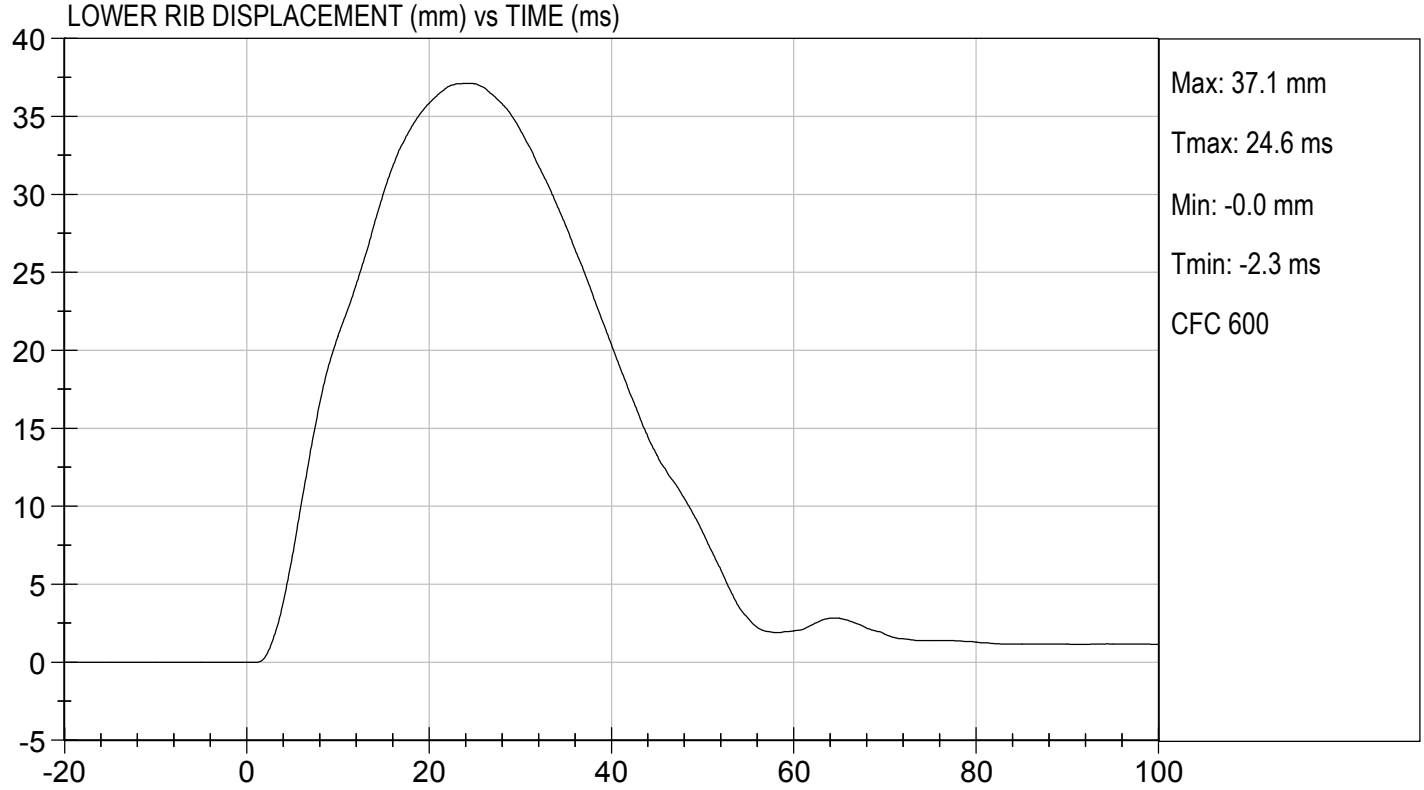
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 05/30/2019
TEST #: D191695

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



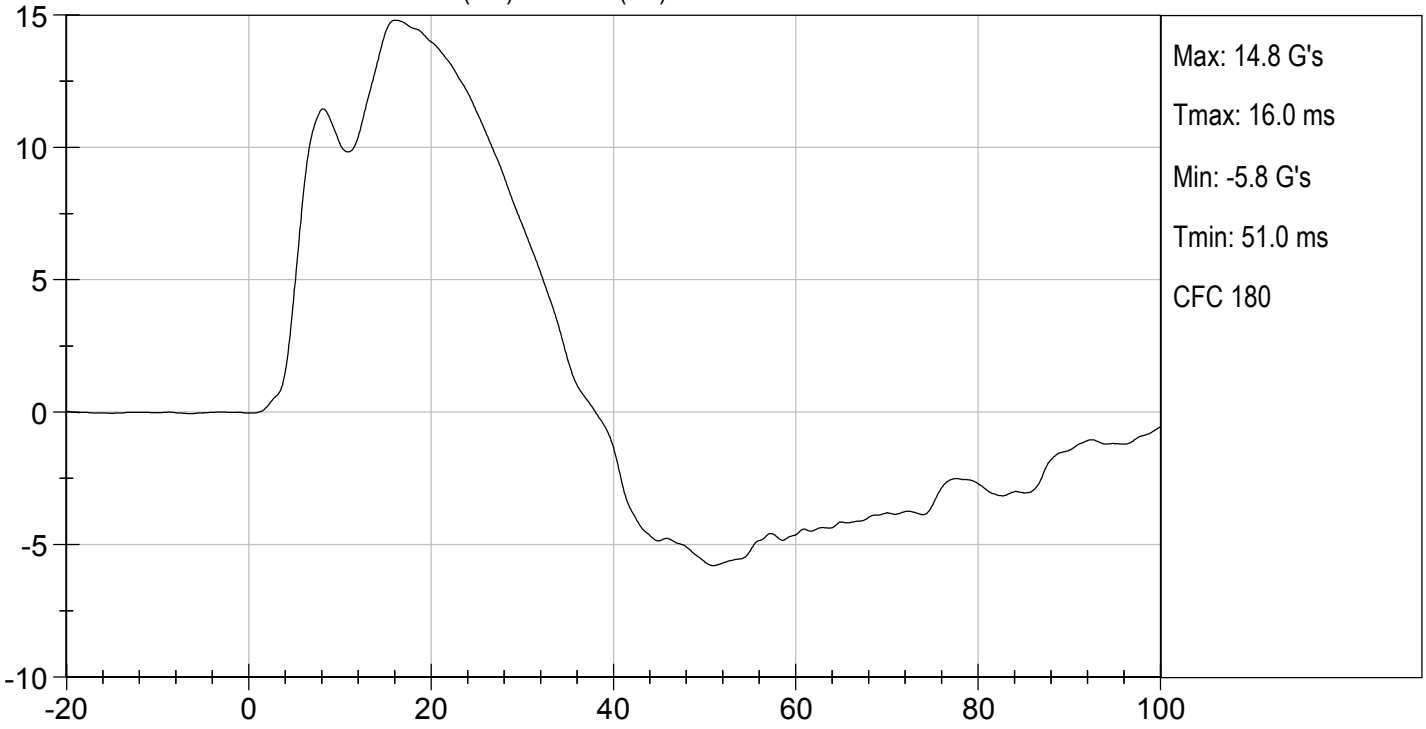
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



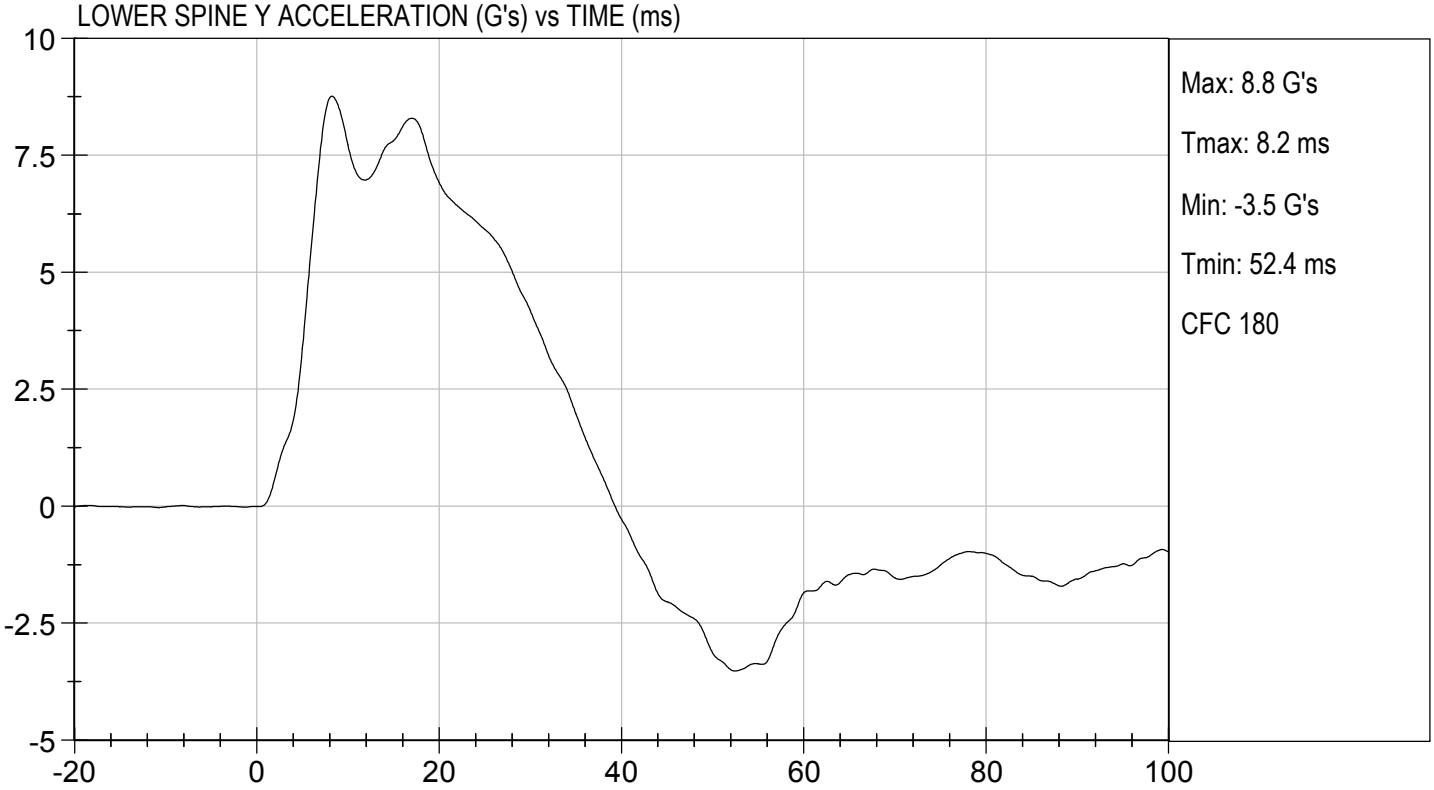
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 05/30/2019
TEST #: D191695

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: 306 **Test I.D:** D191696

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	41	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	37	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	12	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/30/2019

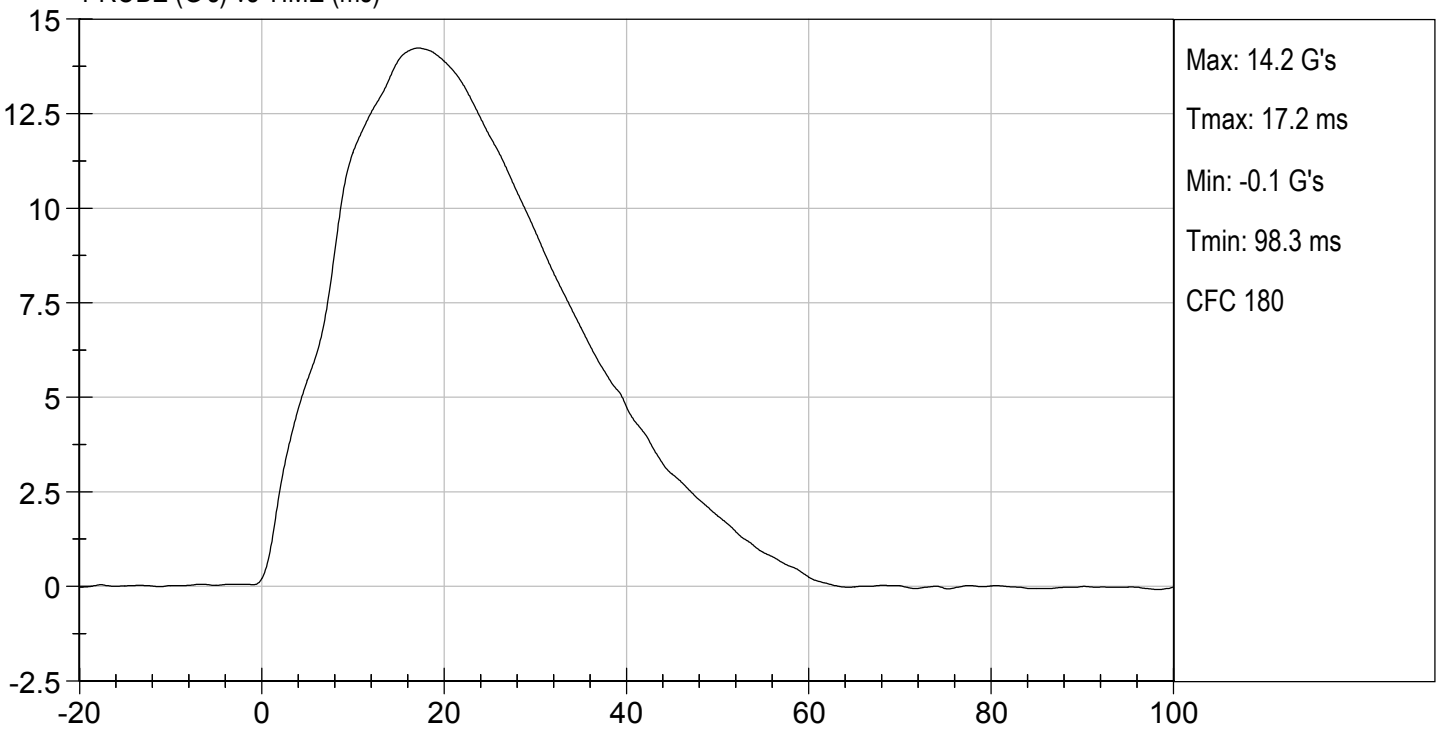
Test Date

Approved By

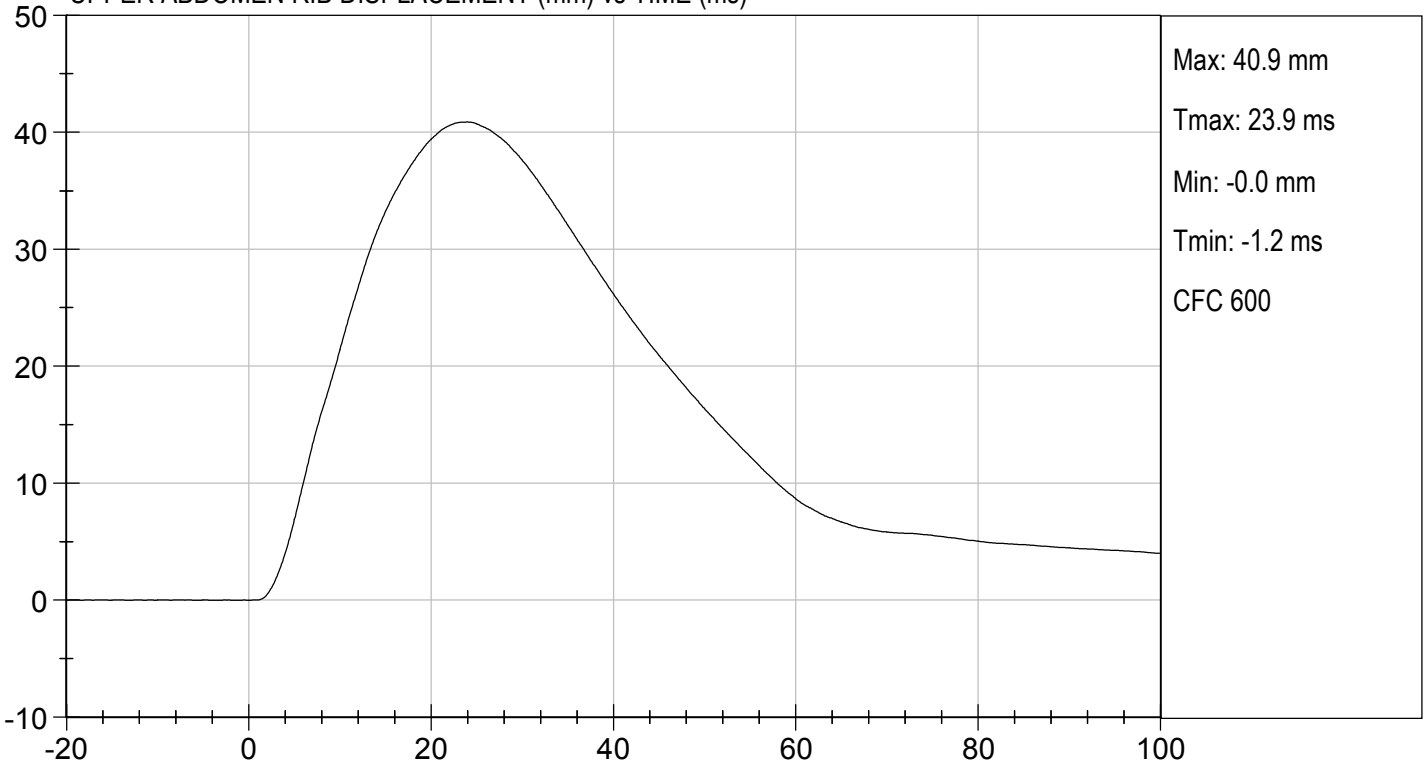
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 05/30/2019
TEST #: D191696

PROBE (G's) vs TIME (ms)



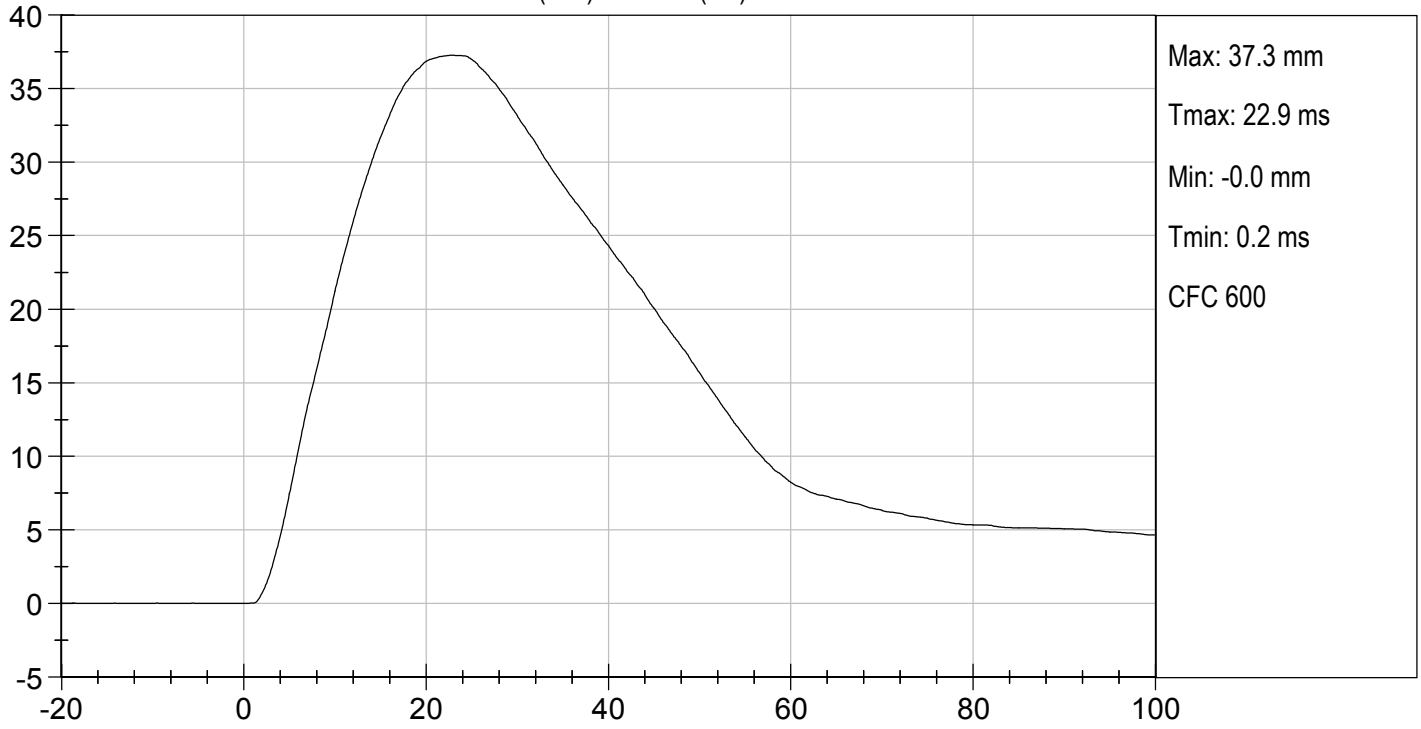
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



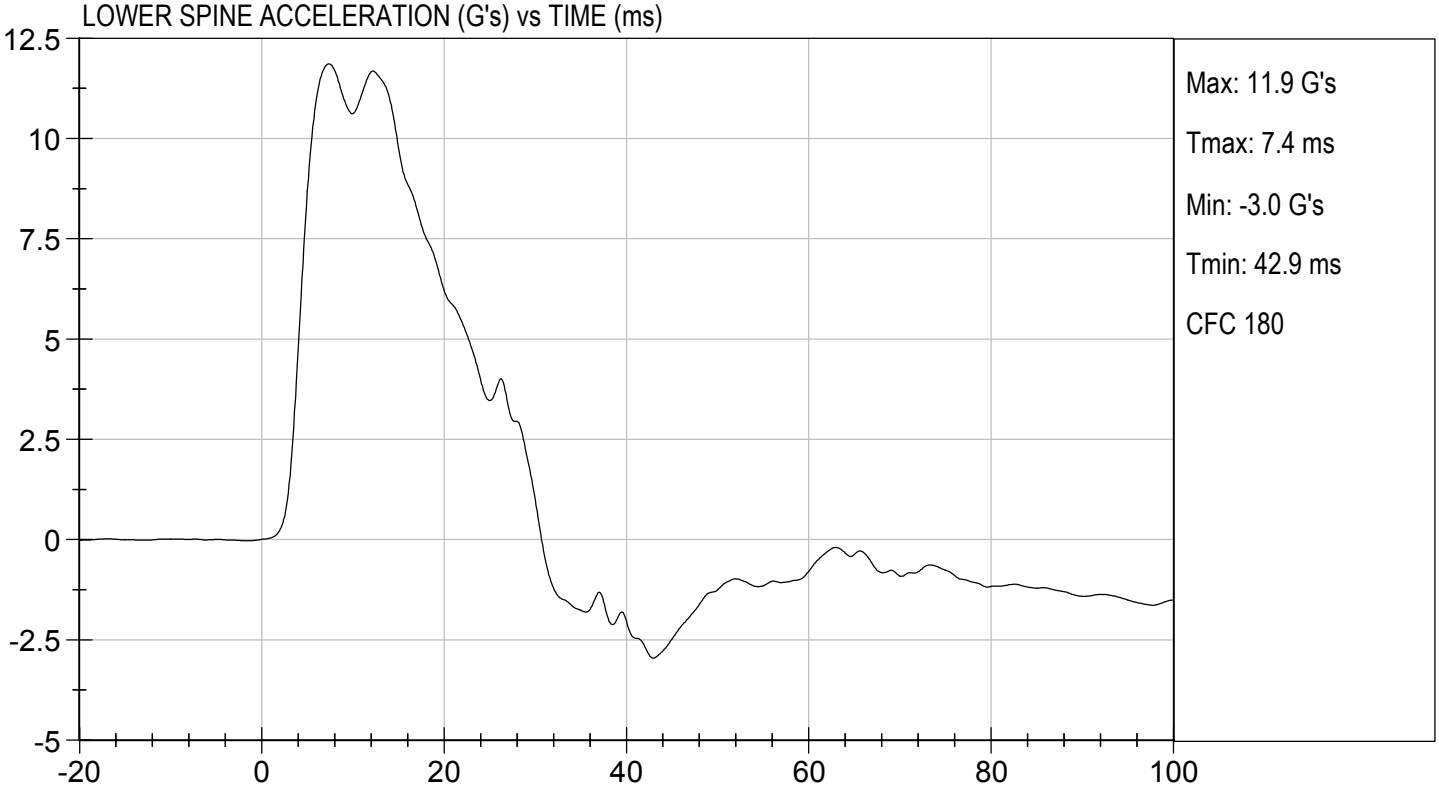
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 05/30/2019
TEST #: D191696

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: 306 **Test I.D:** D191697

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	38 to 47	43	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	37	Pass
Peak Acetabulum Force	N	3600 to 4300	4,018	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

05/30/2019

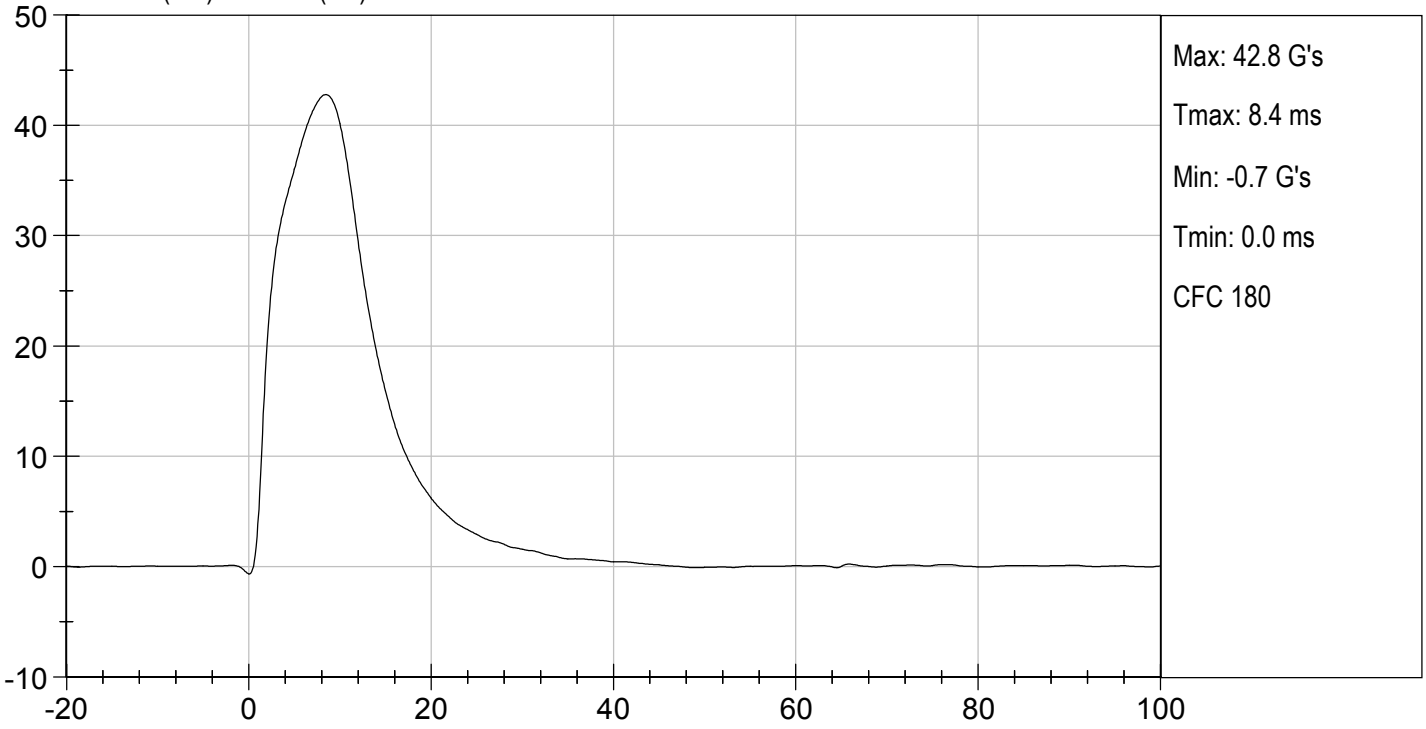
Test Date

Approved By

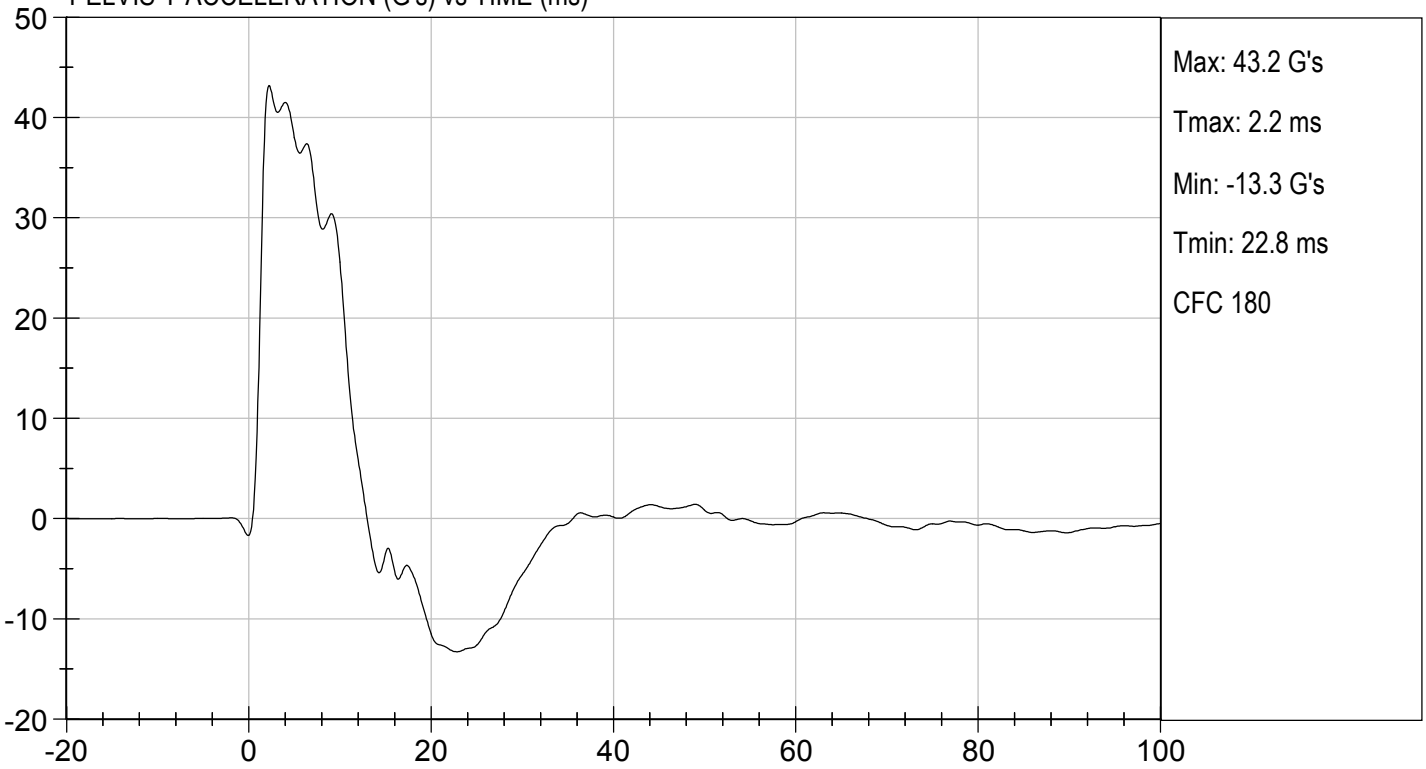
TEST DESC: PELVIS IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 05/30/2019
TEST #: D191697

PROBE (G's) vs TIME (ms)

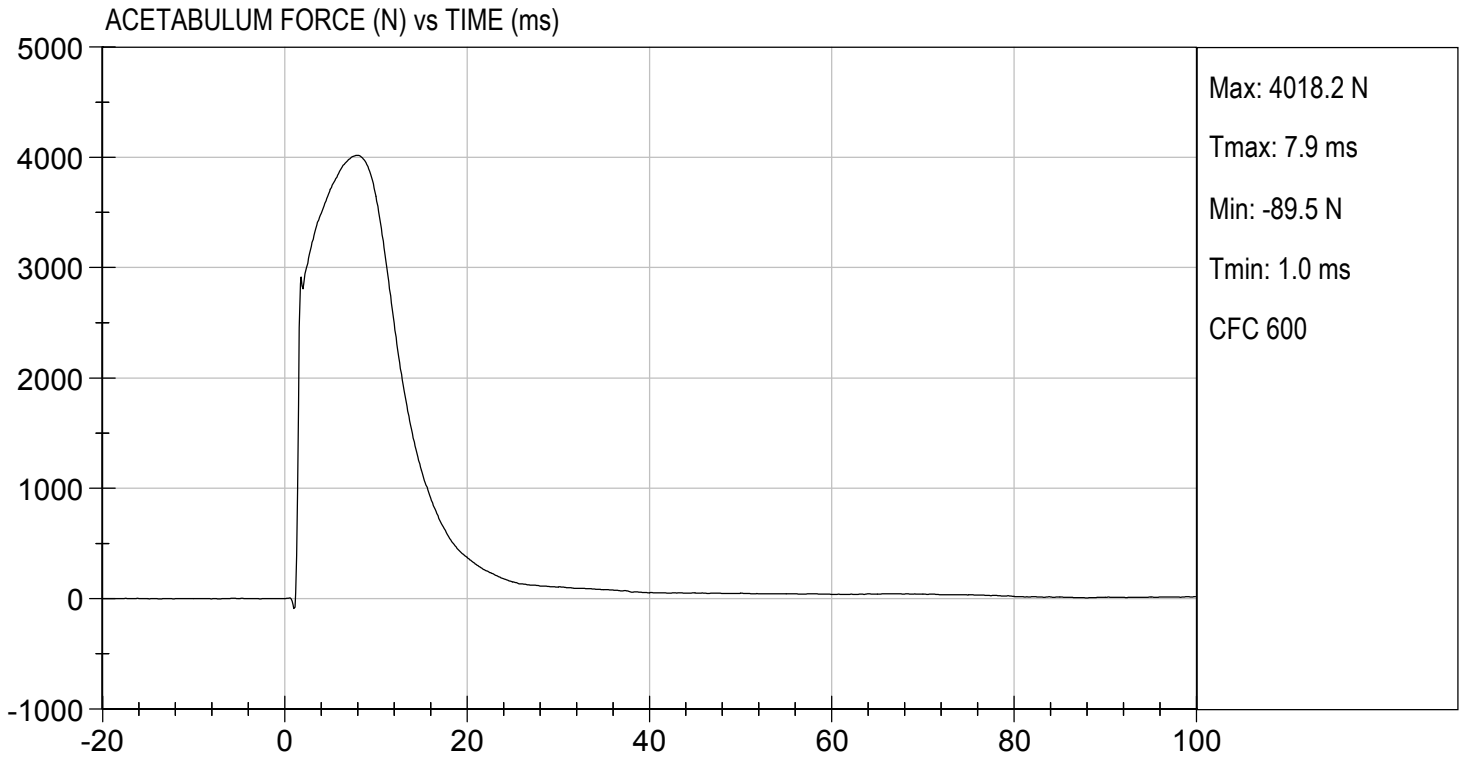


PELVIS Y ACCELERATION (G's) vs TIME (ms)



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

TEST DATE: 05/30/2019
TEST #: D191697



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D191698

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	4.20 to 4.40	4.21	Pass
Maximum Probe Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	35	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,628	Pass
		Overall Test Results		Pass

Jacob D Taylor

Laboratory Technician

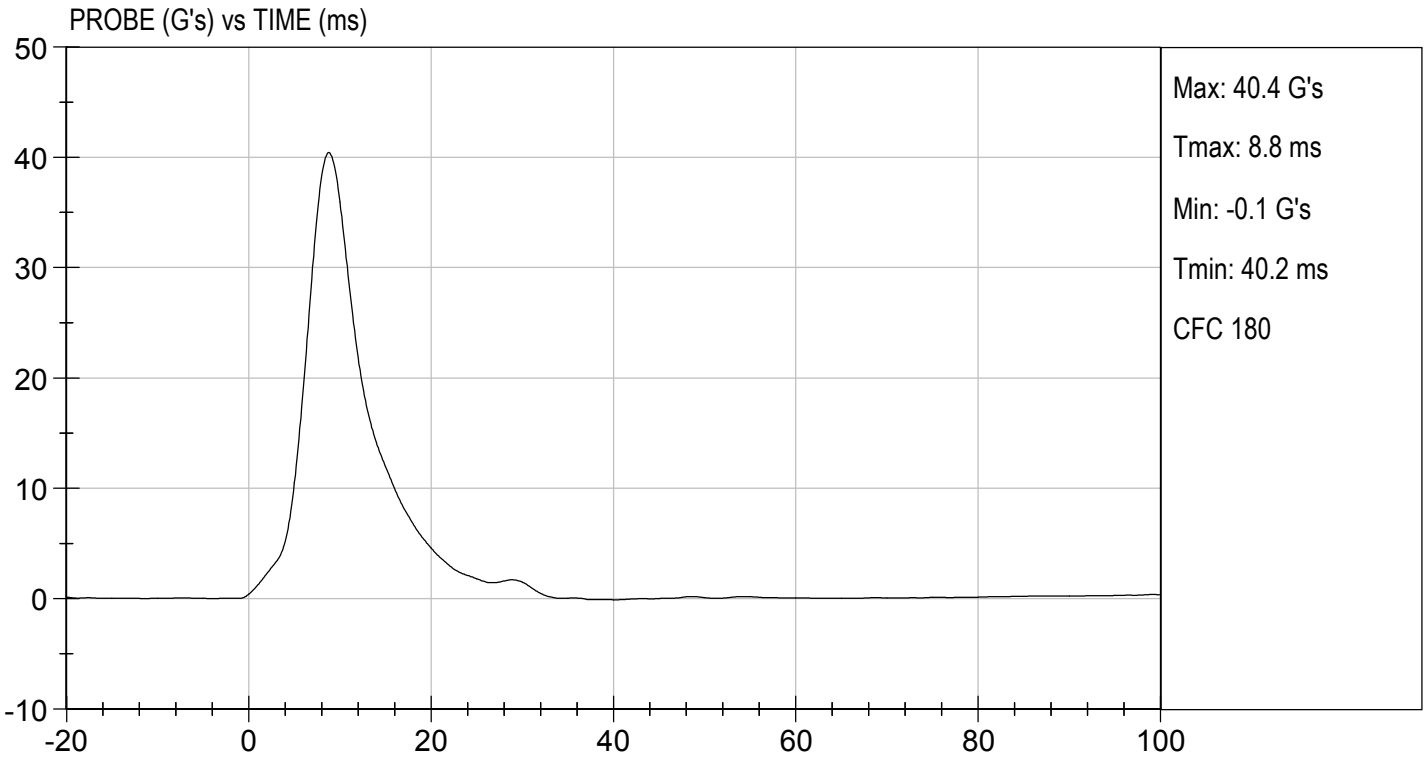
05/30/2019

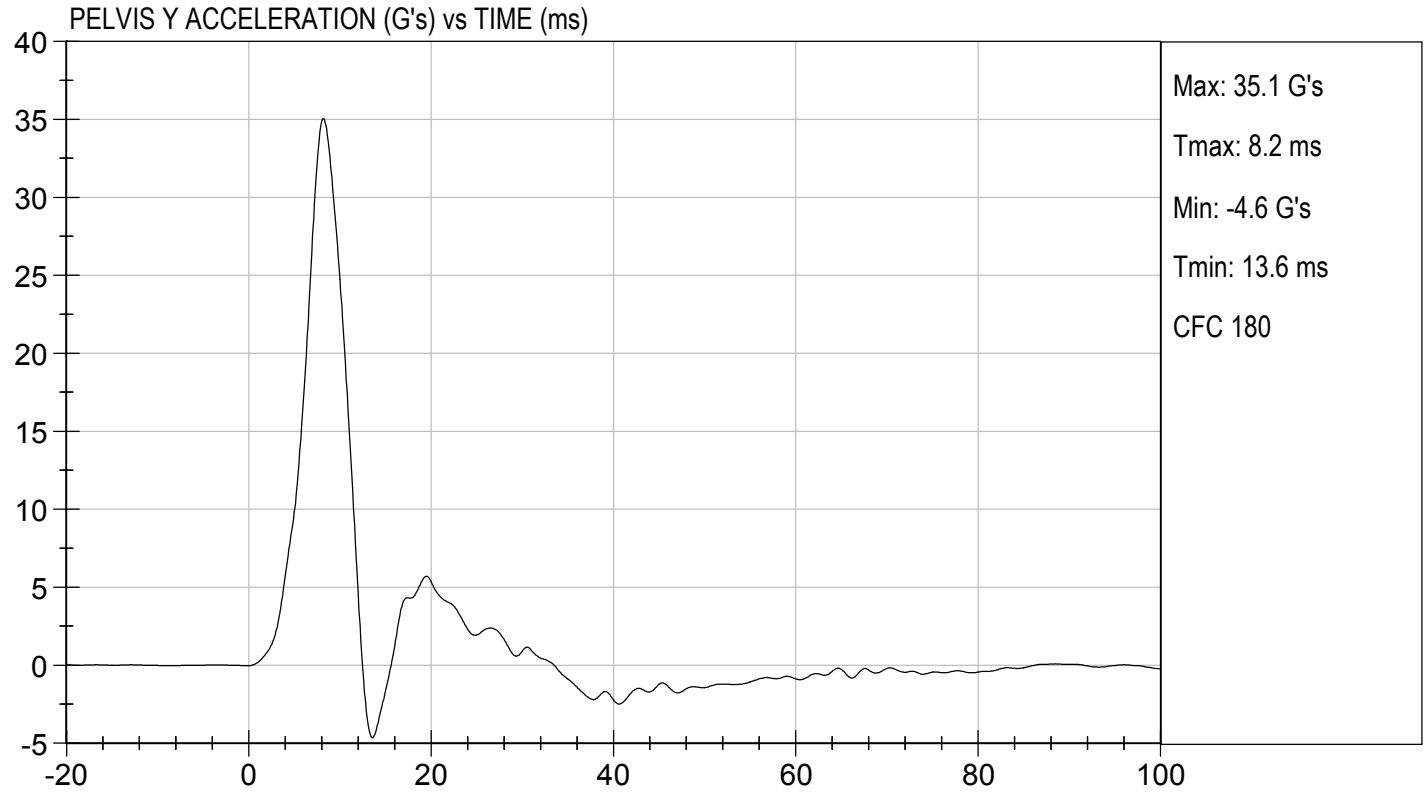
Test Date

Approved By

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

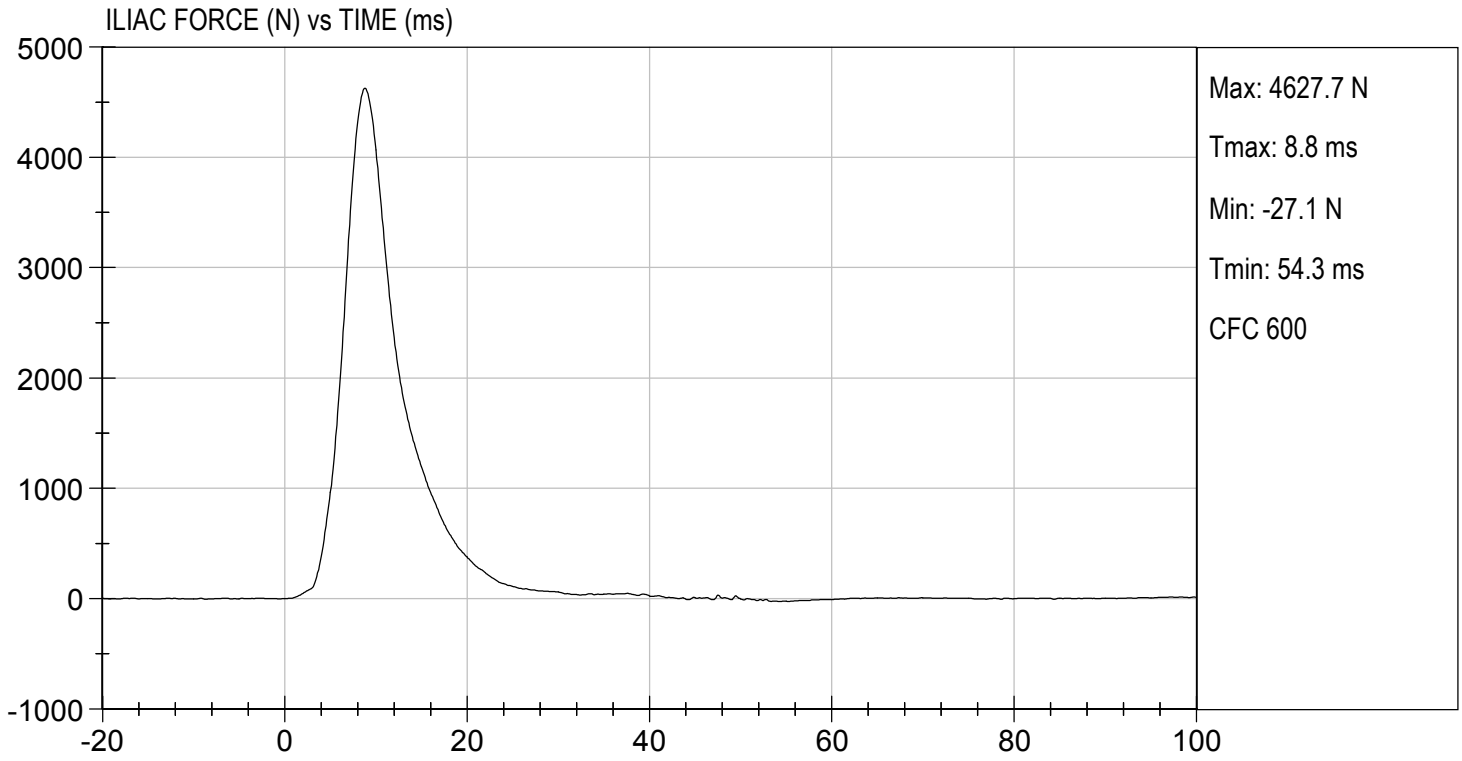
TEST DATE: 05/30/2019
TEST #: D191698





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

TEST DATE: 05/30/2019
TEST #: D191698



SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 11769
Test Number 5848
Report Number 5864
Test Date 1/16/2018 12:39:12 PM

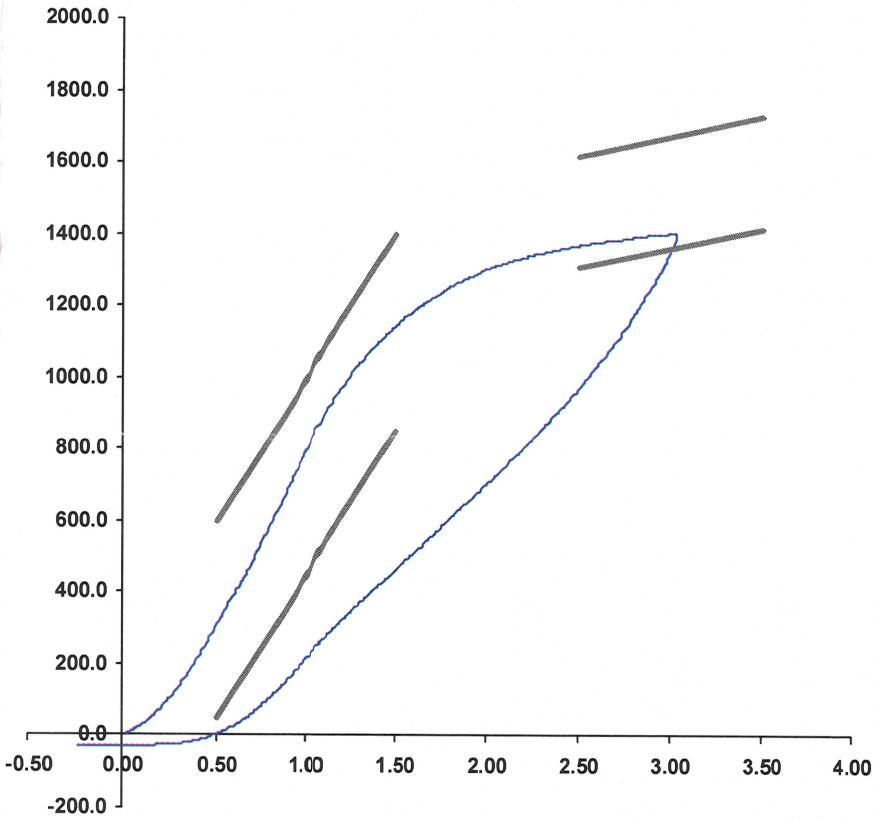
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	309.28	50.00	600.00
Force @ 1.5 mm (N)	1,146.32	850.00	1,400.00
Force @ 2.5 mm (N)	1,369.39	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,402.74	1,361.00	1,673.00

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

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

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 **16-Jan-18**
SACO Research

By : DC Date : 1/16/18

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

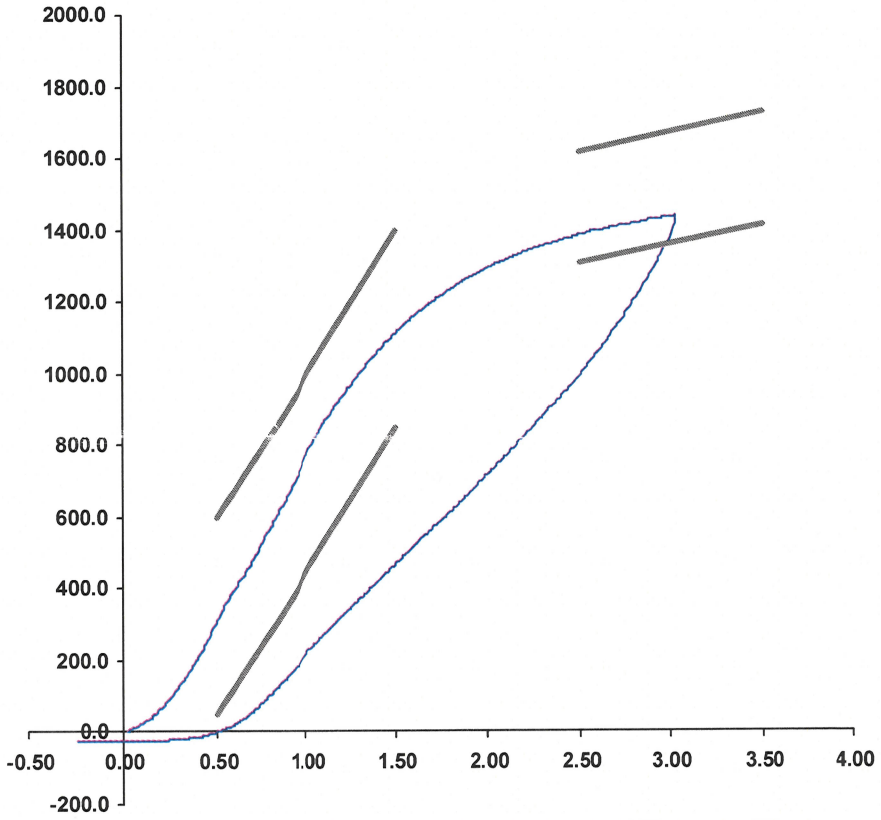
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 12385
Test Number 6773
Report Number 6788
Test Date 3/23/2018 9:58:44 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	306.36	50.00	600.00
Force @ 1.5 mm (N)	1,116.10	850.00	1,400.00
Force @ 2.5 mm (N)	1,387.64	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,437.05	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 Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Operator

Part Number 180-4450

Template No 107 **23-Mar-18**
SACO Research

By : DC Date : 3/23/18

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 032		
			Serial Number	Manufacturer	Calibration Date
Head CG Accelerometers		X	P79711	Endevco	01/18/19
		Y	P79712	Endevco	01/18/19
		Z	P88170	Endevco	01/18/19
		Xr	P79750	Endevco	01/18/19
		Yr	P79751	Endevco	01/18/19
		Zr	P79753	Endevco	01/18/19
Thorax Rib Displacement Potentiometers	Upper	Y	G176	Honeywell	01/18/19
	Middle	Y	G169	Honeywell	01/18/19
	Lower	Y	G164	Honeywell	01/18/19
Abdomen Load Cells	Forward	Y	ABG1513	Denton	09/12/18
	Middle	Y	ABG1531	Denton	09/12/18
	Rear	Y	ABG1536	Denton	09/12/18
Lower Spine Accelerometers (T12)		X	P79574	Endevco	01/18/19
		Y	P82097	Endevco	01/18/19
		Z	P82603	Endevco	01/18/19
Public Symphysis Load Cell		Y	PG462	Denton	09/12/18

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 306		
				Serial Number	Manufacturer	Calibration Date
Head CG Accelerometers			X	P79445	Endevco	01/11/19
			Y	P79721	Endevco	01/11/19
			Z	P79724	Endevco	01/11/19
			Xr	P84999	Endevco	01/11/19
			Yr	P85000	Endevco	01/11/19
			Zr	P85001	Endevco	01/11/19
Head Angular Rate Sensors			X	ARS7416	DTS	07/15/14
			Y	ARS7442	DTS	07/15/14
			Z	ARS7475	DTS	07/15/14
Displacement Potentiometers	Thoracic Rib	Upper	Y	G033	FTSS	01/11/19
		Middle	Y	G1261	FTSS	01/11/19
		Lower	Y	G1270	FTSS	01/11/19
	Abdominal Rib	Upper	Y	G032	FTSS	01/11/19
		Lower	Y	G1304	FTSS	01/11/19
Lower Spine Accelerometers (T12)			X	P96332	Endevco	01/11/19
			Y	P96335	Endevco	01/11/19
			Z	P96341	Endevco	01/11/19
Acetabulum Load Cell			Y	ACG268	Denton	12/04/18
Iliac Wing Load Cell			Y	IWG273	Denton	12/04/18
Pelvis Plug (struck side)				11769	SACO	01/16/18
Pelvis Plug (non-struck side)				12385	SACO	03/23/18

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	T18394	Endevco	01/14/19
	Vehicle Center of Gravity	Y	T18351	Endevco	01/14/19
	Vehicle Center of Gravity	Z	T18385	Endevco	01/14/19
2	Right Sill at Front Seat	X	T18370	Endevco	01/04/19
	Right Sill at Front Seat	Y	T18984	Endevco	01/23/19
	Right Sill at Front Seat	Z	T19039	Endevco	01/23/19
3	Right Sill at Rear Seat	X	T17852	Endevco	01/14/19
	Right Sill at Rear Seat	Y	T19032	Endevco	01/23/19
	Right Sill at Rear Seat	Z	T19022	Endevco	01/24/19
4	Left Sill at Front Door	Y	T19018	Endevco	01/24/19
5	Left Sill at Rear Door	Y	T12063	Endevco	03/05/19
6	Left A-Post Lower	Y	T19390	Endevco	05/03/19
7	Left A-Post Middle	Y	T19338	Endevco	05/02/19
8	Left B-Post Lower	Y	T19517	Endevco	05/02/19
9	Left B-Post Middle	Y	T19373	Endevco	04/30/19
10	Front Seat Track	Y	P96856	Endevco	12/10/18
11	Rear Seat Track or Structure	Y	T19533	Endevco	04/12/19
12	Right Rear Occ. Compartment	Y	T17931	Endevco	01/16/19
13	Engine Block	X	T19381	Endevco	05/02/19
	Engine Block	Y	T19510	Endevco	05/03/19
14	Rear Floorpan Above Axle	X	PCB1231	PCB	01/09/19
	Rear Floorpan Above Axle	Y	PCB1185	PCB	12/05/18
	Rear Floorpan Above Axle	Z	PCB1140	PCB	01/16/19

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	PCB753D	PCB	03/21/19
MDB Center of Gravity	Y	PCB557D	PCB	03/21/19
MDB Center of Gravity	Z	PCB511D	PCB	03/21/19
Left Frame at Rear Axle Centerline	X	PCB660D	PCB	03/21/19
Left Frame at Rear Axle Centerline	Y	PCB661D	PCB	03/21/19