

REPORT NUMBER: SINCAP-MGA-2019-019

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

**TOYOTA MOTOR MANUFACTURING, KENTUCKY, INC.
2019 Toyota Avalon XLE 4-Door Sedan
NHTSA No.: O20195109**

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



Test Date: January 17, 2019

Final Report Date: April 11, 2019

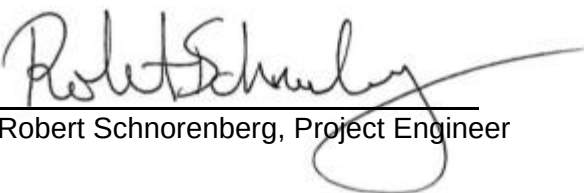
FINAL REPORT

**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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Approval Date: April 11, 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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16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the 2019 Toyota Avalon 4-Dr. 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 January 17, 2019. The impact velocity of the Moving Deformable Barrier (MDB) was 62.05 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.3°C. The target vehicle post-test maximum crush was 170 mm at level 3. The test vehicle's performance was as follows: <table border="1" style="margin: 10px auto; width: 80%; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: center;">Driver ATD (ES-2re)</th> </tr> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">Threshold</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">163</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">44</td> <td style="text-align: center;">21</td> </tr> <tr> <td>Total Abdominal Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">2500</td> <td style="text-align: center;">692</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">6000</td> <td style="text-align: center;">1413</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td style="text-align: center;">Gs</td> <td style="text-align: center;">82*</td> <td style="text-align: center;">25</td> </tr> </tbody> </table> <table border="1" style="margin: 10px auto; width: 80%; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: center;">Passenger ATD (SID-IIs)</th> </tr> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">Threshold</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">266</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td style="text-align: center;">Gs</td> <td style="text-align: center;">82</td> <td style="text-align: center;">41</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td style="text-align: center;">N</td> <td style="text-align: center;">5525</td> <td style="text-align: center;">3050</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">38*</td> <td style="text-align: center;">17</td> </tr> <tr> <td>Maximum Abdomen Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">45*</td> <td style="text-align: center;">23</td> </tr> </tbody> </table> *Proposed IARV				Driver ATD (ES-2re)				Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	163	Maximum Thorax Rib Deflection	mm	44	21	Total Abdominal Force	N	2500	692	Pubic Symphysis Force	N	6000	1413	Resultant Lower Spine Acceleration	Gs	82*	25	Passenger ATD (SID-IIs)				Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	266	Resultant Lower Spine Acceleration	Gs	82	41	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3050	Maximum Thoracic Rib Deflection	mm	38*	17	Maximum Abdomen Rib Deflection	mm	45*	23
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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 Toyota Avalon 4-Dr. 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 Toyota Avalon 4-Dr. 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 62.05 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 January 17, 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	163
Maximum Thorax Rib Deflection	mm	44	21
Total Abdominal Force	N	2500	692
Pubic Symphysis Force	N	6000	1413
Resultant Lower Spine Acceleration	Gs	82*	25

Passenger ATD (SID-IIs)			
Measurement Description	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	266
Resultant Lower Spine Acceleration	Gs	82	41
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3050
Maximum Thoracic Rib Deflection	mm	38*	17
Maximum Abdomen Rib Deflection	mm	45*	23

*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.dot.gov

GENERAL COMMENTS

Left Lower B-Post has recorded questionable data at 5 ms.
Left Front Sill Y recorded questionable data from 36-39 ms.
Vehicle CG Z recorded questionable data.

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

SECTION 3
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. 020195109
Test Date: 1/17/2019

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20195109	Traction Control System (TCS)	Yes
Model Year	2019	Auto-Leveling System	No
Make	Toyota	Automatic Door Locks (ADL)	Yes
Model	Avalon XLE	Power Window Auto-Reverse	Yes
Body Style	4-Door Sedan	Other Optional Feature	N/A
VIN	4T1BZ1FB2KU007567	Driver Front Airbag	Yes
Body Color	Brownstone	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	79km / 49mi	Driver Head/Torso Airbag	No
Engine Displacement (L)	3.5L	Driver Torso Airbag	No
Type/No. Cylinders	6	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Lateral	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	Yes
Transmission Speeds	8	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	FWD	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	Yes
Sunroof/T-Top	Yes	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	Yes
Power Seats	Yes	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	Yes
		Other Restraint Feature	N/A

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

Manufactured By	TOYOTA MOTOR MANUFACTURING, KENTUCKY, INC.	GVWR (kg)	2145
Date of Manufacture	06/18	GAWR Front (kg)	1188
Vehicle Type	Passenger Car	GAWR Rear (kg)	1098

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				418*	(A)
DSC x 68.04 kg				340	(B)
Rated Cargo and Luggage Weight (RCLW) (kg)				78	(A-B)

*Vehicle Capacity Weight (VCW) reduced by 7 kg to account for Load Carrying Capacity Reduction label.

VEHICLE SEAT TYPE

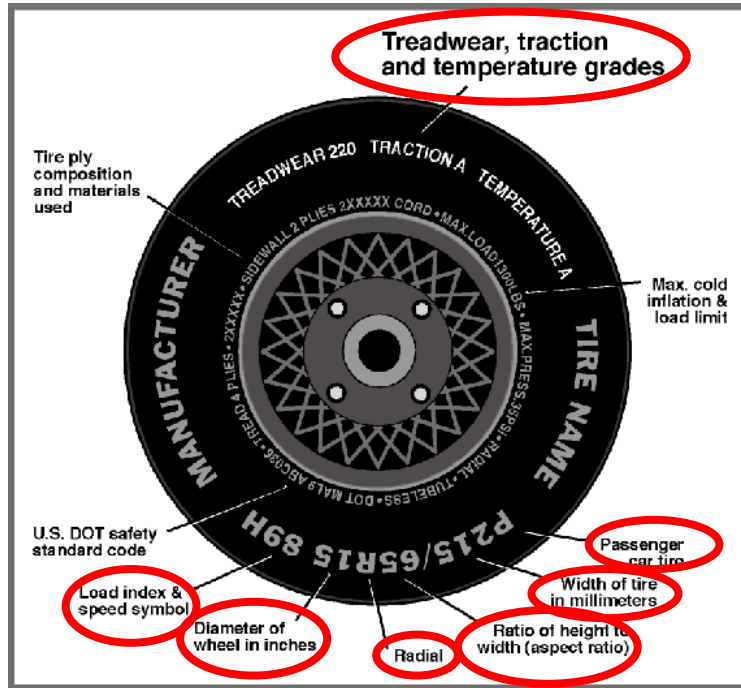
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X						X
Rear or Second Row Seat				X	X		
Third Row Seat							

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	215/55R17	215/55R17
Tire Size on Vehicle	215/55R17	215/55R17
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Ecopia EP422	Ecopia EP422
Treadwear	640	640
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Polyester	1 Polyester, 2 Steel, 1 Polyester
Load Index/Speed Symbol	94V	94V
Tire Material	Rubber	Rubber
DOT Safety Code Left	OB3R EC1 1918	OB3R EC1 1918
DOT Safety Code Right	OB3R EC1 1918	OB3R EC1 1918

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. 020195109
 Test Date: 1/17/2019

TEST PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	255	250	250	260
Tire Placard	kPa	240	240	240	240
Owner's Manual	kPa	240	240	240	240
As Tested	kPa	240	240	240	240

MDB TIRE SPECIFICATIONS

Requirement		Units	LF	RF	LR	RR
Tire Size	P205/75R15	N/A	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire	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	505.5	325.0		546.0	413.0		532.0	429.0	
Right	kg	493.0	324.0		505.0	384.0		499.5	393.5	
Ratio	%	60.6%	39.4%		56.9%	43.1%		55.6%	44.4%	
Totals	kg	998.5	649.0	1647.5	1051.0	797.0	1848.0	1031.5	822.5	1854.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1647.5	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	78	(C)
Calculated Test Vehicle Target Weight (TV/TW)	kg	1854.5	(A+B+C)

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

TEST VEHICLE ATTITUDES AND CG

	Units	Fully Loaded	As Tested	Meets Requirement***
Left Front	mm	693	696	Yes
Right Front	mm	704	696	Yes
Right Rear	mm	685	695	Yes
Left Rear	mm	684	676	Yes
Vehicle CG (Aft of Front Axle)	mm	1275	1239	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	30	30	

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

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
Test Date: 1/17/2019

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Weight of Ballast, if any	67
None	

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019

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	24.6	13.9	19.3
Front Passenger Seat	24.3	13.7	19.0
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 SCRIP Height (mm)	SCRIP Height Position	SCRIP Height (mm)		
				Rear-Most	Mid	Forward-Most
Driver Seat	19.3	0	Max	58	58	58
			Mid	29	29	29
			Min	0	0	0
Front Passenger Seat	19.0	0	Max	58	58	58
			Mid	29	29	29
			Min	0	0	0
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

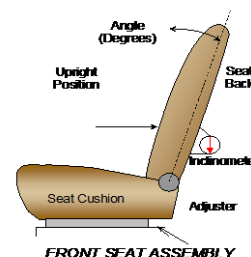
NHTSA No. 020195109
 Test Date: 1/17/2019

SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-Most Position	
	mm	Detents (1 st as 1)	mm	Detent (1 st as 0)
Driver Seat	260		130	
Front Passenger Seat	260		130	
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 (1 st as 1)	Degrees	Detent (1 st as 0)
Driver Seat	59.2		4.7	
Front Passenger Seat	59.3		4.5	
Front Center Seat				
Struck Side Rear Seat	Fixed		Fixed	
Non-Struck Side Rear Seat	Fixed		Fixed	
Rear Center Seat	Fixed		Fixed	

Driver seat back angle measured with level on seatback.

DATA SHEET NO. 2 (CONTINUED)

SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
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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	4	0 (Uppermost as 0)
Rear Seat	Fixed	

HEAD RESTRAINT ADJUSTMENT

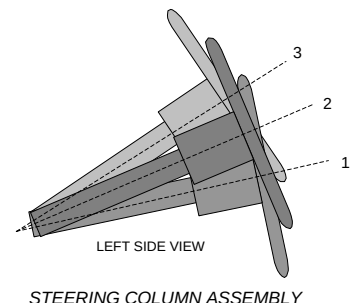
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	3	2 (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.

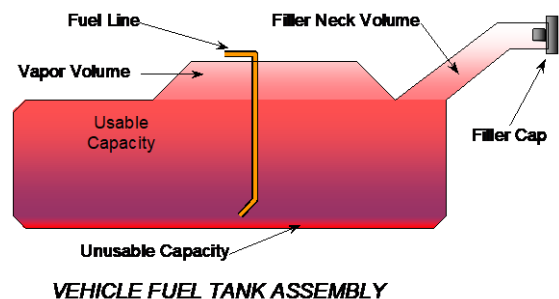
	Wheel Angle (deg)	Fore/Aft Position (mm)
Lowermost, Position 1	71.6	258
Geometric Center, Position 2	69.4	229
Uppermost, Position 3	67.2	200
Telescoping Steering Wheel Travel		58
Test Position	69.4	229



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 electric fuel pump. The fuel pump is activated when the ignition is turned on. The filler neck is located on the driver's side.



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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
Test Date: 1/17/2019

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of Standard Tank (see Form No. 1)	59.8
Usable Capacity of Optional Tank (see Form No. 1)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	54.9
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	55.6
Actual Amount of Solvent Used	55.6
1/3 of Usable Capacity	19.9

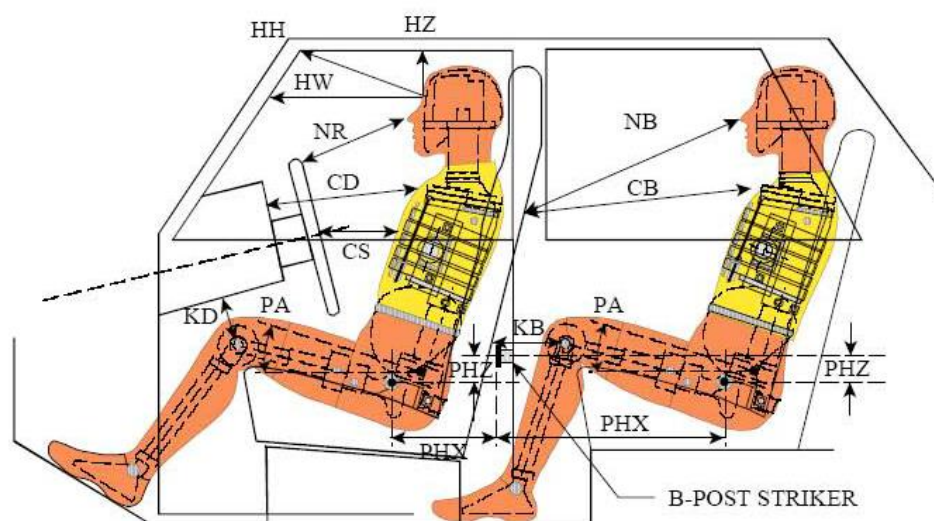
Is the actual amount of solvent used in the test equal to 93% + 1%
of the Usable Capacity stated in Form No. 1?

YES

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
Test Date: 1/17/2019



LEFT SIDE VIEW

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

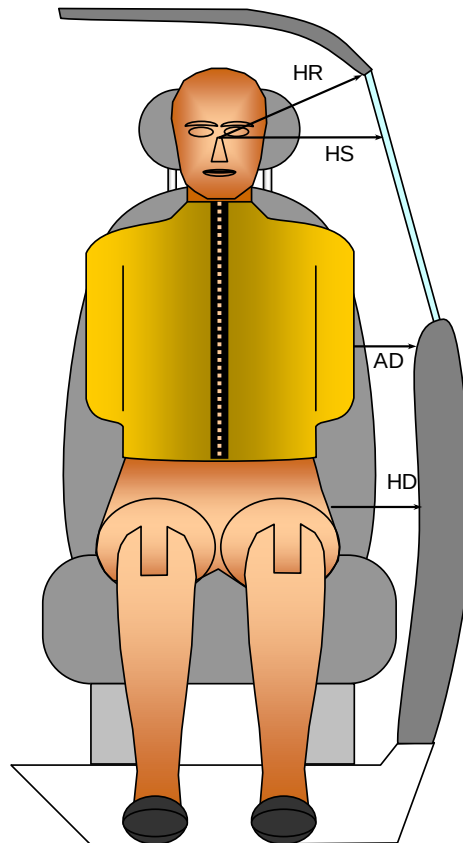
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	376	14.3		
HW		Head to Windshield	694	0		
HZ	HZ	Head to Roof Liner	142	90	248	90
NR	NB	Nose to Rim/Seat Back	456	9.1	608	15.8
CD	CB	Chest to Dashboard/Seat Back	599	10.1	589	11.9
CS		Chest to Steering Wheel	387	6.6		
KDL	KBL	Left Knee to Dash/Seat Back	185	41.2	312	14.5
KDR	KBR	Right Knee to Dash/Seat Back	199	49.5	318	14.5
PAX	PAX	Pelvic Tilt Angle X		21.2		28.1
PAY	PAY	Pelvic Tilt Angle Y		-1.4		-0.1
PHX	PHX	Hip Point to Striker (X-Axis)	219		298	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	239		325	

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019



FRONT VIEW OF DUMMY

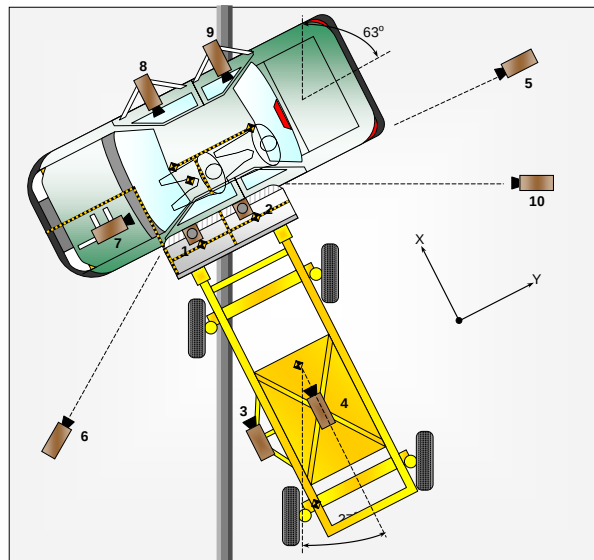
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	199	242
HS	Head to Side Window	mm	329	388
AD	Arm to Door	mm	108	186
HD	Hip Point to Door	mm	167	196

DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
Test Date: 1/17/2019



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X*	Y*	Z*		
1	Overhead Overall	930	740	-4995	14	1000
2	Overhead Close-Up	0	0	-4895	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	30	6890	-1610	24	1000
6	Left Front	-1980	-6430	-1580	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

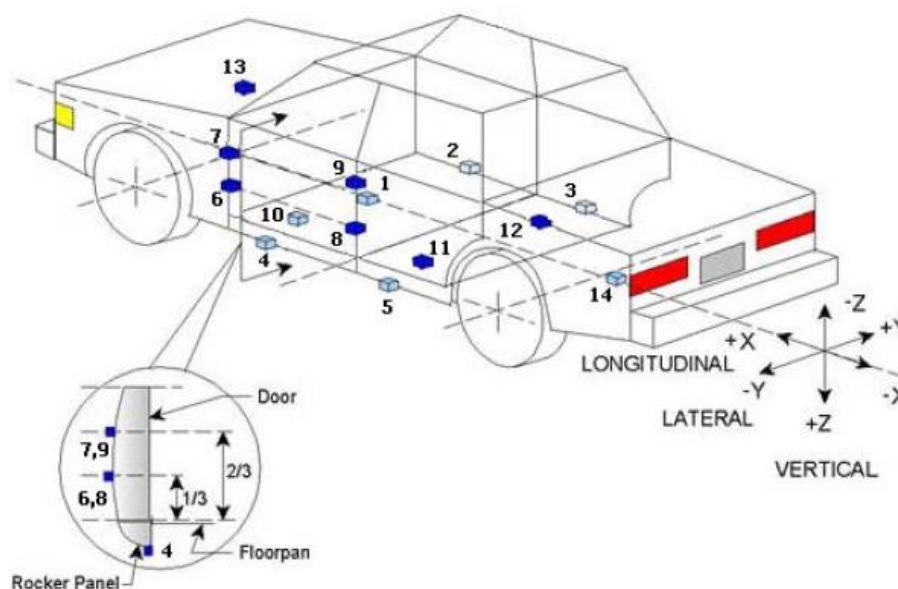
INSTRUMENTATION

	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 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
Test Date: 1/17/2019



TEST VEHICLE ACCELEROMETER LOCATIONS

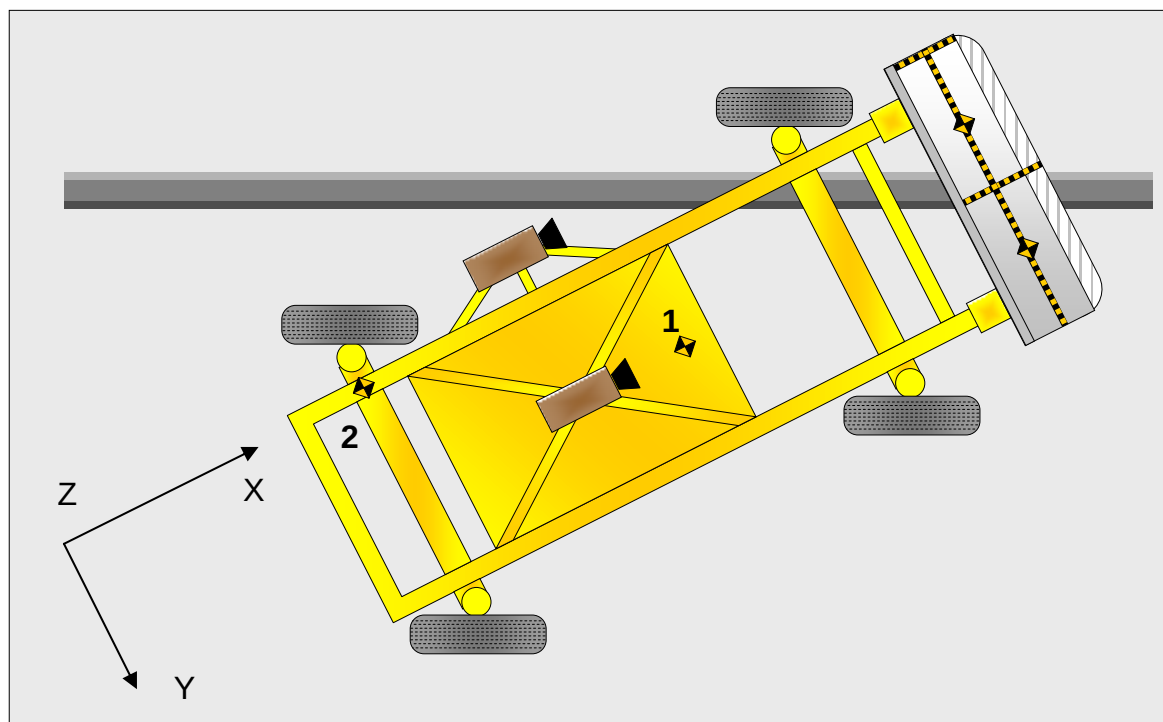
Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2799	185	-208
2	Right Sill at Front Seat	2427	740	-215
3	Right Sill at Rear Seat	1563	740	-220
4	Left Sill at Front Door	2860	-740	-210
5	Left Sill at Rear Door	1895	-740	-212
6	Left Lower A-Post	3505	-840	-540
7	Left Middle A-Post	3476	-855	-760
8	Left Lower B-Post	2310	-760	-570
9	Left Middle B-Post	2305	-730	-775
10	Front Seat Track	2485	-369	-225
11	Rear Seat Structure	2005	-390	-300
12	Rt. Rear Occ. Compartment	2048	365	-221
13	Engine Block	4214	26	-850
14	Rear Above Axle	1085	0	-511

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 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019



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 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. 020195109
Test Date: 1/17/2019

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-lis)
Face	Curtain Airbag	Curtain Airbag, Seatback
Top of Head	Headliner	Curtain Airbag, Center Headrest
Left Side of Head	Curtain Airbag, Headliner	Curtain Airbag
Back of Head	Curtain Airbag, Headliner, Headrest	Seat Back
Left Shoulder	Side Torso/Pelvis Airbag	Seat Back
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

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	No	No	No
Seat Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	20.4°	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	Cracked
Side Window Damage	LF and LR Window Broken
Other Notable Effects	None

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
Test Date: 1/17/2019

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		2874
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		497
Actual Impact Point (Aft of Front Axle)	mm		491
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	6
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	2

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
Test Date: 1/17/2019

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

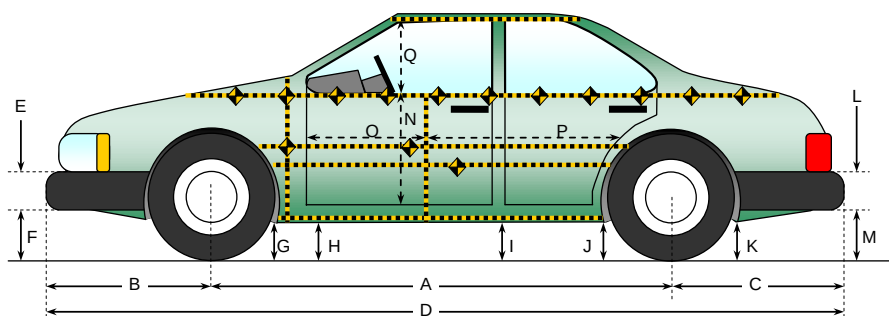
SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.05
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.98
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.3
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	62.9
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	26.8

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019



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

LEFT SIDE VIEW

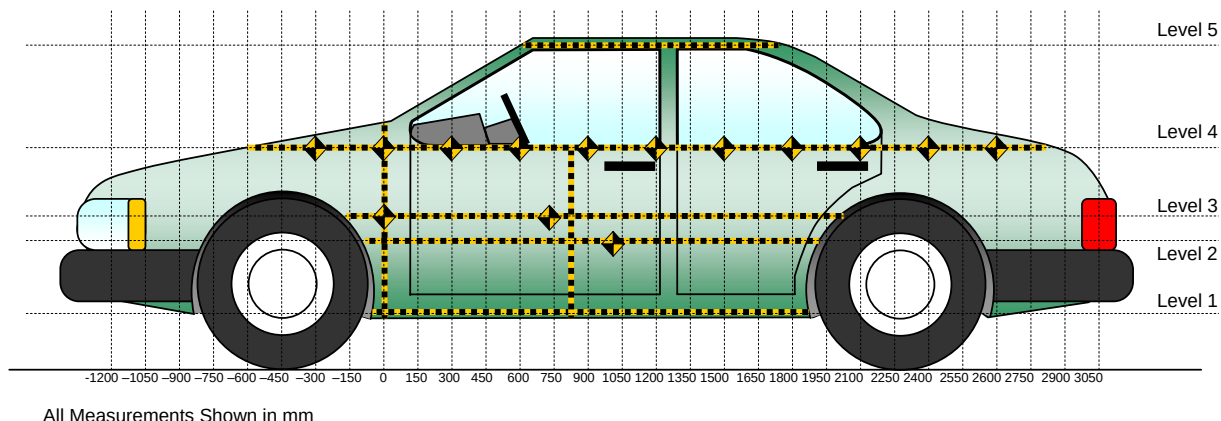
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2874	2878	-4
B	Front Axle to FSOV	973	966	7
C	Rear Axle to RSOV	1129	1138	-9
D	Total Length at Centerline	4976	4982	-6
E	Front Bumper Thickness	126	126	0
F	Front Bumper Bottom to Ground	214	221	-7
G	Sill Height at Front Wheel Well	180	181	-1
H	Sill Height at Front Door Leading Edge	175	176	-1
I	Sill Height at B Pillar	175	184	-9
J1	Sill Height at Rear Wheel Well	175	184	-9
J2	Pinch Weld Height at Rear Wheel Well	175	182	-7
K	Sill Height Aft of Rear Wheel Well	188	199	-11
L	Rear Bumper Thickness	106	106	0
M	Rear Bumper Bottom to Ground	252	278	-26
N	Sill Height to Window Bottom Sill	735	693	42
O	Front Door Leading Edge to Impact CL	893	797	96
P	Rear Door Trailing Edge to Impact CL	1224	1175	49
Q	Front Window Opening	404	415	-11
R	Right Side Length	4062	4045	17
S	Left Side Length	4062	4053	9
T	Vehicle Width at B Post	1836	1754	82

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	290	21	1950
2	Occupant H-Point	516	138	1650
3	Mid Door	604	170	1650
4	Window Sill	915	152	1650
5	Window Top	1355	17	1350

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

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019

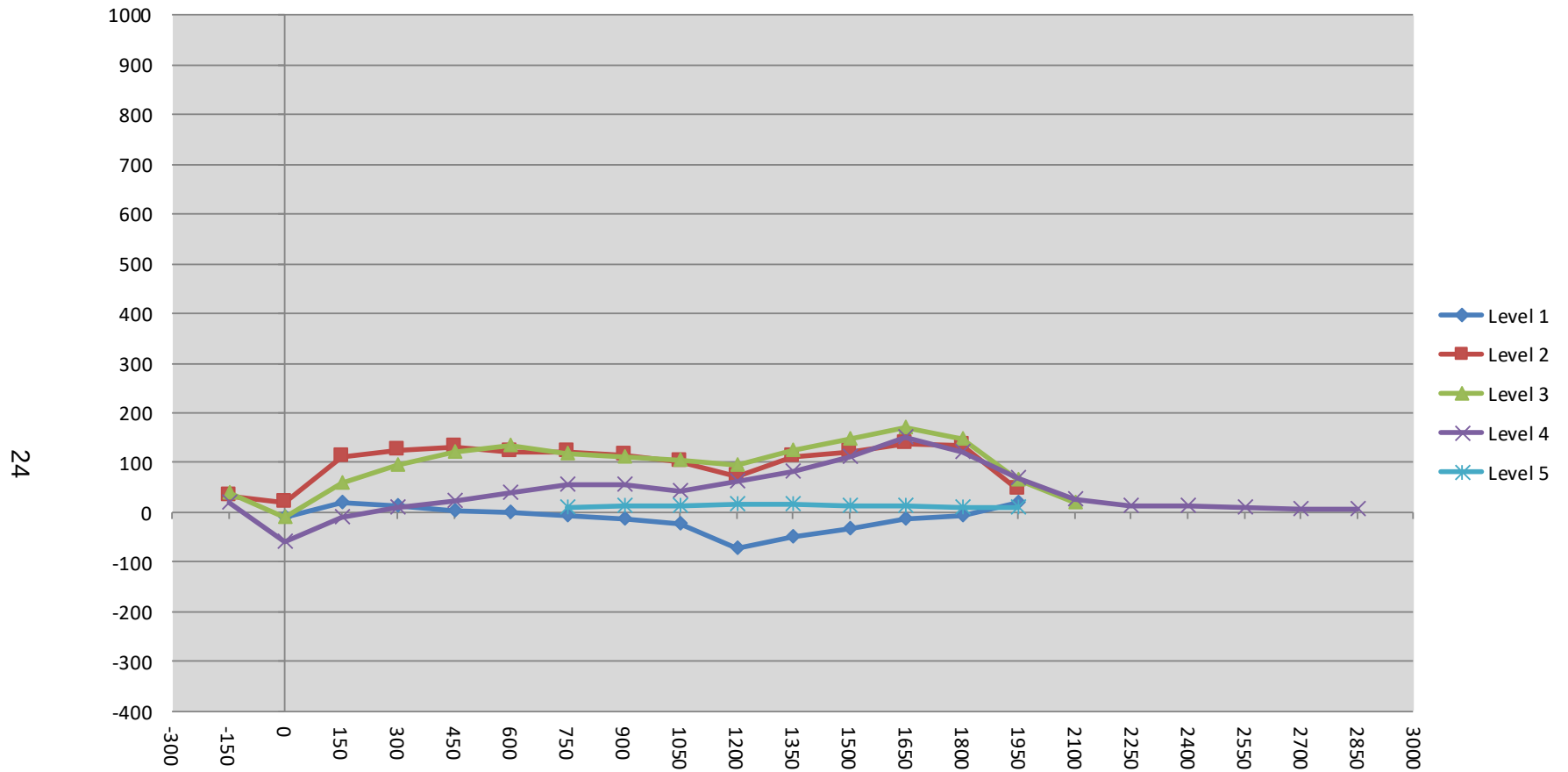
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-2100															
-1950															
-1800															
-1650															
-1500															
-1350															
-1200															
-1050															
-900															
-750															
-600															
-450															
-300															
-150		178	176	288			209	214	306			31	38	18	
0	195	178	182	285		185	198	172	225		-10	20	-10	-60	
150	195	180	183	275		213	291	241	266		18	111	58	-9	
300	211	180	184	266		225	304	279	277		14	124	95	11	
450	212	181	184	262		214	313	304	286		2	132	120	24	
600	212	182	185	261		211	302	321	299		-1	120	136	38	
750	212	182	185	257	517	204	303	303	313	527	-8	121	118	56	10
900	212	183	185	257	488	197	298	296	312	500	-15	115	111	55	12
1050	213	183	185	255	477	189	285	289	296	491	-24	102	104	41	14
1200	215	183	185	254	477	142	256	281	316	493	-73	73	96	62	16
1350	214	184	185	250	476	164	294	308	331	493	-50	110	123	81	17
1500	212	184	185	244	478	180	306	332	357	492	-32	122	147	113	14
1650	208	184	184	236	483	196	322	354	388	496	-12	138	170	152	13
1800	201	181	182	228	494	195	317	330	349	505	-6	136	148	121	11
1950	196	176	178	223	515	217	221	242	292	523	21	45	64	69	8
2100			175	222				194	247				19	25	
2250				229					242					13	
2400				238					250					12	
2550				249					258					9	
2700				267					273					6	
2850				286					291					5	
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 Toyota Avalon XLE 4-Door Sedan
Test Program: NCAP Side MDB Impact Test

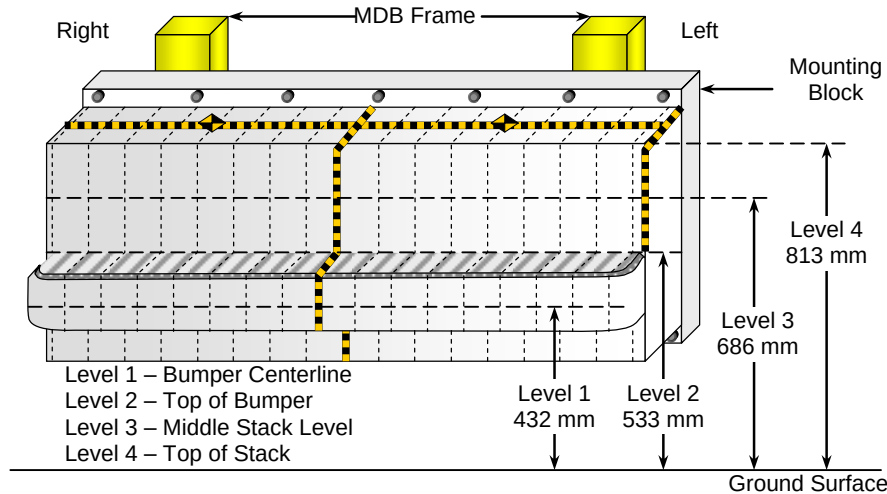
NHTSA No. O20195109
Test Date: 1/17/2019



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019



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	214
B	Top of Bumper	533	700	Right	140
C	Mid-Level	686	800	Left	120
D	Top of Stack	813	800	Left	180

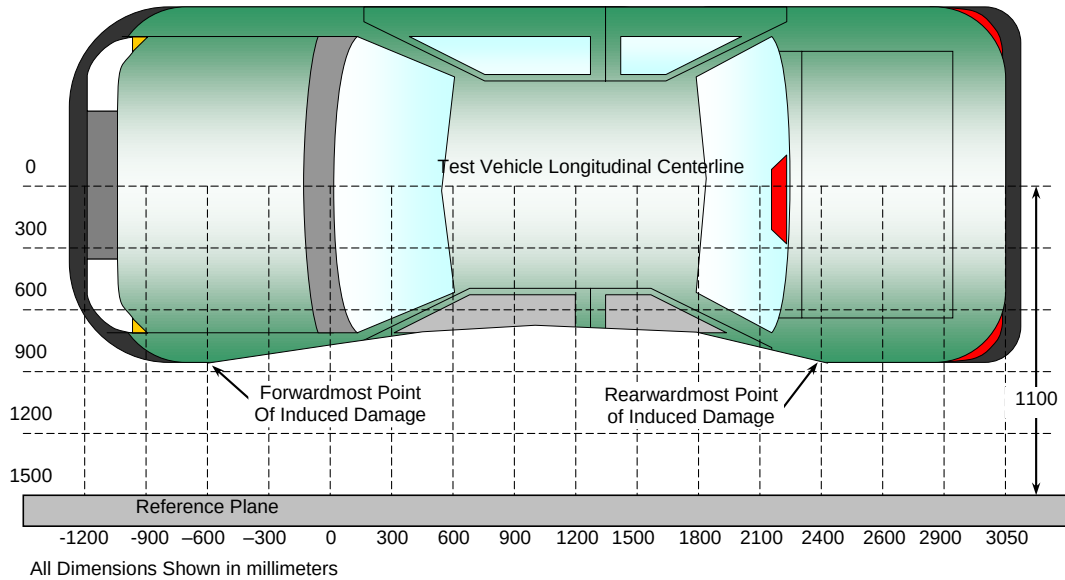
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C _L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
4	31	10	19	37	60	98	138	133	104	80	95	109	111	115	137	160	180
3	38	26	31	33	40	60	95	80	57	45	36	32	35	49	71	89	120
2	136	140	135	118	96	87	83	90	87	83	85	90	95	90	83	82	106
1	214	209	211	200	200	199	188	184	179	173	174	162	157	152	148	139	137

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019



TOP VIEW

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	2045	3	197	182	15
2	1625	3	352	184	168
3	1205	3	288	185	103
4	785	3	302	185	117
5	365	3	297	184	113
6	-55	3	141	180	-39

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	690	476	214
2	480 mm right of center	1	667	463	204
3	160 mm right of center	1	650	463	187
4	160 mm left of center	1	633	463	170
5	480 mm left of center	1	619	463	156
6	800 mm left of center	1	613	476	137

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

Test Vehicle: 2019 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

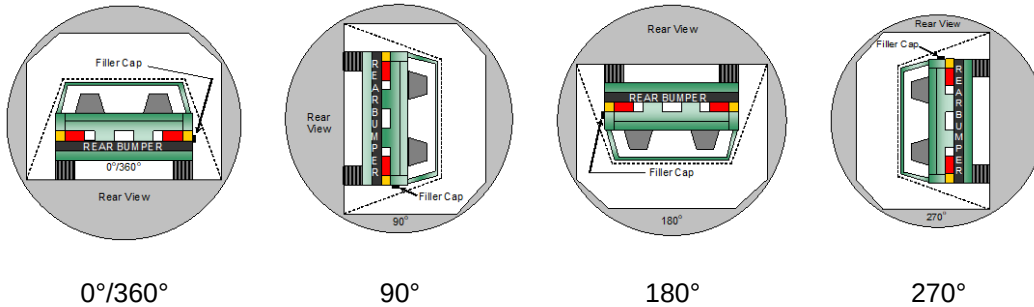
NHTSA No. O20195109
 Test Date: 1/17/2019

Test Time: 12:12 pm

Temperature: 21.3 °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



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	113	300	413
90° to 180°	114	300	414
180° to 270°	113	300	413
270° to 360°	115	300	415

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	

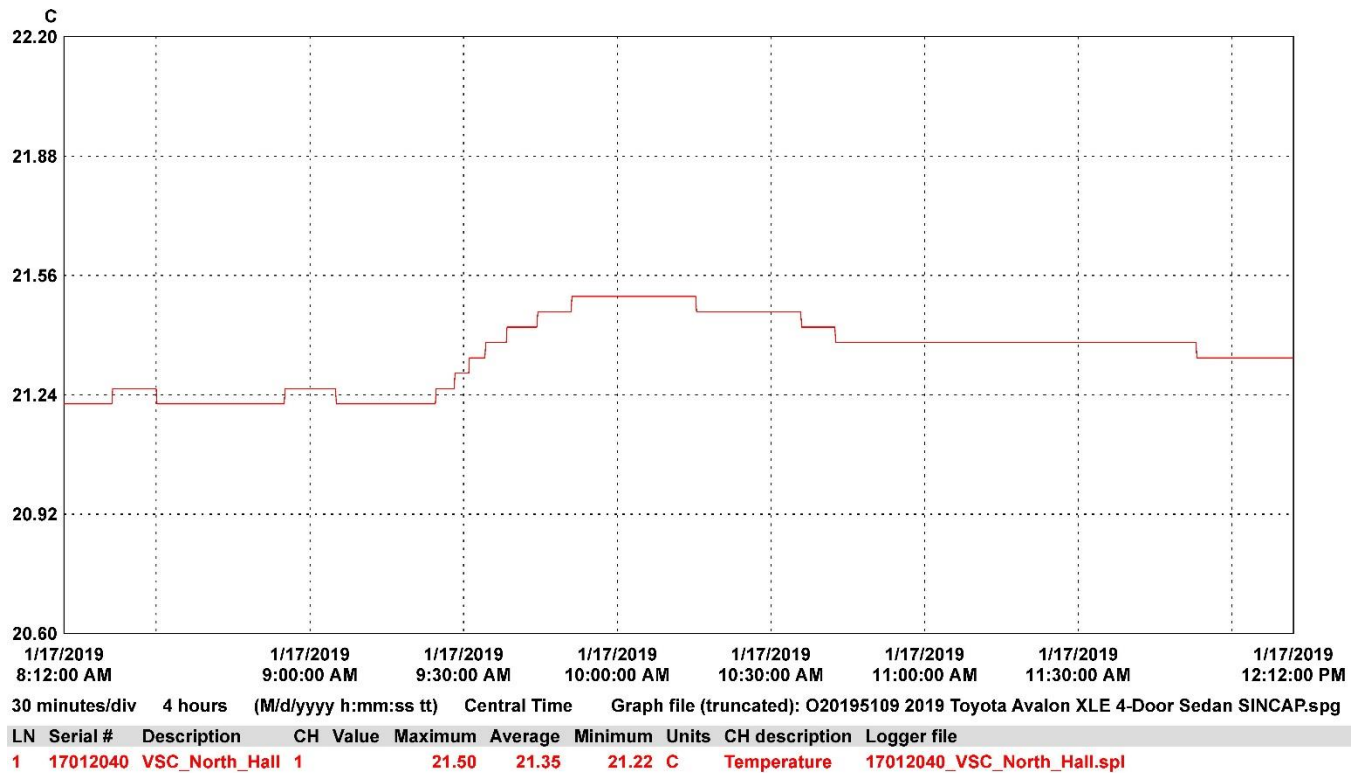
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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 Toyota Avalon XLE 4-Door Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. O20195109
 Test Date: 1/17/2019



**APPENDIX A
PHOTOGRAPHS**

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



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

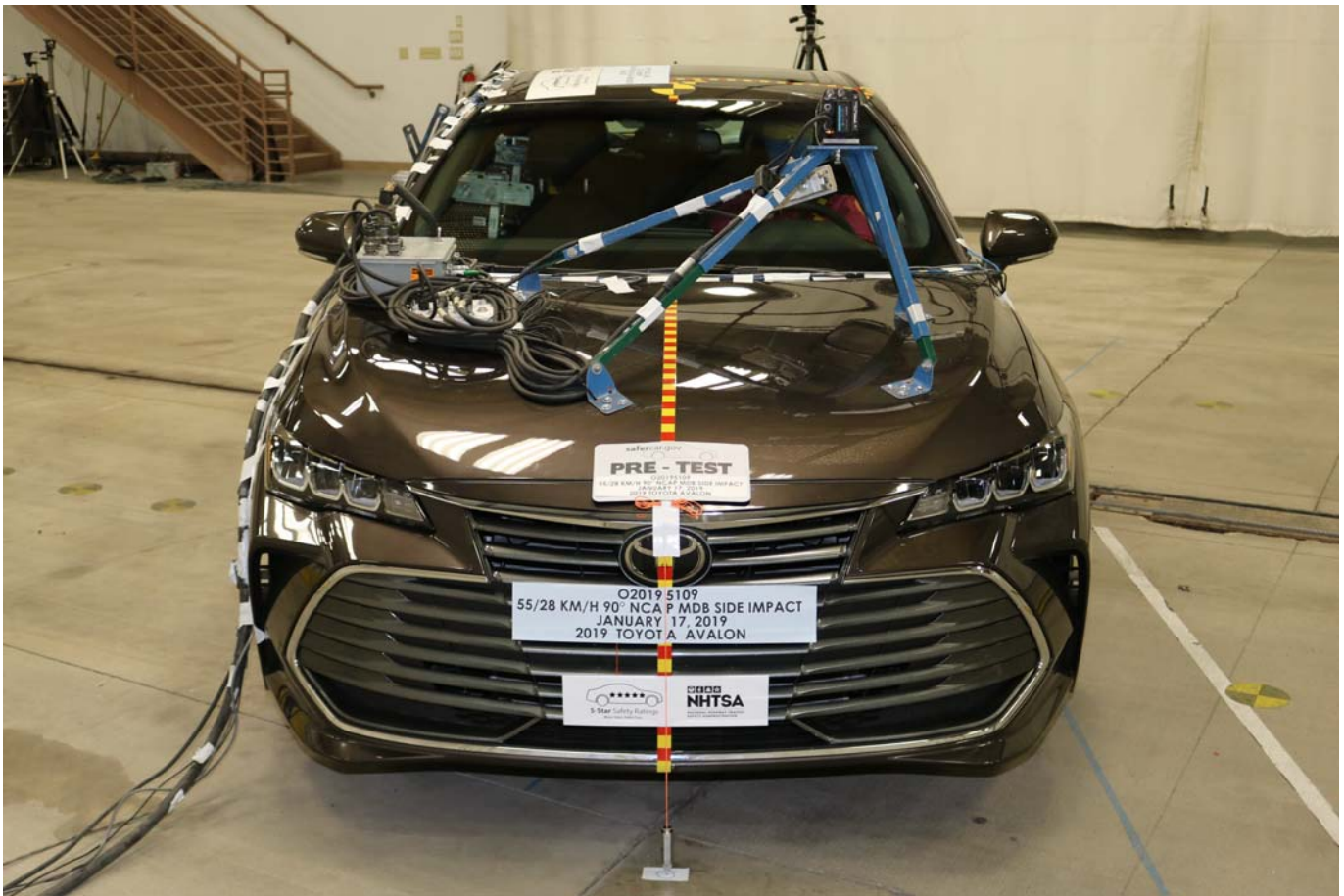


Photo No. 003 - Pre-Test Frontal View of Test Vehicle

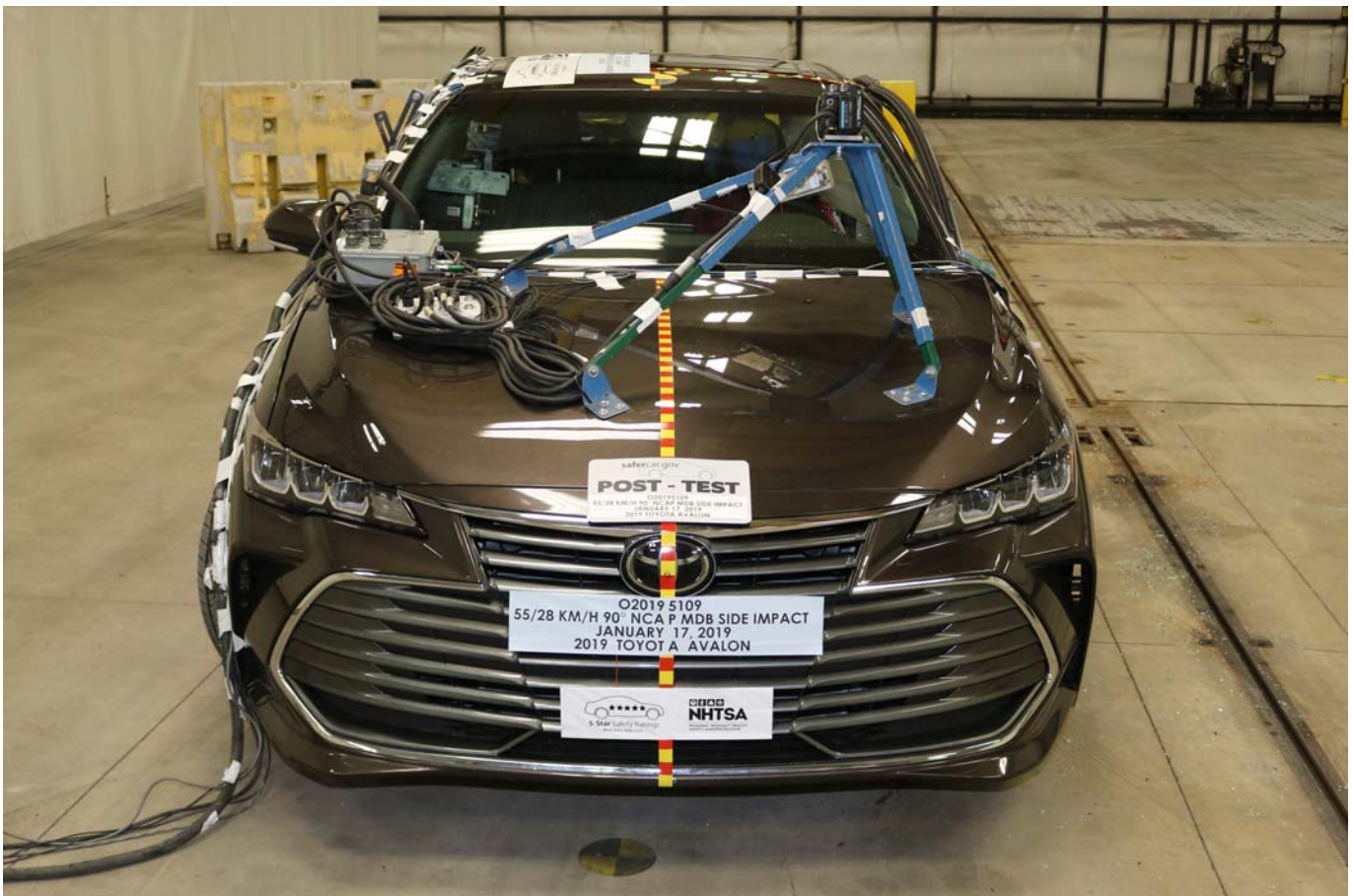


Photo No. 004 - Post-Test Frontal View of Test Vehicle

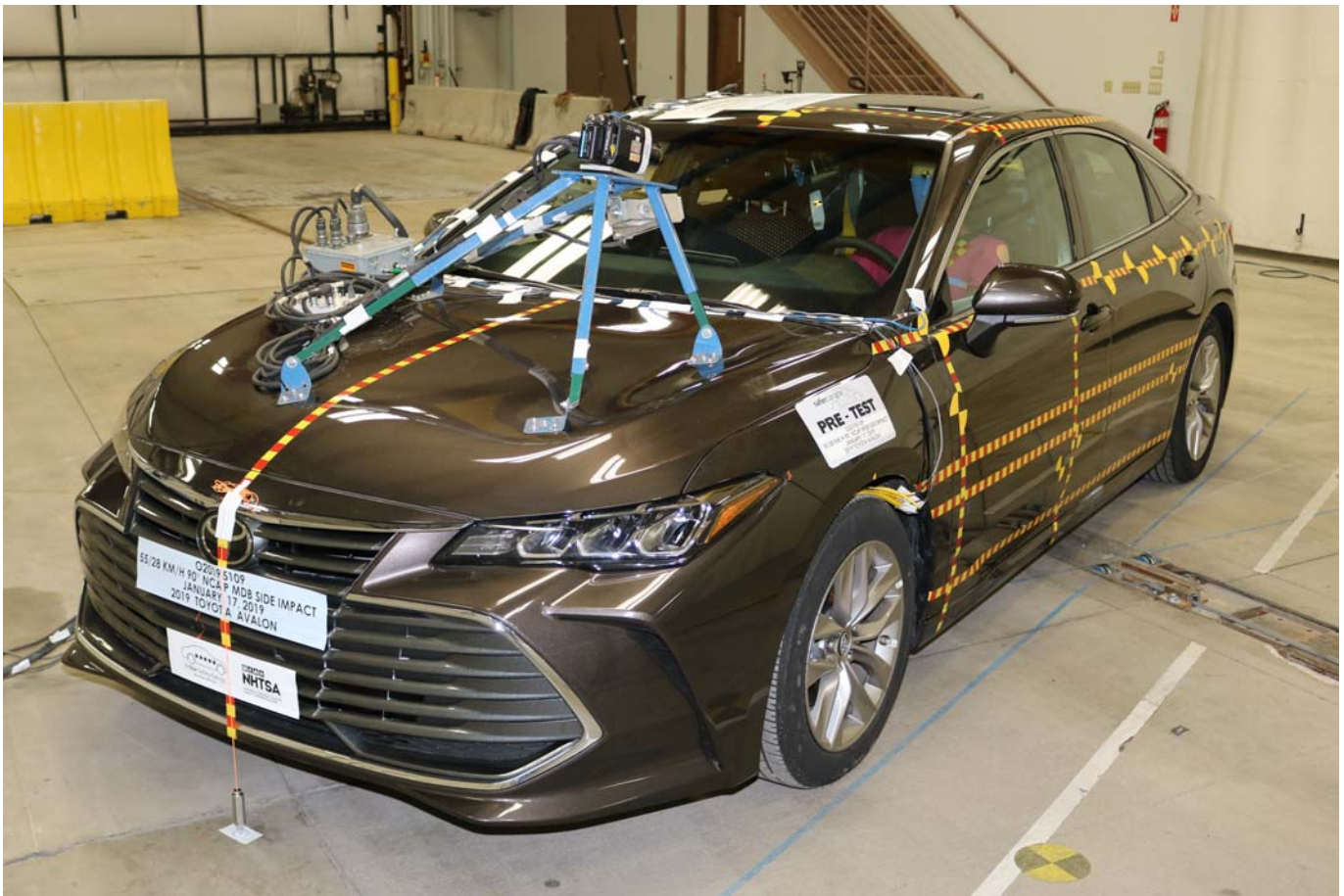


Photo No. 005 - Pre-Test Left Front Three-Quarter View of Test Vehicle

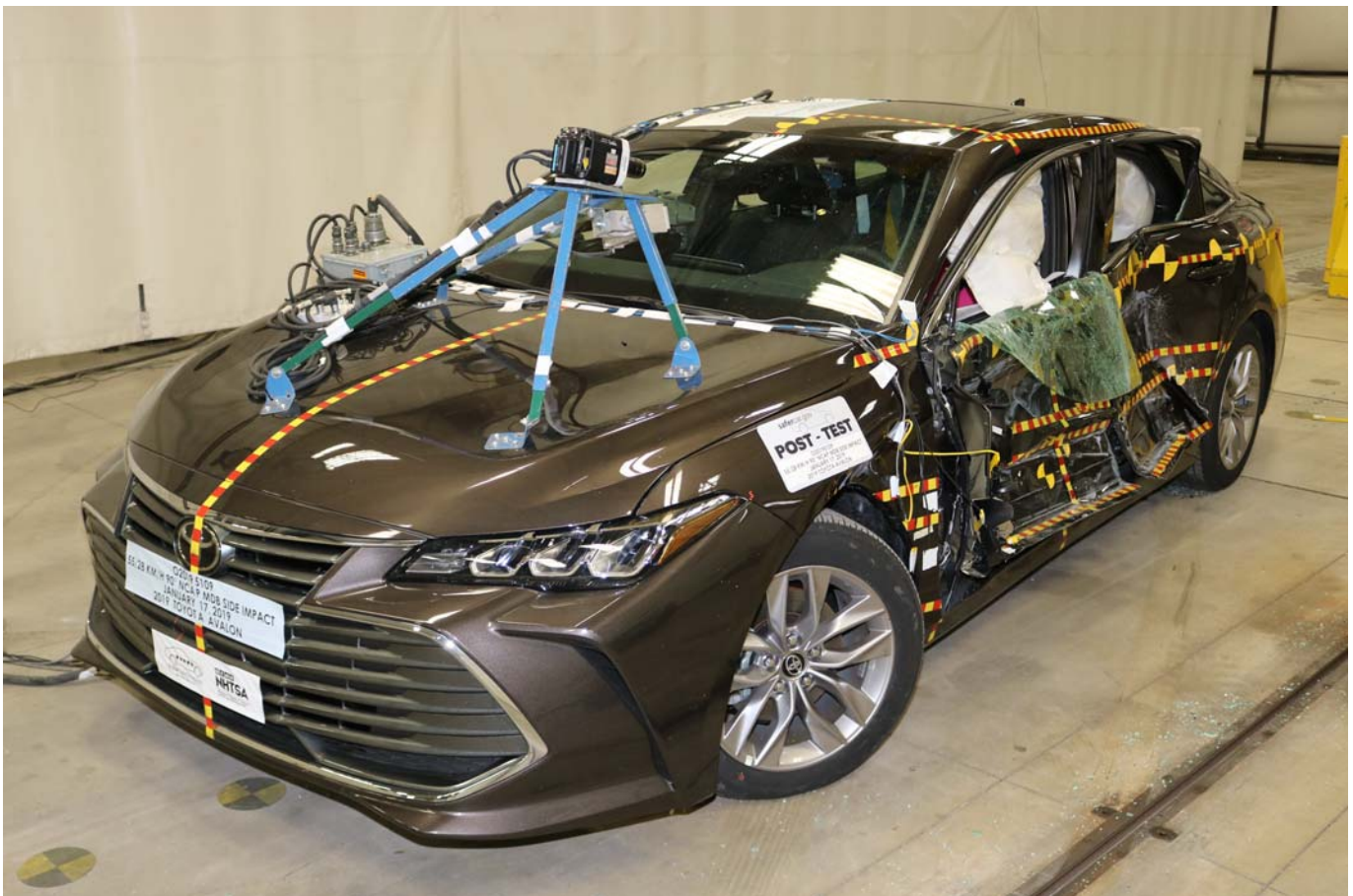


Photo No. 006 - Post-Test Left Front Three-Quarter View of Test Vehicle



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



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



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



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



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

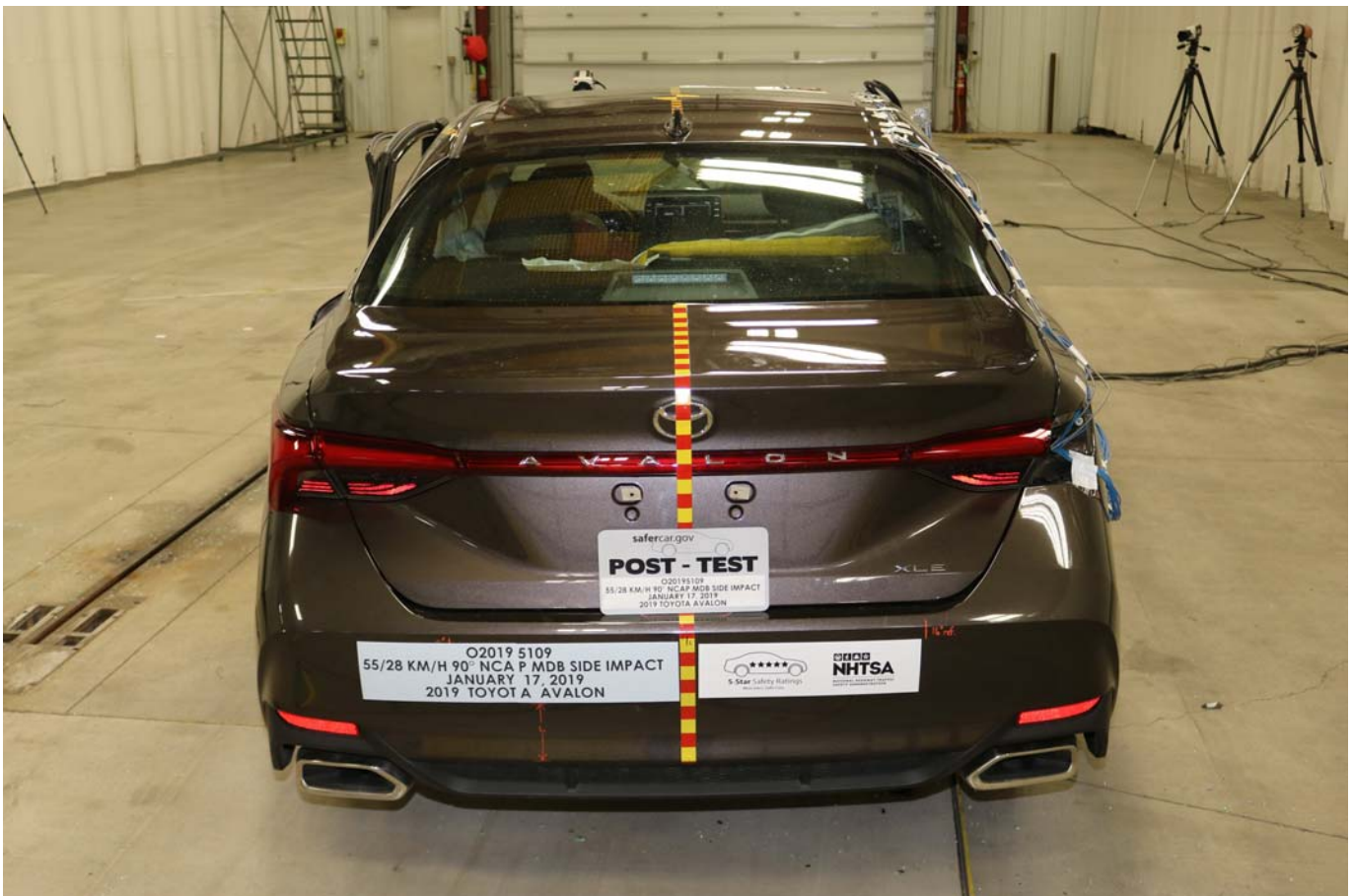


Photo No. 012 - Post-Test Rear View of Test Vehicle



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

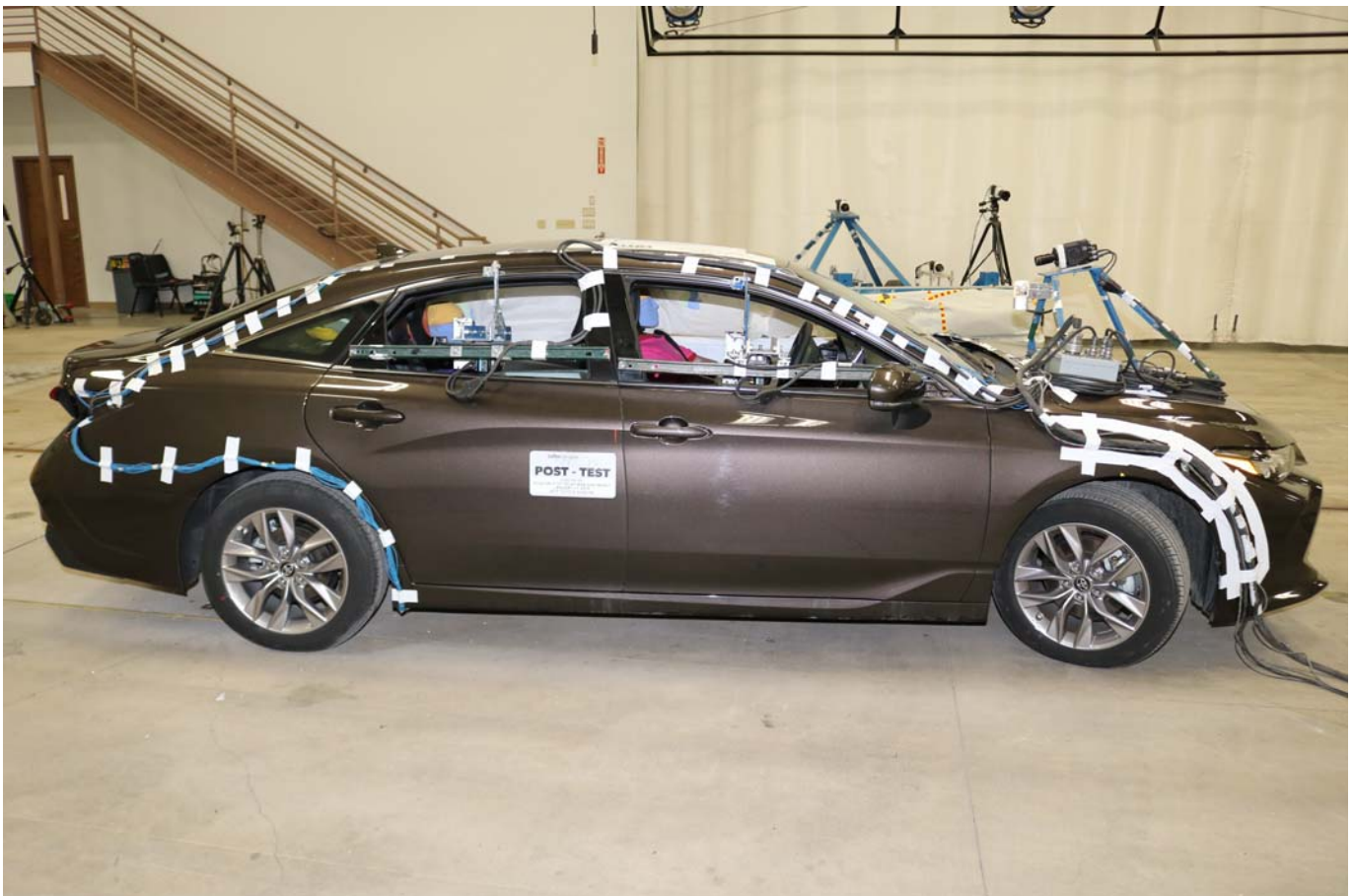


Photo No. 014 - Post-Test Right Side View of Test Vehicle

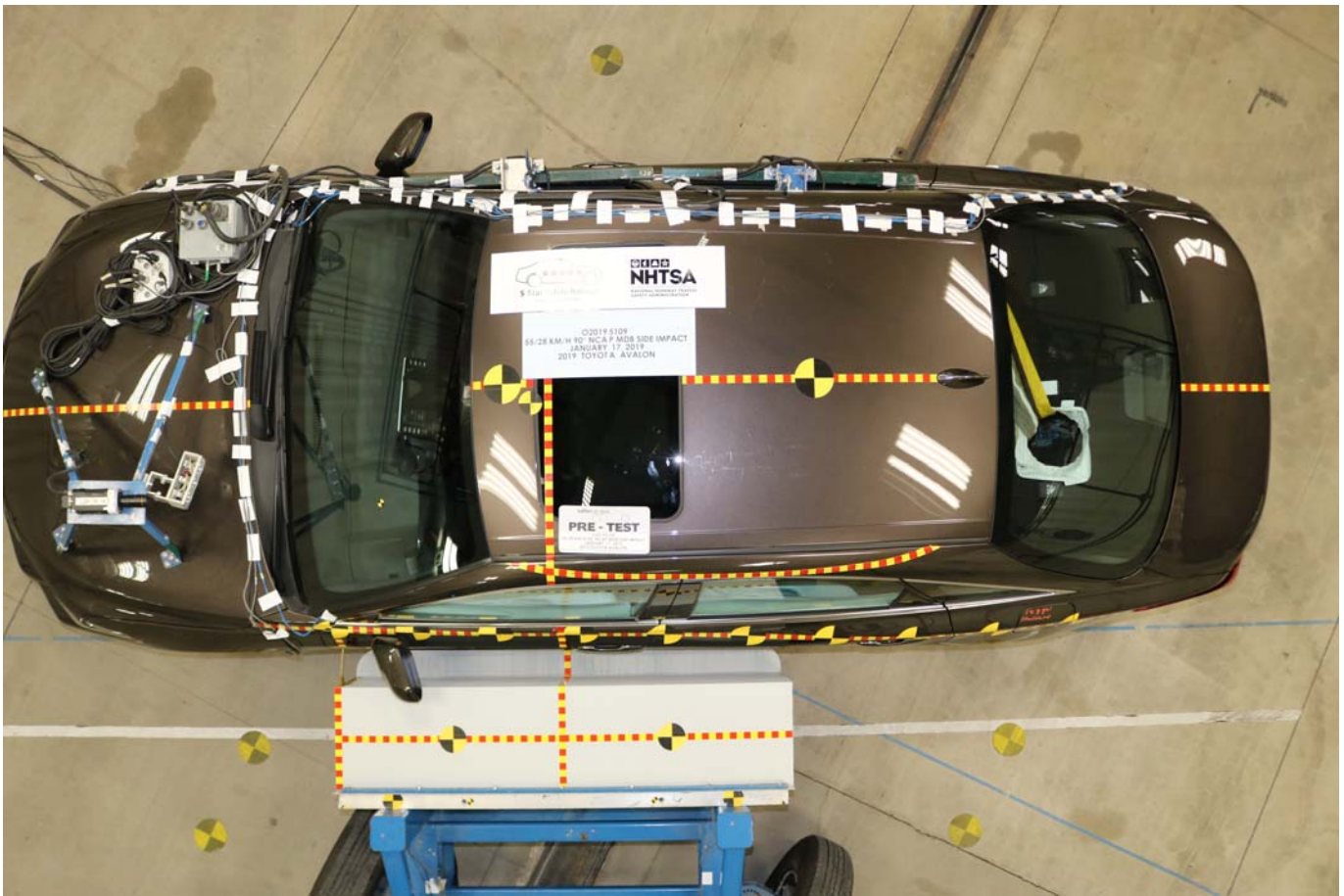


Photo No. 015 - Pre-Test Overhead View of Test Area



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



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



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



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



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



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



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



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



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



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



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



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



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

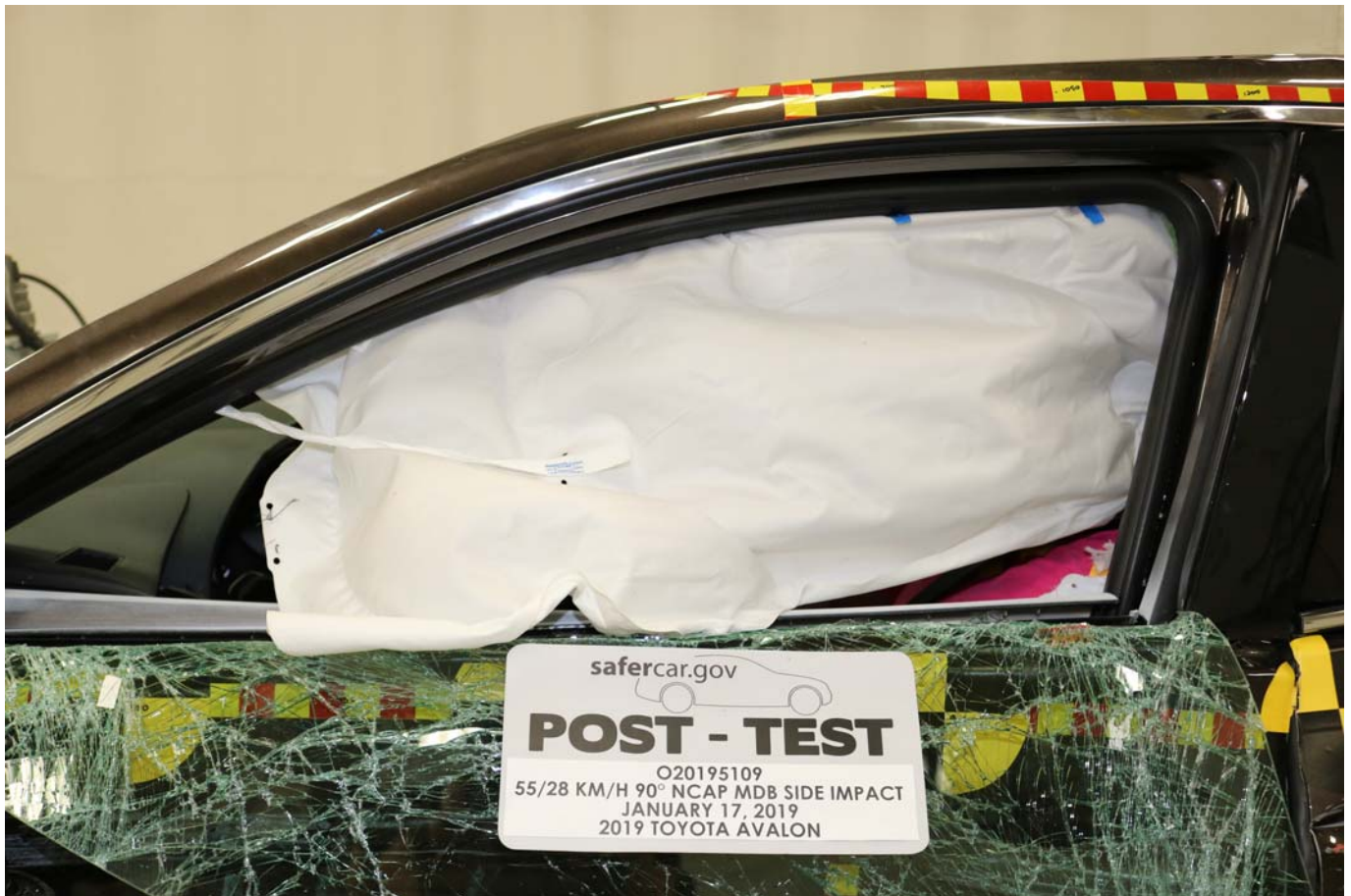


Photo No. 029 - Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



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



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



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



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



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



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



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



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



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



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

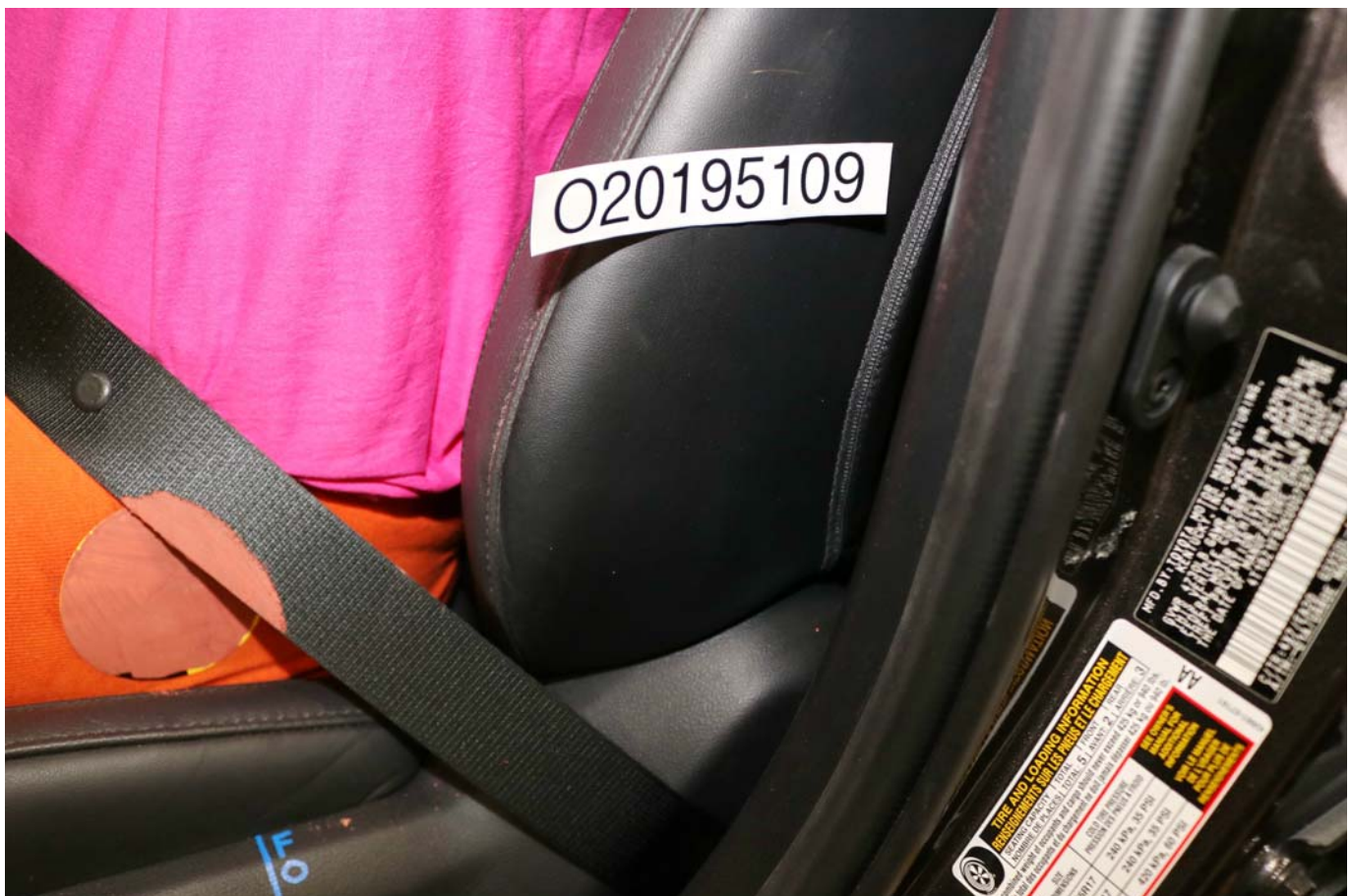


Photo No. 040 - Pre-Test Close-Up Left Side View of Driver Seat Back



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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

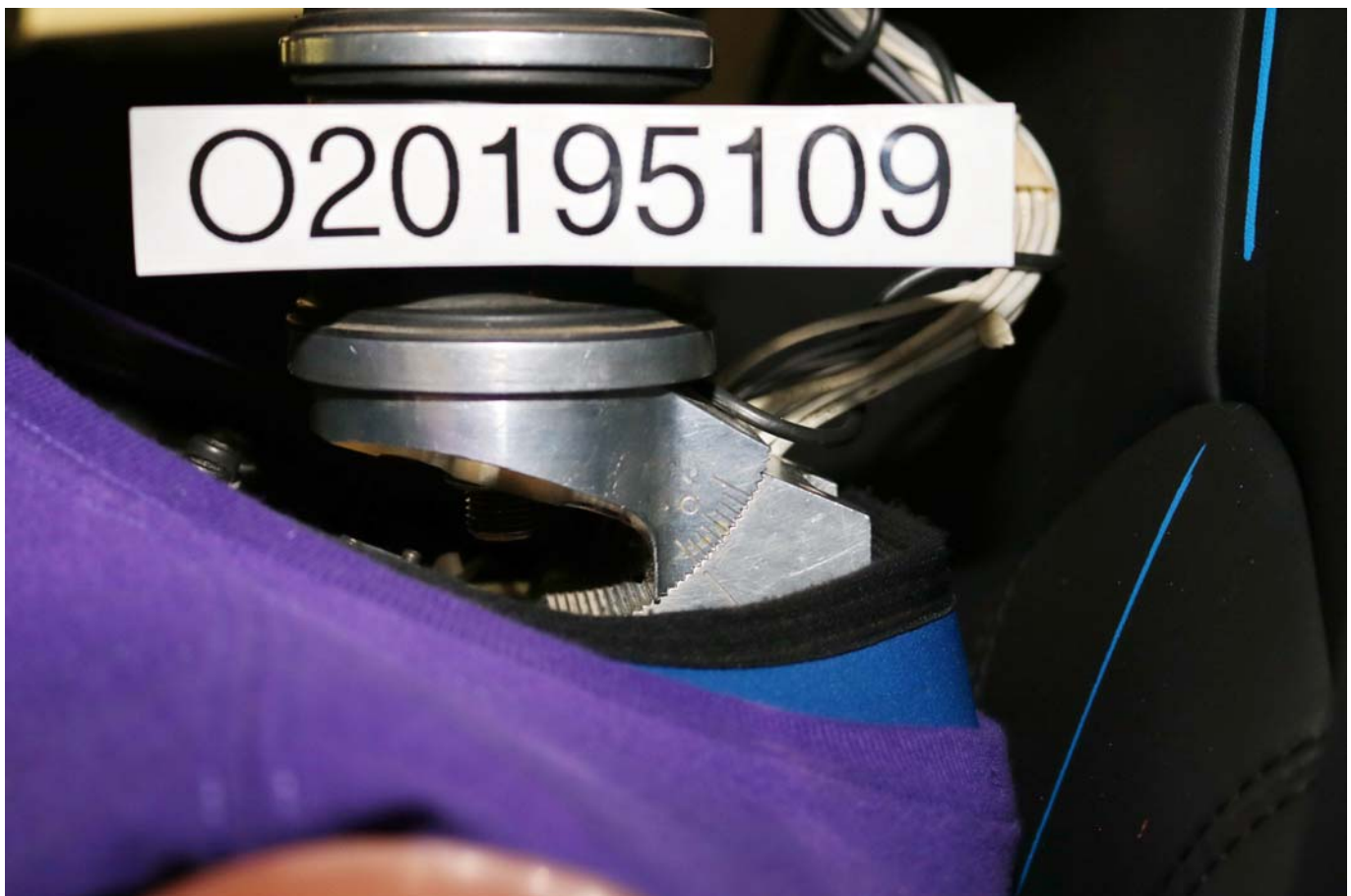


Photo No. 062 - Pre-Test View of Rear Passenger Dummy Neck Showing Position of Adjustable Neck Bracket



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

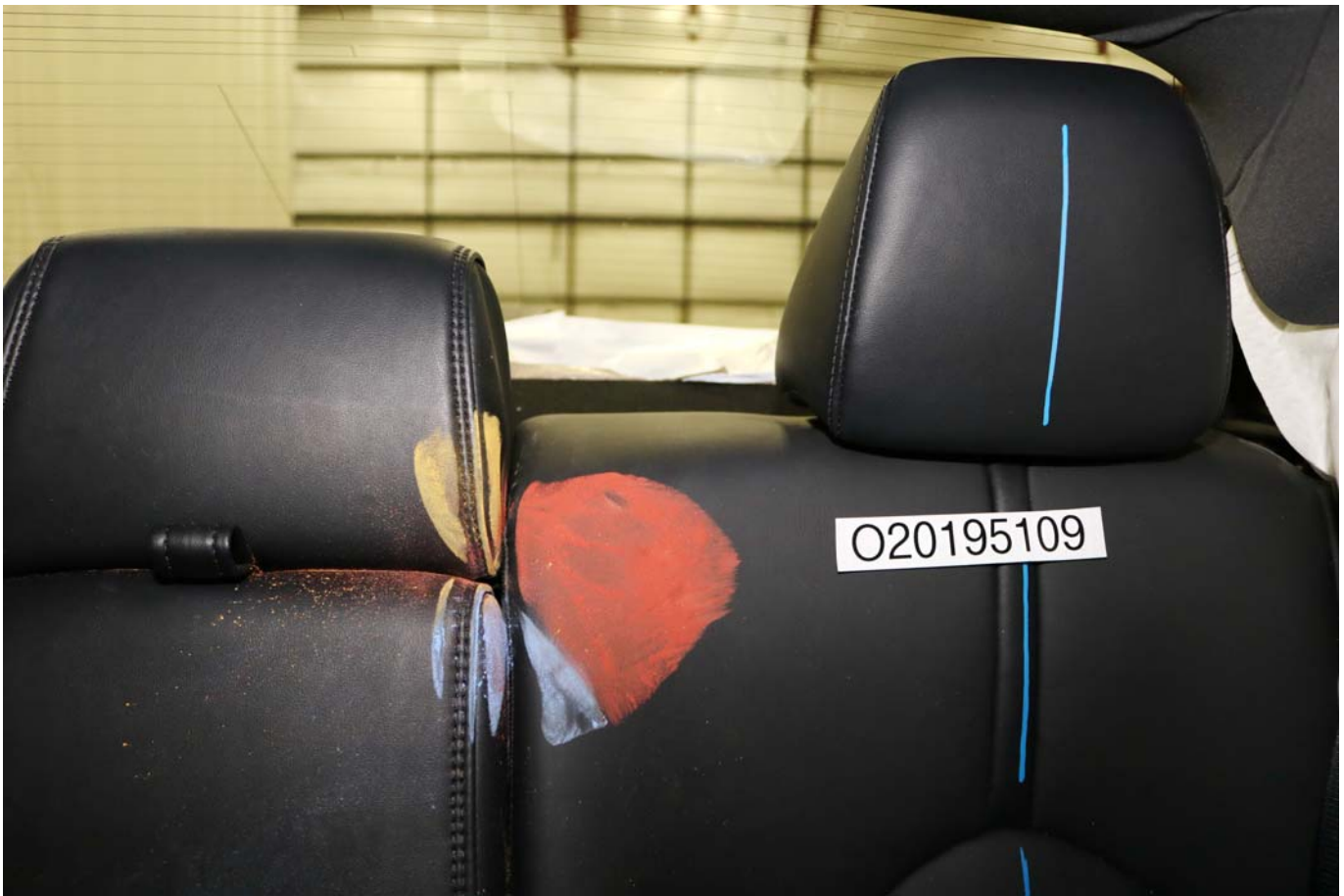


Photo No. 075 - Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View



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

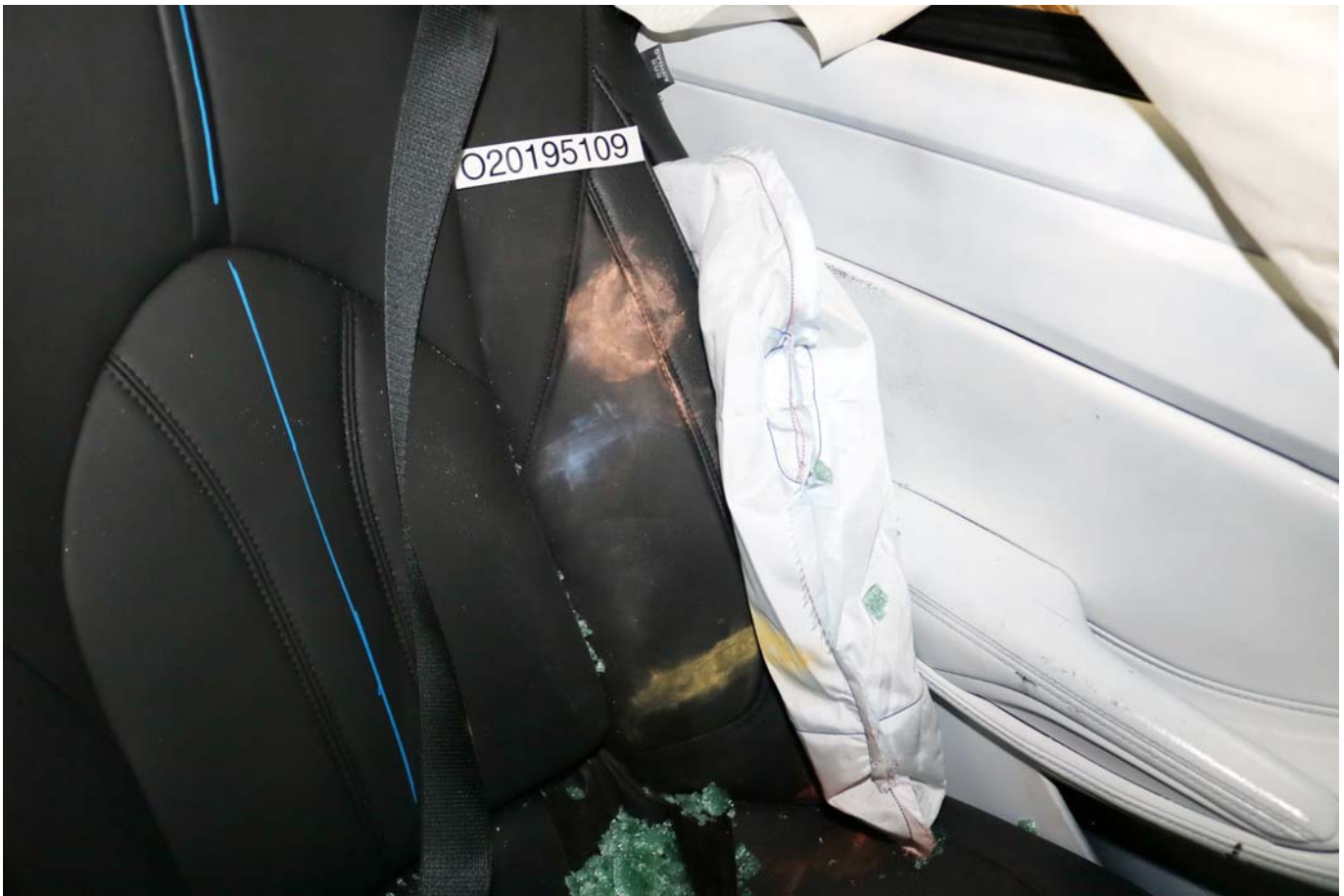


Photo No. 077 - Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View

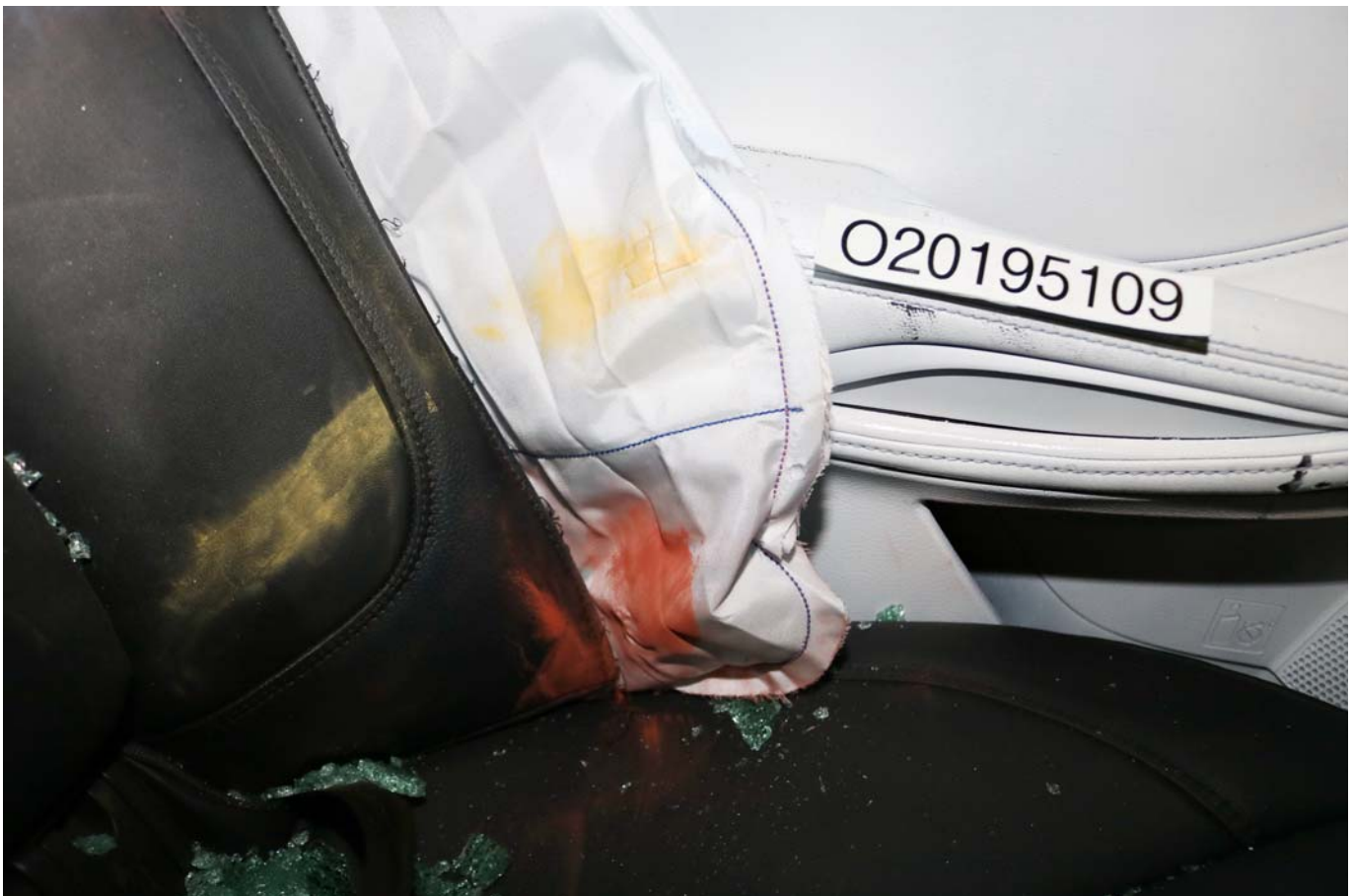


Photo No. 078 - Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View



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

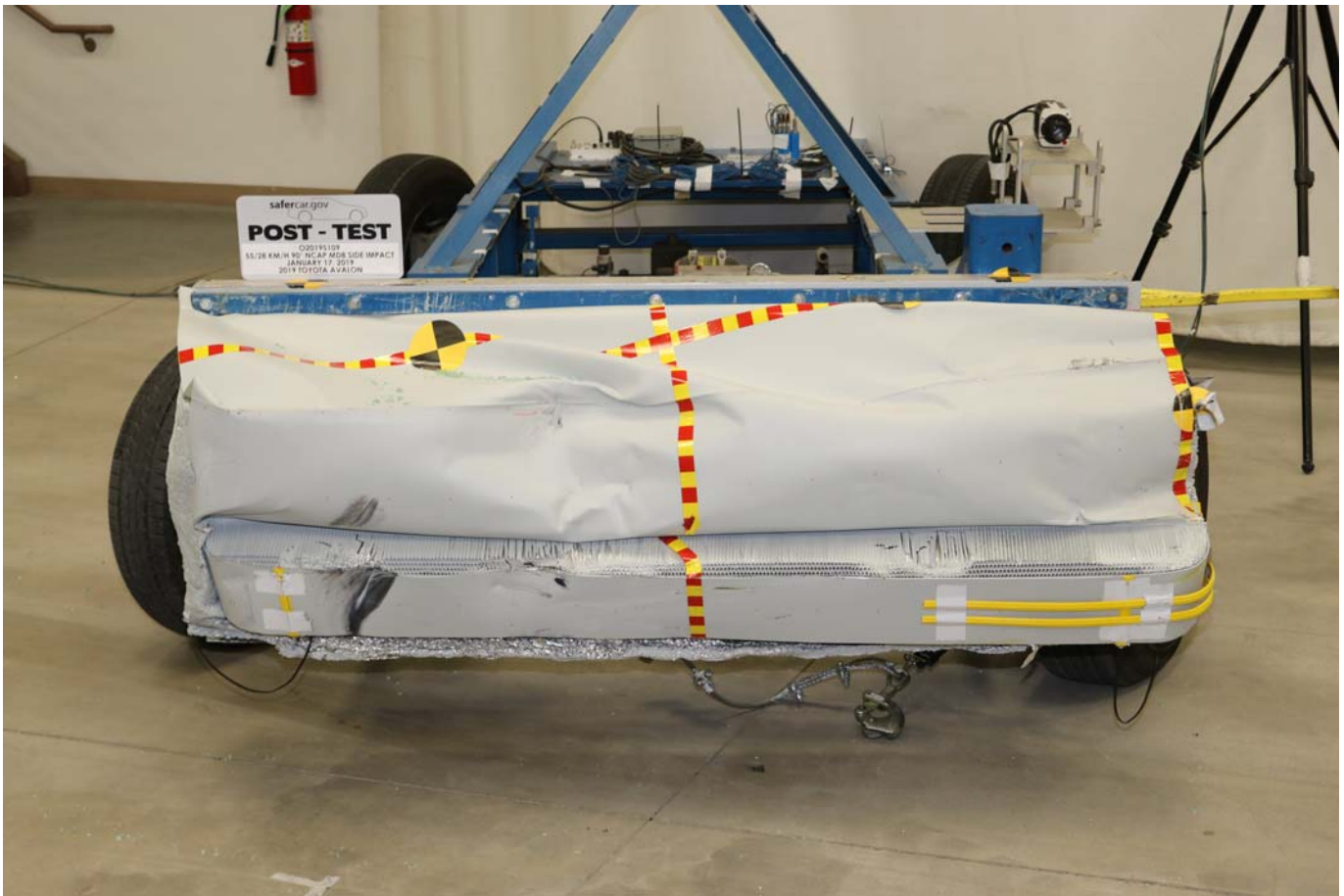


Photo No. 085 - Post-Test Front View of MDB Impactor Face



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

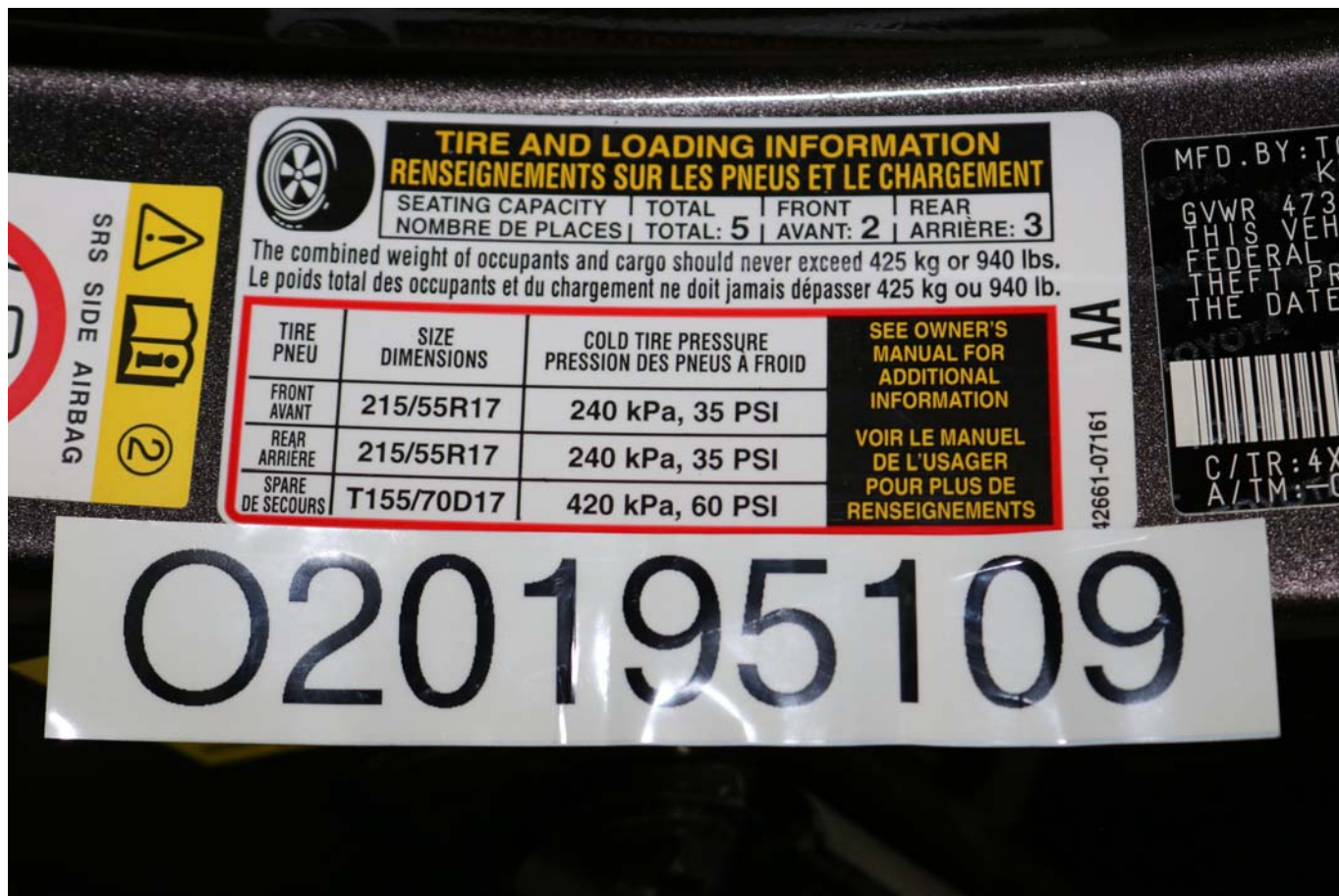


Photo No. 093 - Close-Up View of Vehicle Tire Information Placard or Label



Photo No. 093a - Close-Up View of Vehicle Load Carrying Capacity Reduction Label

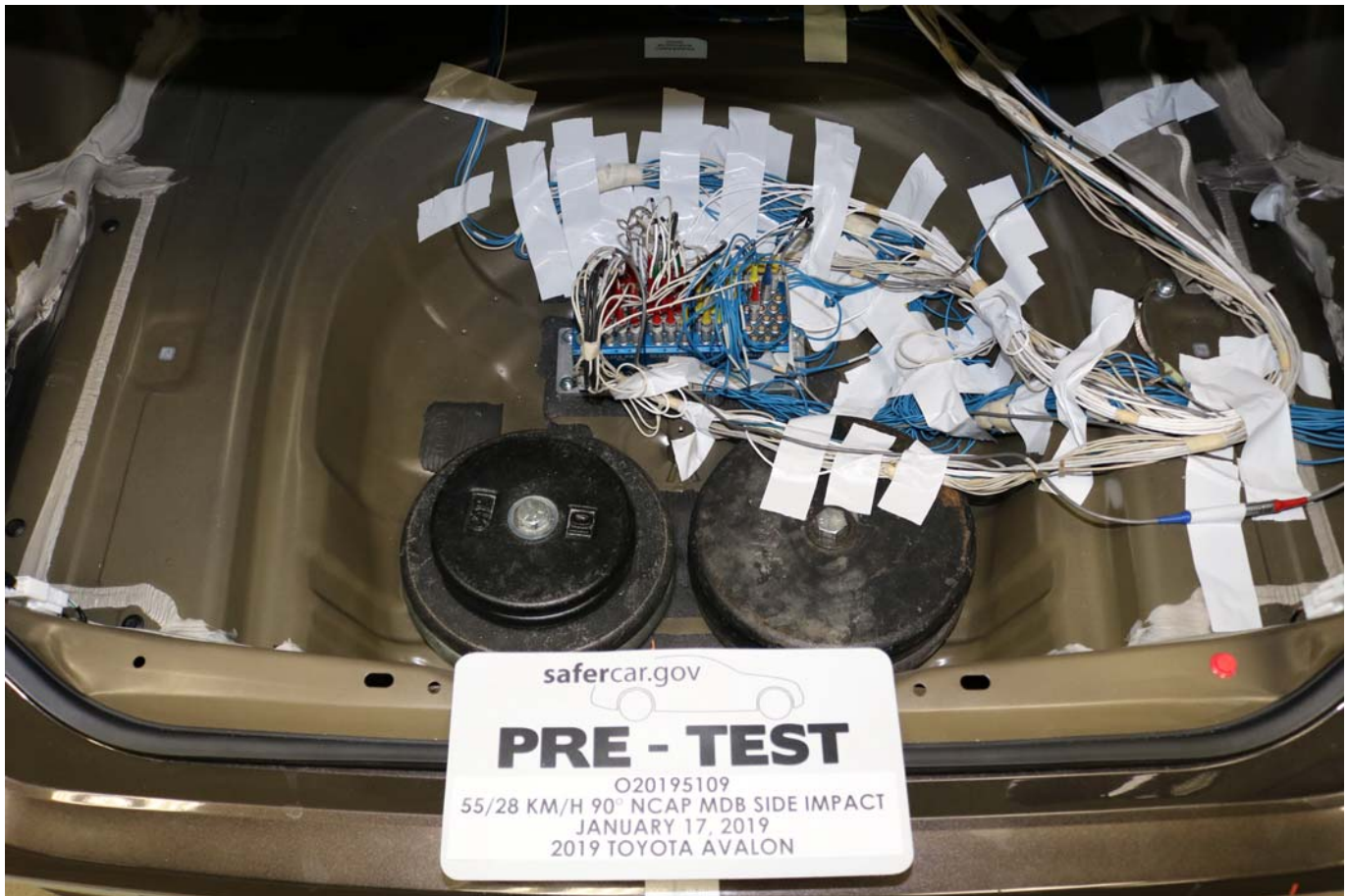


Photo No. 094 - Pre-Test Ballast View



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

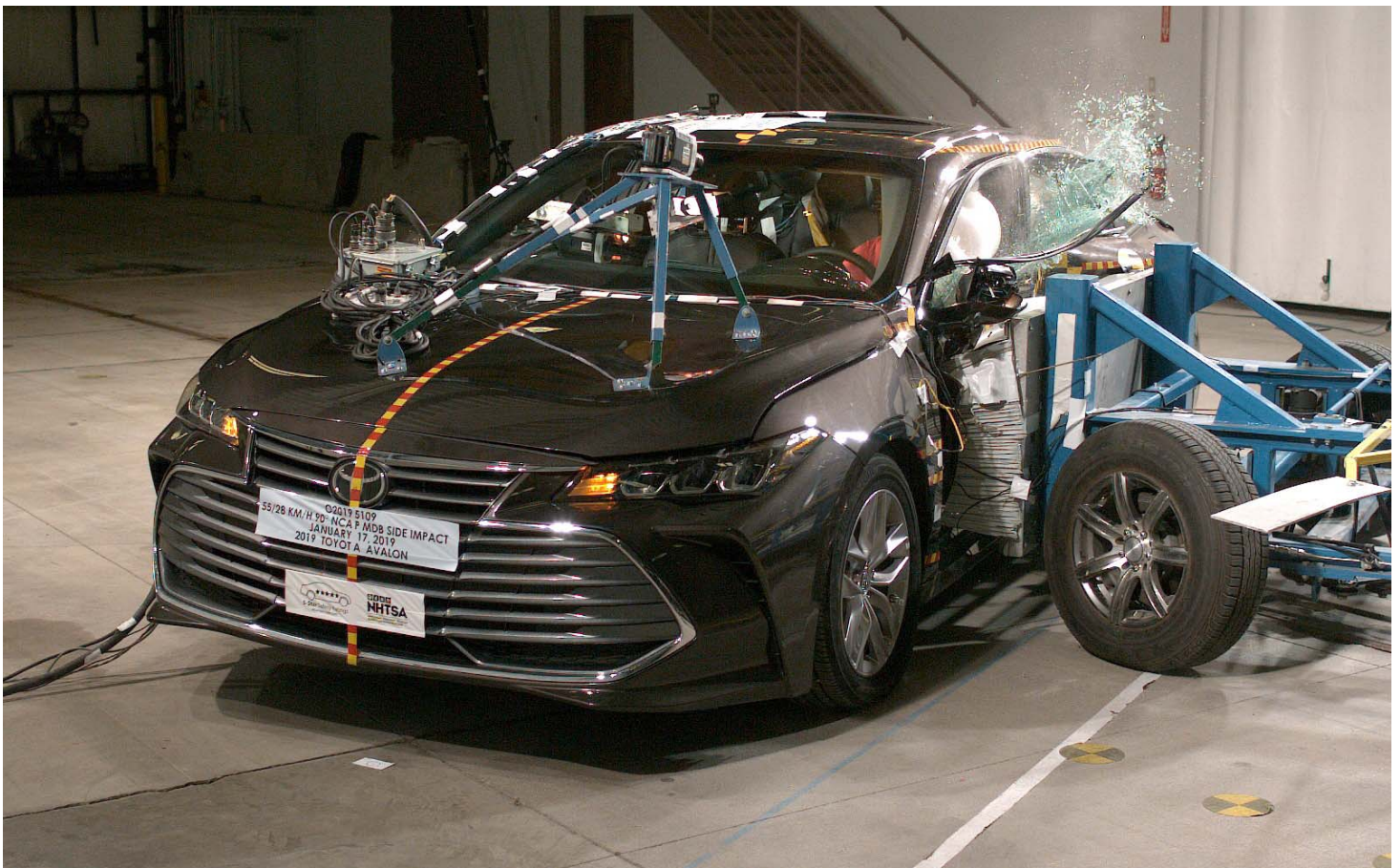


Photo No. 101 - Impact Event

TOYOTA
Let's Go Places

DESC.: **AVALON** 4-DR XLE
VIN: **4T1BZ1FB2KU007567**
YR/MDL: 2019/3544A
CLR: BROWNSTONE/BLACK (04X7/20)
FINAL ASSEMBLY POINT: GEORGETOWN, KENTUCKY, U.S.A.

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.

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

STANDARD EQUIPMENT

MECHANICAL & PERFORMANCE

- 3.5L 301HP V6 DOHC 24V D-4S Dual Inject
- Direct Shift 8-Speed ECTI Transmission
- 17" Alloy Wheels w/P215/55R17 Tires
- Per-Ascend FR/Vent RR/Solid Disc Brakes

SAFETY & CONVENIENCE

- Toyota Safety Sense P (TSS-P) Includes: Pre-Collision System w/Pedestrian Detection, Lane Departure Alert w/Steering Assist, Automatic High Beams & Dynamic Radar Cruise Control
- Star Safety System Includes: VSC, TRAC, ABS, EBD, BA & Smart Stop Technology
- 10 Airbags
- Blind Spot Monitor (BSM)
- Rear Cross-Traffic Alert (RCTA)
- Anti-Theft System w/Engine Immobilizer
- LATCH (Lwr Anchor & Tethers for Children) on Outboard Rear Seats

EXTERIOR

- LED Headlamps & DRL with Auto On/Off
- Heated Outside Mirror w/Turn Signal, BSM
- Dual Chrome-Tipped Exhaust

INTERIOR

- Dual Zone Auto Climate Control w/Filter and Rear-Seat Vents
- Entune 3.0 Audio Plus w/App Suite, 9" Touch Scrn, 6 Speakers, HandsFree Bluetooth® Phone/Music, USB Media Port, 4 USB Charge-Ports
- SiriusXM® w/3-Month All Access Trial
- Sirius Eyes Free, Apple CarPlay Comp.
- 7" TFT Multi-Information Display
- Tilt & Telescopic Steering Wheel
- SofTex, 18d Front Seats
- 8-Way Power Driver and Passenger Seat w/2-Way Power Driver Lumbar Support
- Smart Key System with Push Button Start

Full Tank of Gas

MANUFACTURER'S SUGGESTED RETAIL PRICE \$35,500.00

OPTIONAL EQUIPMENT

FE	50 State Emissions	
MR	Moonroof Package Includes: Power Tilt/Slide Moonroof with Sliding Sunshade and Qi-Compatible Wireless Charging System.	1,000.00
2T	All Weather Package	248.00

EPA DOT Fuel Economy and Environment

Gasoline Vehicle

Fuel Economy

26 MPG
combined city/hwy

22 MPG
city

32 MPG
highway

3.8 gallons per 100 miles

You spend \$250 more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$1,450

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

Smog Rating (tailpipe only)

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.55 per gallon. MPG is miles per gallon. Gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov
Calculate personalized estimates and compare vehicles

DELIVERY PROCESSING AND HANDLING FEE 920.00

TOTAL \$37,668.00

The New Vehicle Limited Warranty provides 3-year/50,000-mile basic coverage, 5-year/100,000-mile powertrain coverage, plus 3-year/unlimited-mile corrosion perforation coverage. See Warranty and Maintenance Guide for details. An extended service contract may be available for the vehicle.

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Cassini, license and title fees, applicable federal, state and local taxes and dealer and distributor installed options and accessories are not included in the manufacturer's suggested retail price.

ToyotaCare, which covers normal factory scheduled maintenance for two years or 25,000 miles, whichever occurs first, is included as part of the sales price of the vehicle for qualifying buyers. See dealer location dealer for details and coverage details.

Delivered by Truck to: 31152
WILLIAMS TOYOTA OF ELMIRA
951 COUNTY ROUTE 64
ELMIRA NY14903

Photo No. 102 - Monroney Label

3-3. Adjusting the seats

141

3-3. Adjusting the seats

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Head restraints

Head restraints are provided for all seats.

► Front seats and rear outboard seats

- 1 Up
Pull the head restraint up.
- 2 Down
Push the head restraint down while pressing the lock release button.

► Rear center seat
Head restraints cannot be adjusted or removed.

► Removing the head restraints
Pull the head restraint up while pressing the lock release button.
If the head restraint touches the ceiling, making the removal difficult, change the seat back angle or, if possible, the seat height. (→P. 132, 134)

Operation of each component

► Installing the head restraints

► Front seats
Align the head restraint with the installation holes and push it down to the lock position.
Press and hold the lock release button when lowering the head restraint.

► Rear outboard seats
Align the head restraint with the installation holes and push it down to the lowest lock position while pressing the lock release button.

► Adjusting the height of the head restraints
Make sure that the head restraints are adjusted so that the center of the head restraint is closest to the top of your ears.

WARNING

► Head restraint precautions
Observe the following precautions regarding the head restraints. Failure to do so may result in death or serious injury.

- Use the head restraints designed for each respective seat.
- Adjust the head restraints to the correct position at all times.
- After adjusting the head restraints, push down on them and make sure they are locked in position.
- Do not drive with the head restraints removed.
(However, if a head restraint interferes with installation of a child restraint system, the head restraint can be removed to accommodate the child restraint system: →P. 54)

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

<u>No.</u>	<u>Description</u>	<u>Page No.</u>
Figure No. 1.	Driver Head Acceleration (X) Primary vs. Time	B-1
Figure No. 2.	Driver Head Acceleration (Y) Primary vs. Time	B-1
Figure No. 3.	Driver Head Acceleration (Z) Primary vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration Primary vs. Time	B-1
Figure No. 5.	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-2
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Figure No. 9.	Driver Anterior Abdomen Force (Y) vs. Time	B-3
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Figure No. 13.	Driver Pubic Symphysis Force (Y) vs. Time	B-4
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Figure No. 16.	Passenger Head Acceleration (Z) Primary vs. Time	B-5
Figure No. 17.	Passenger Head Resultant Acceleration Primary vs. Time	B-5
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Figure No. 19.	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-6
Figure No. 20.	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-6
Figure No. 21.	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-6
Figure No. 22.	Passenger Iliac Force on Impact Side (Y) vs. Time	B-7
Figure No. 23.	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
Figure No. 24.	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-7

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

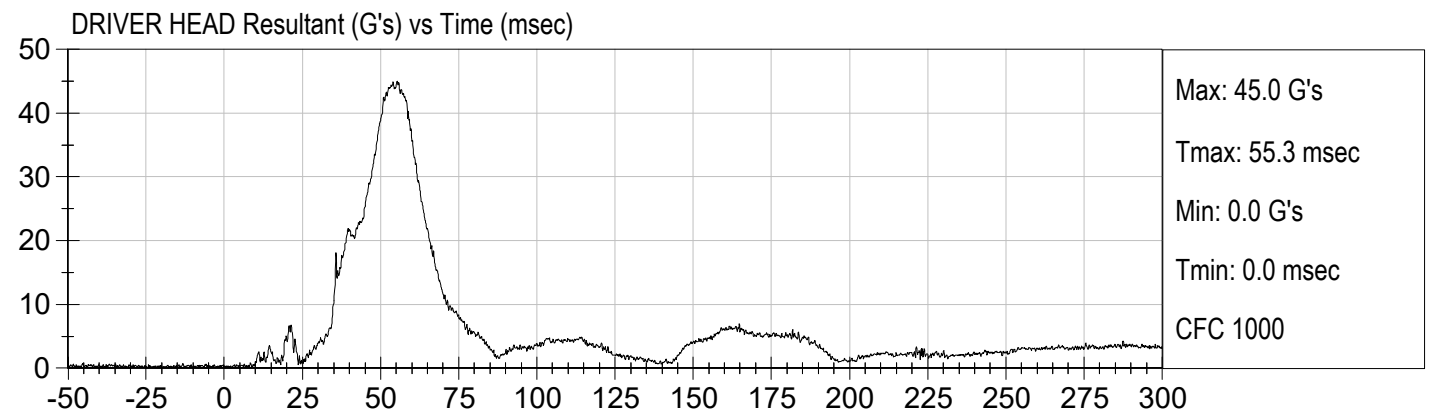
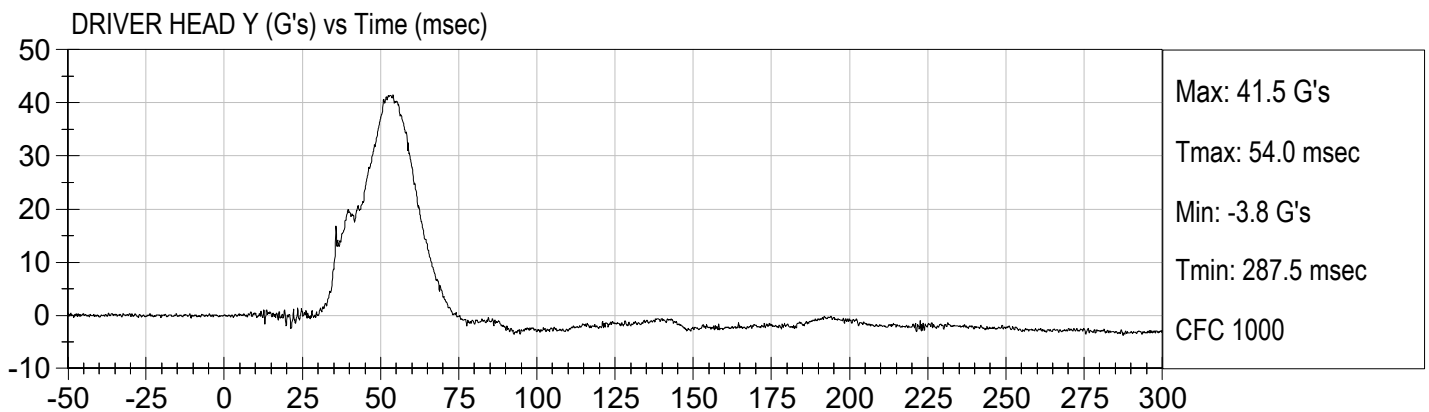
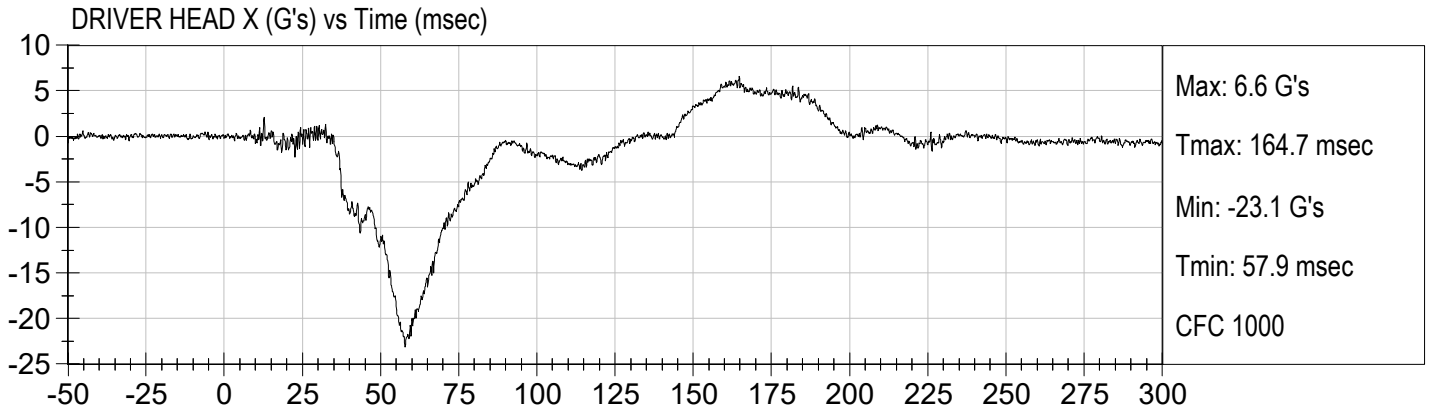
MDB Center of Gravity Acceleration (Z)

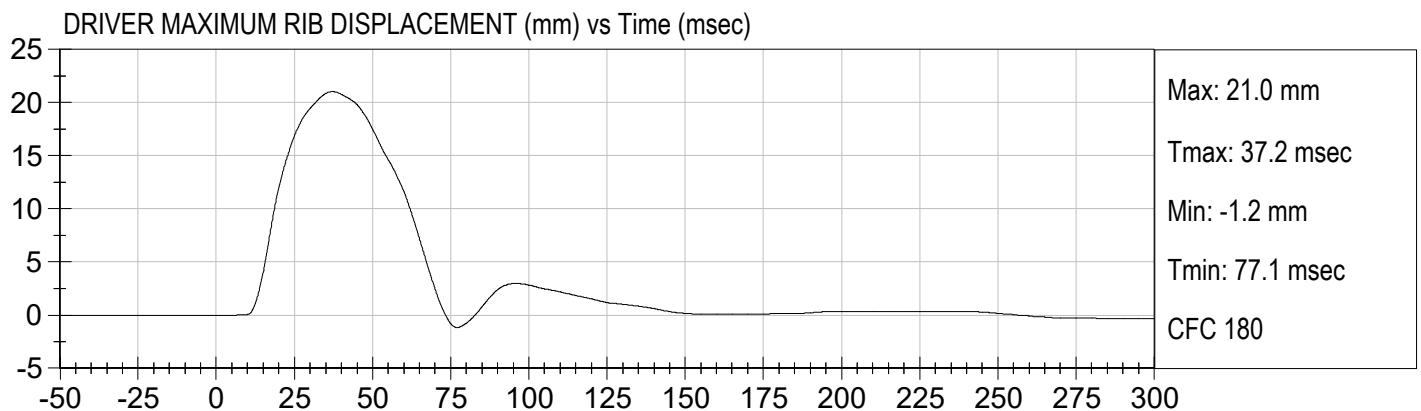
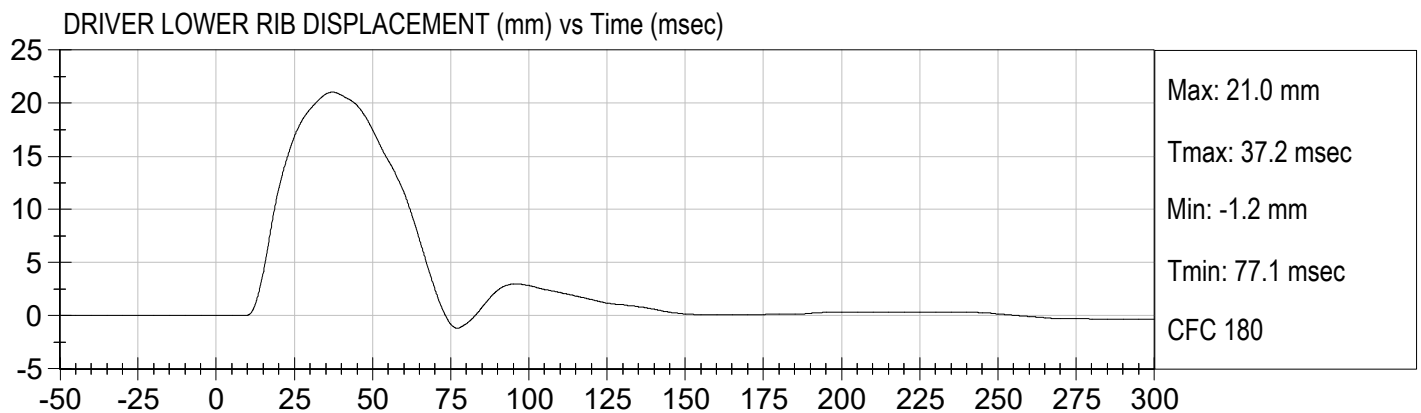
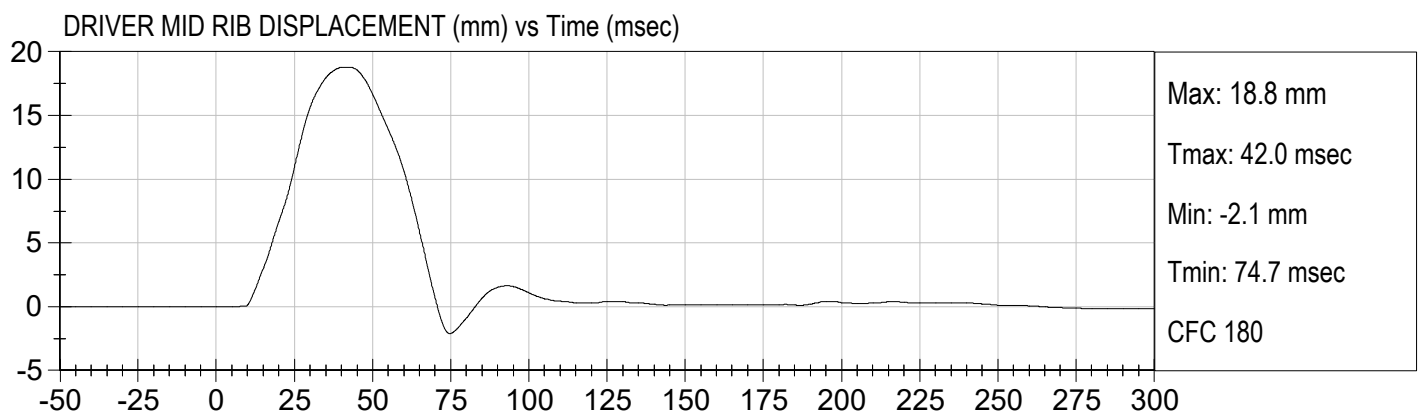
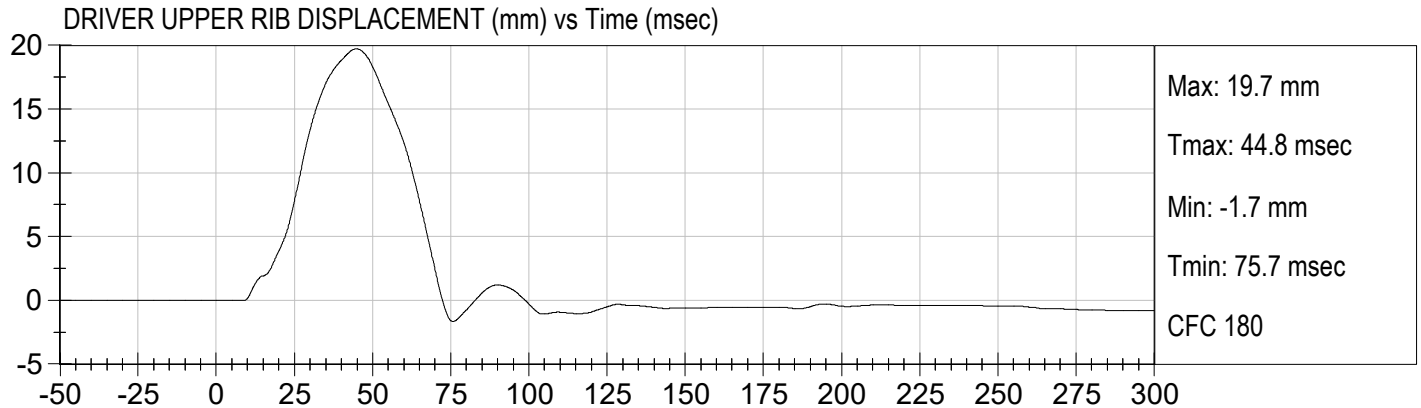
MDB Rear Acceleration (X)

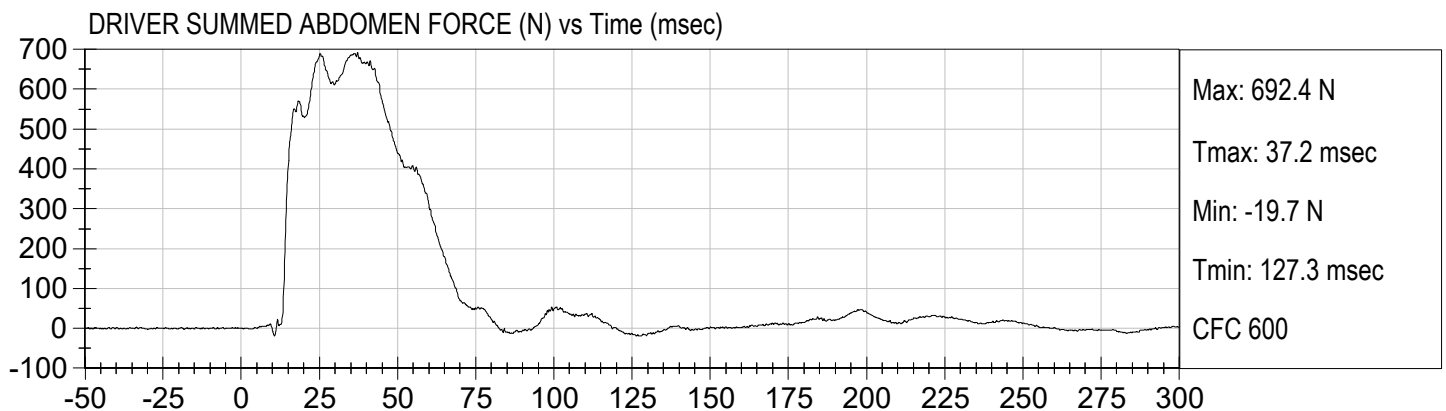
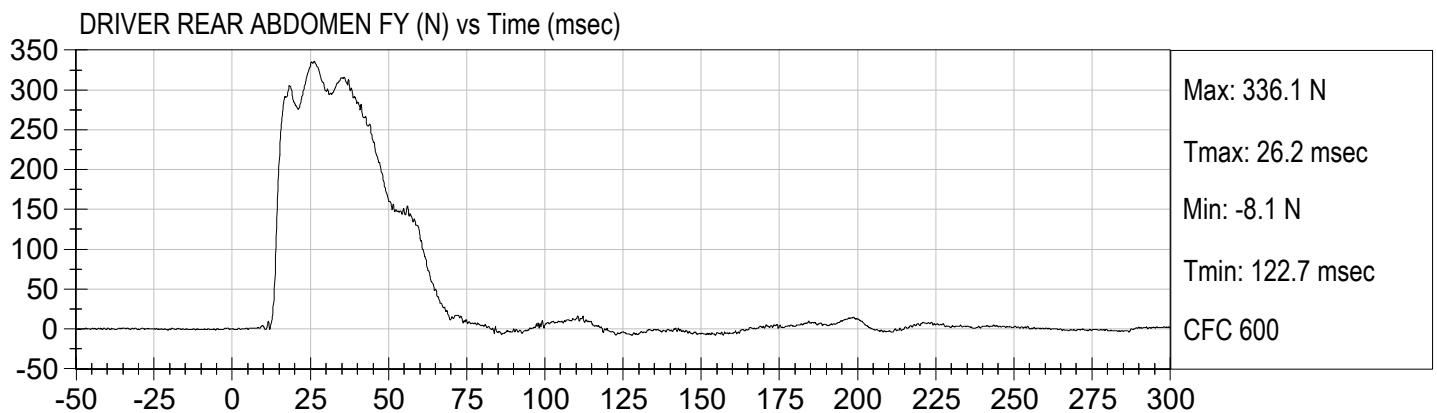
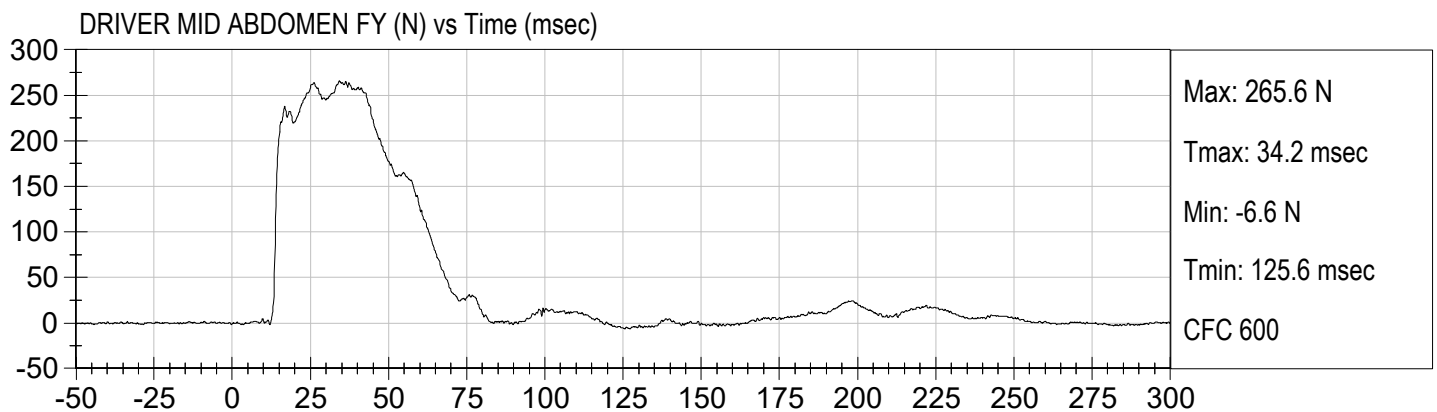
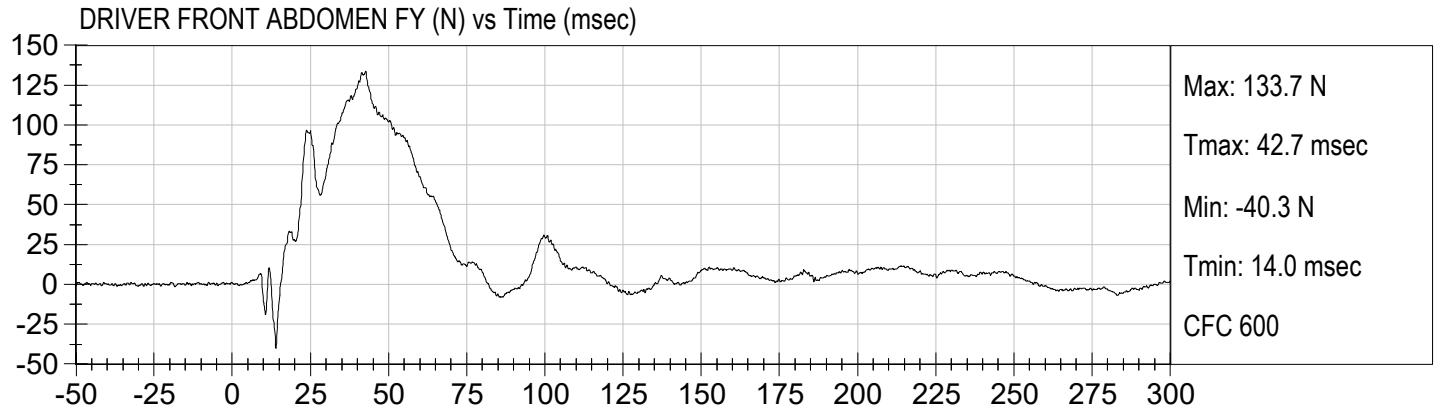
MDB Rear Acceleration (Y)

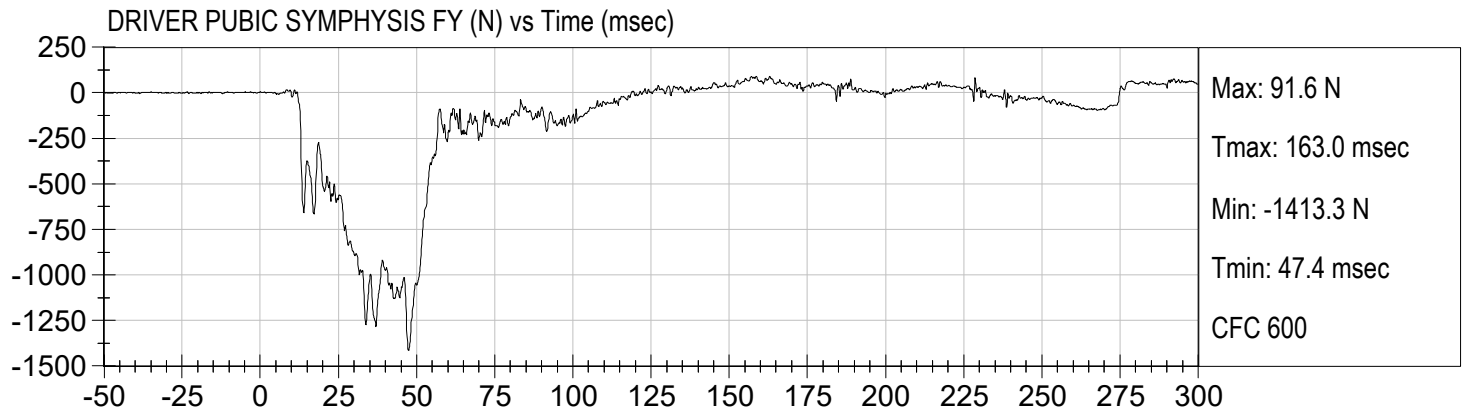
Left MDB Contact Switch

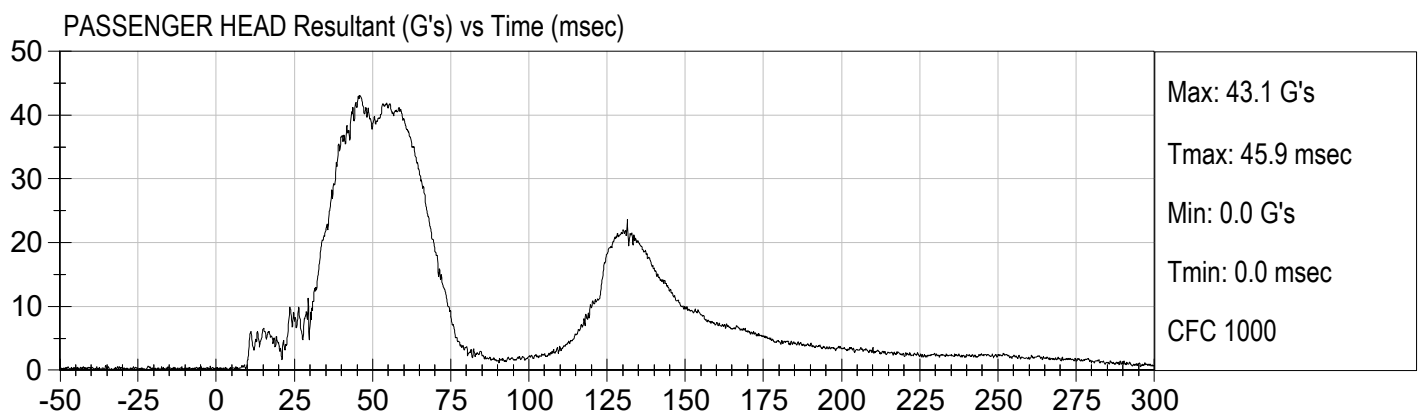
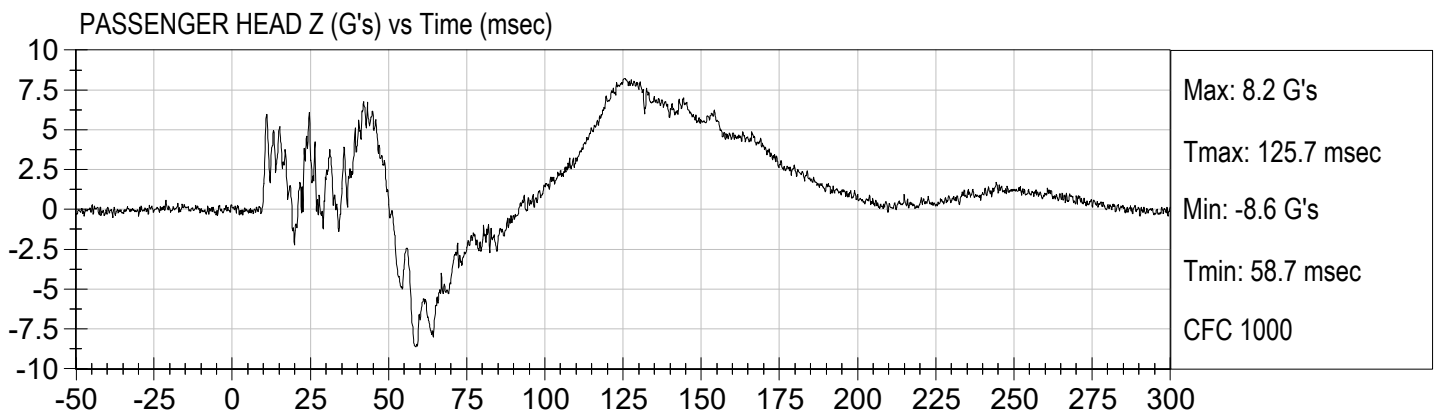
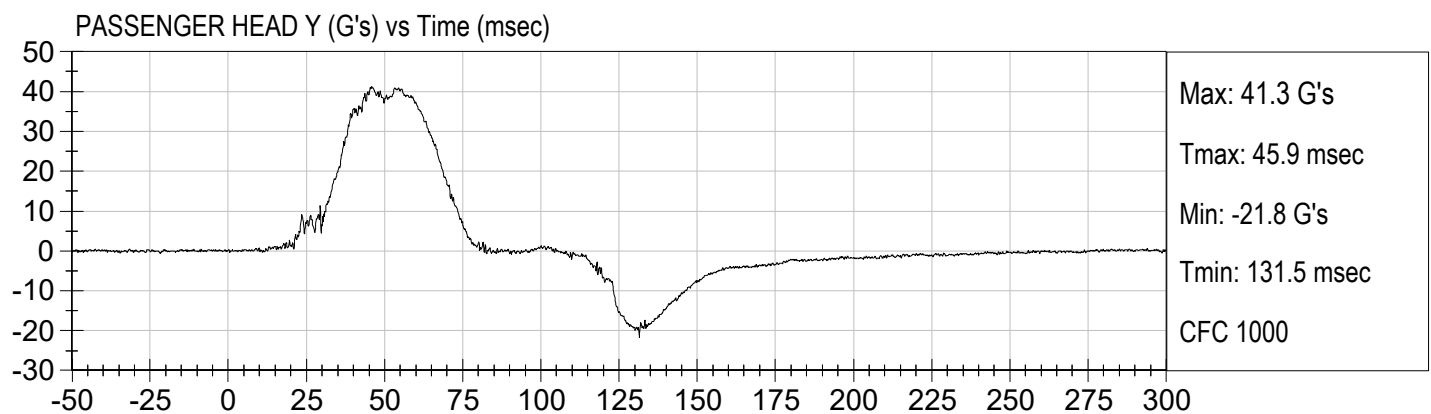
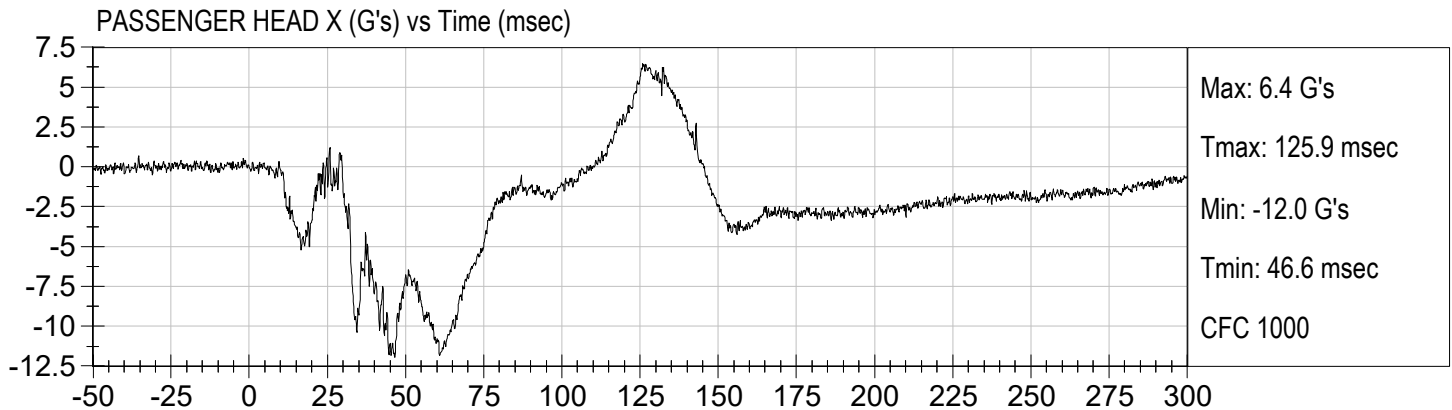
Right MDB Contact Switch

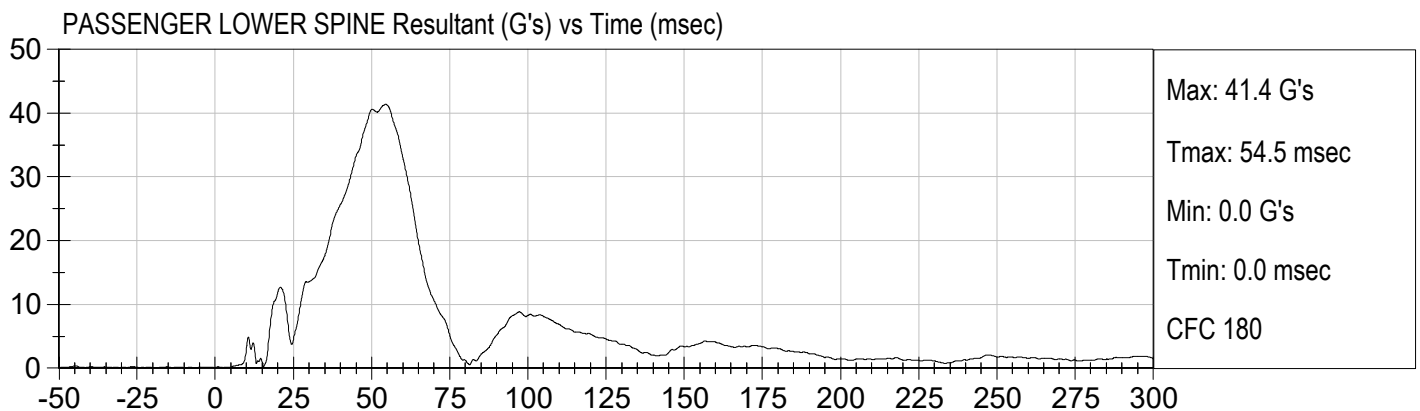
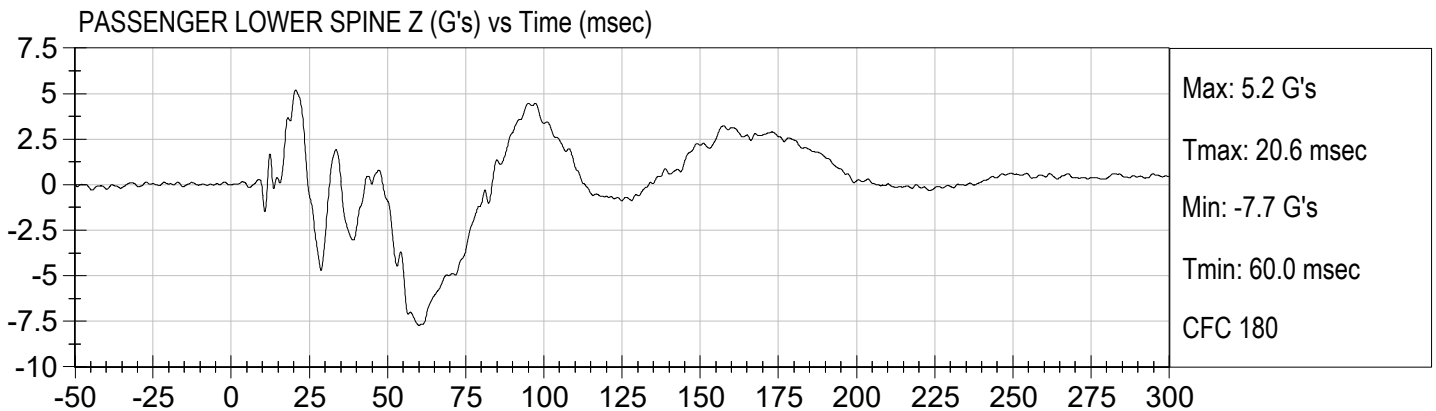
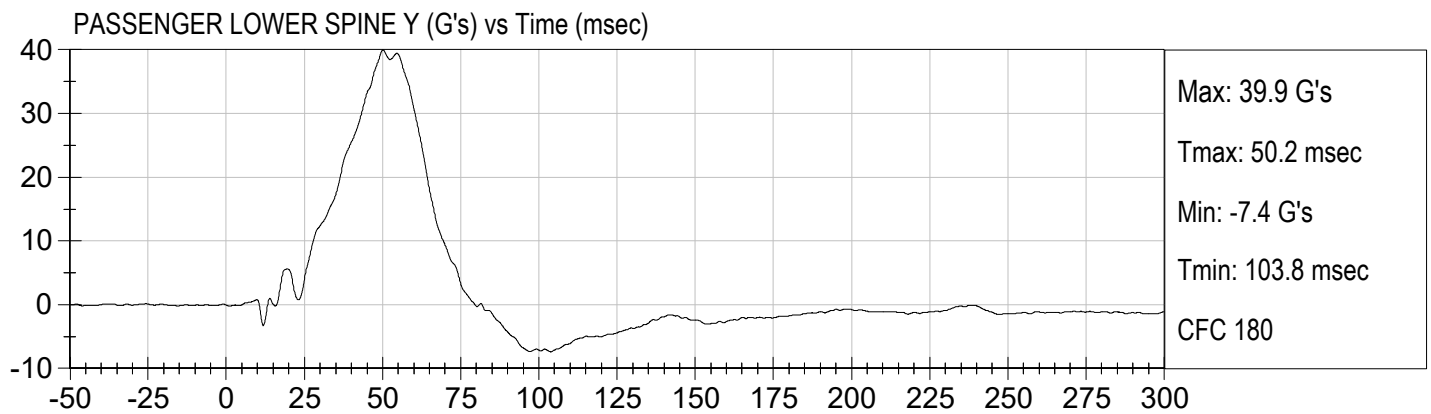
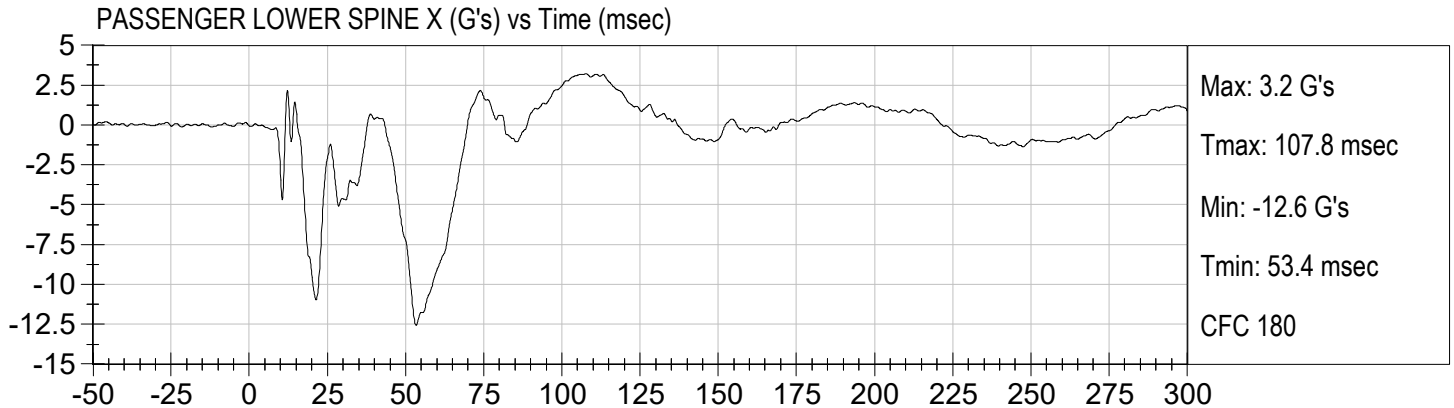


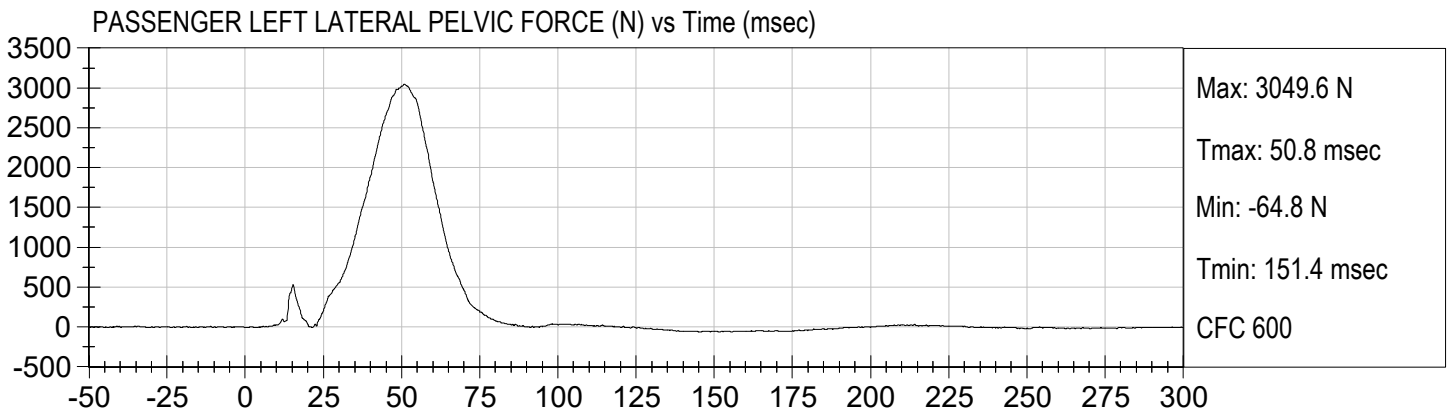
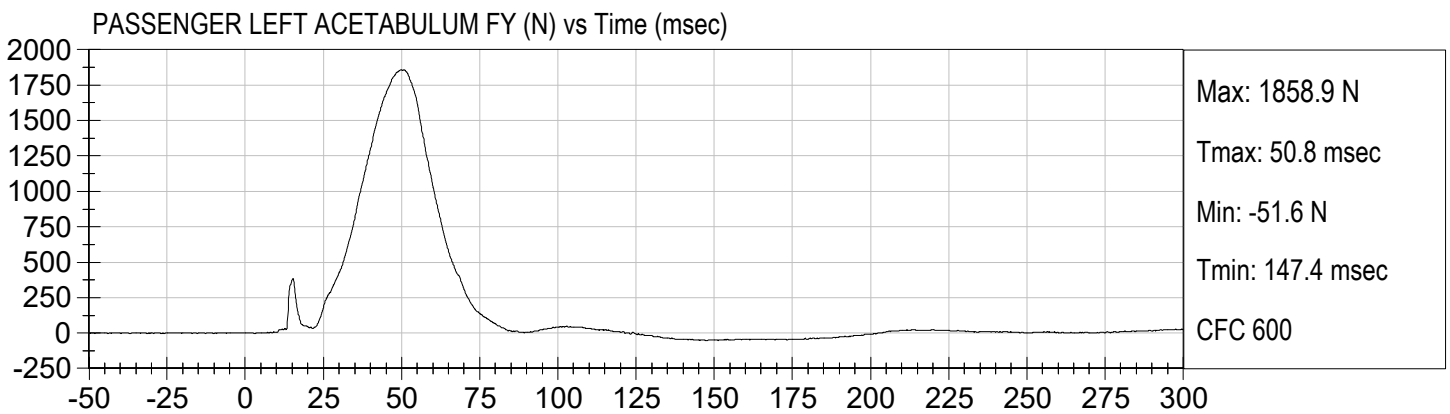
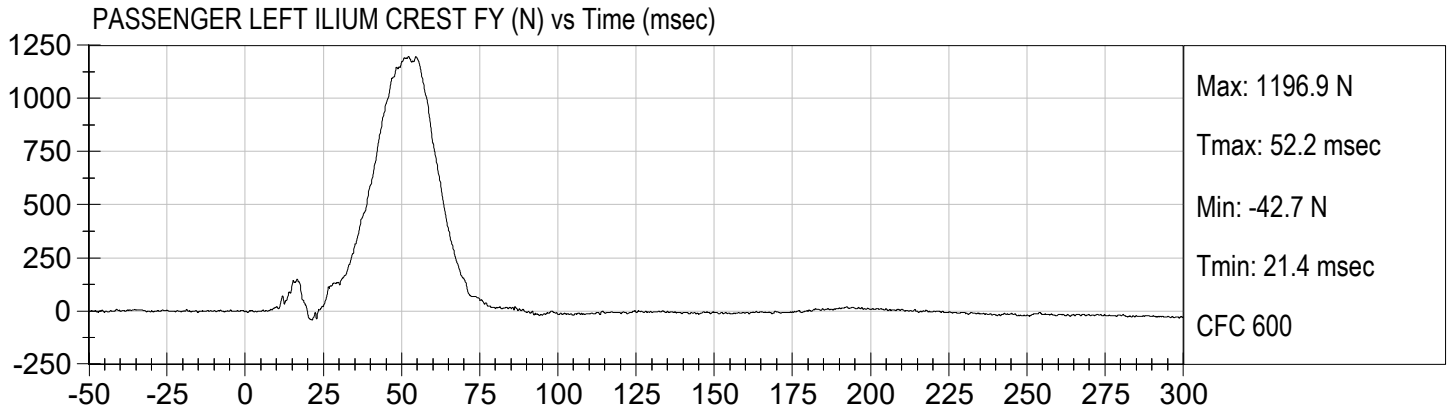












APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

ES-2re External Measurements
SN: 032

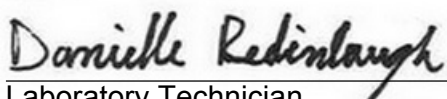
No.	Name	Spec. (mm)	Result	Pass/Fail
1	Sitting Height	900 - 918	915	Pass
2	Seat to Shoulder Joint	558 - 572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346 - 356	355	Pass
4	Seat to Hip Joint (center of bolt)	97 - 103	98	Pass
5	Sole to Seat, Sitting	333 - 451	440	Pass
6	Head Width	152 - 158	157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

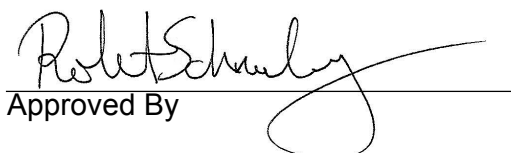
ATD Serial No: 032

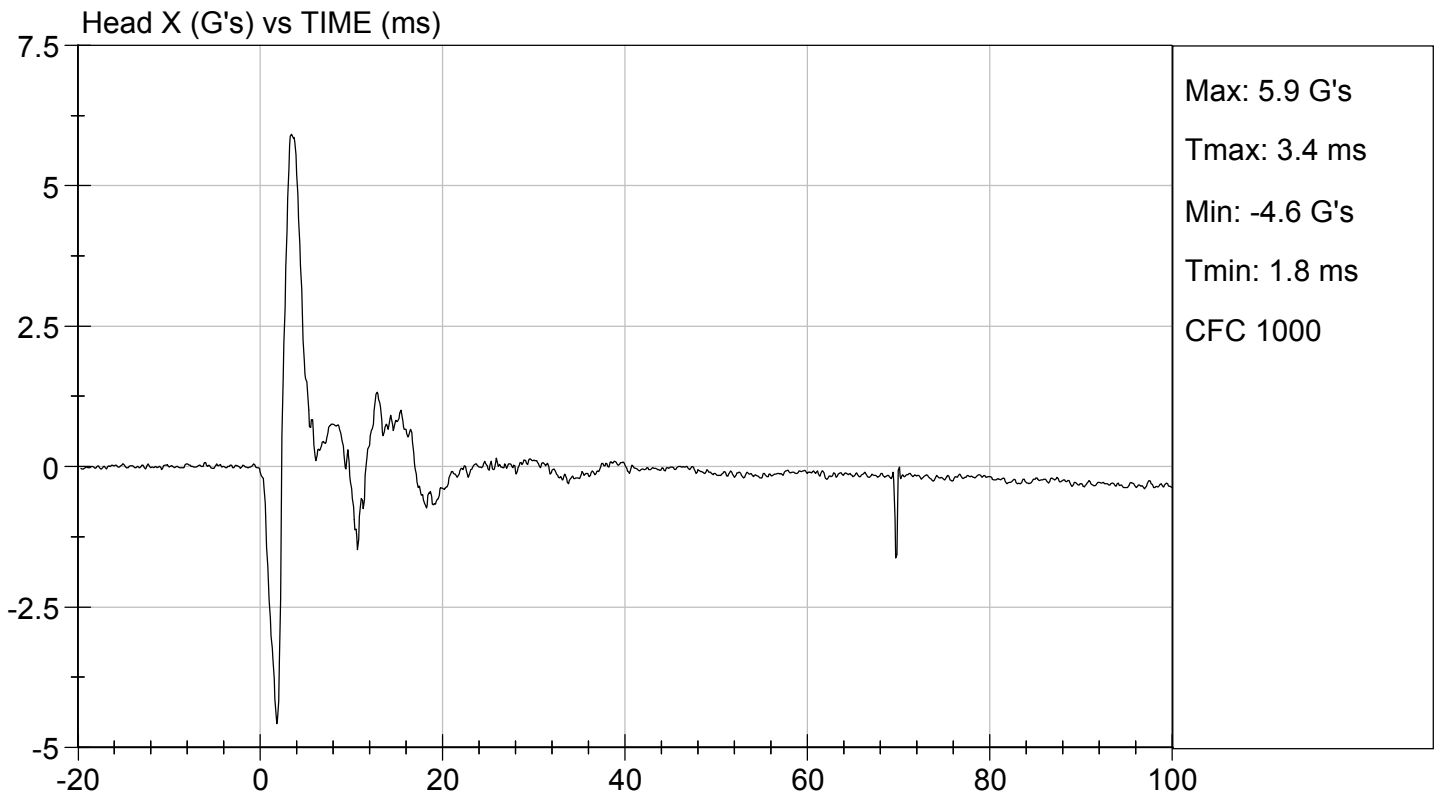
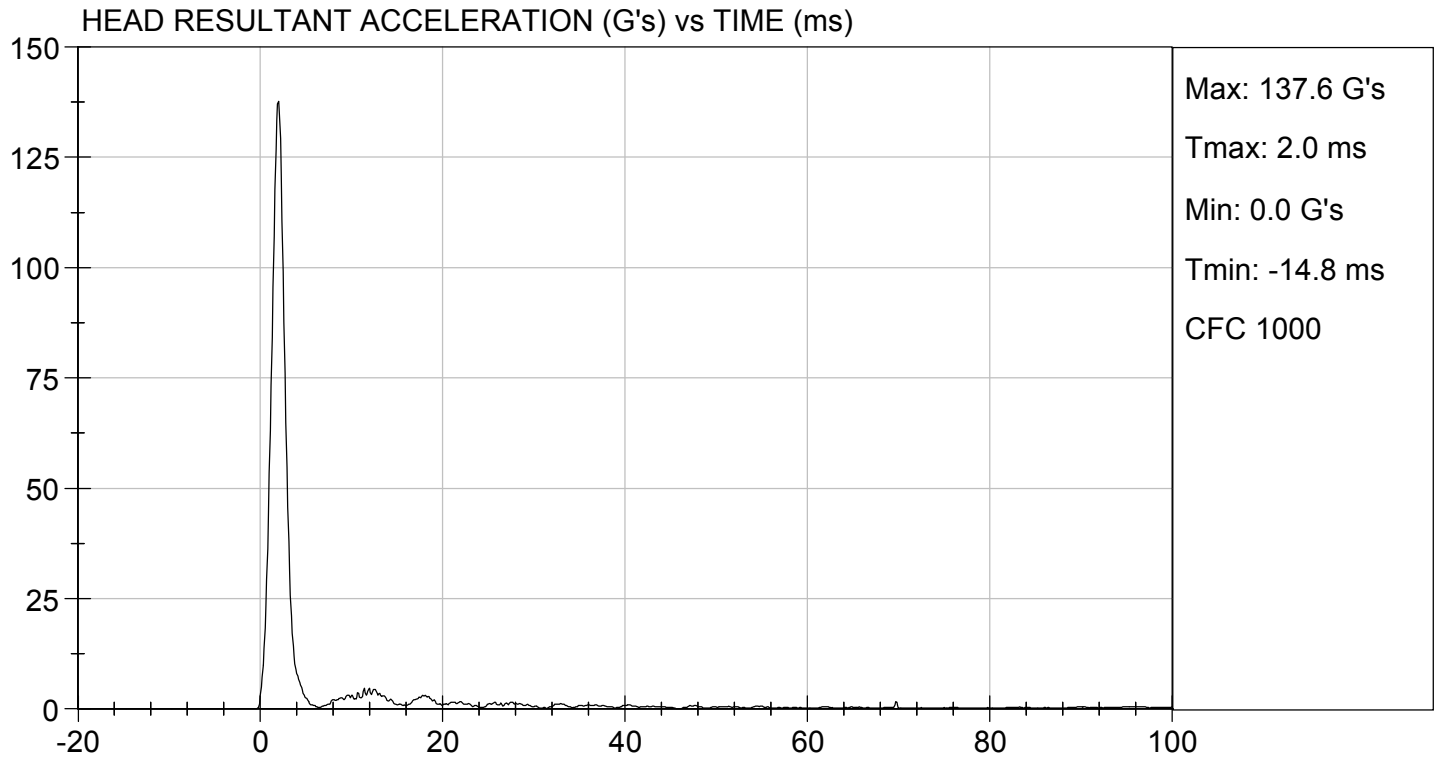
Test ID: D190151

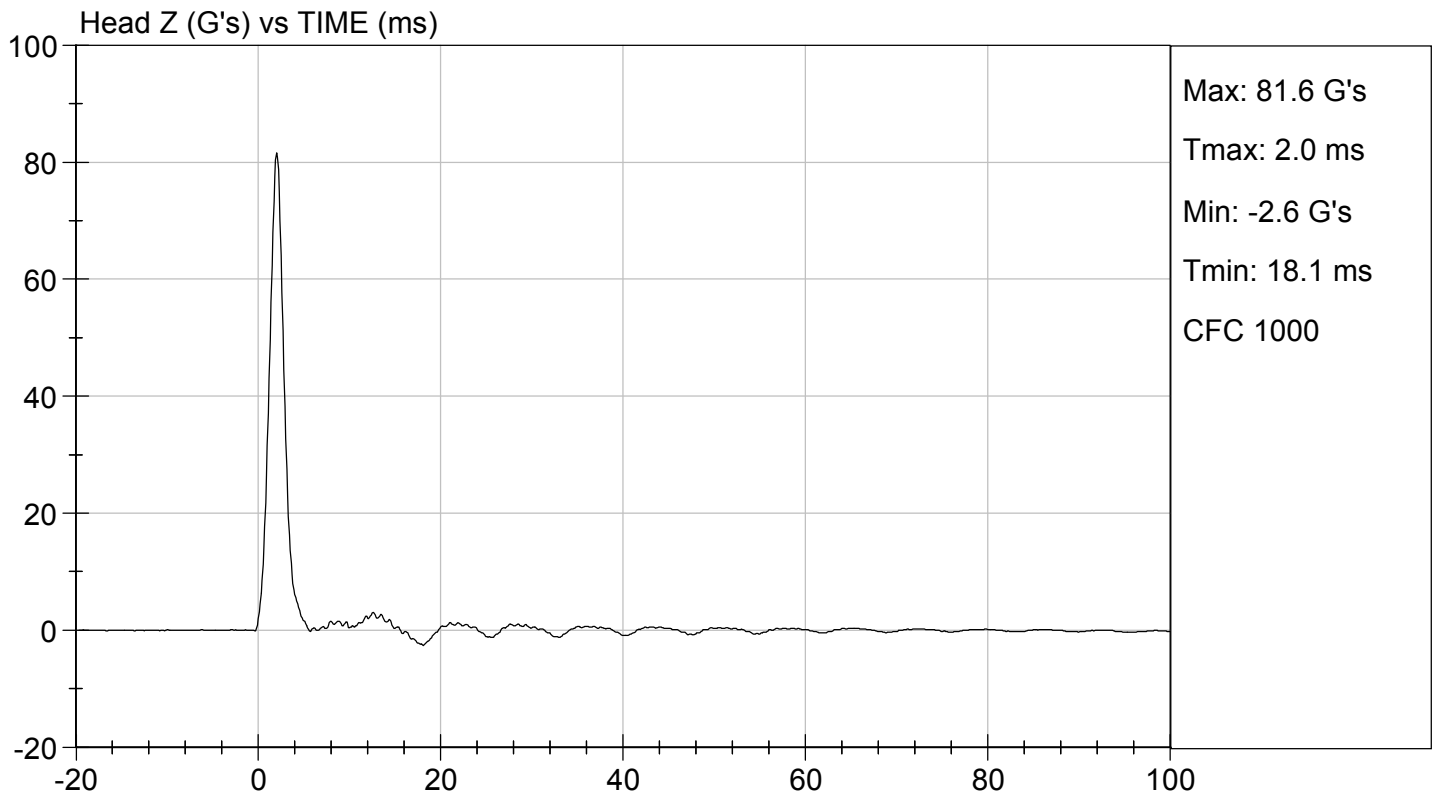
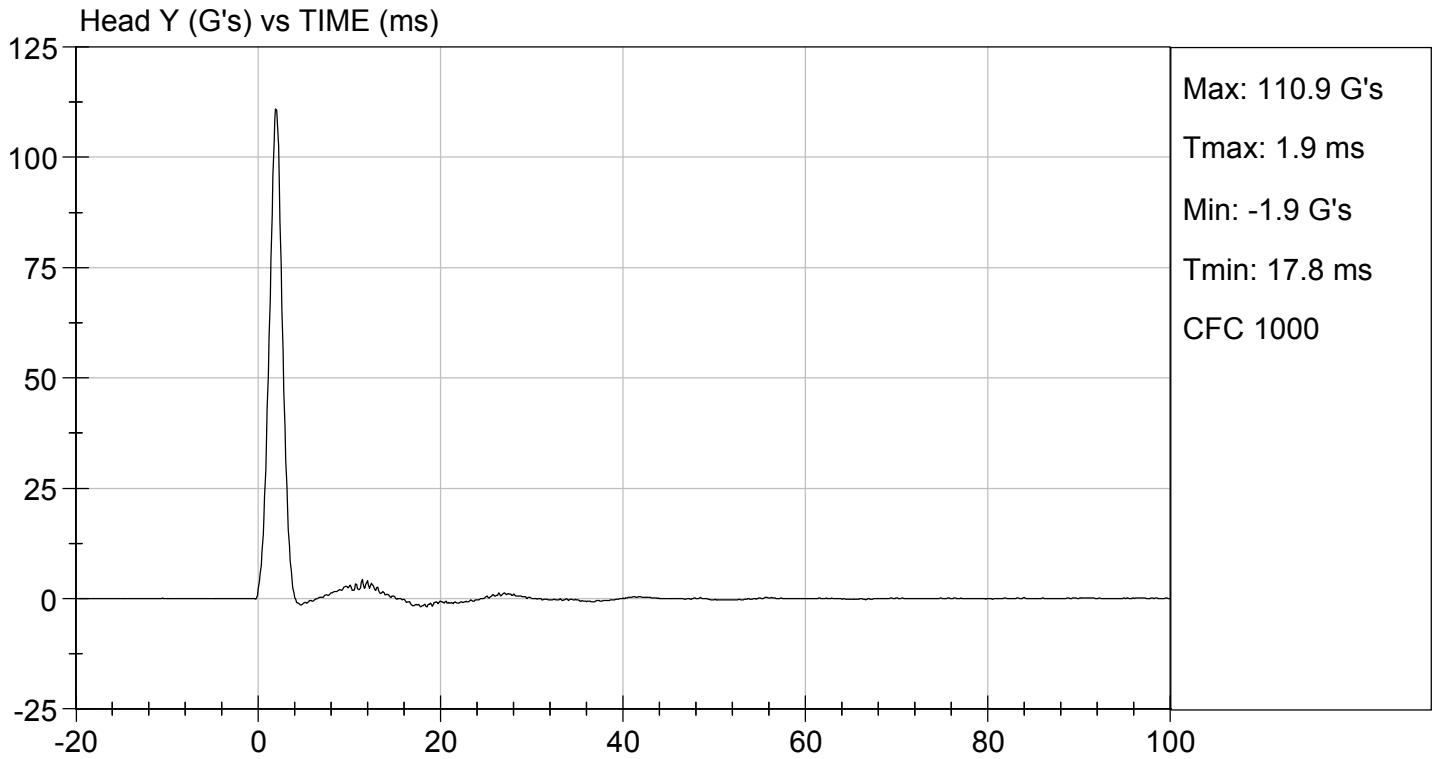
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	125 to 155	138	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	5.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
			Overall Test Results	Pass


Laboratory Technician

01/10/2019
Test Date


Approved By



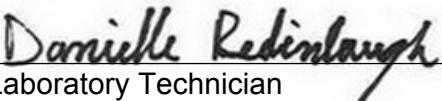


MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

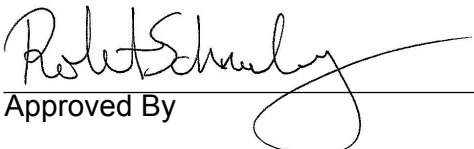
ATD Serial No: 032

Test I.D: D190152

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.84	Pass
Laboratory Relative Humidity		%	10 to 70	21.5	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.47	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	0.00	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.54	Pass
	17 ms	m/s	>= -3.70	-3.39	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	50.6	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	55.1	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	62.8	Pass
Overall Results					Pass


Laboratory Technician

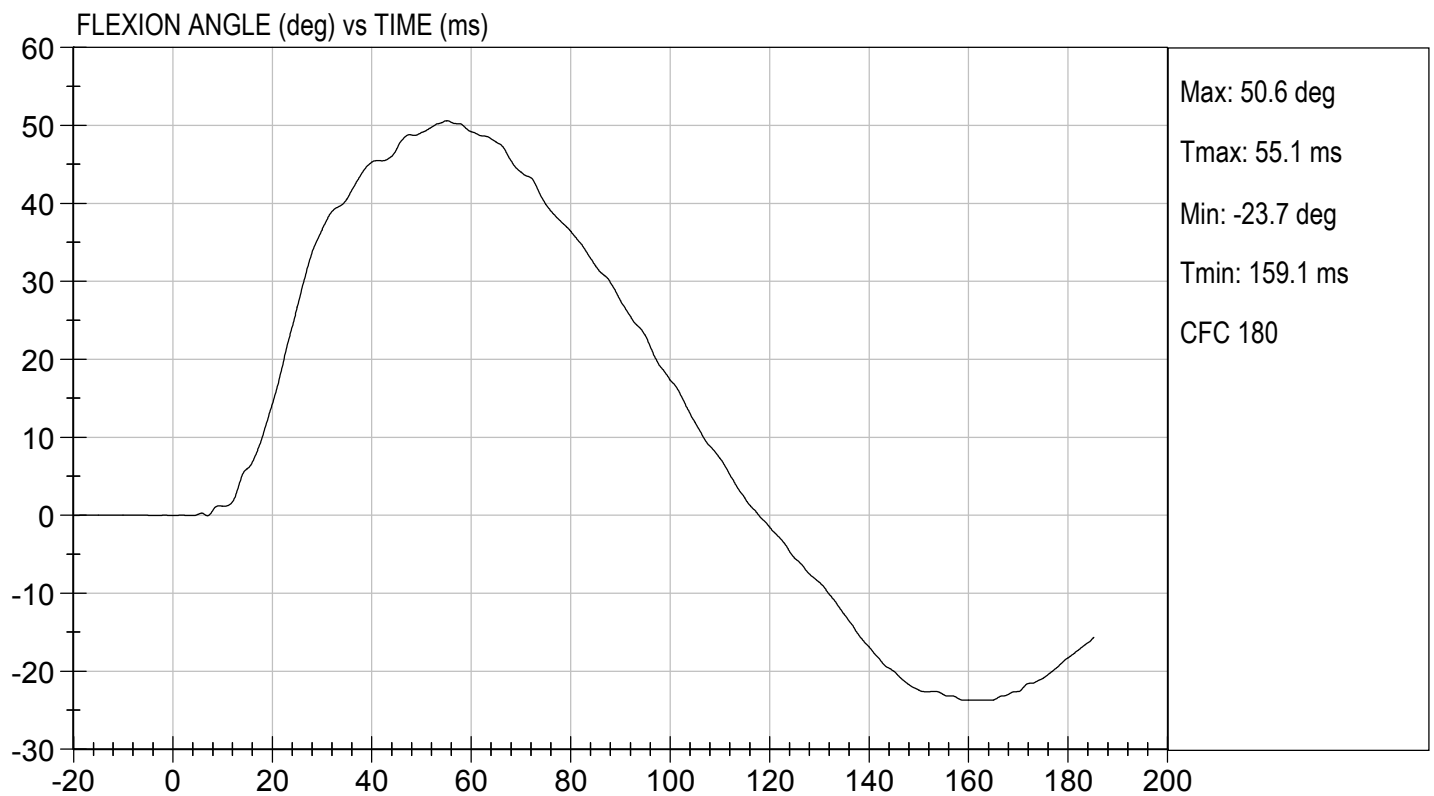
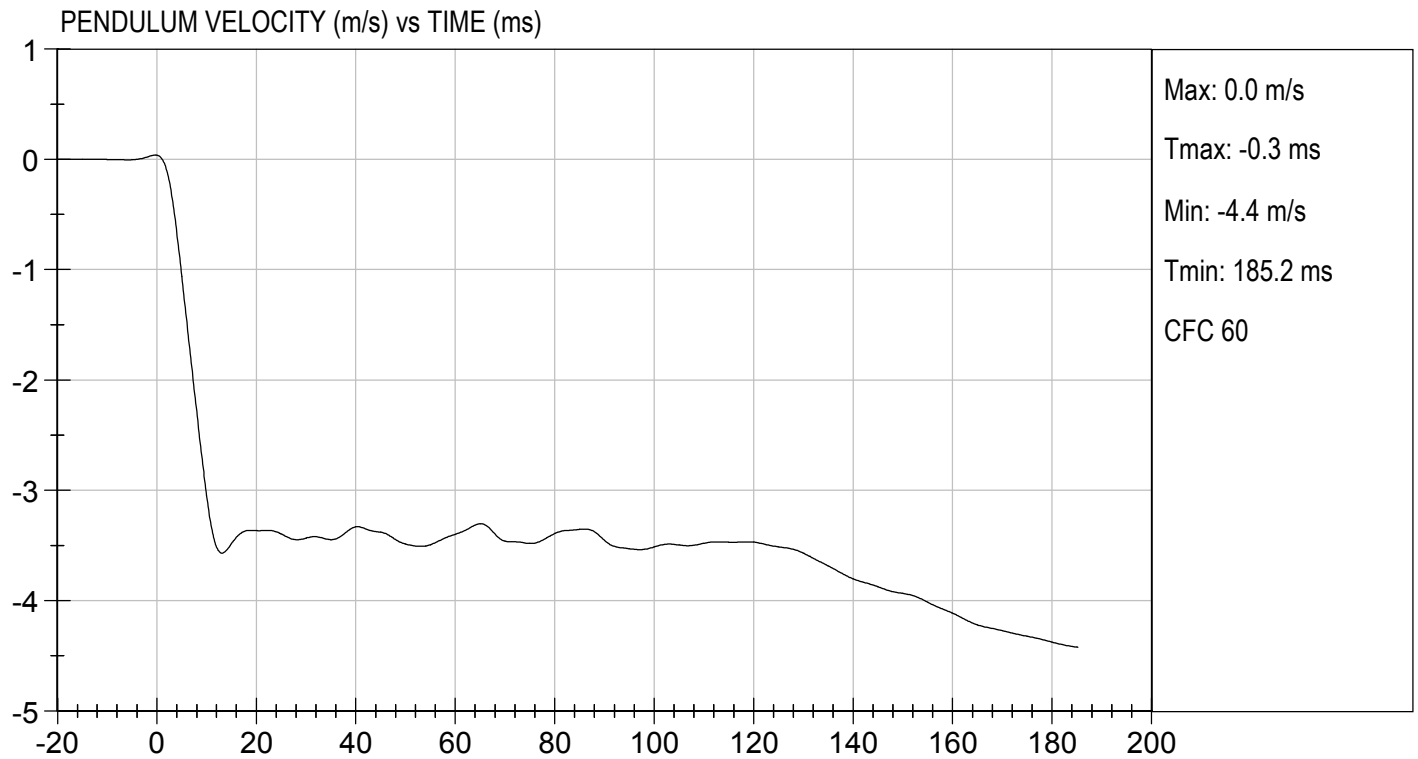
01/10/2019
Test Date


Approved By



TEST DESC: NECK BENDING
VELOCITY: 11.40 ft/s, 3.47 m/s

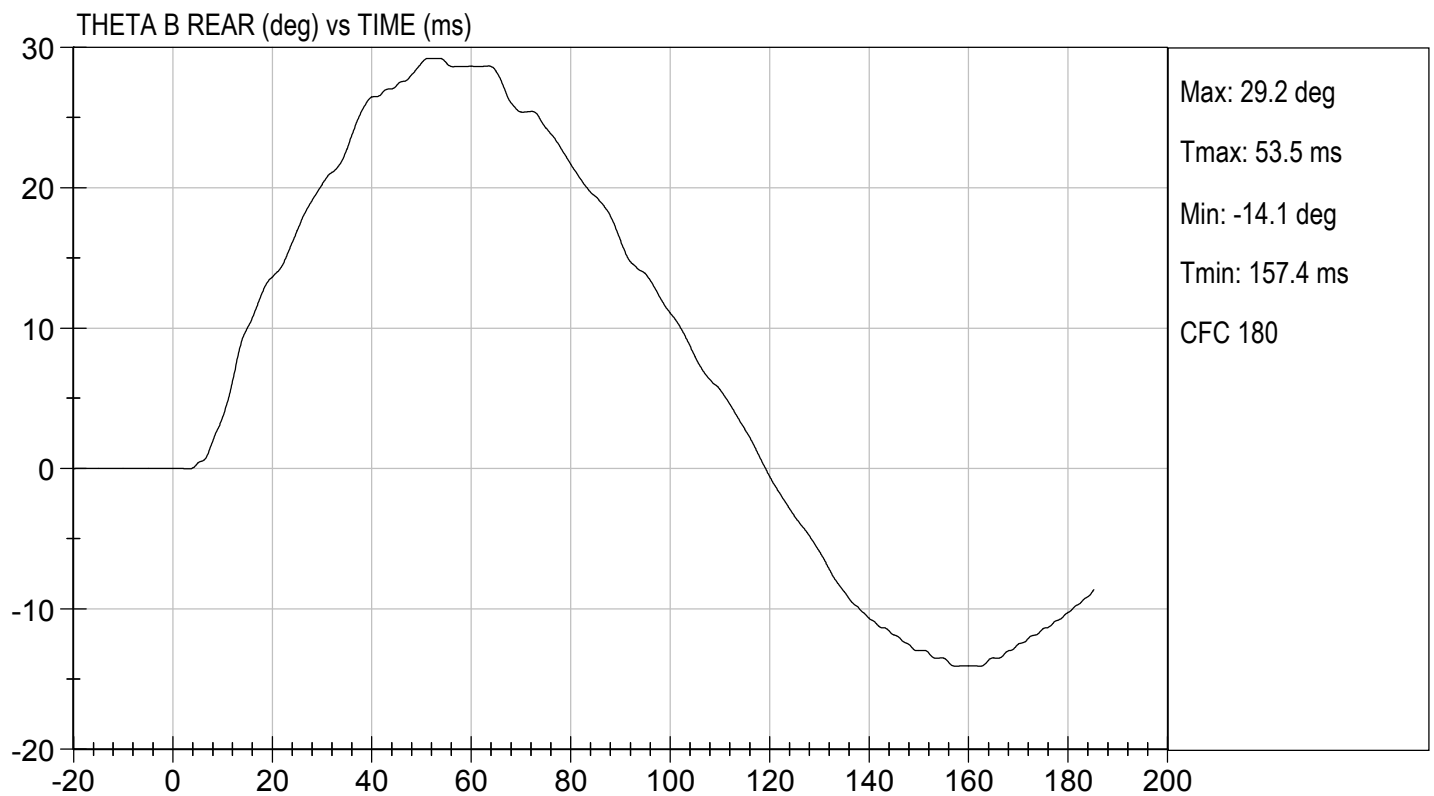
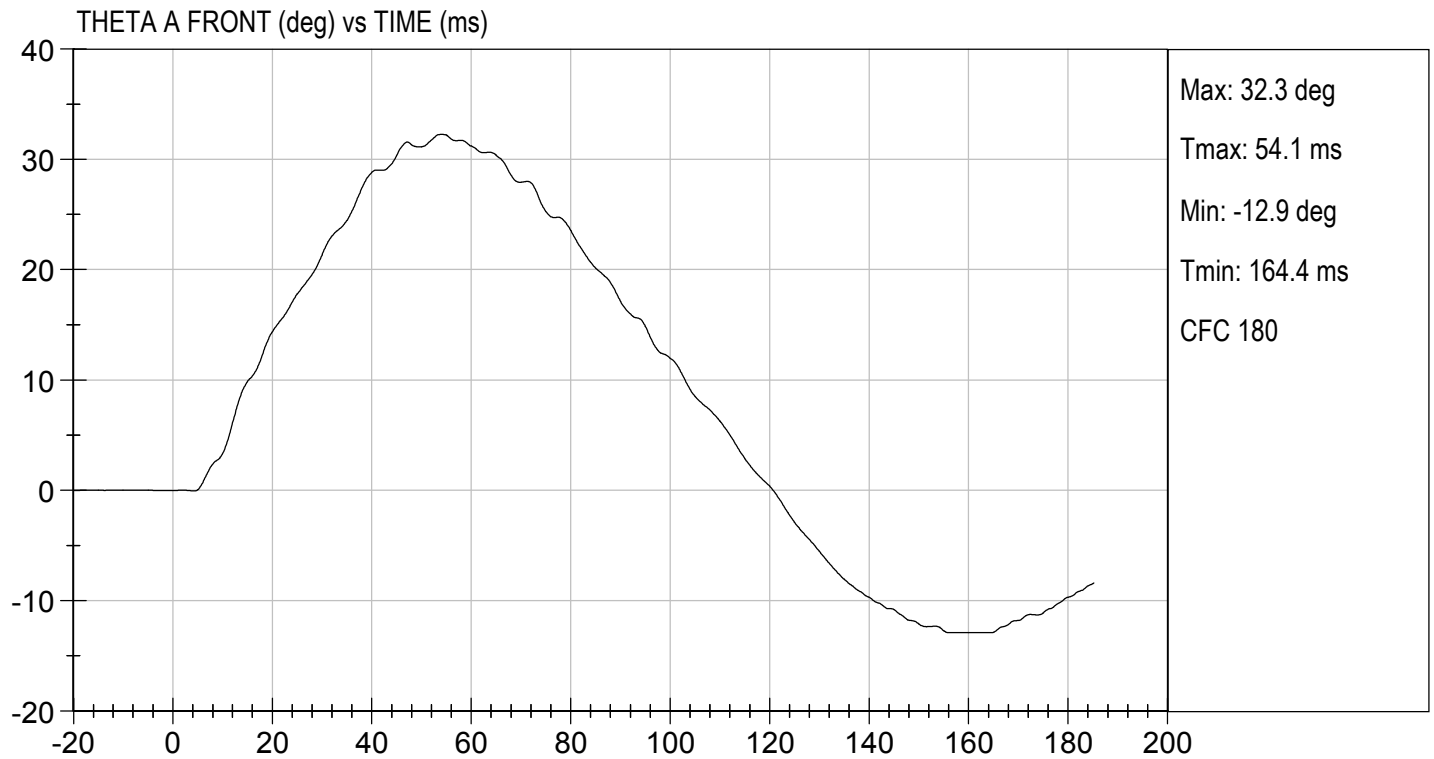
TEST DATE: 01/10/2019
TEST #: D190152





TEST DESC: NECK BENDING
VELOCITY: 11.40 ft/s, 3.47 m/s

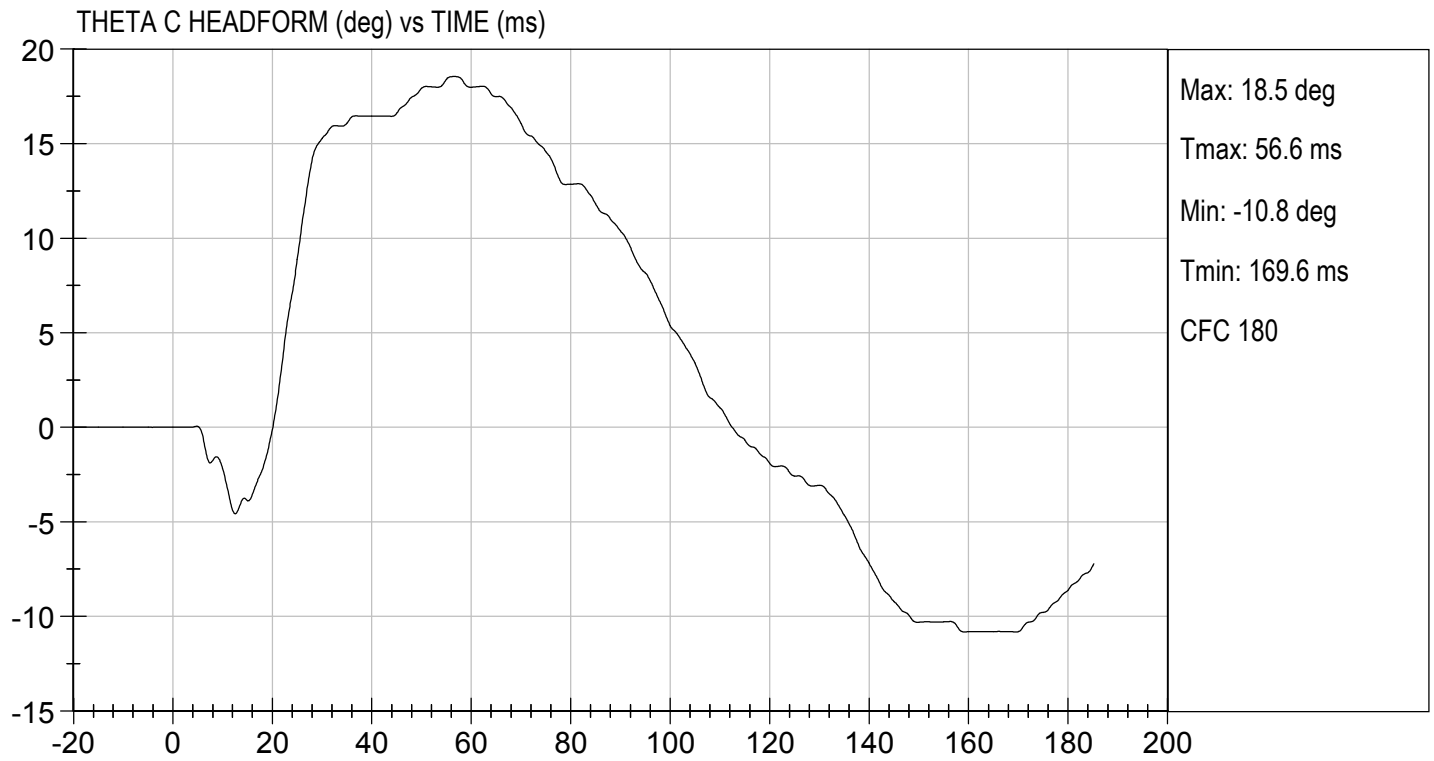
TEST DATE: 01/10/2019
TEST #: D190152





TEST DESC: NECK BENDING
VELOCITY: 11.40 ft/s, 3.47 m/s

TEST DATE: 01/10/2019
TEST #: D190152

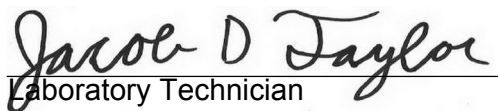


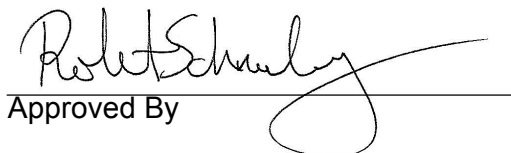
MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D190153

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	10.1	Pass
Overall Test Results				Pass


Laboratory Technician

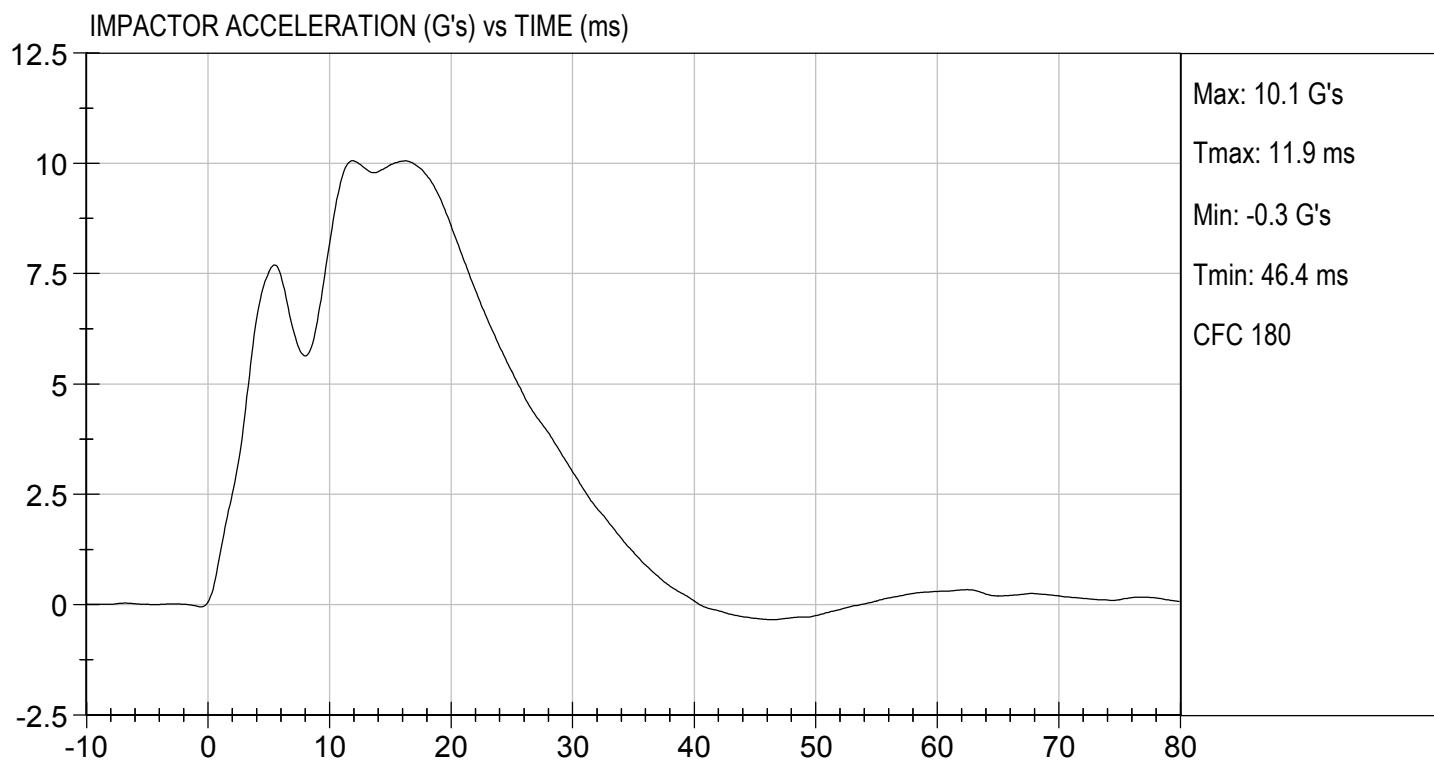

Approved By

01/11/2019
Test Date



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

TEST DATE: 01/11/2019
TEST #: D190153



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

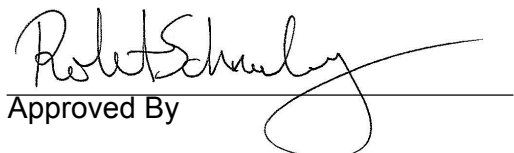
ATD Serial No: 032

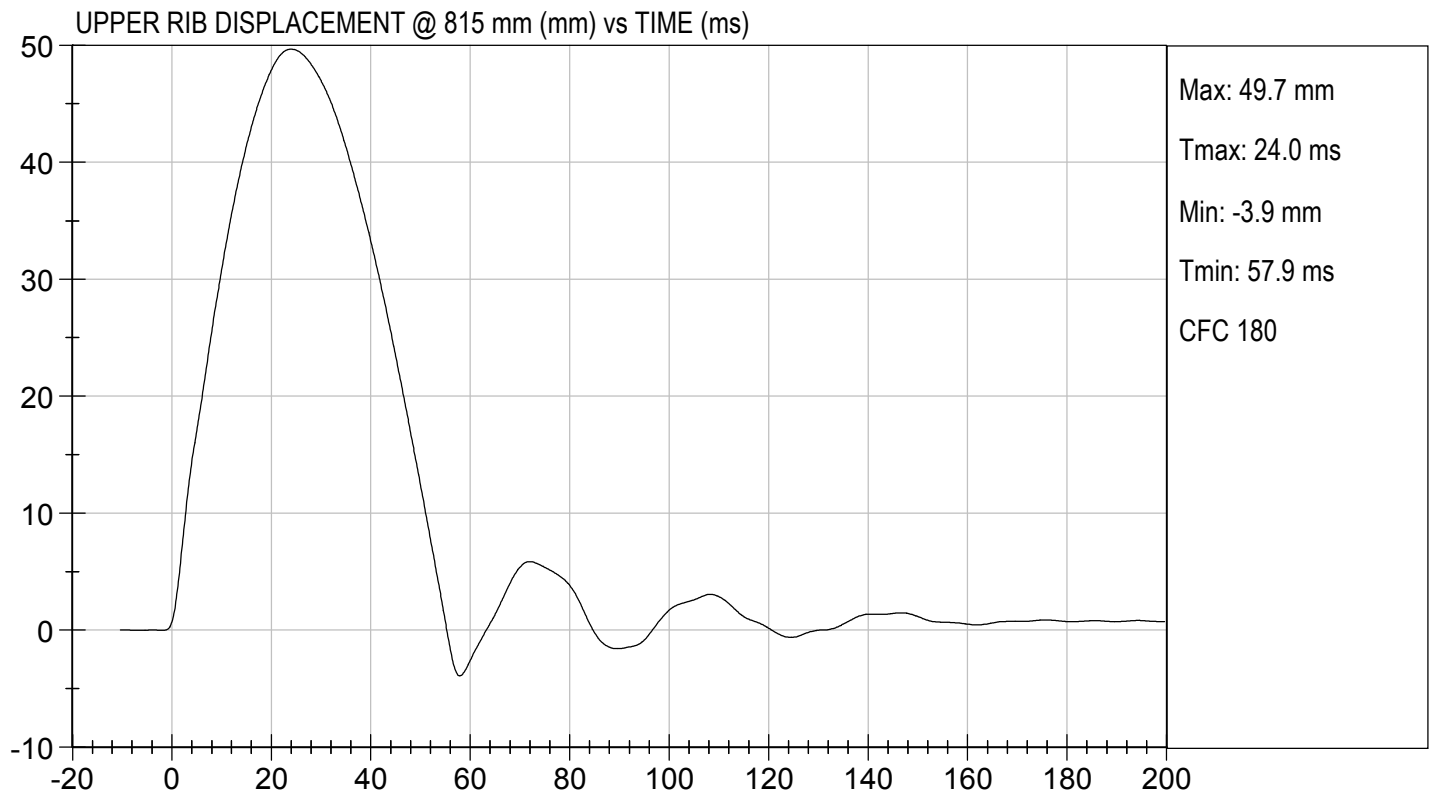
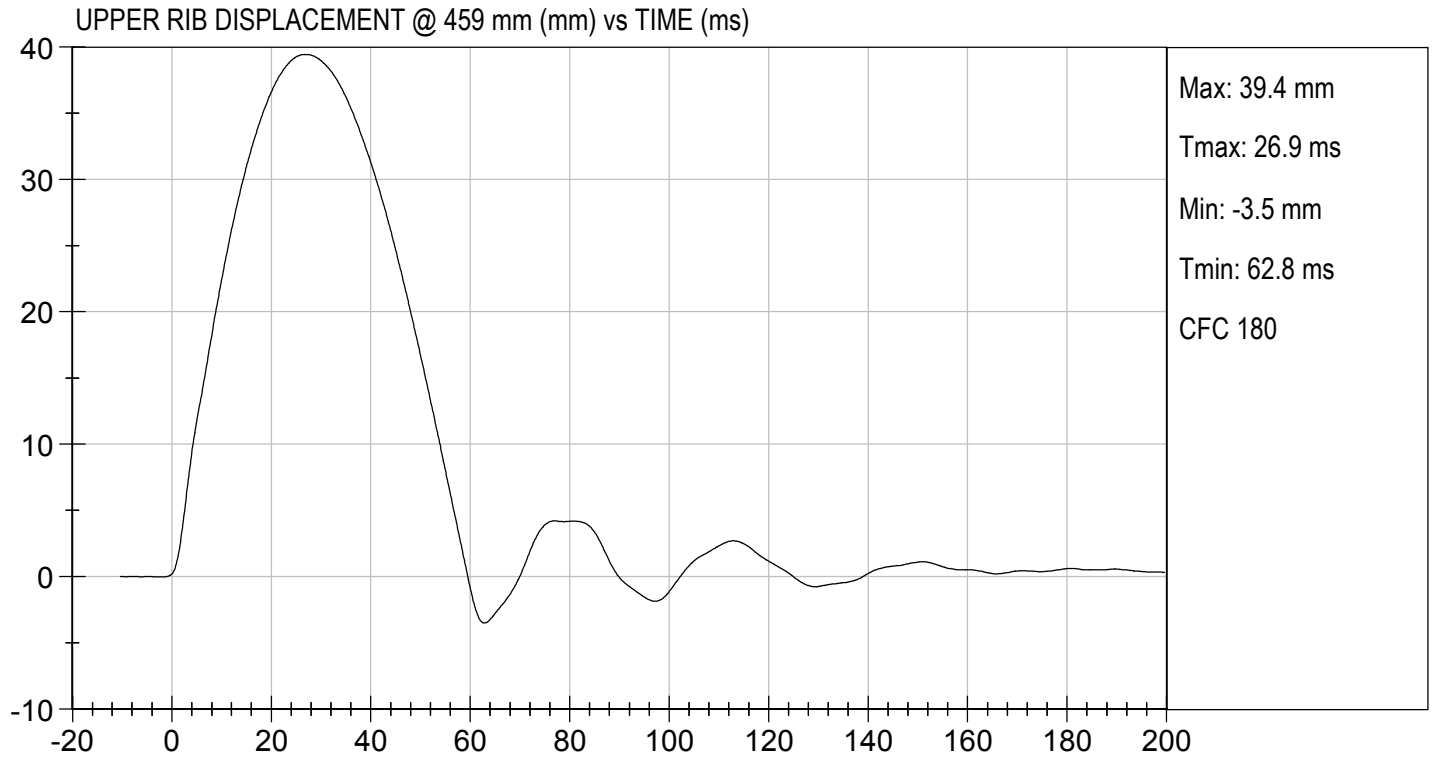
Test I.D: D190154

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.84	Pass
Laboratory Relative Humidity	%	10 to 70	21.5	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.7	Pass
Overall Test Results				Pass


Laboratory Technician

01/10/2019
Test Date


Approved By



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

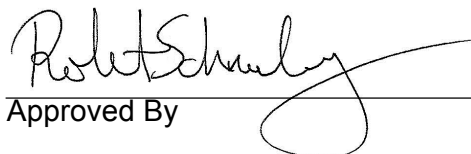
ATD Serial No: 032

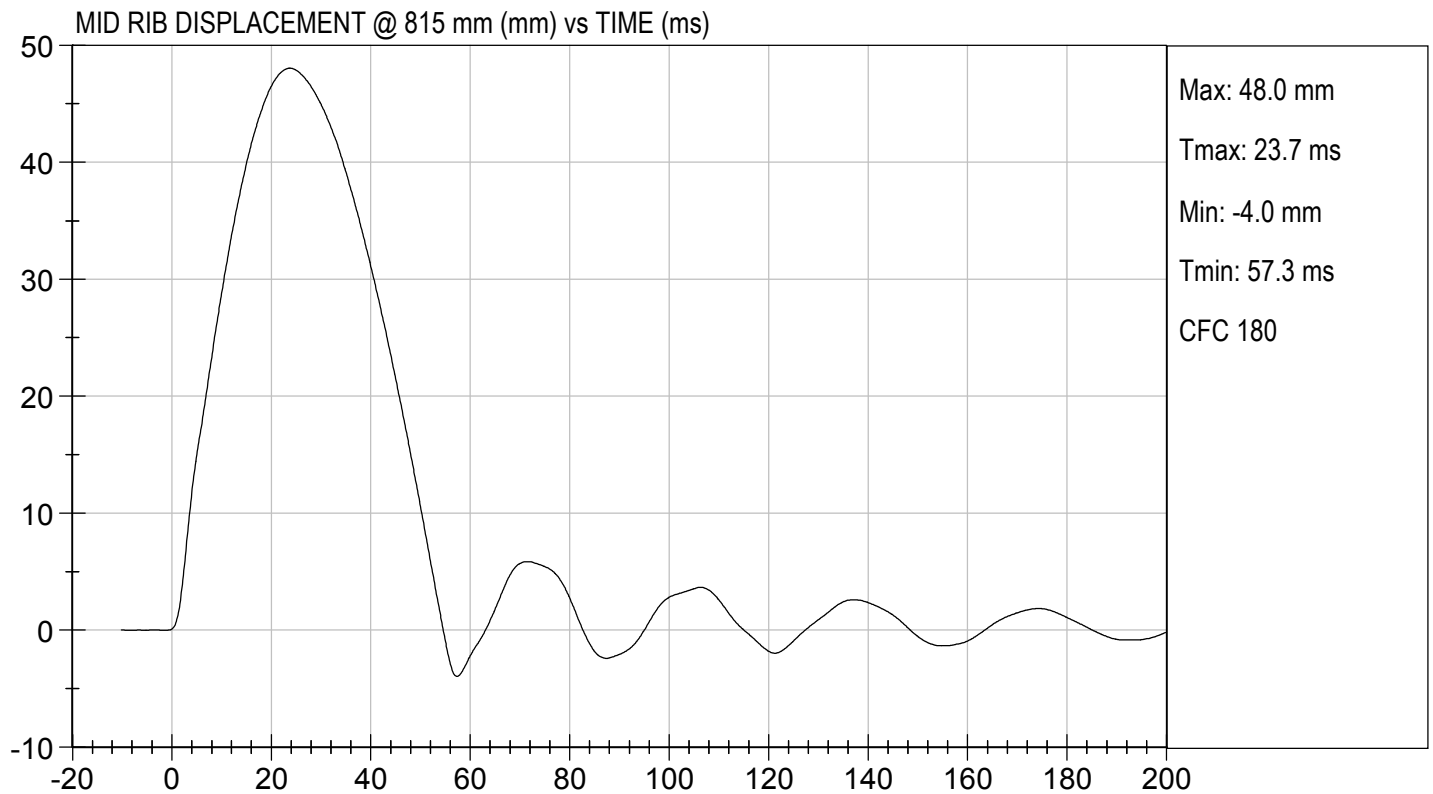
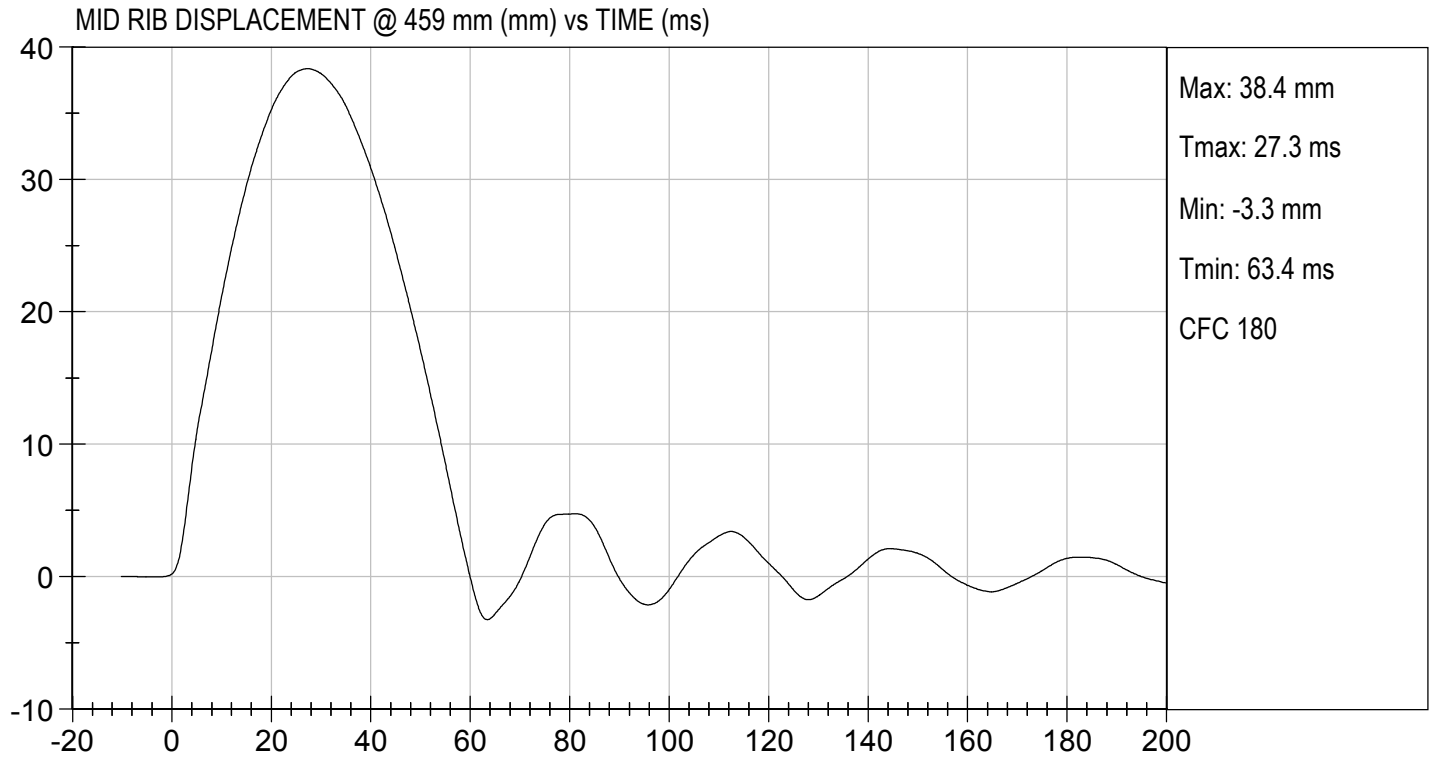
Test I.D: D190155

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.84	Pass
Laboratory Relative Humidity	%	10 to 70	21.5	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.0	Pass
Overall Test Results				Pass


Laboratory Technician

01/10/2019
Test Date


Approved By



MGA RESEARCH CORPORATION

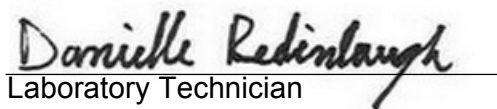
LOWER RIB TEST

ES-2re DUMMY

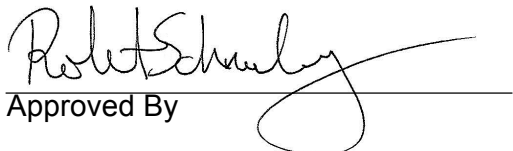
ATD Serial No: 032

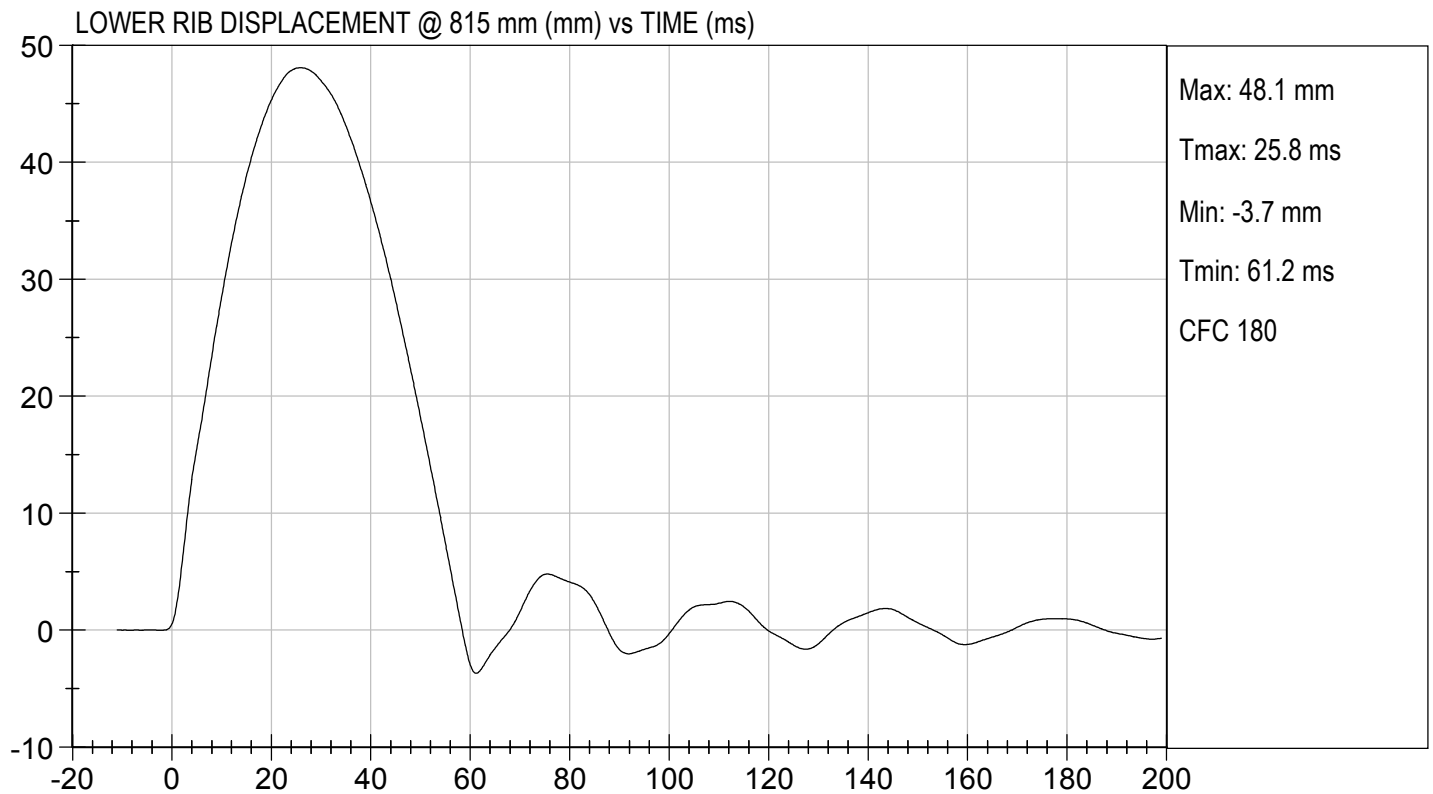
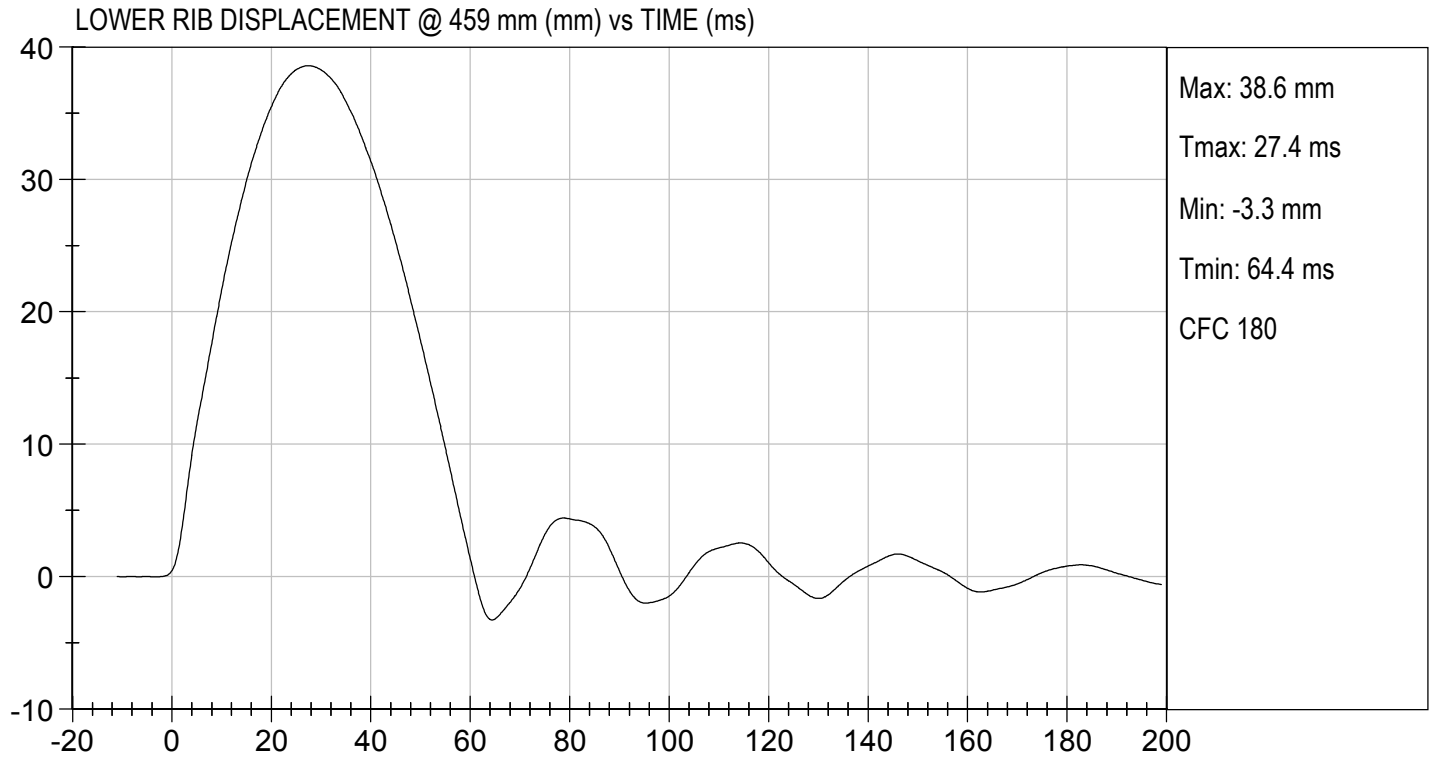
Test I.D: D190156

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.84	Pass
Laboratory Relative Humidity	%	10 to 70	21.5	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.1	Pass
Overall Test Results				Pass


Laboratory Technician

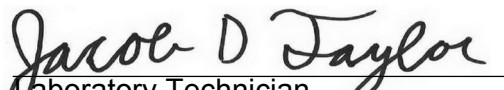
01/10/2019
Test Date

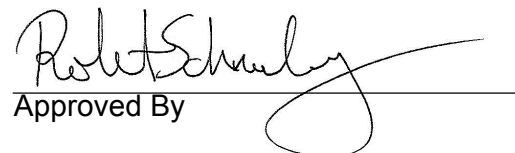

Approved By



MGA RESEARCH CORPORATION**ABDOMEN TEST****ES-2re DUMMY**ATD Serial No: 032Test I.D: D190157

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impactor Force	N	4000 to 4800	4380	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	10.9	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2269	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.0	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

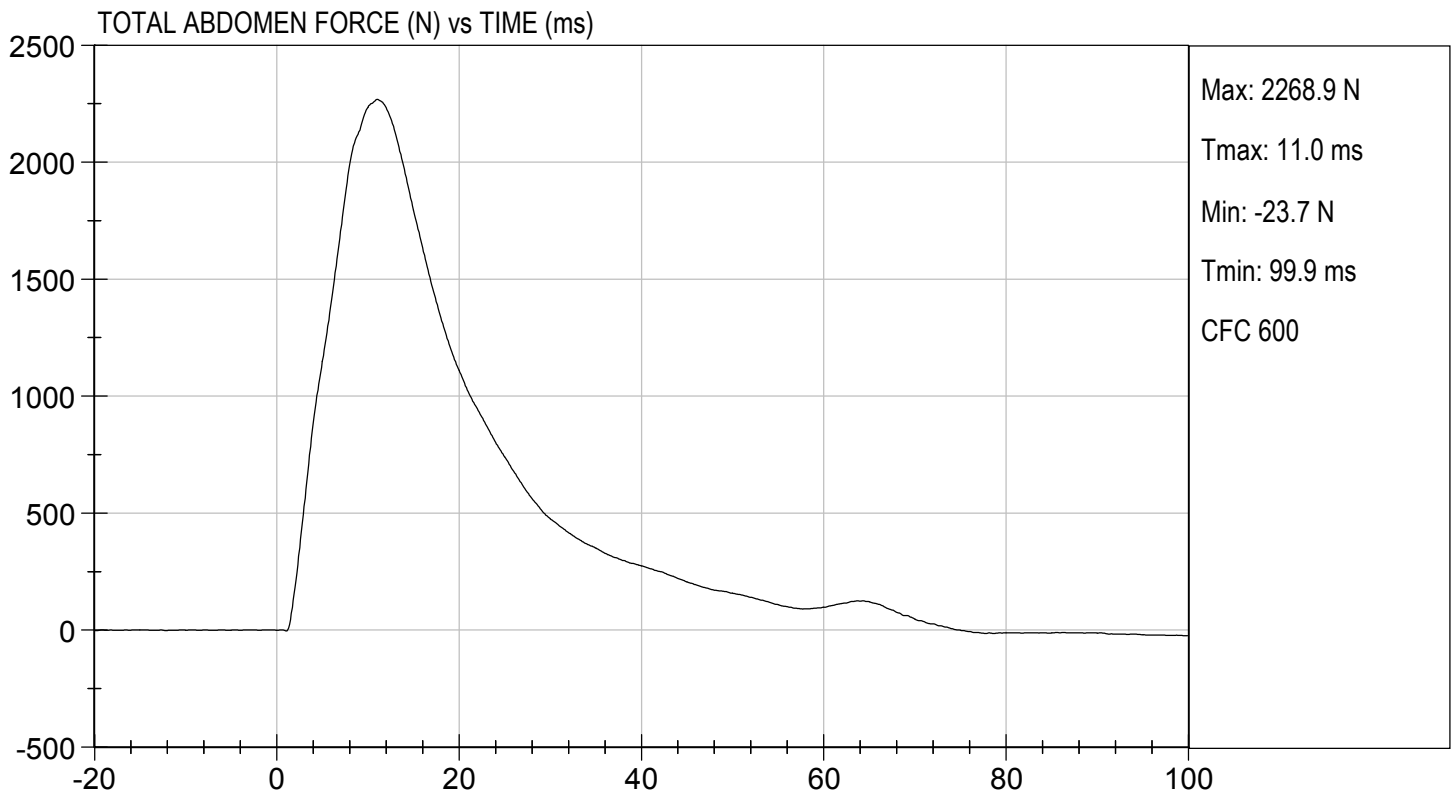
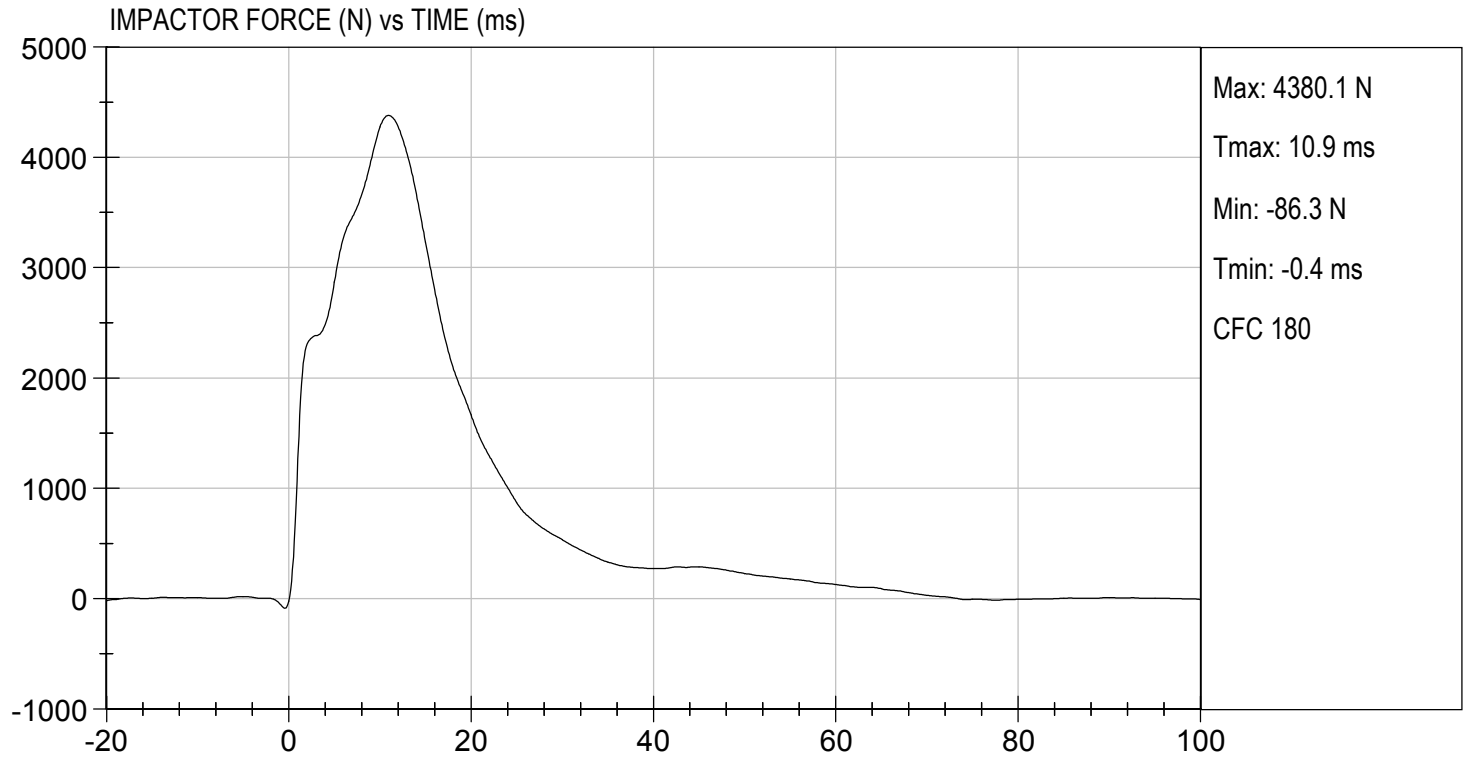
01/11/2019

Test Date



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

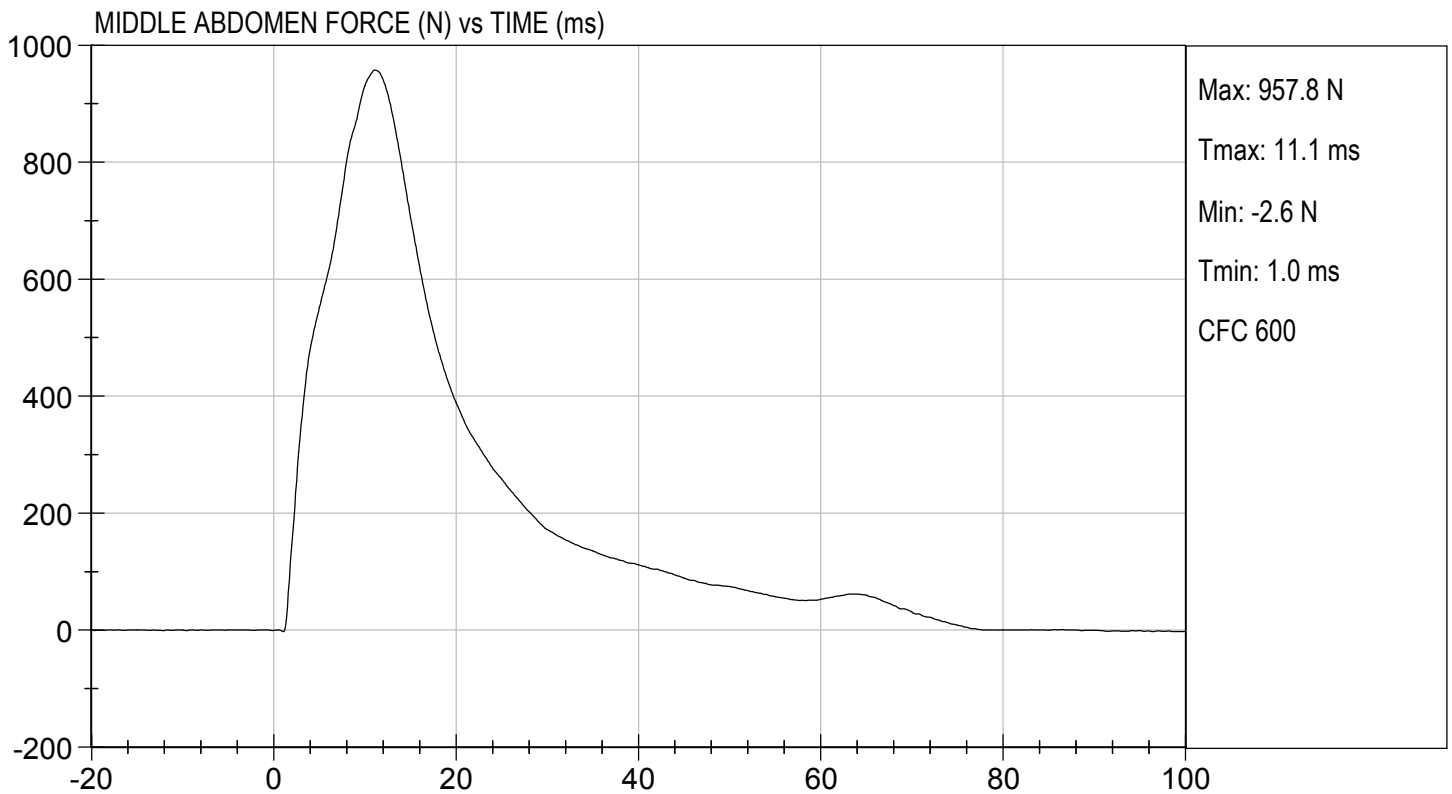
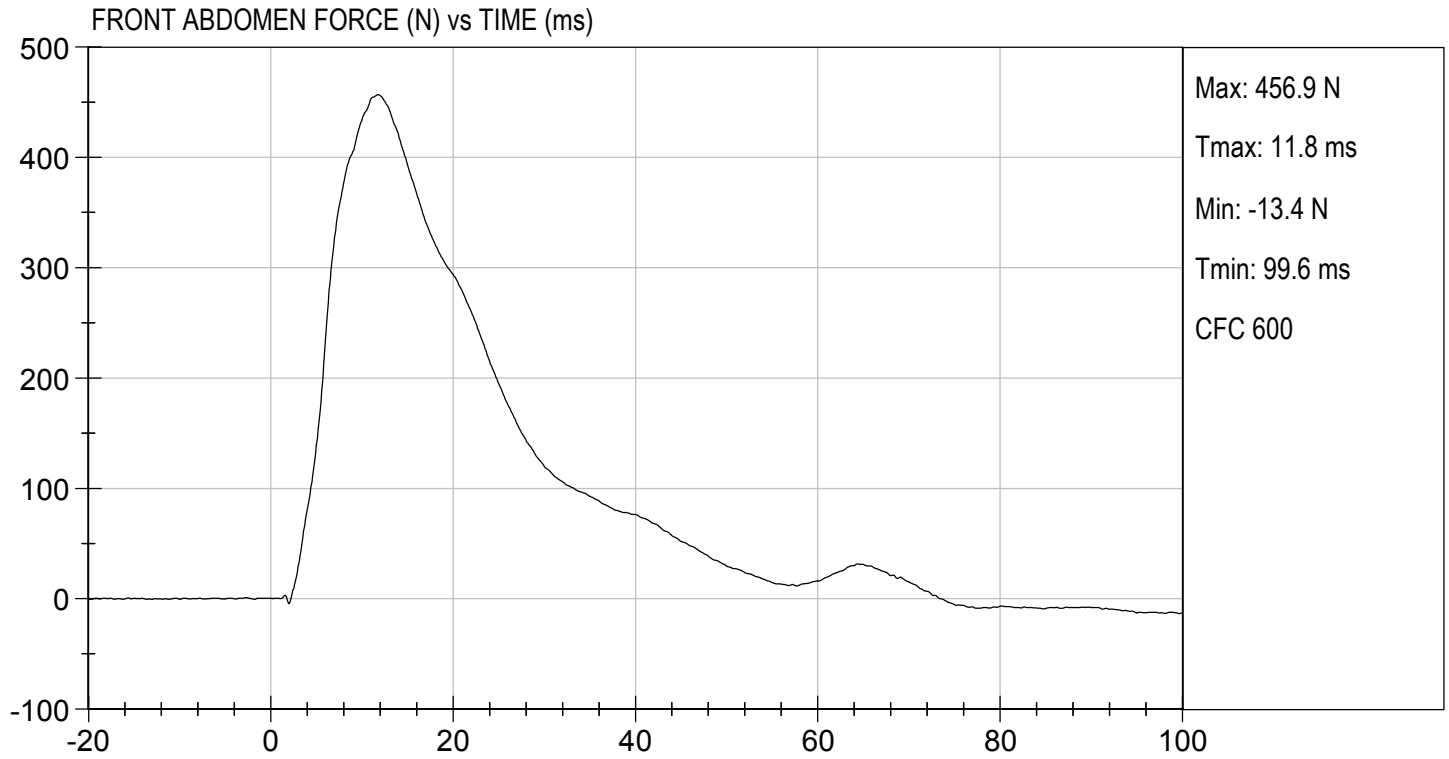
TEST DATE: 01/11/2019
TEST #: D190157





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

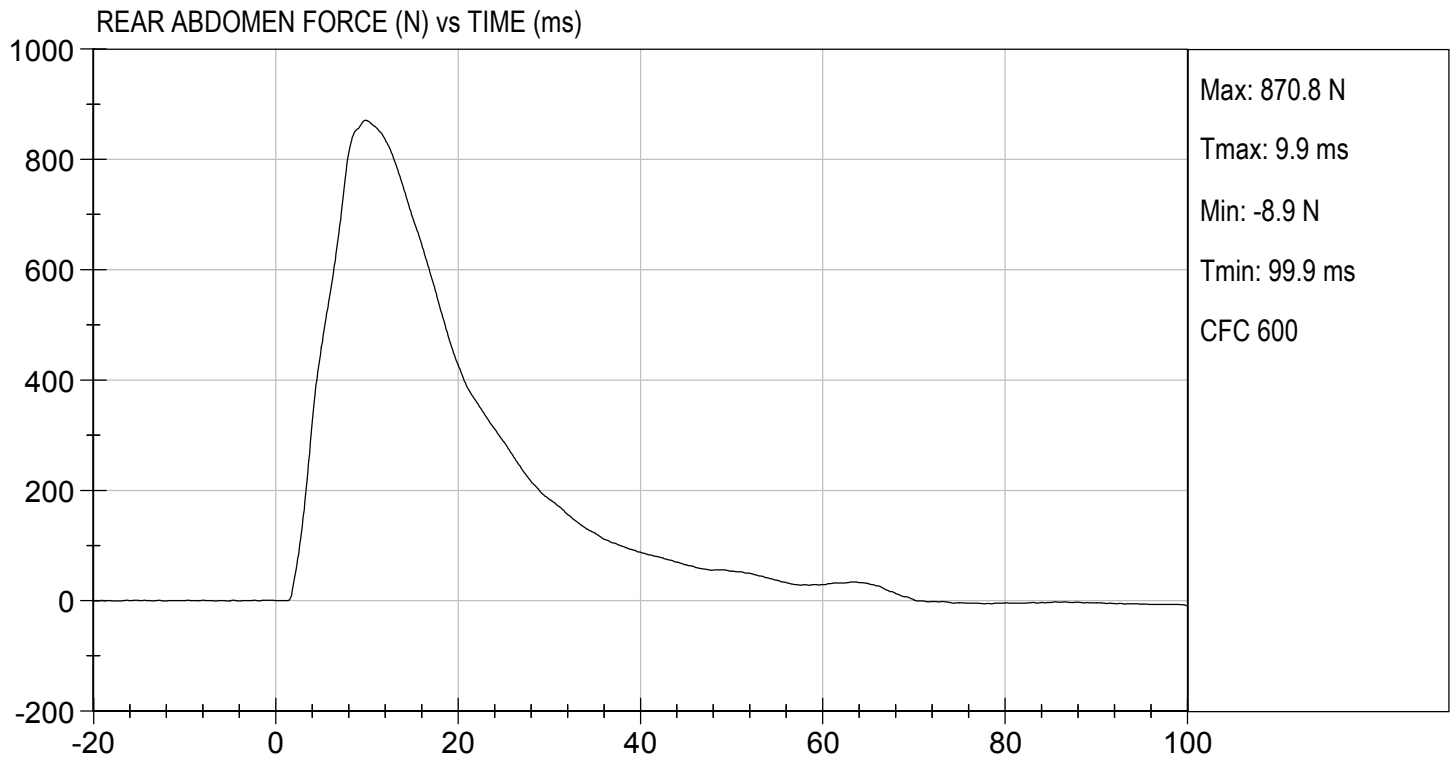
TEST DATE: 01/11/2019
TEST #: D190157





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

TEST DATE: 01/11/2019
TEST #: D190157



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

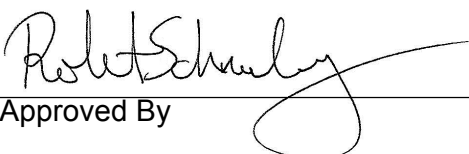
ATD Serial No: 032

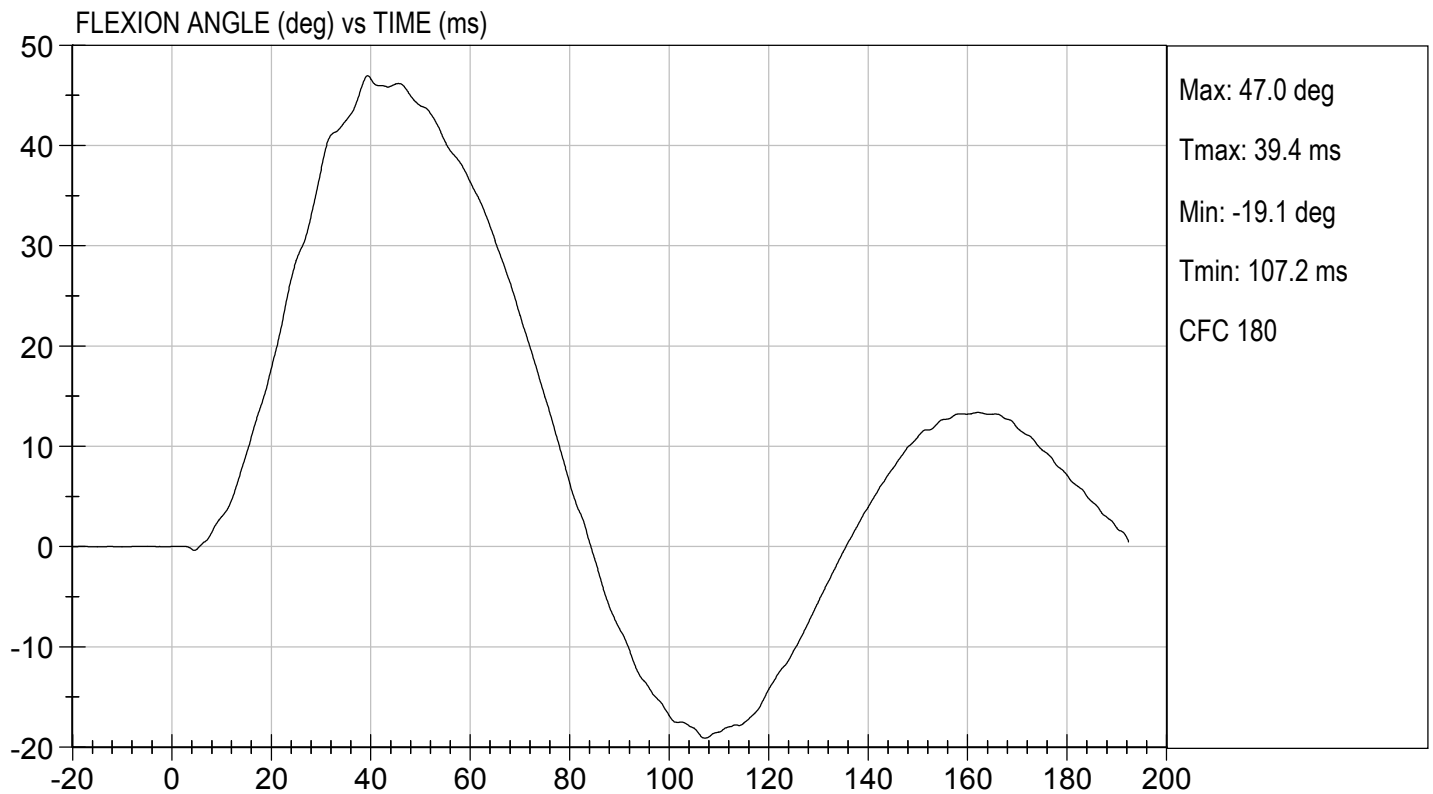
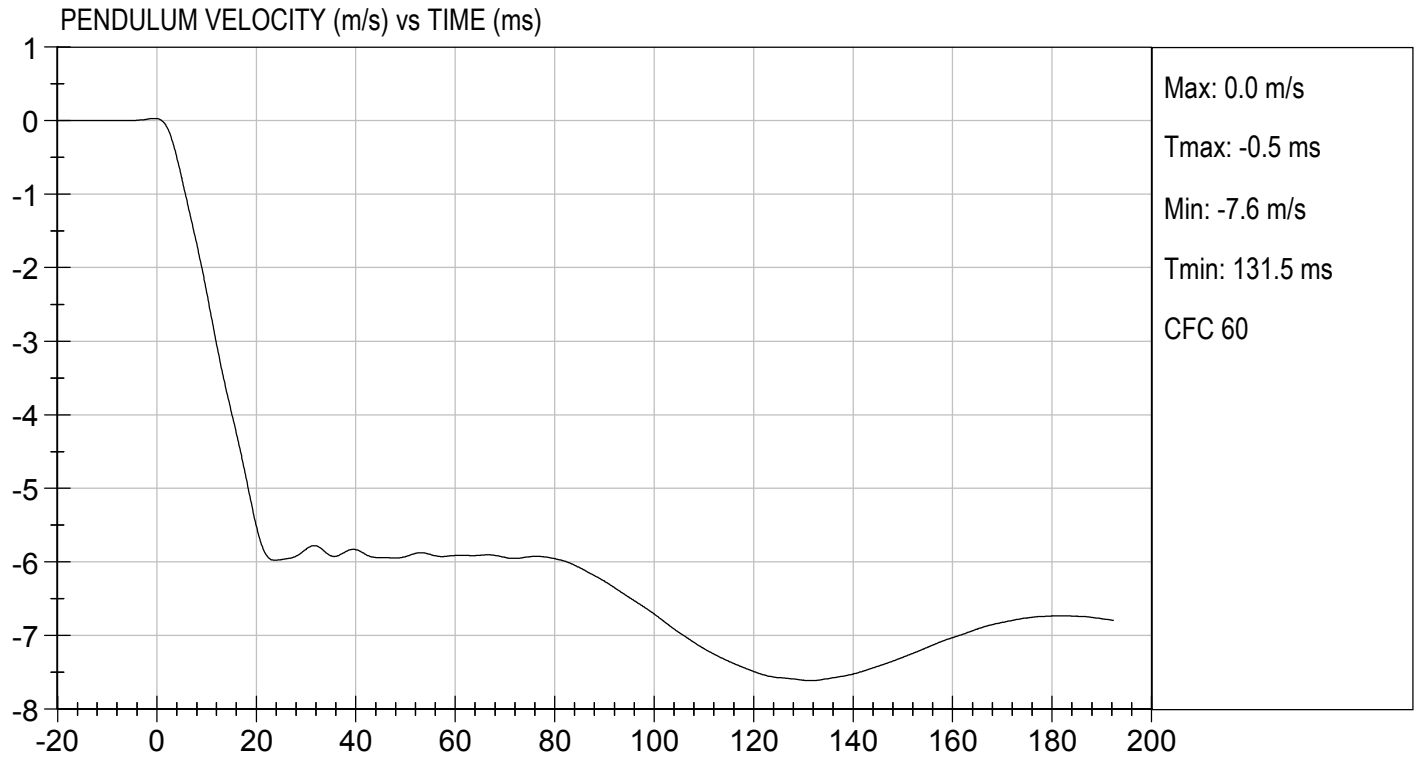
Test I.D: D190158

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.84	Pass
Laboratory Relative Humidity		%	10 to 70	21.5	Pass
Pendulum Speed		m/s	5.95 to 6.15	5.97	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.00	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.419	Pass
	27 ms	m/s	-6.50 to -5.80	-5.95	Pass
	30 ms	m/s	>= -6.50	-5.83	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	47.0	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	39.4	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	45	Pass
Overall Results					Pass


Laboratory Technician

01/10/2019
Test Date

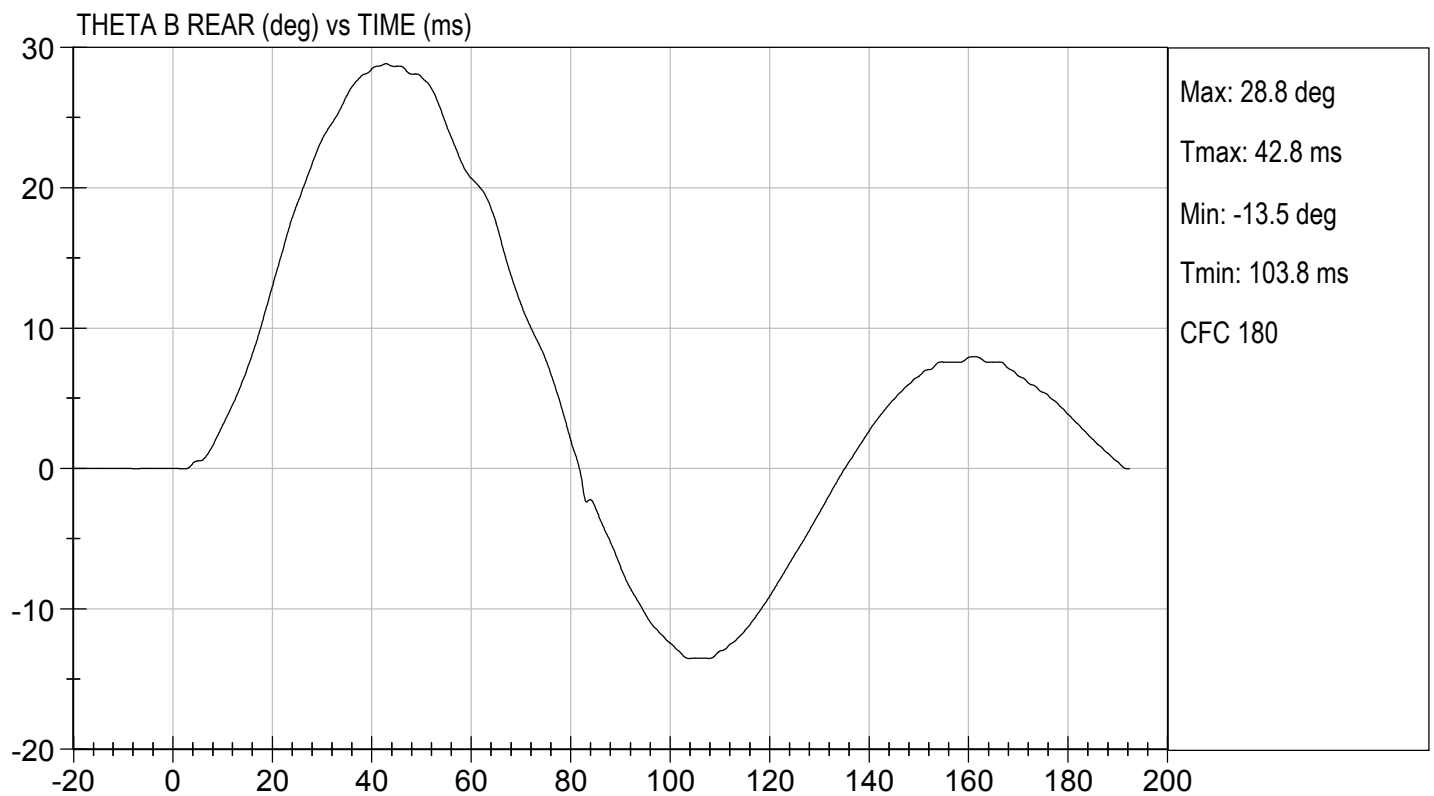
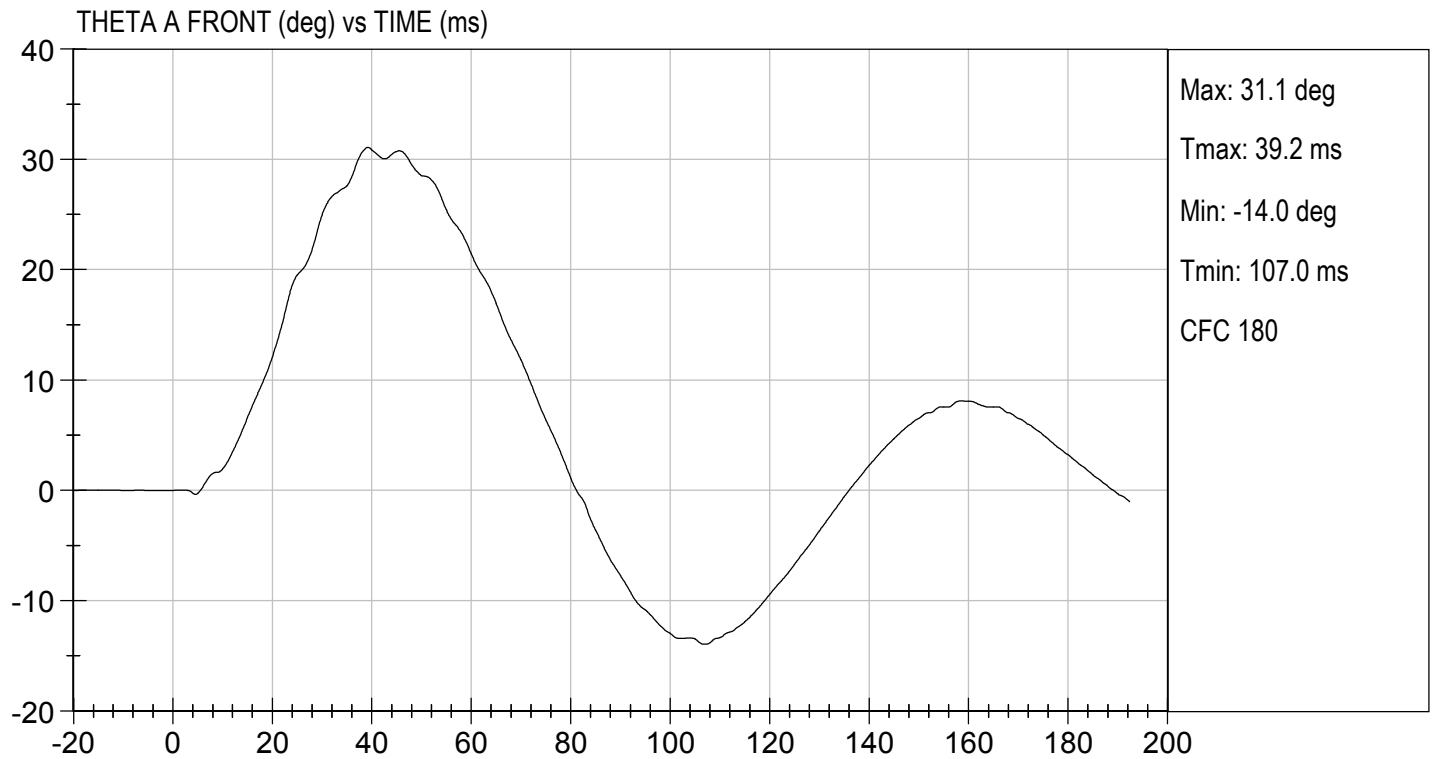

Approved By





TEST DESC: LUMBAR BENDING
VELOCITY: 19.60 ft/s, 5.97 m/s

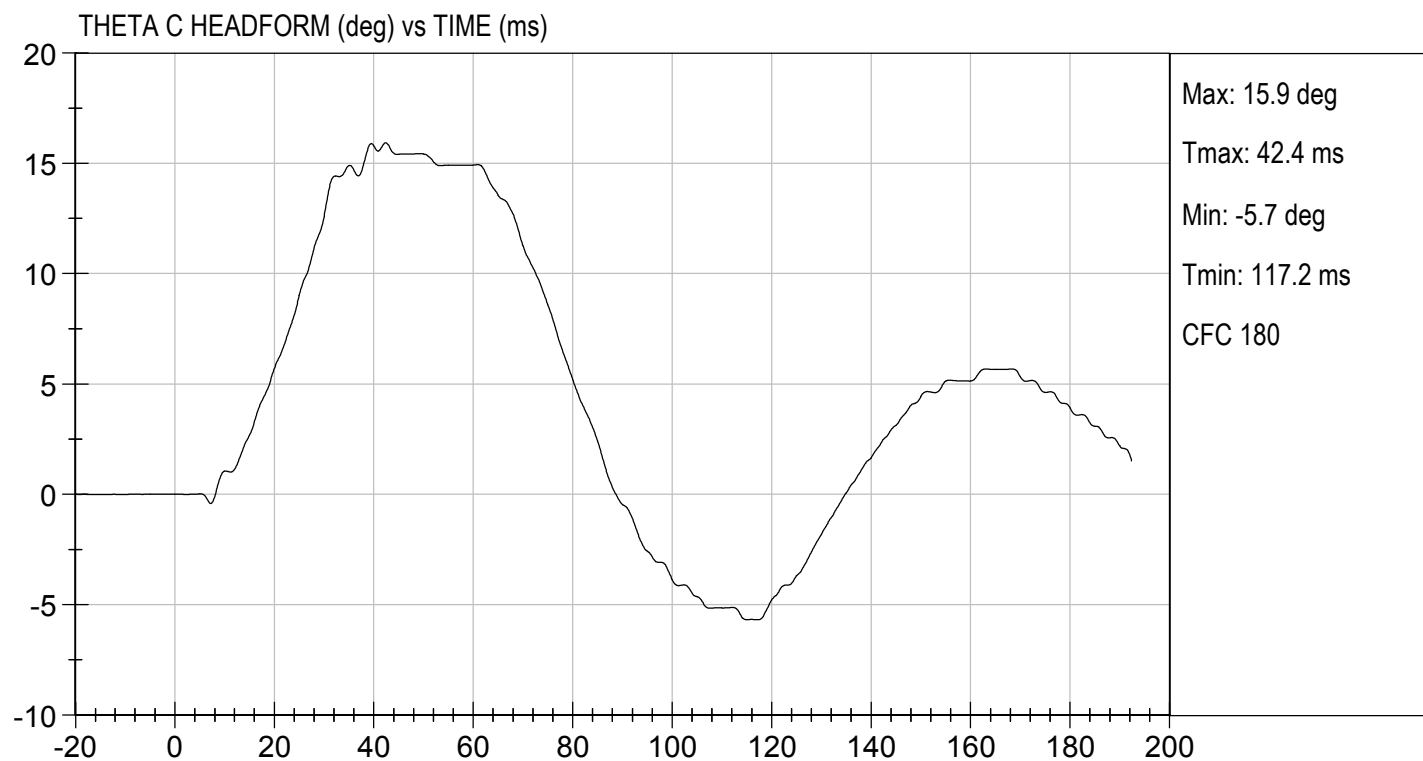
TEST DATE: 01/10/2019
TEST #: D190158





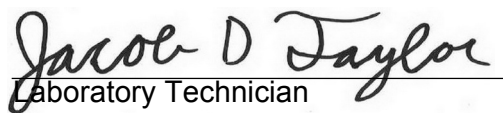
TEST DESC: LUMBAR BENDING
VELOCITY: 19.60 ft/s, 5.97 m/s

TEST DATE: 01/10/2019
TEST #: D190158

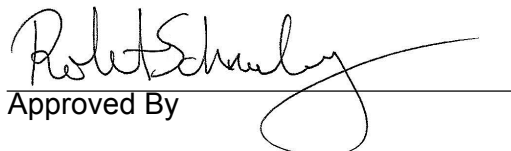


MGA RESEARCH CORPORATION**PELVIS TEST
ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D190159

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	N	4700 to 5400	5241	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	12.1	Pass
Maximum Pubic Force	N	1230 to 1590	1360	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.1	Pass
Overall Test Results				Pass


Laboratory Technician

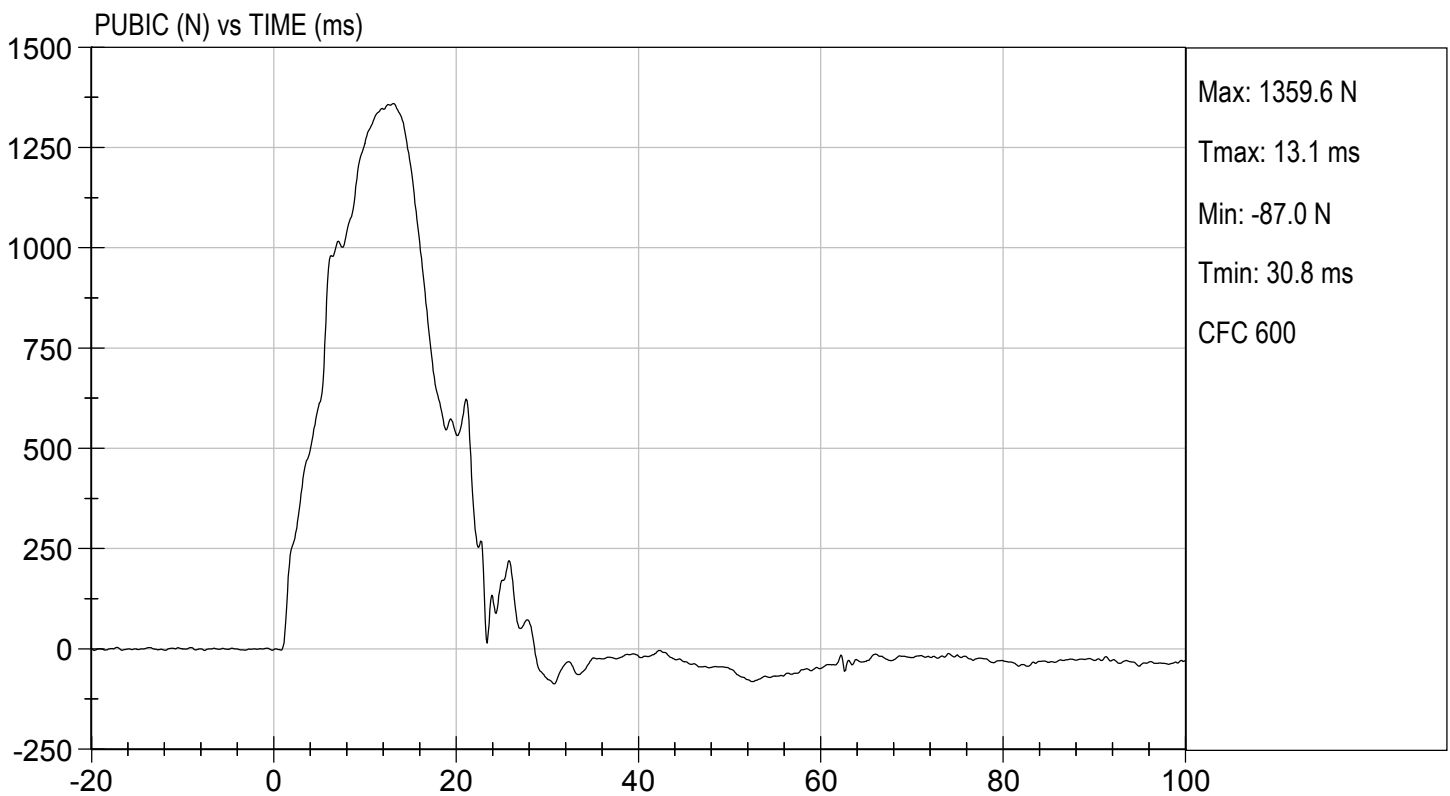
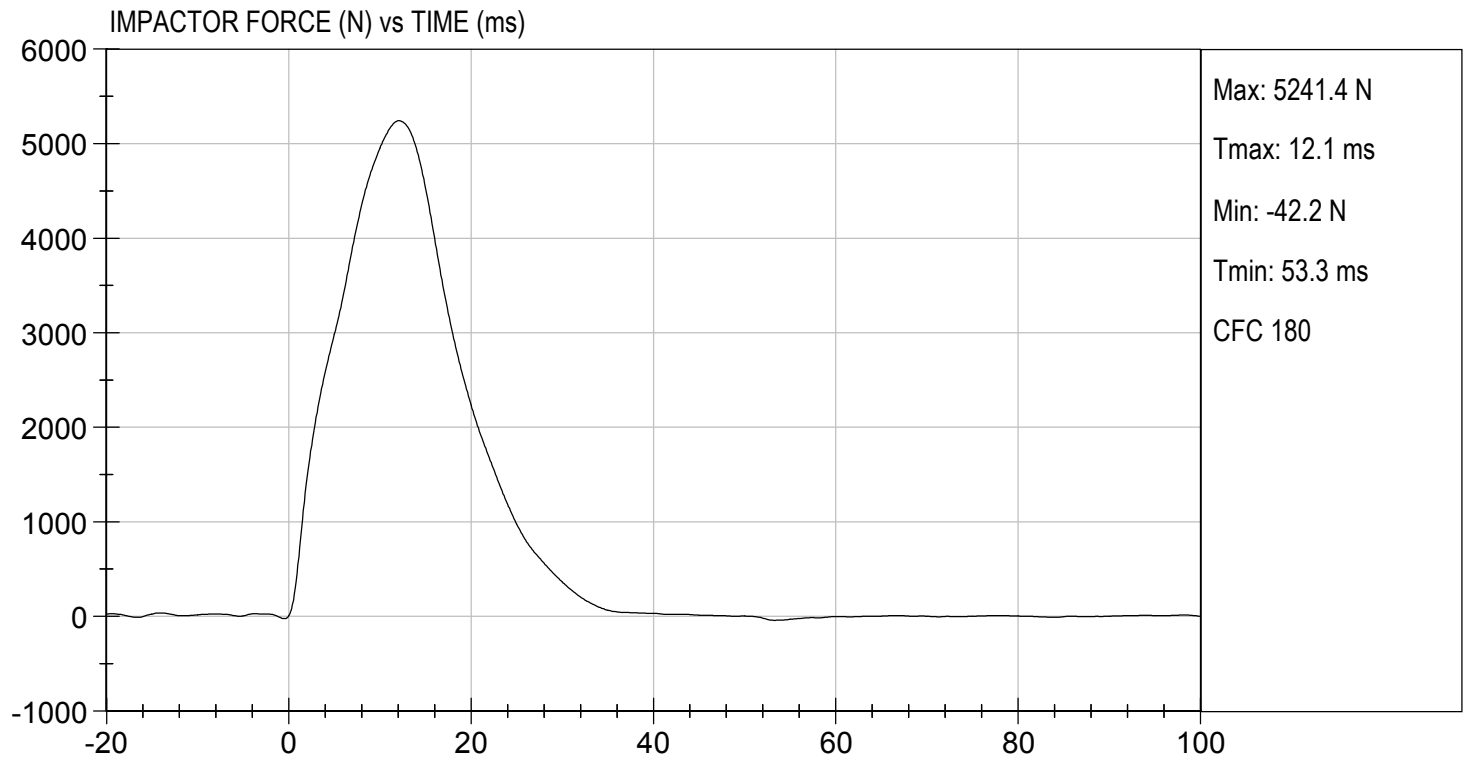
01/11/2019
Test Date


Approved By



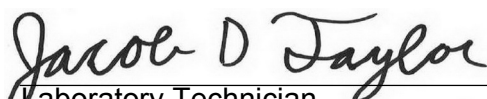
TEST DESC: PELVIS IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/11/2019
TEST #: D190159



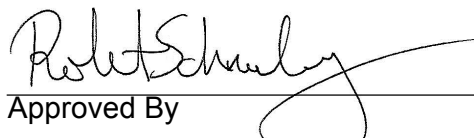
MGA RESEARCH CORPORATION**THORAX IMPACT TEST****ES-2re DUMMY****ATD Serial No:** 032**Test I.D:** D190150

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	25	Pass
Probe Speed	m/s	5.40 to 5.60	5.52	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5510	Pass
Upper Rib Displacement	mm	34.0 to 41.0	39.3	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.5	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.8	Pass
Overall Test Results				Pass


Laboratory Technician

01/11/2019

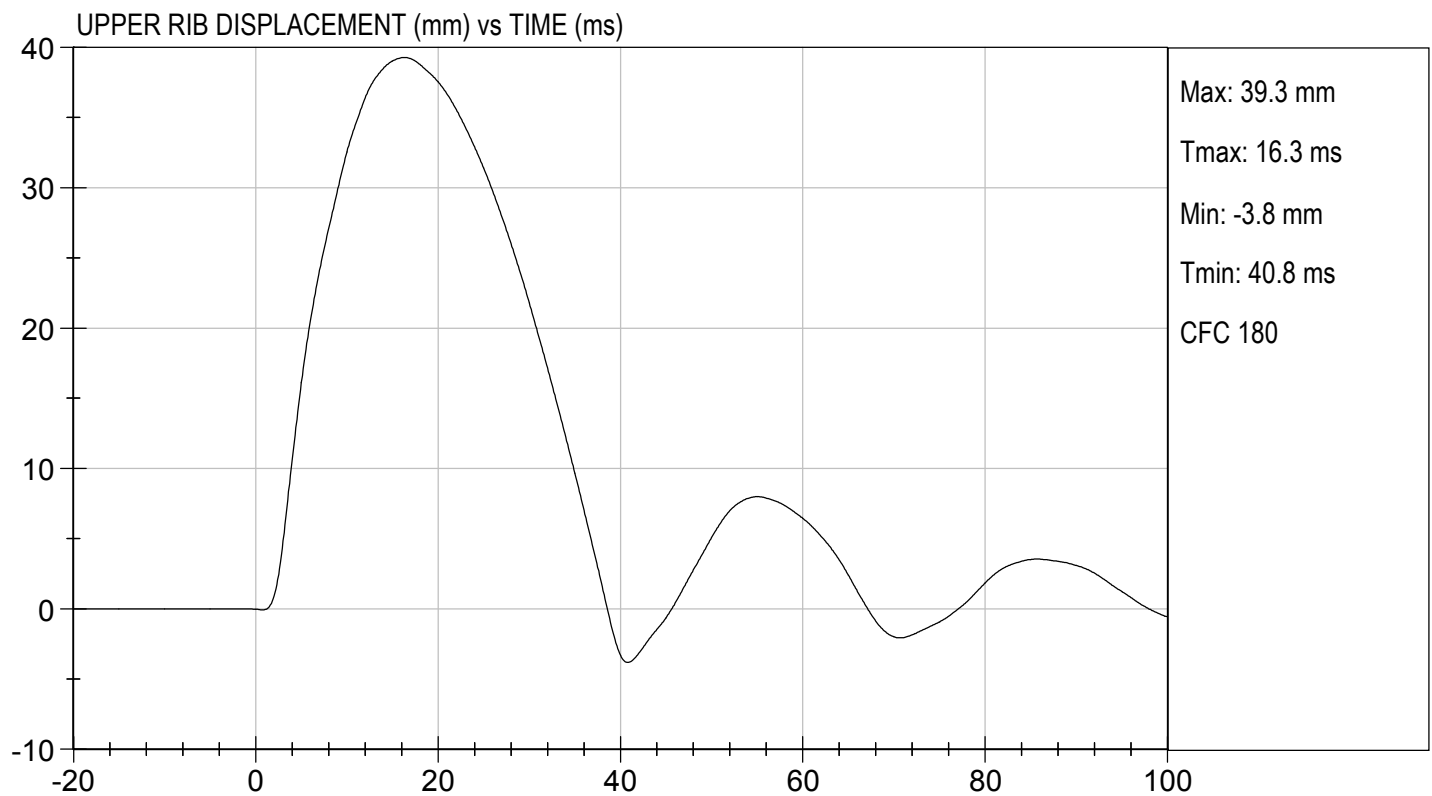
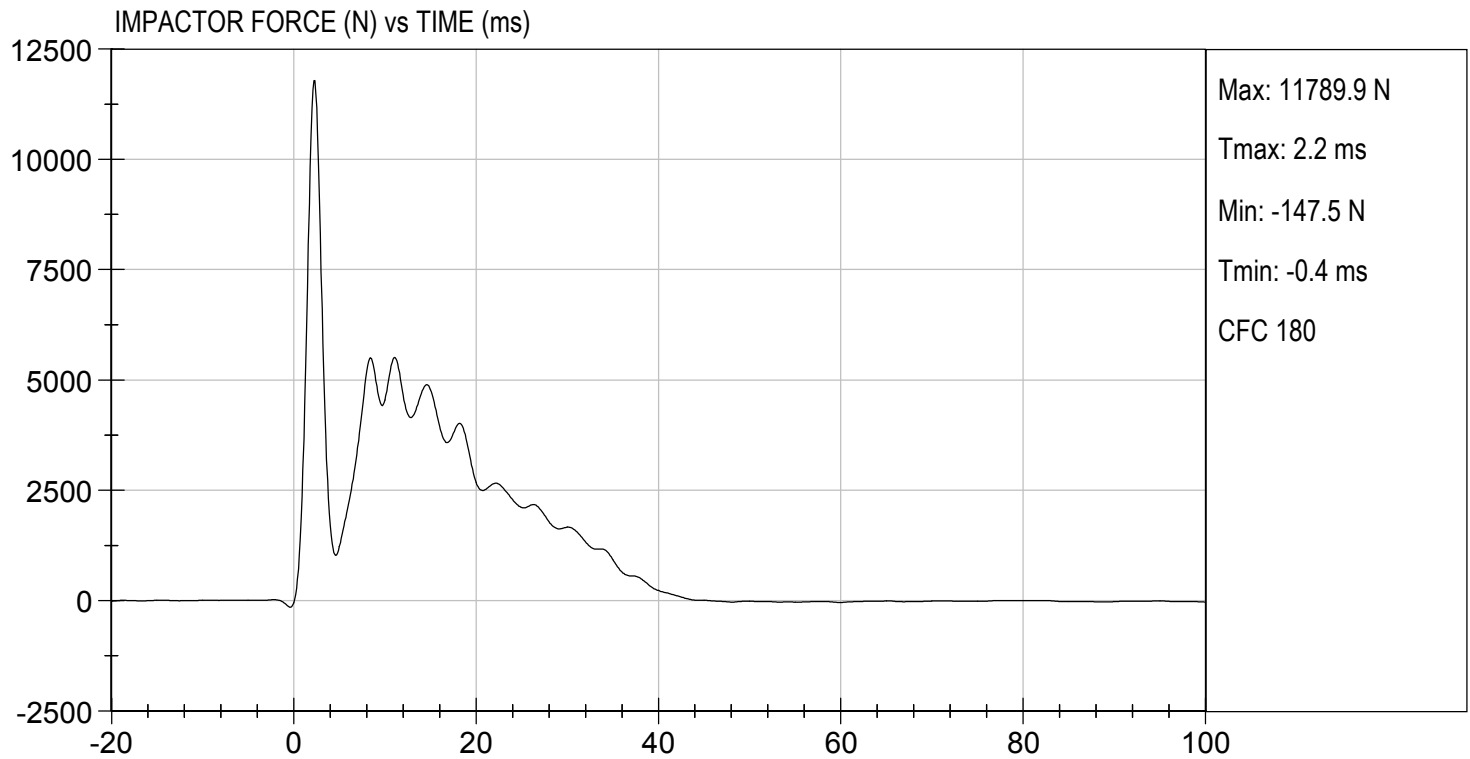
Test Date


Approved By



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

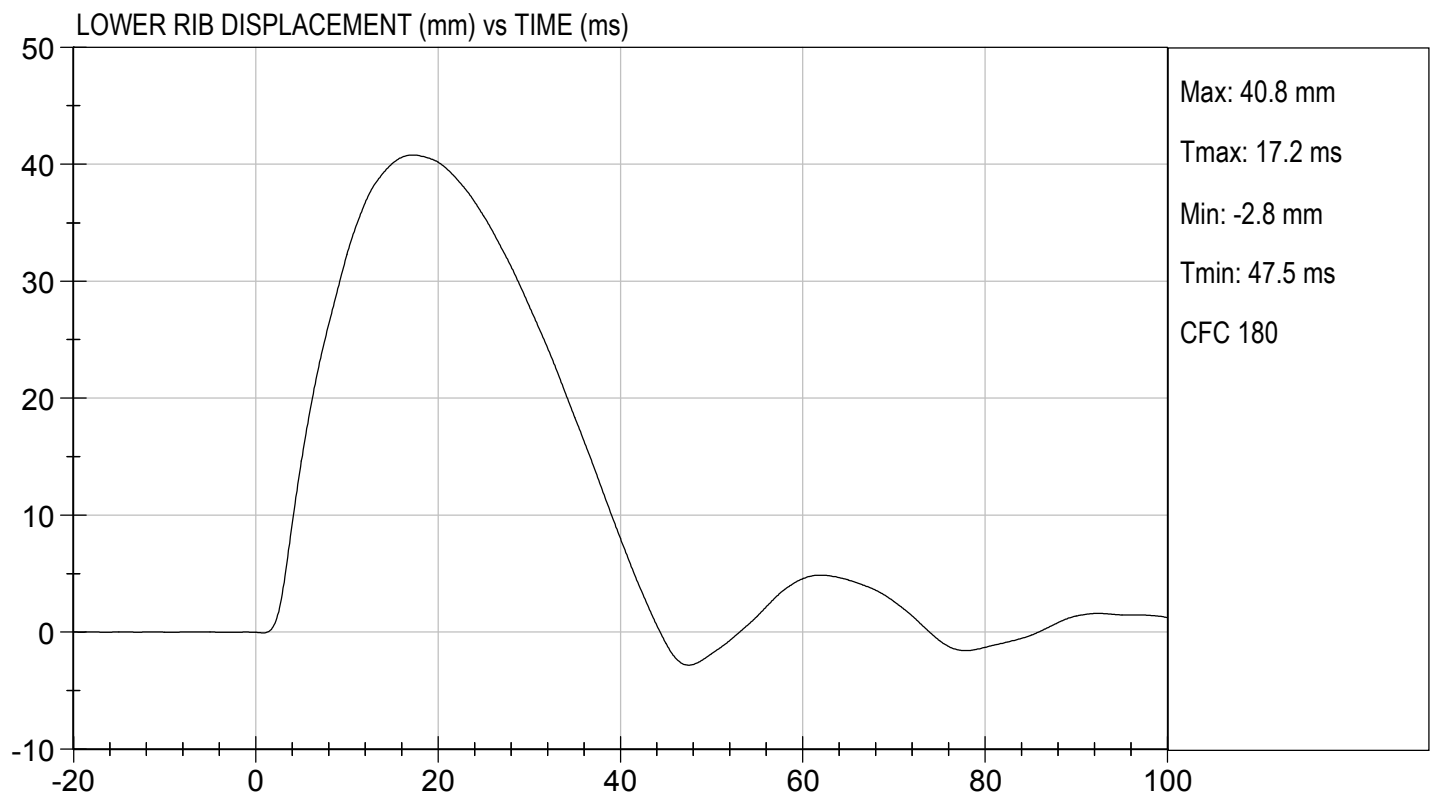
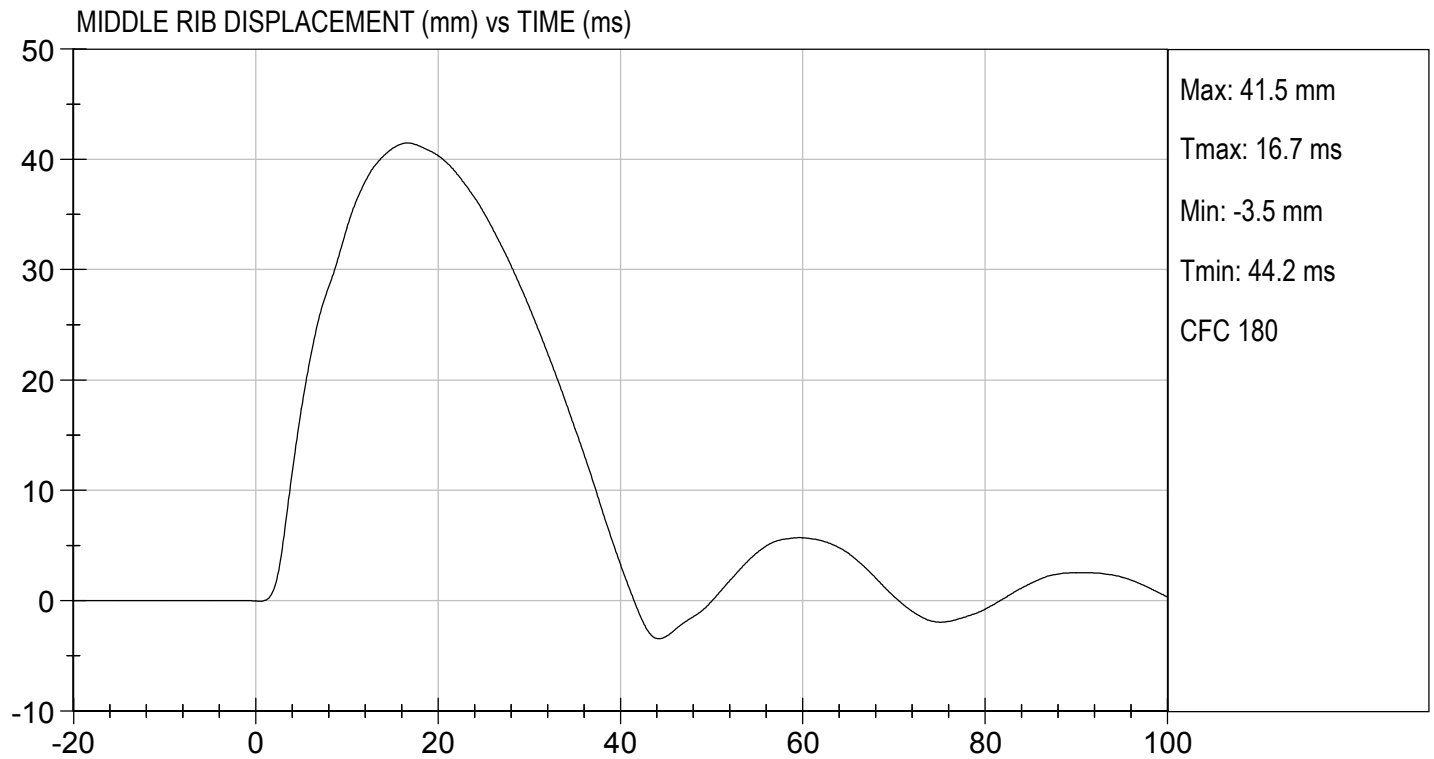
TEST DATE: 01/11/2019
TEST #: D190150





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

TEST DATE: 01/11/2019
TEST #: D190150



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

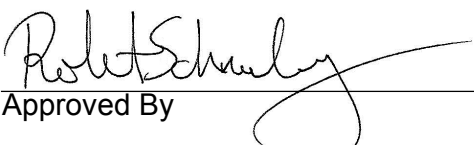
ATD Serial No: 032

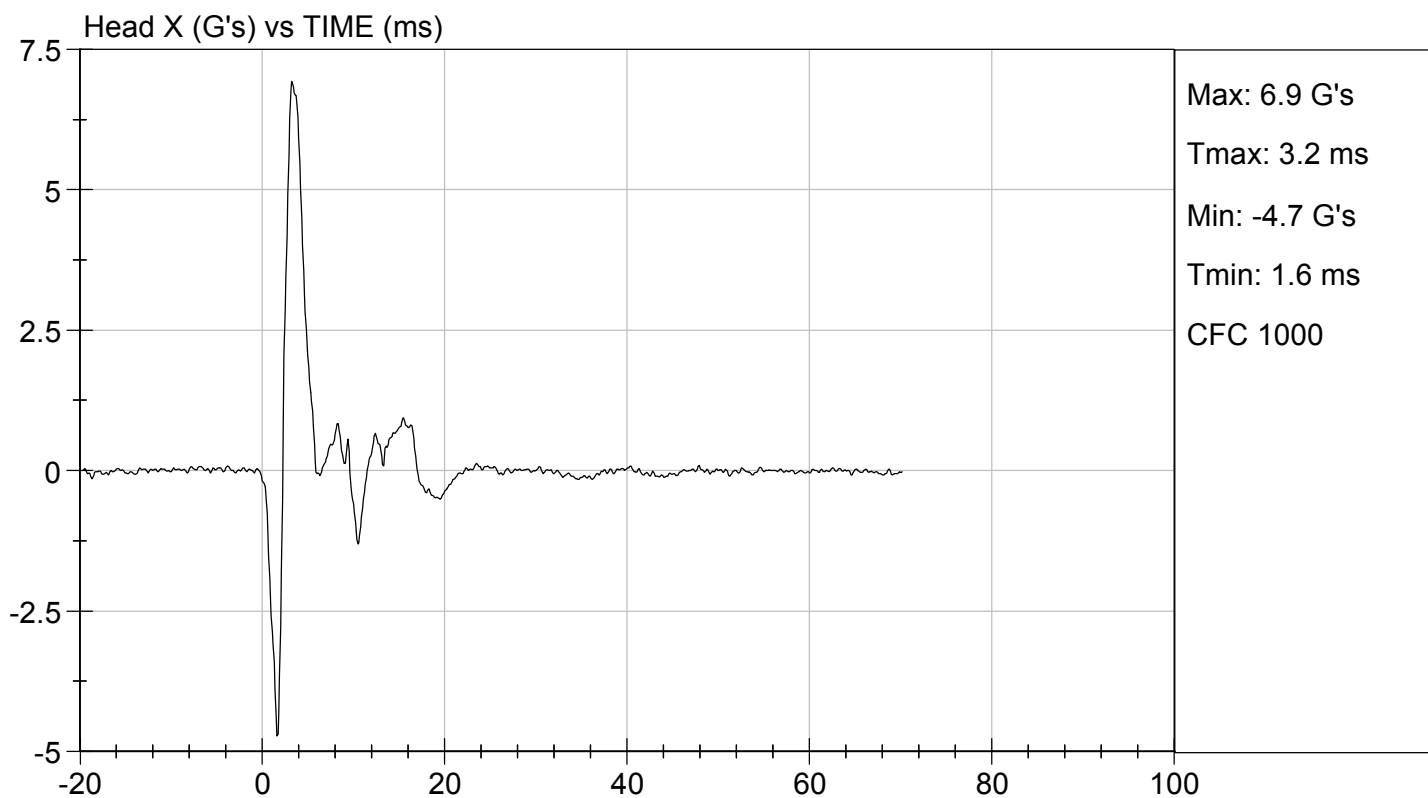
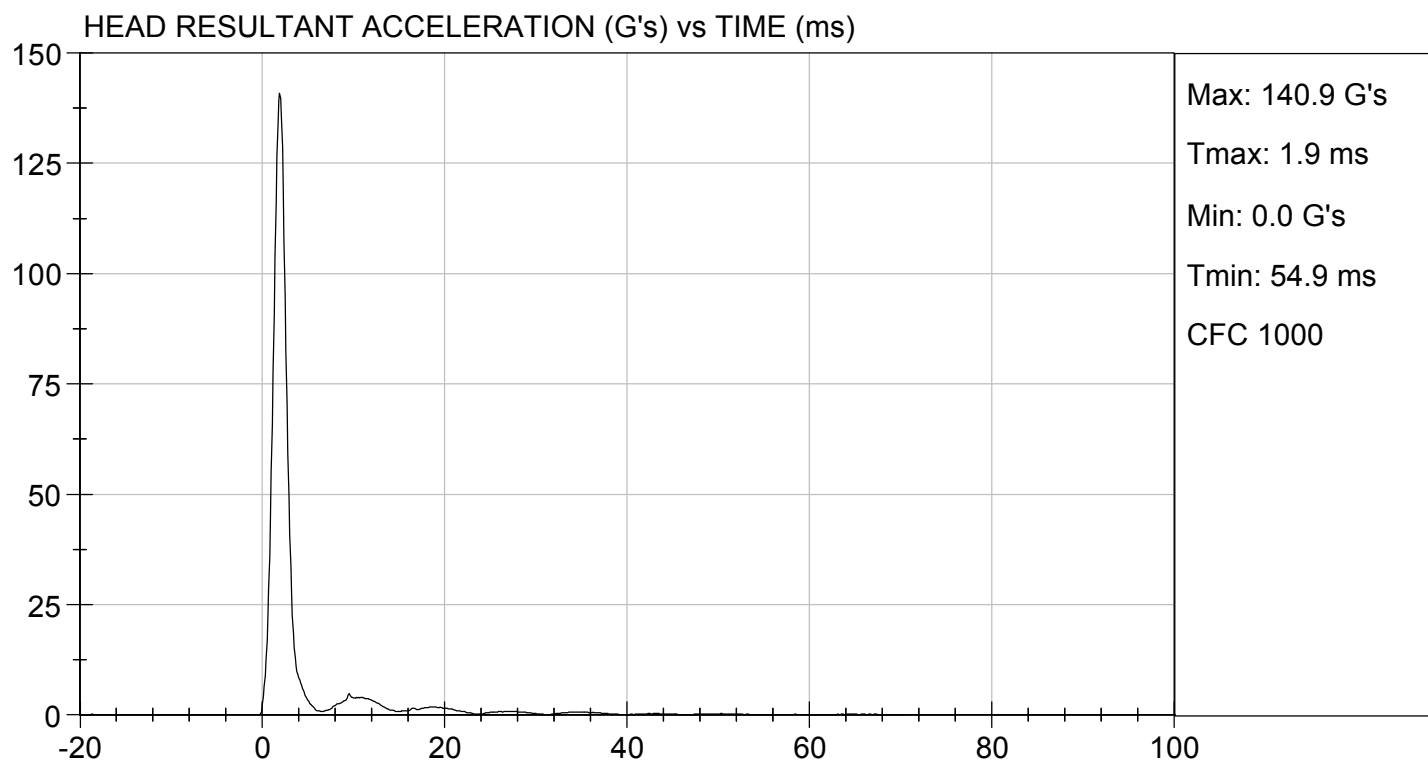
Test ID: D190261

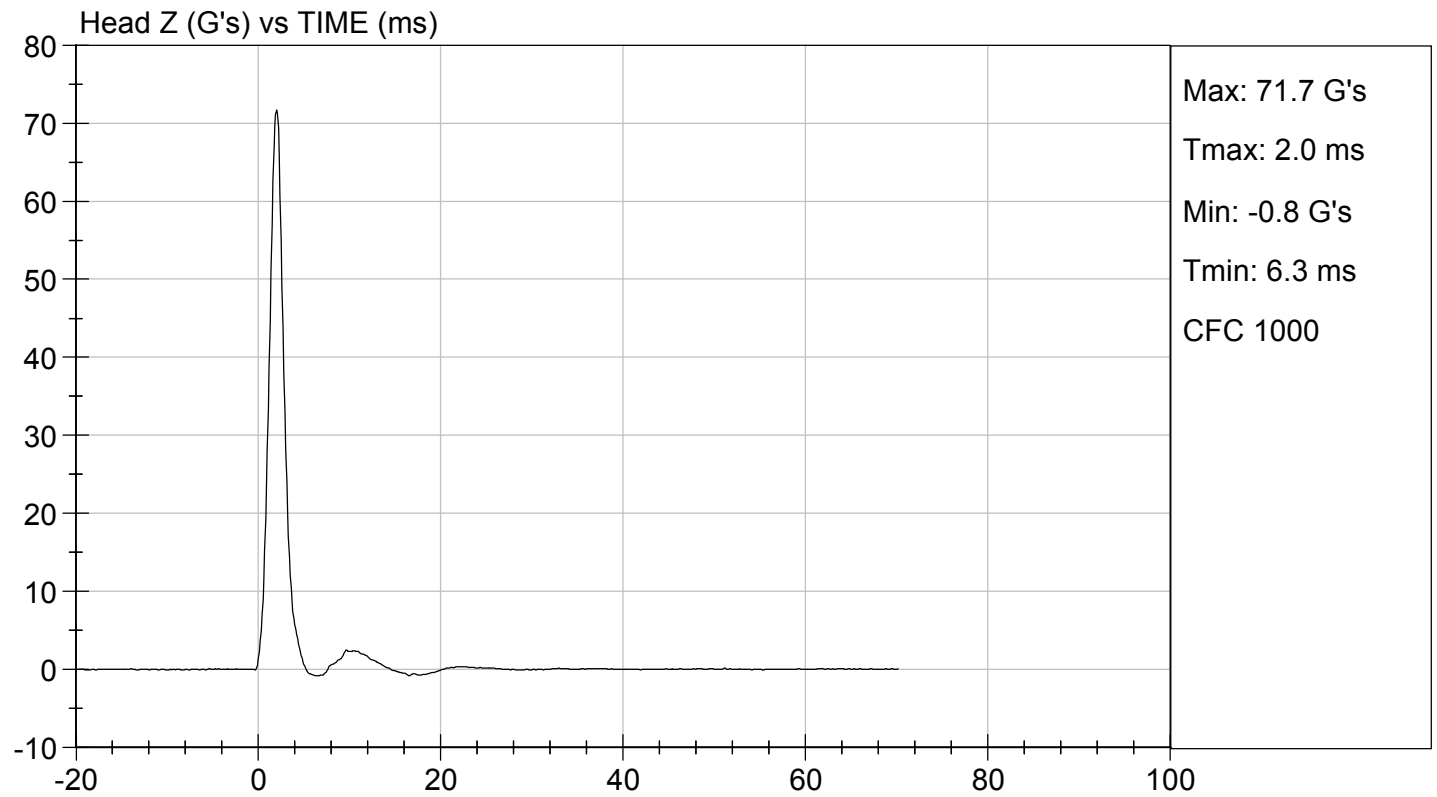
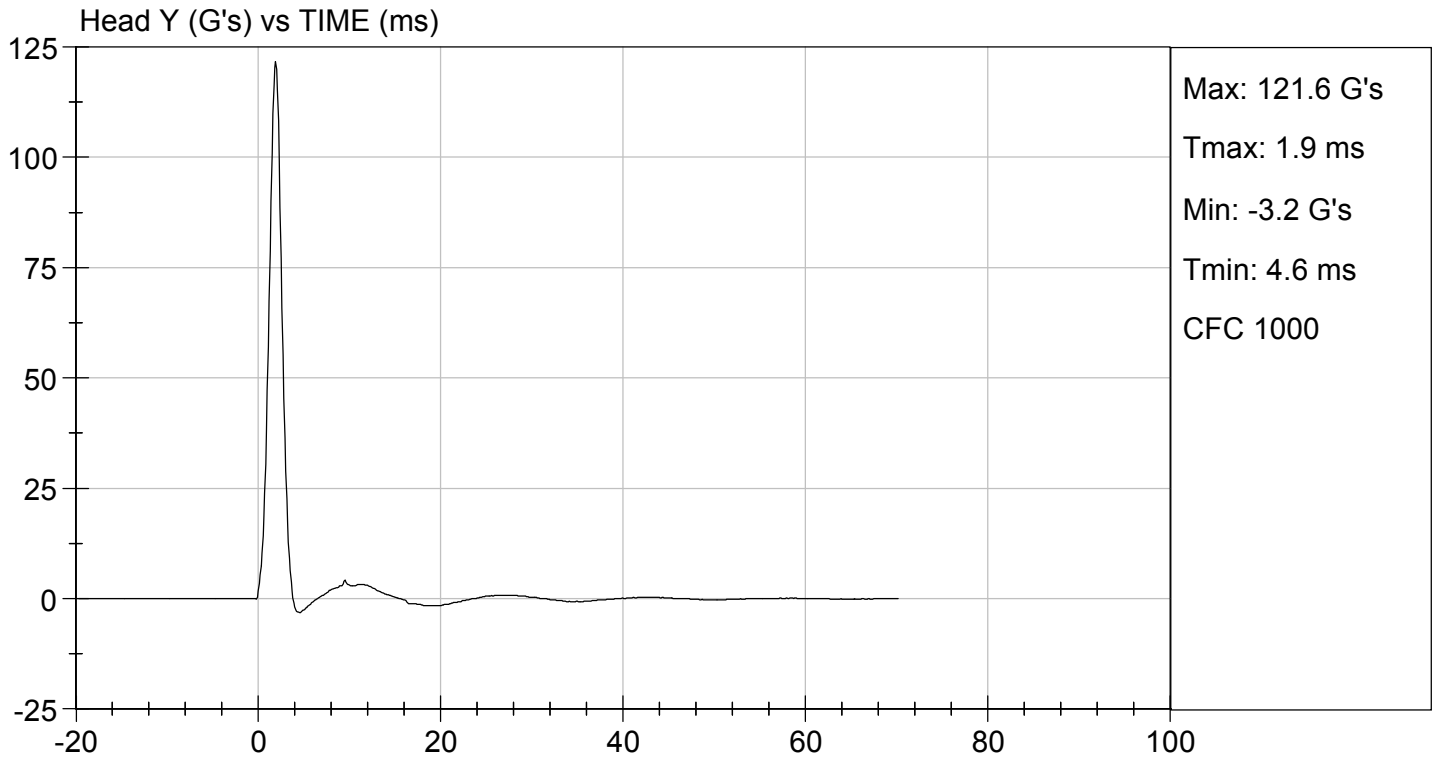
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	125 to 155	141	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	6.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
			Overall Test Results	Pass


Laboratory Technician

01/18/2019
Test Date


Approved By





MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

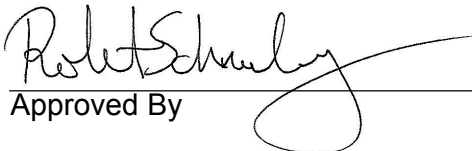
ATD Serial No: 032

Test I.D: D190262

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.50	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.58	Pass
	17 ms	m/s	>= -3.70	-3.39	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	49.1	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	56.5	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	60.3	Pass
Overall Results					Pass


Laboratory Technician

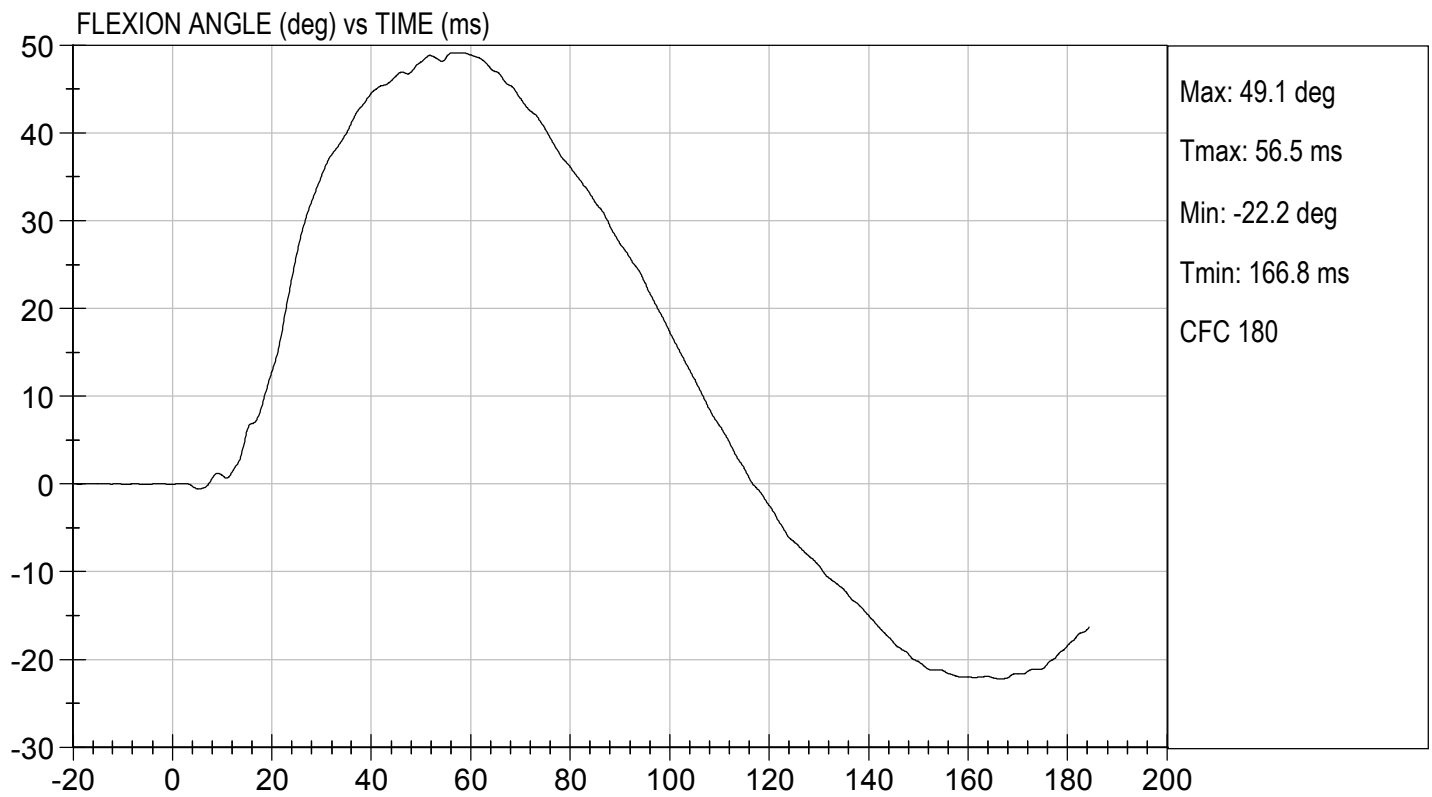
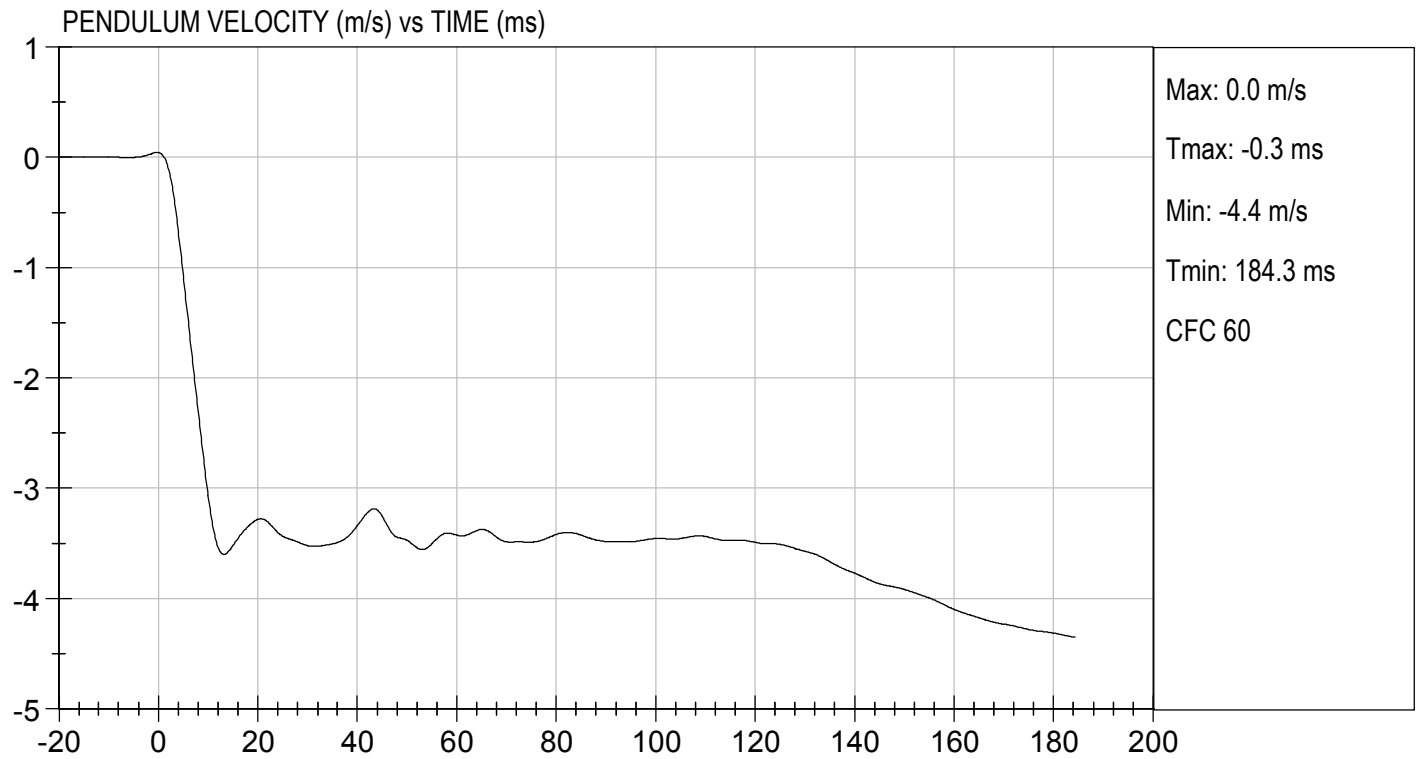
01/18/2019
Test Date


Approved By



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

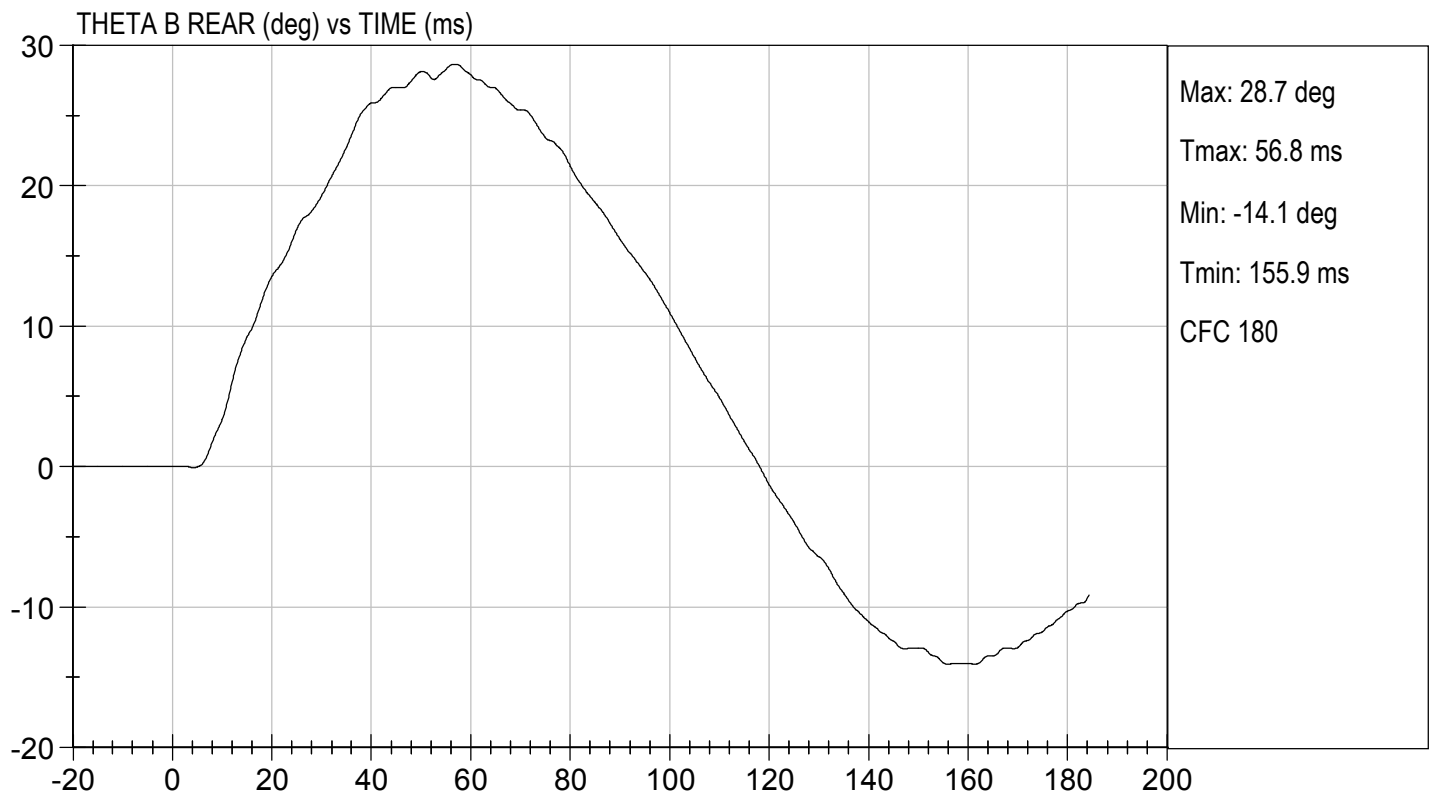
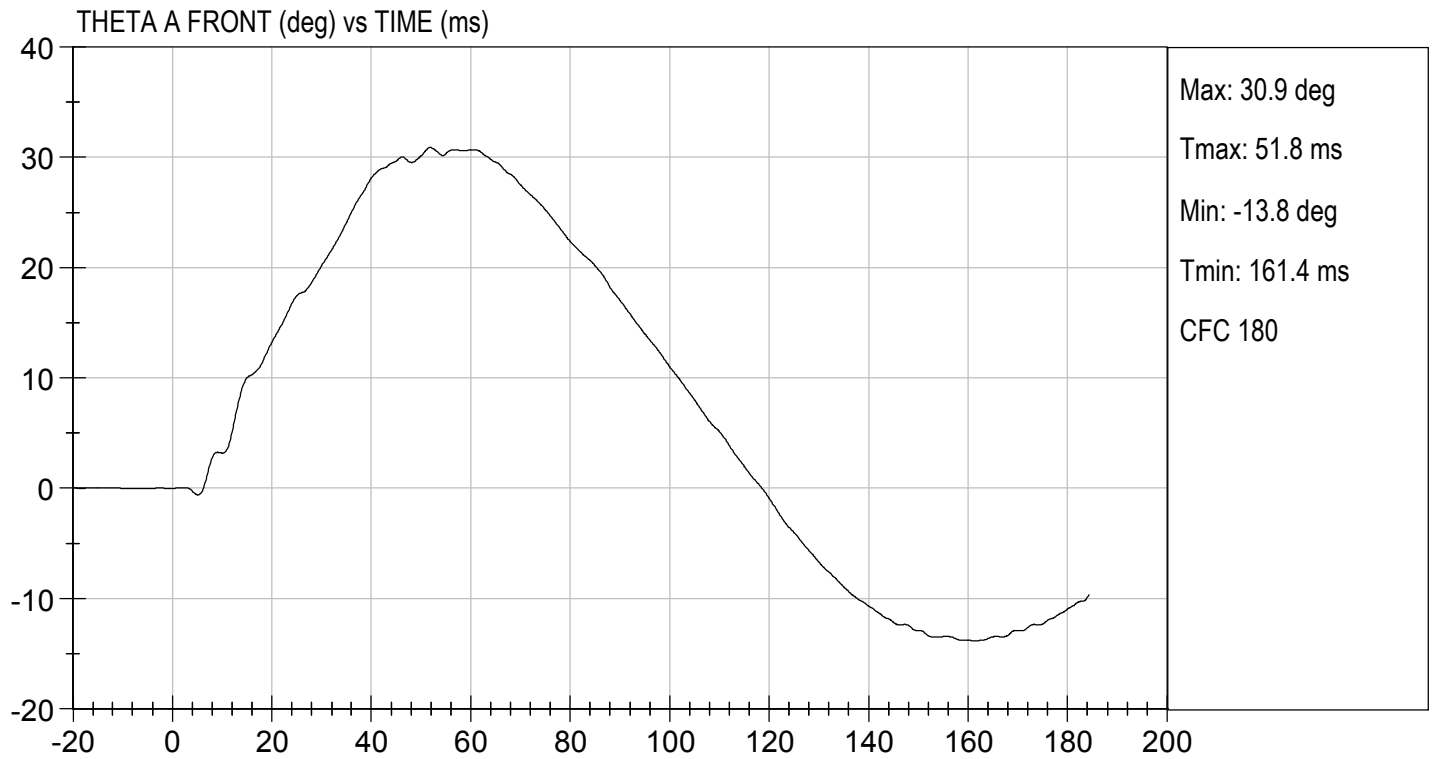
TEST DATE: 01/18/2019
TEST #: D190262





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

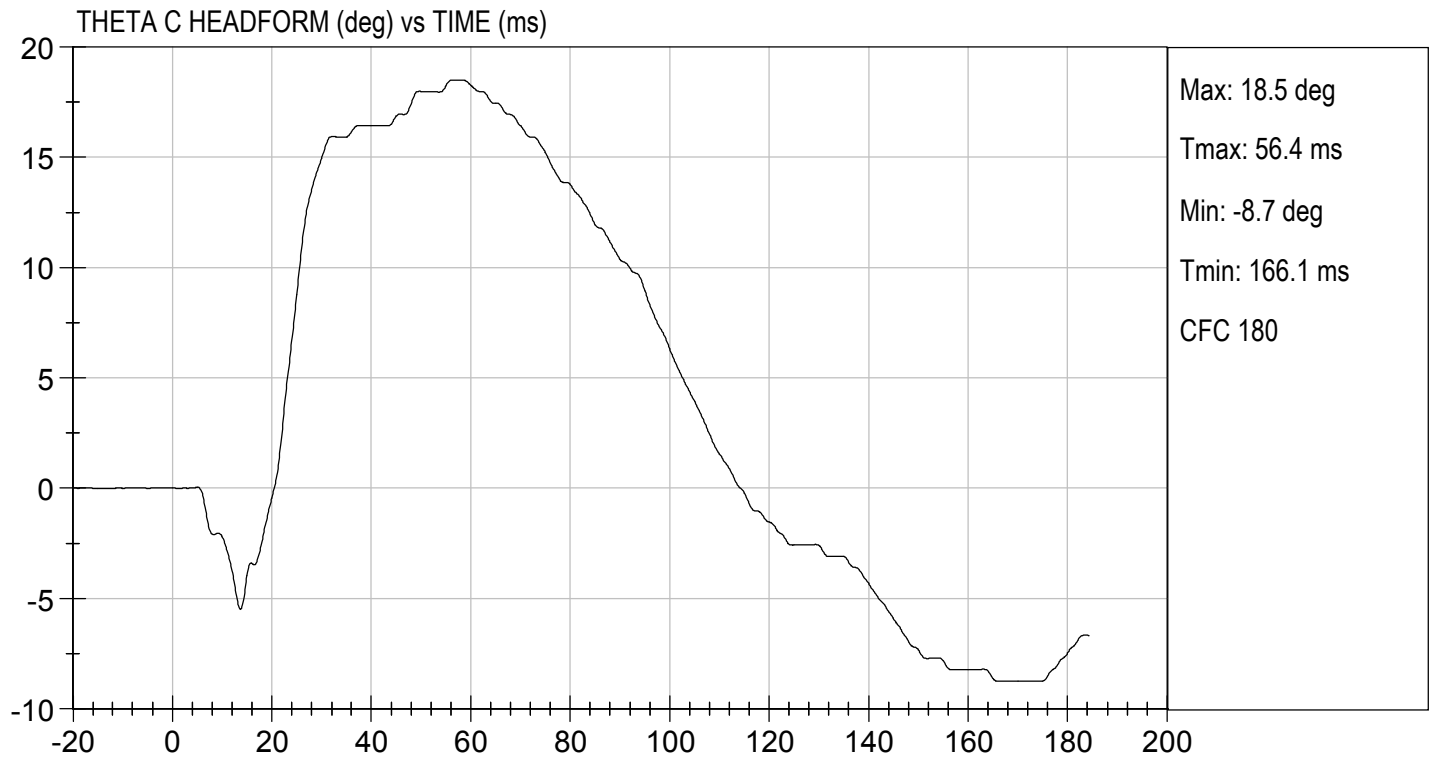
TEST DATE: 01/18/2019
TEST #: D190262





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

TEST DATE: 01/18/2019
TEST #: D190262



MGA RESEARCH CORPORATION

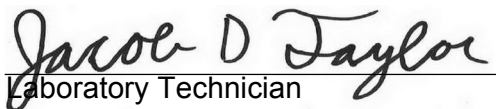
SHOULDER IMPACT TEST

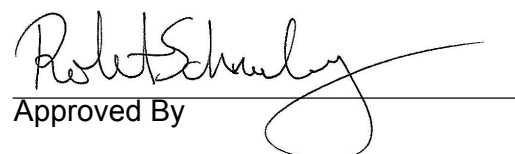
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D190263

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	7.8	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

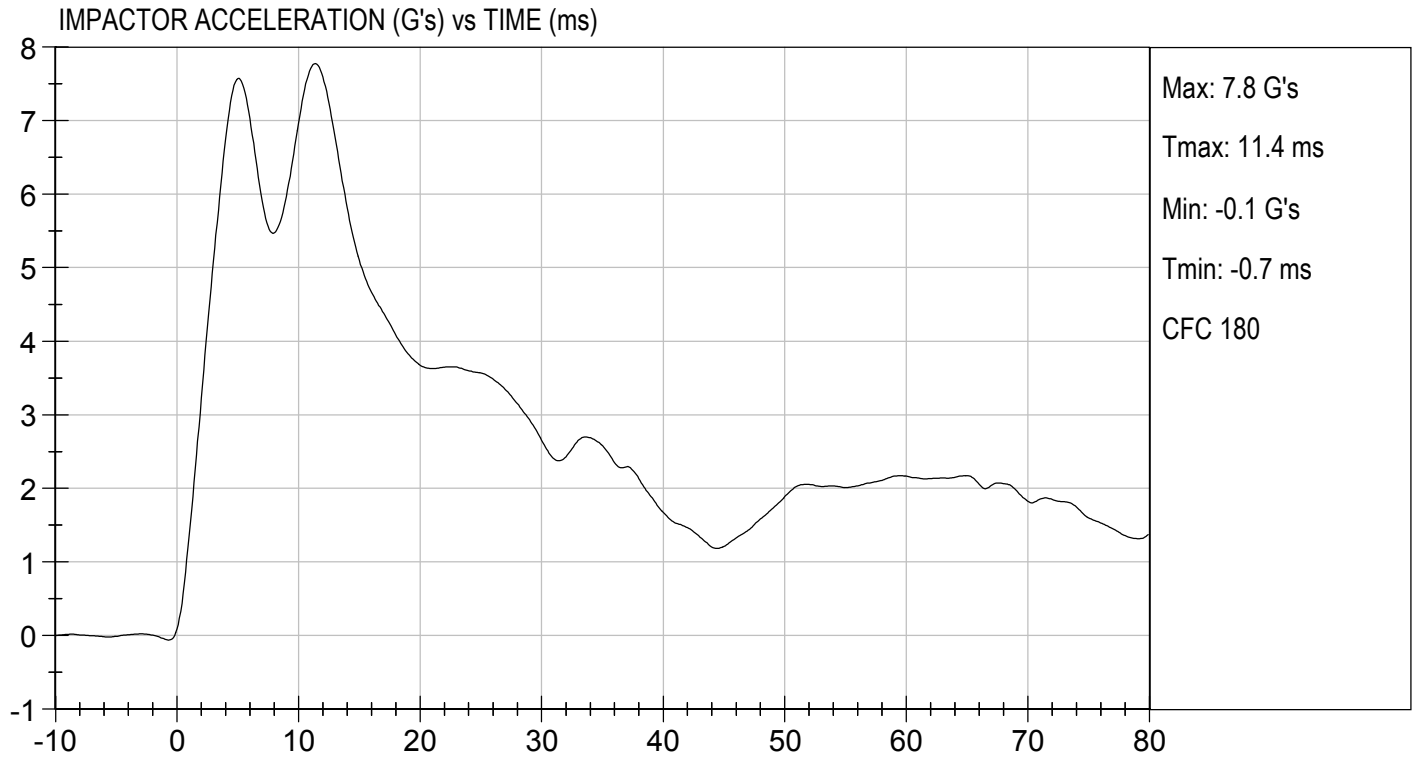
01/22/2019

Test Date



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

TEST DATE: 01/22/2019
TEST #: D190263



MGA RESEARCH CORPORATION

UPPER RIB TEST

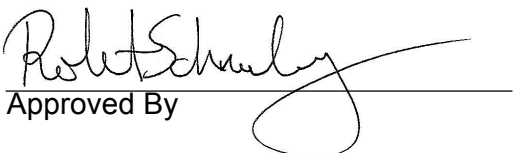
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D190264

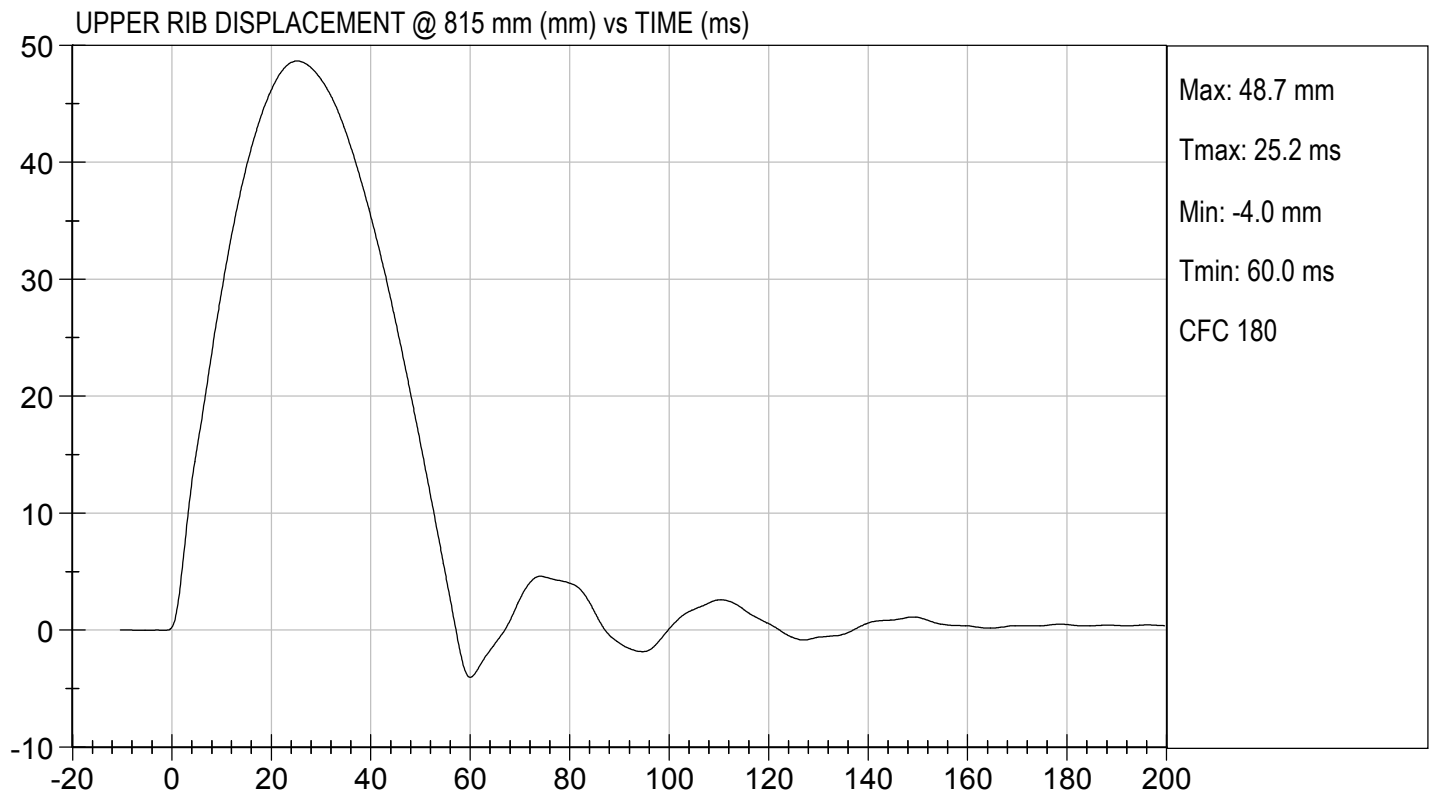
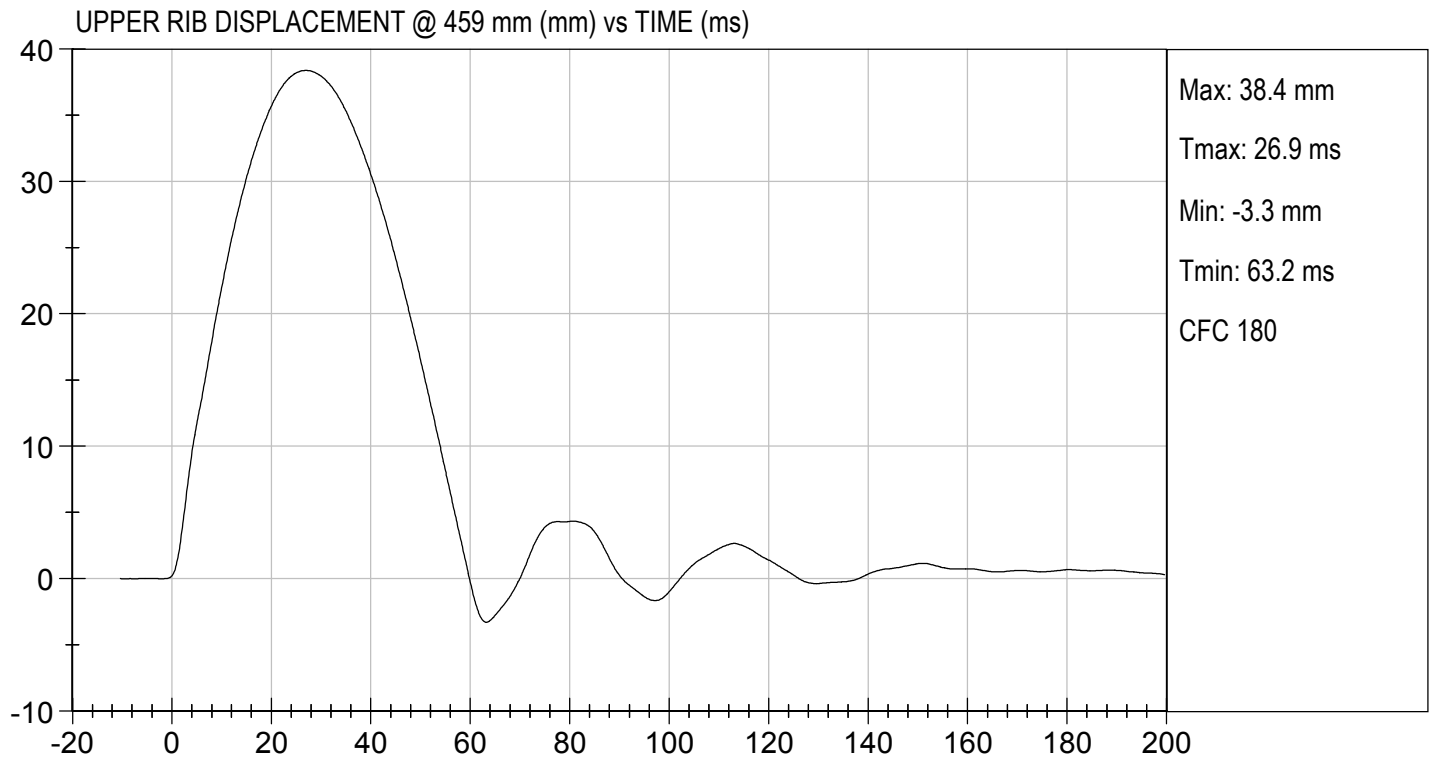
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.7	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

01/18/2019

Test Date



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

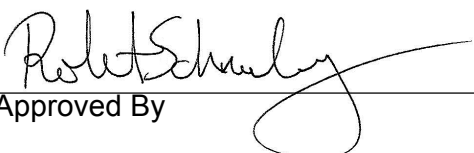
ATD Serial No: 032

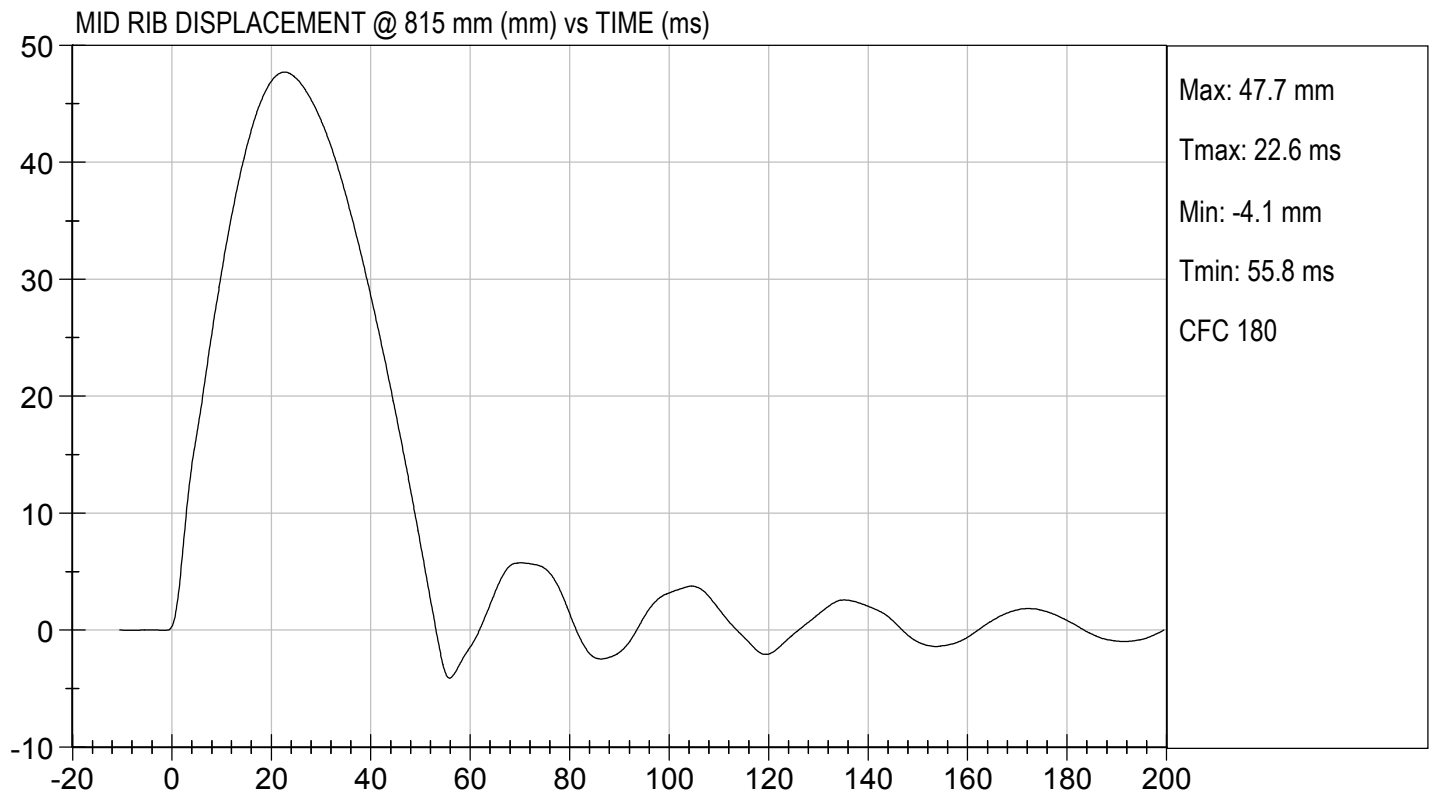
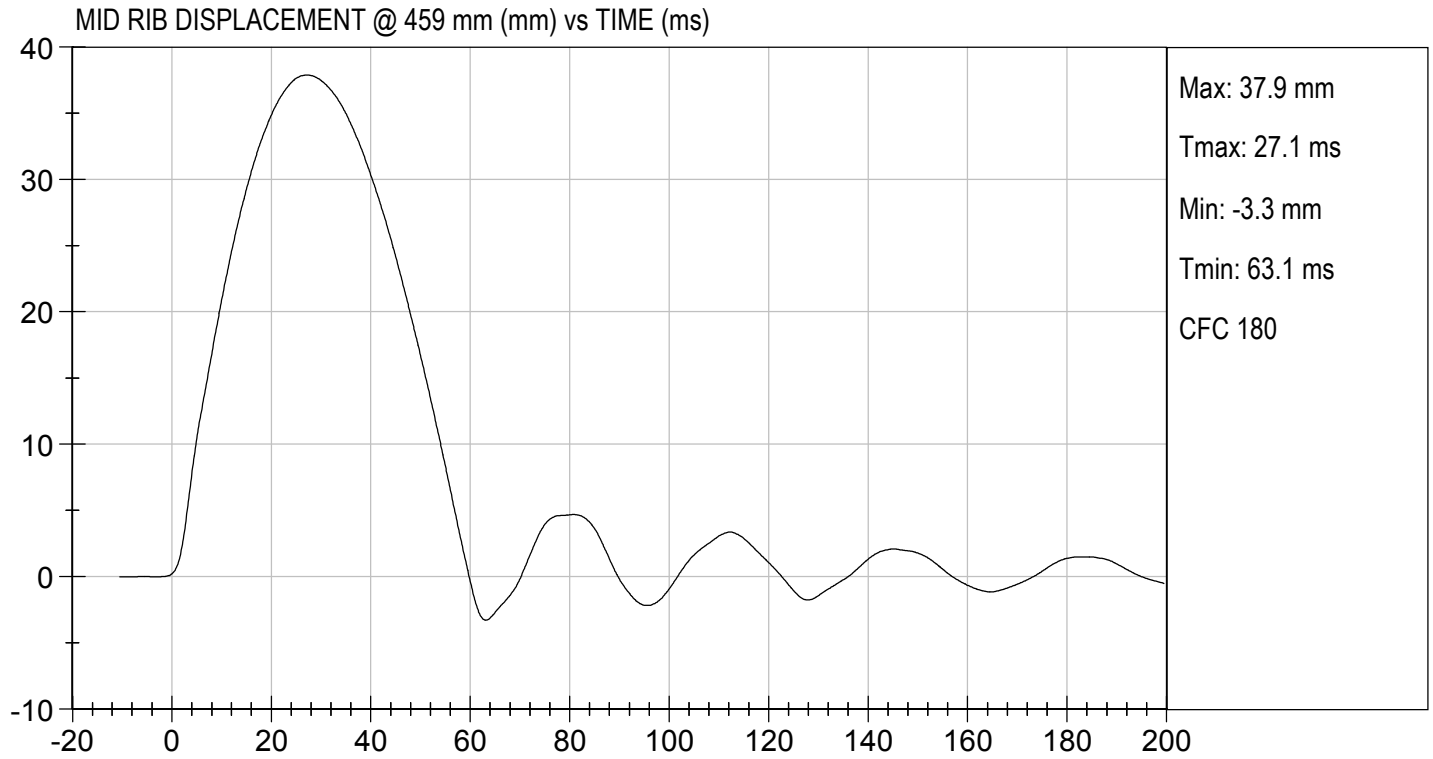
Test I.D: D190265

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	21	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.9	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.7	Pass
Overall Test Results				Pass


Laboratory Technician

01/18/2019
Test Date


Approved By



MGA RESEARCH CORPORATION

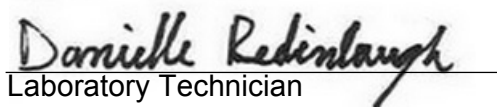
LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

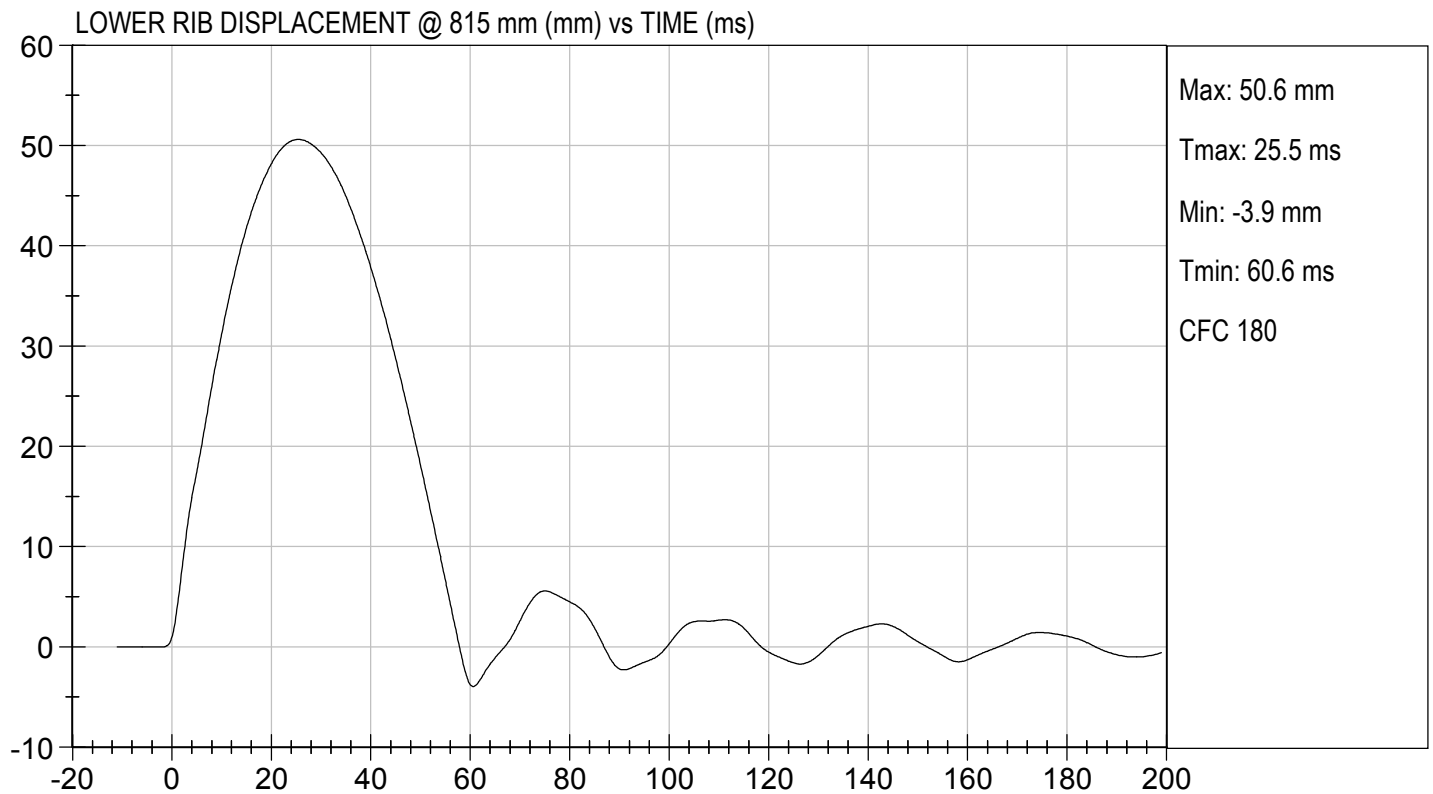
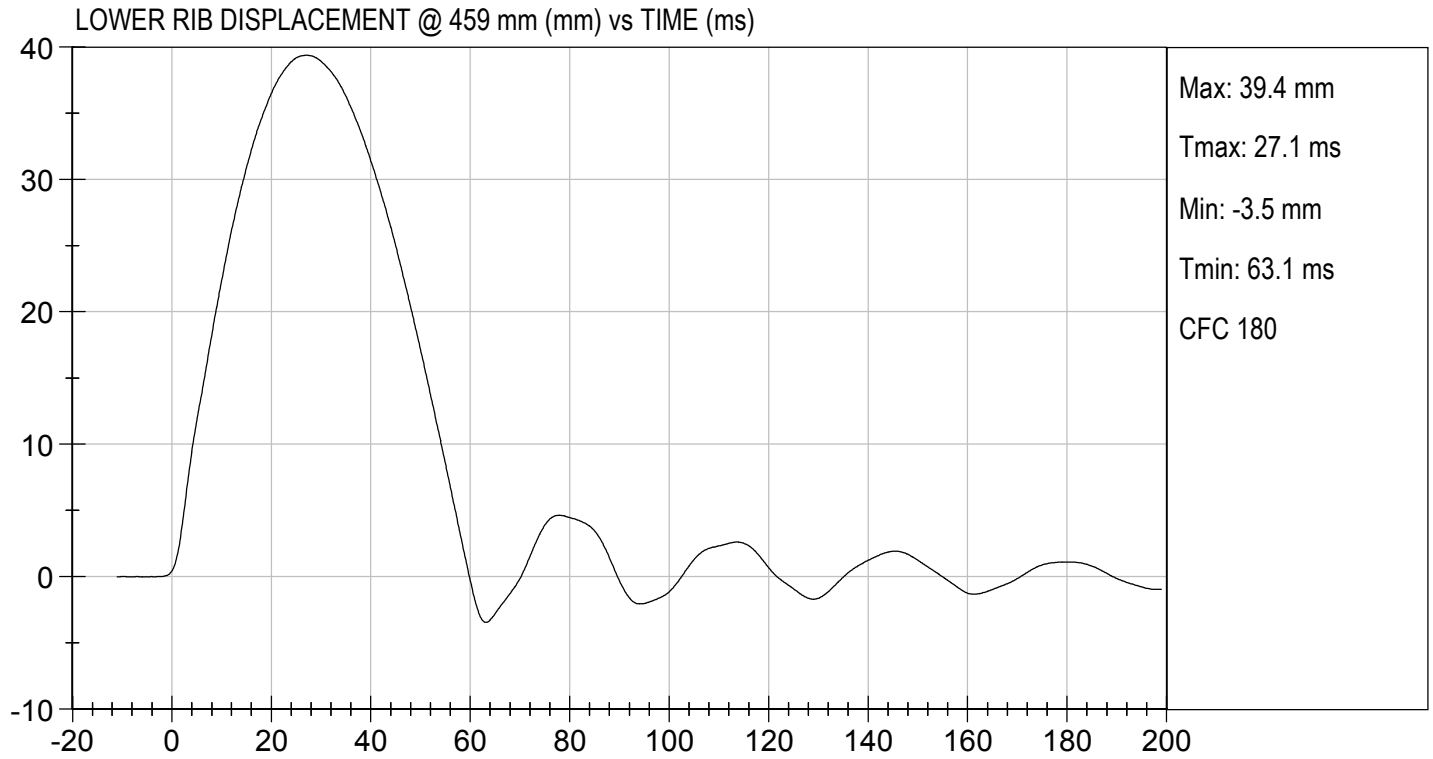
Test I.D: D190266

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	50.6	Pass
Overall Test Results				Pass


Laboratory Technician

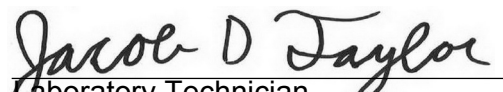
01/22/2019
Test Date

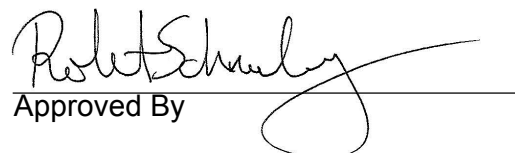

Approved By



MGA RESEARCH CORPORATION**ABDOMEN TEST****ES-2re DUMMY**ATD Serial No: 032Test I.D: D190267

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impactor Force	N	4000 to 4800	4251	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	10.9	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2374	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	10.7	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

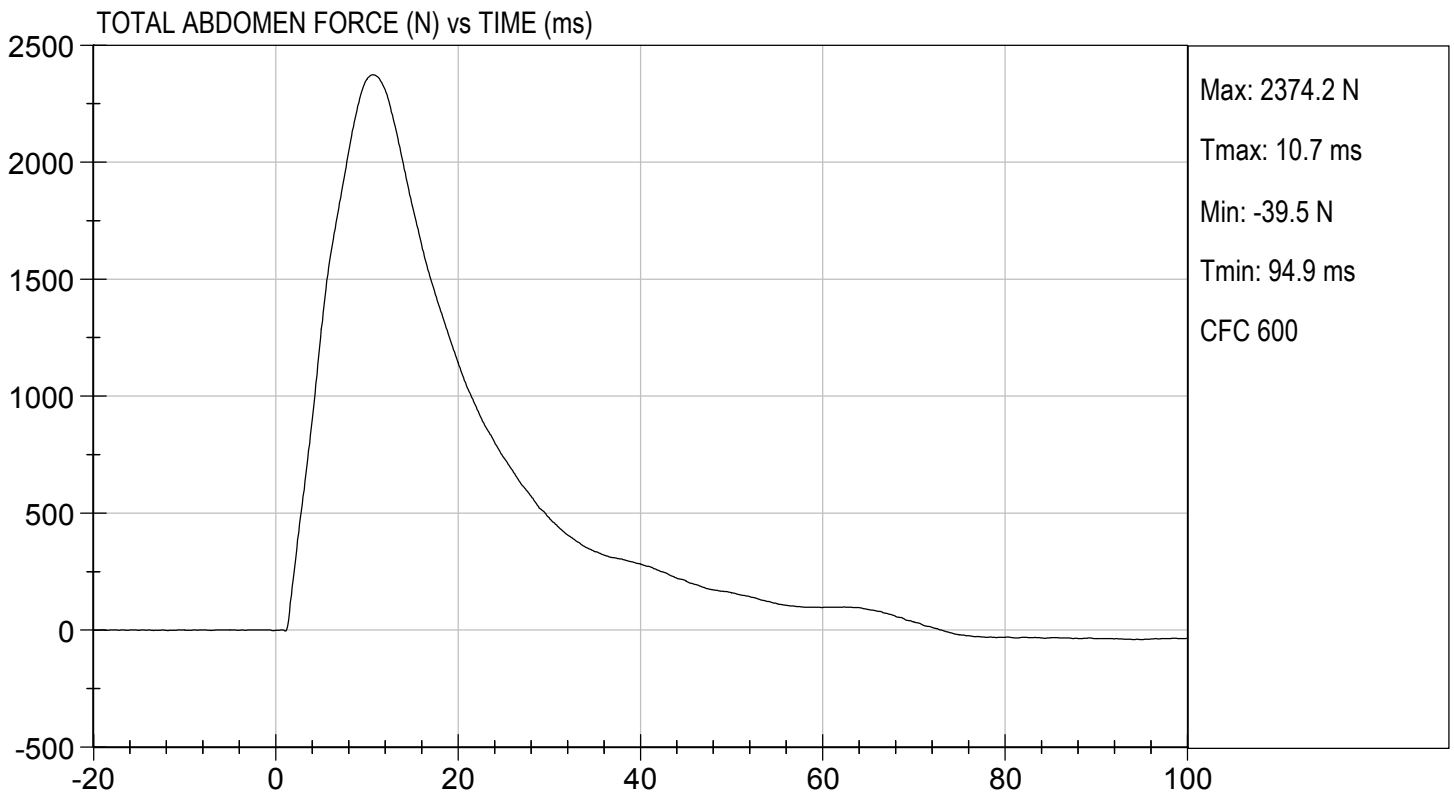
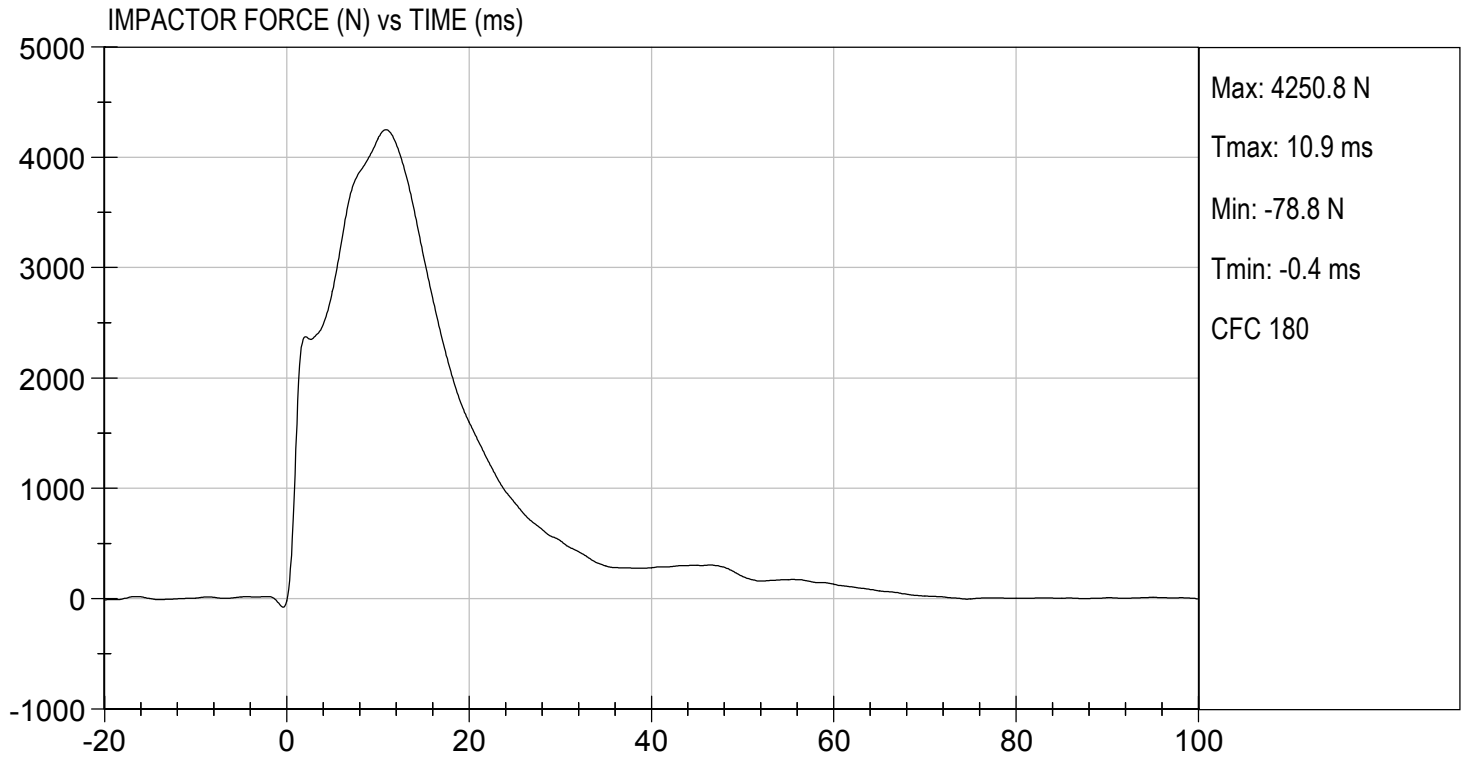
01/22/2019

Test Date



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

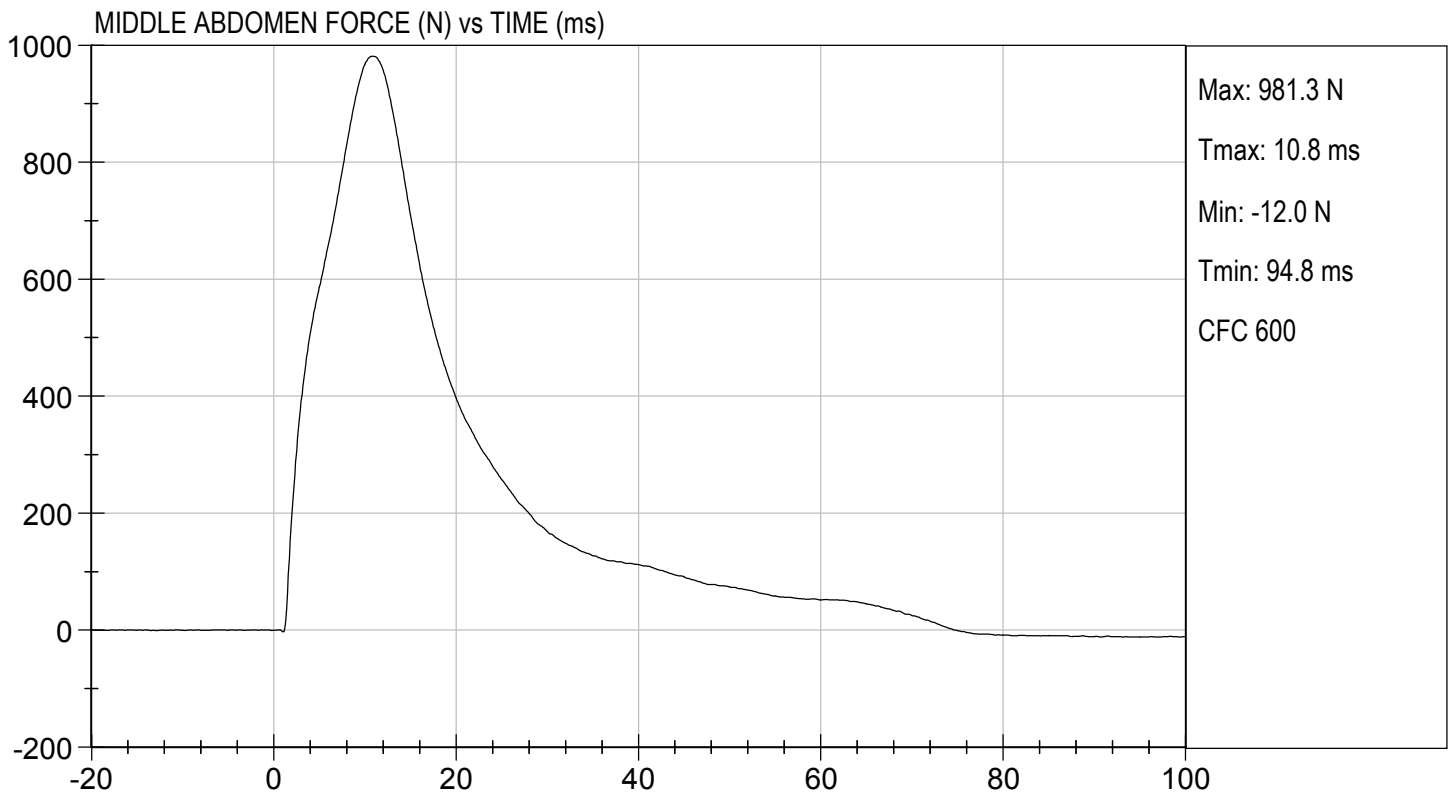
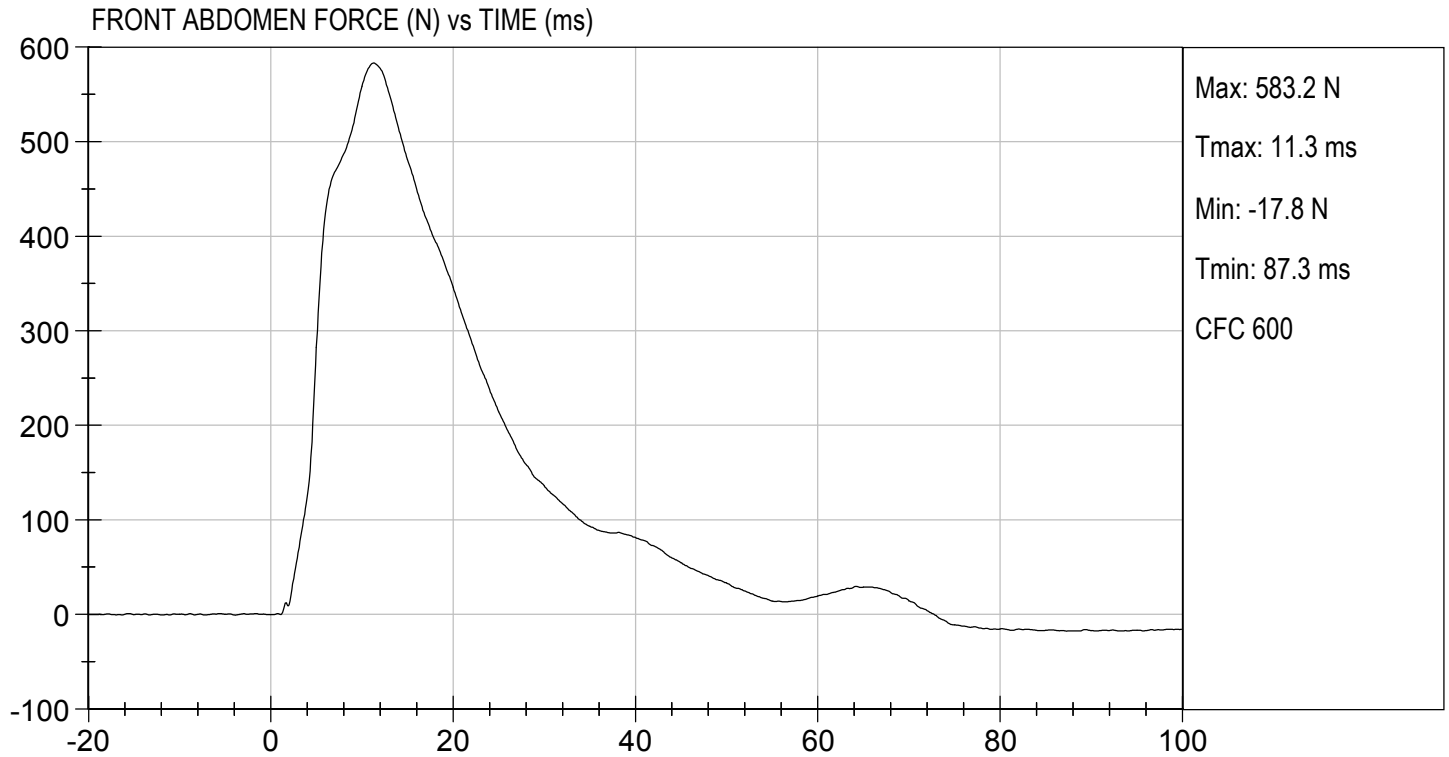
TEST DATE: 01/22/2019
TEST #: D190267





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

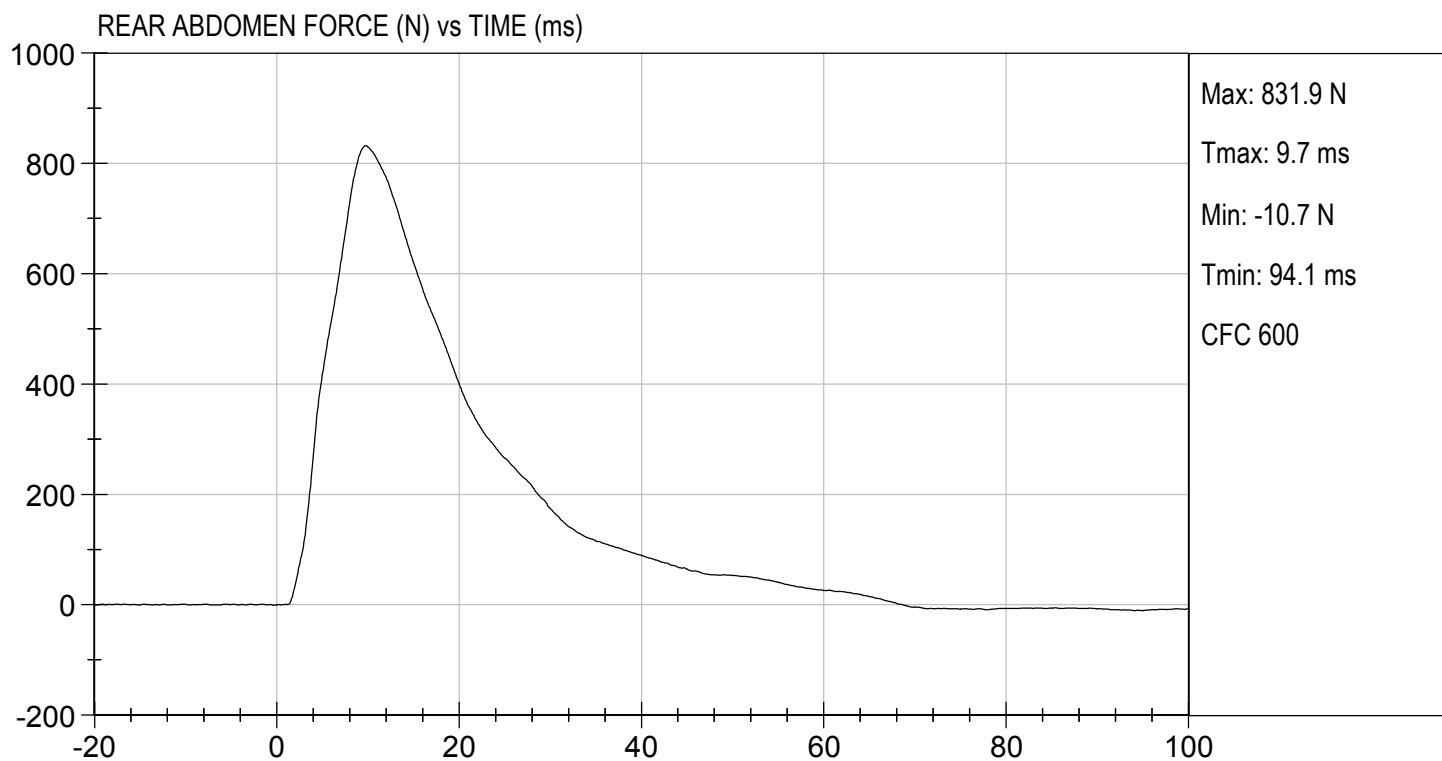
TEST DATE: 01/22/2019
TEST #: D190267





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

TEST DATE: 01/22/2019
TEST #: D190267



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

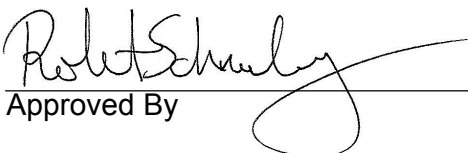
ATD Serial No: 032

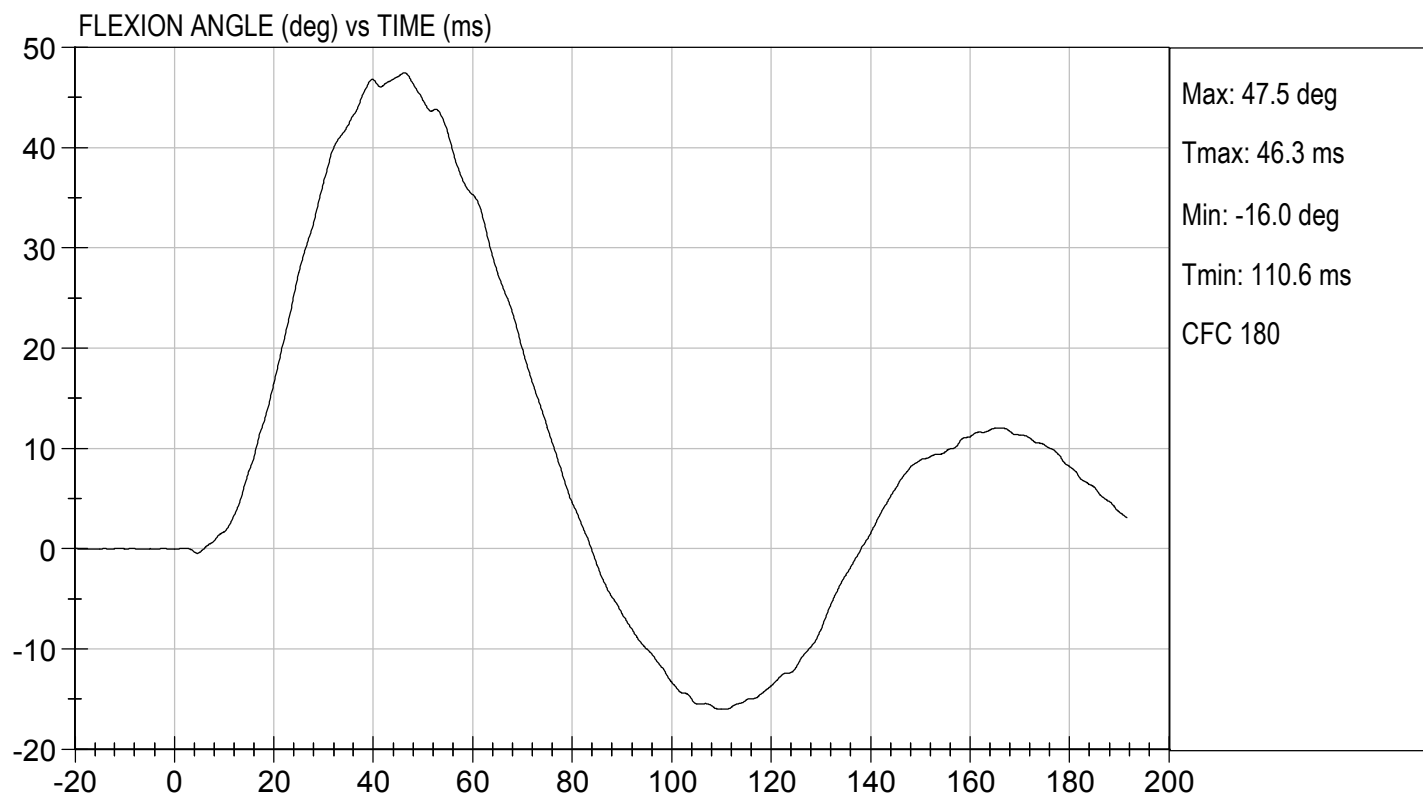
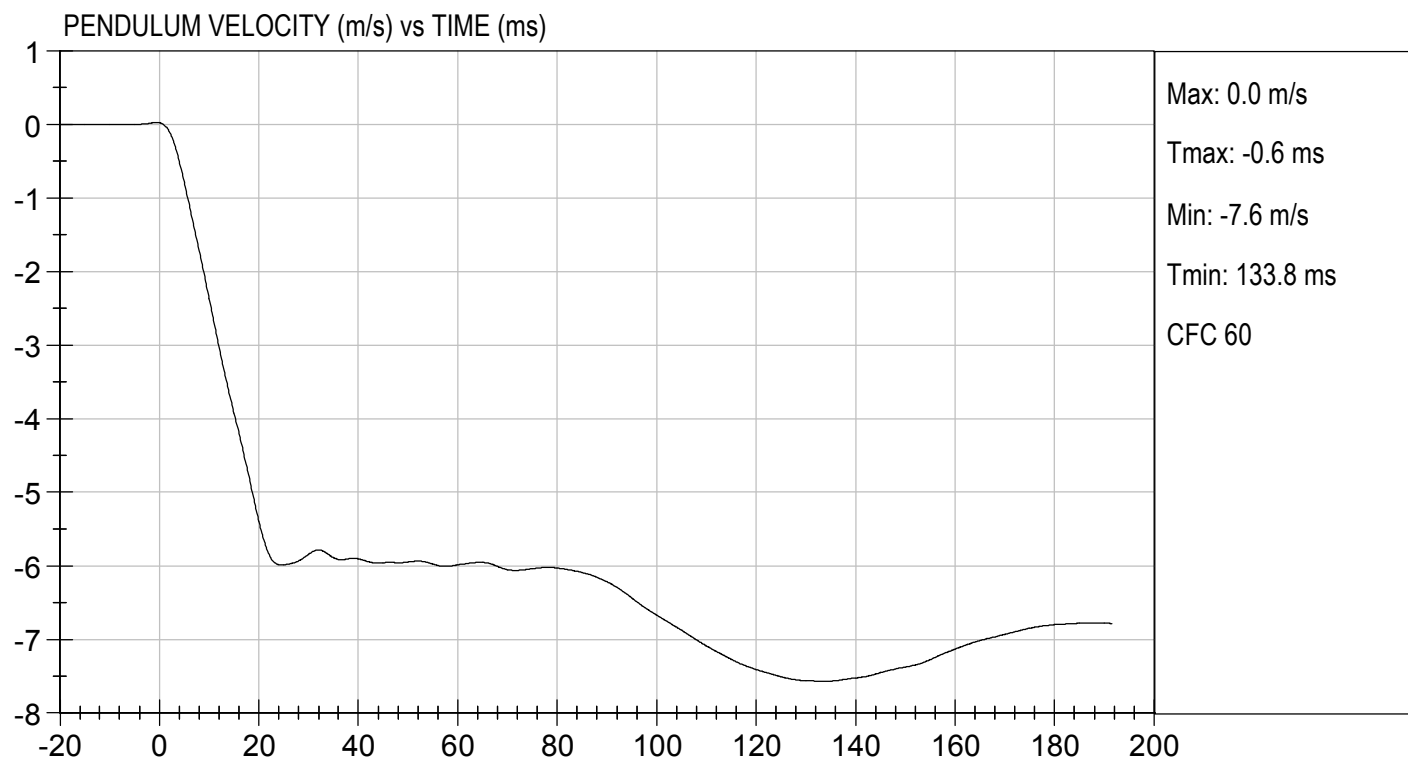
Test I.D: D190268

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.424	Pass
	27 ms	m/s	-6.50 to -5.80	-5.96	Pass
	30 ms	m/s	>= -6.50	-5.84	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	47.5	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	46.3	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	38	Pass
Overall Results					Pass


 Laboratory Technician

01/18/2019
 Test Date

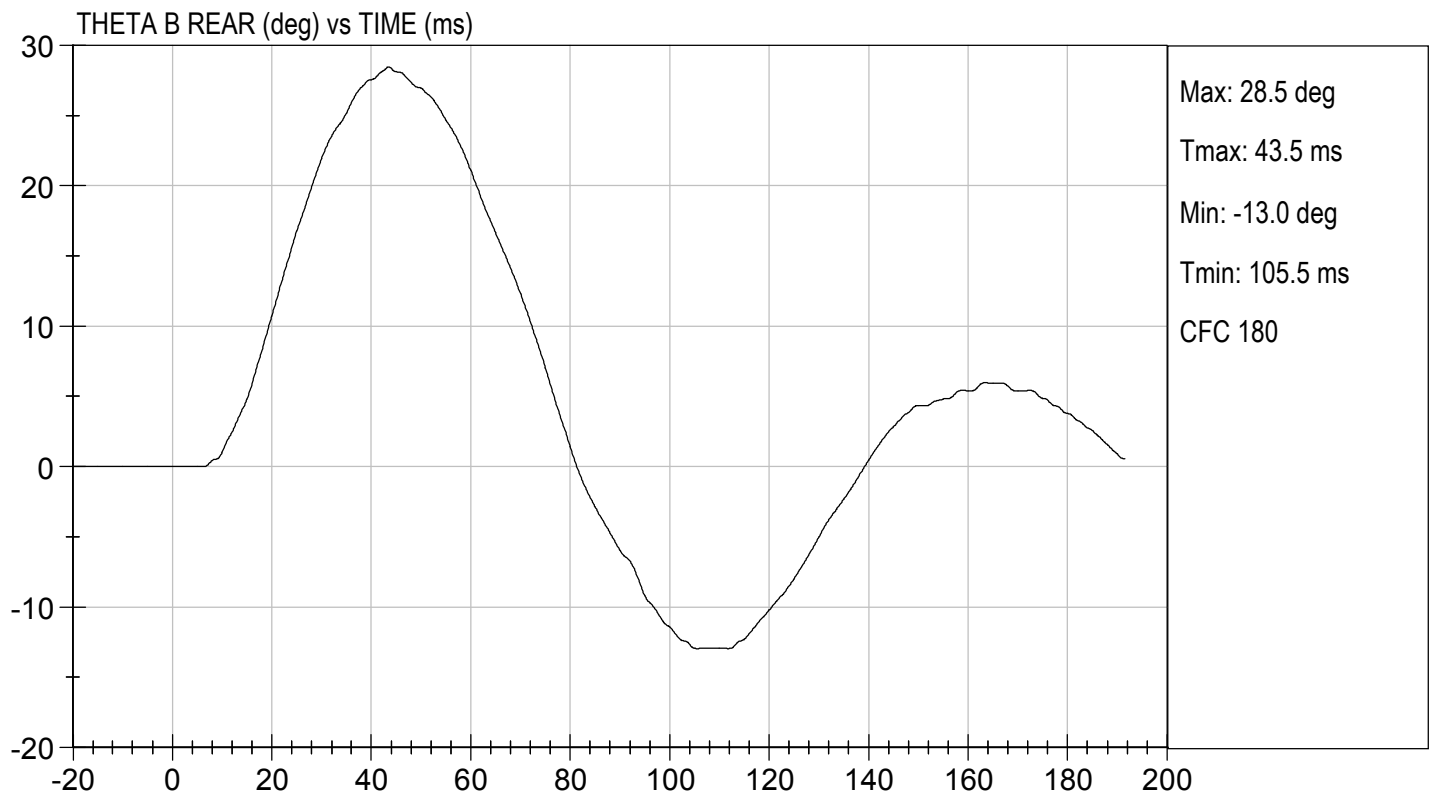
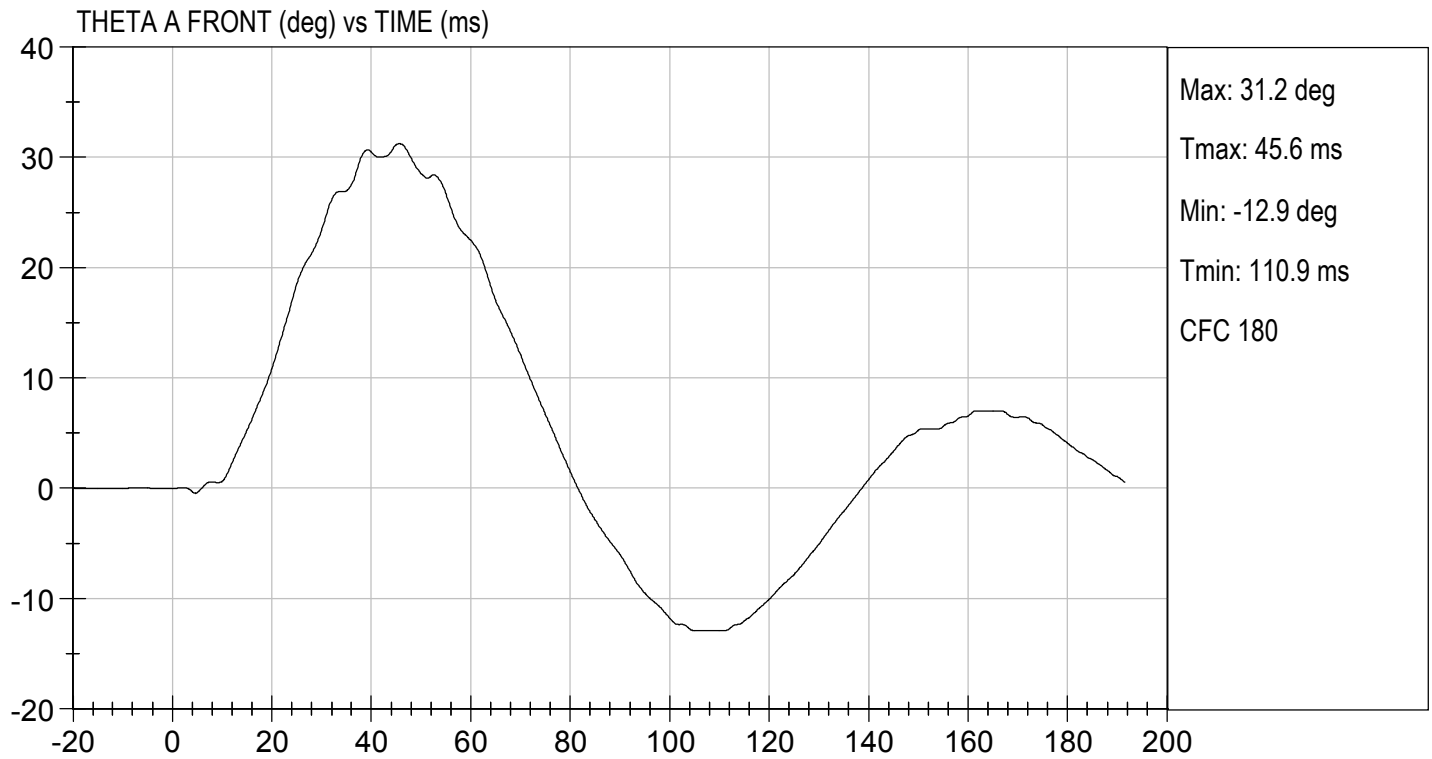

 Approved By





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

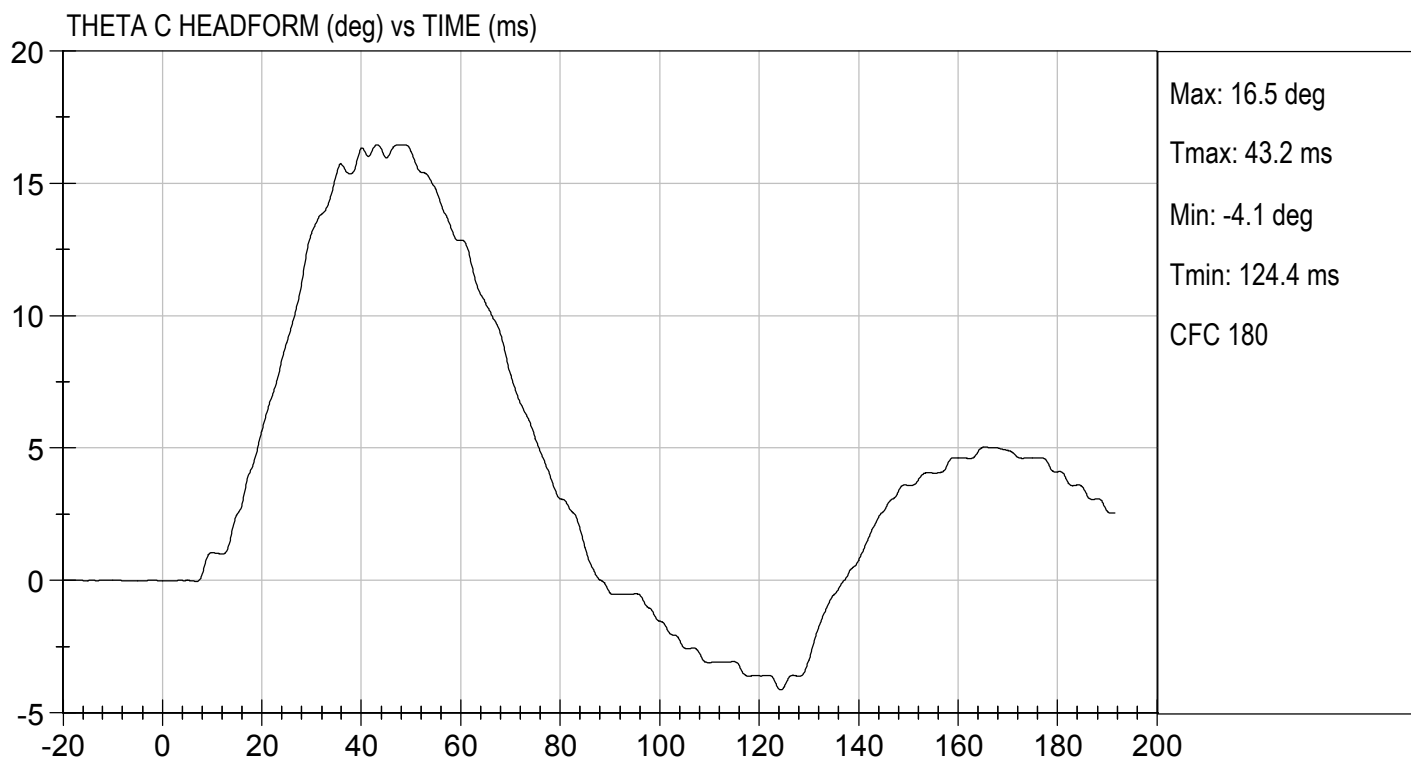
TEST DATE: 01/18/2019
TEST #: D190268





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

TEST DATE: 01/18/2019
TEST #: D190268



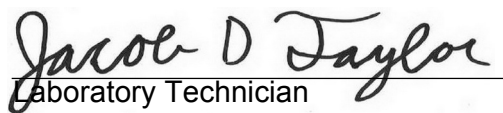
MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

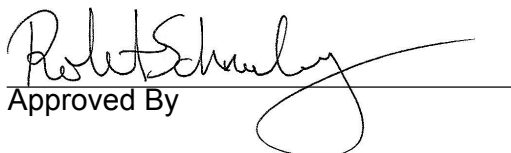
ATD Serial No: 032

Test I.D: D190269

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	4.20 to 4.40	4.38	Pass
Maximum Impactor Force	N	4700 to 5400	5367	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	12.7	Pass
Maximum Pubic Force	N	1230 to 1590	1388	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.6	Pass
Overall Test Results				Pass


Laboratory Technician

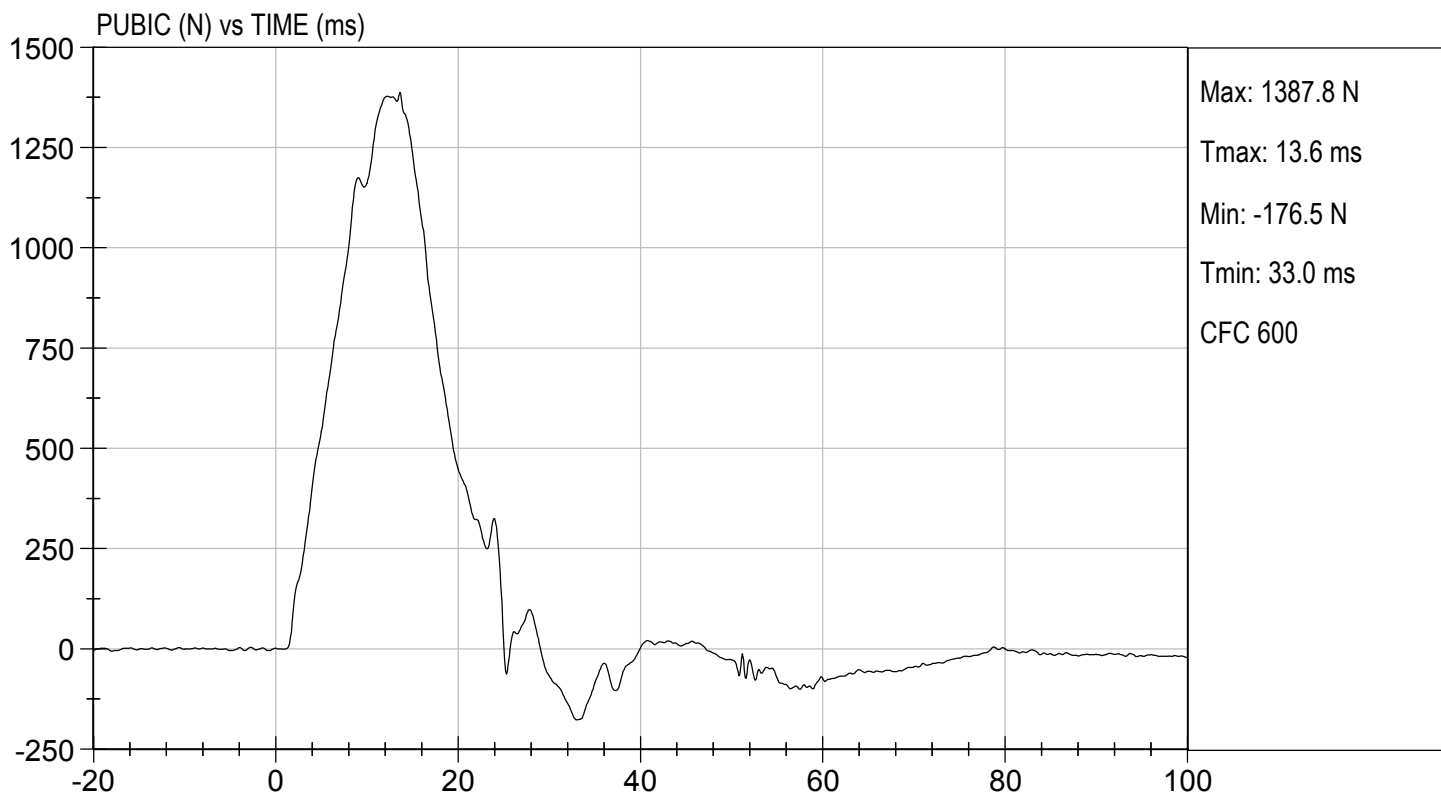
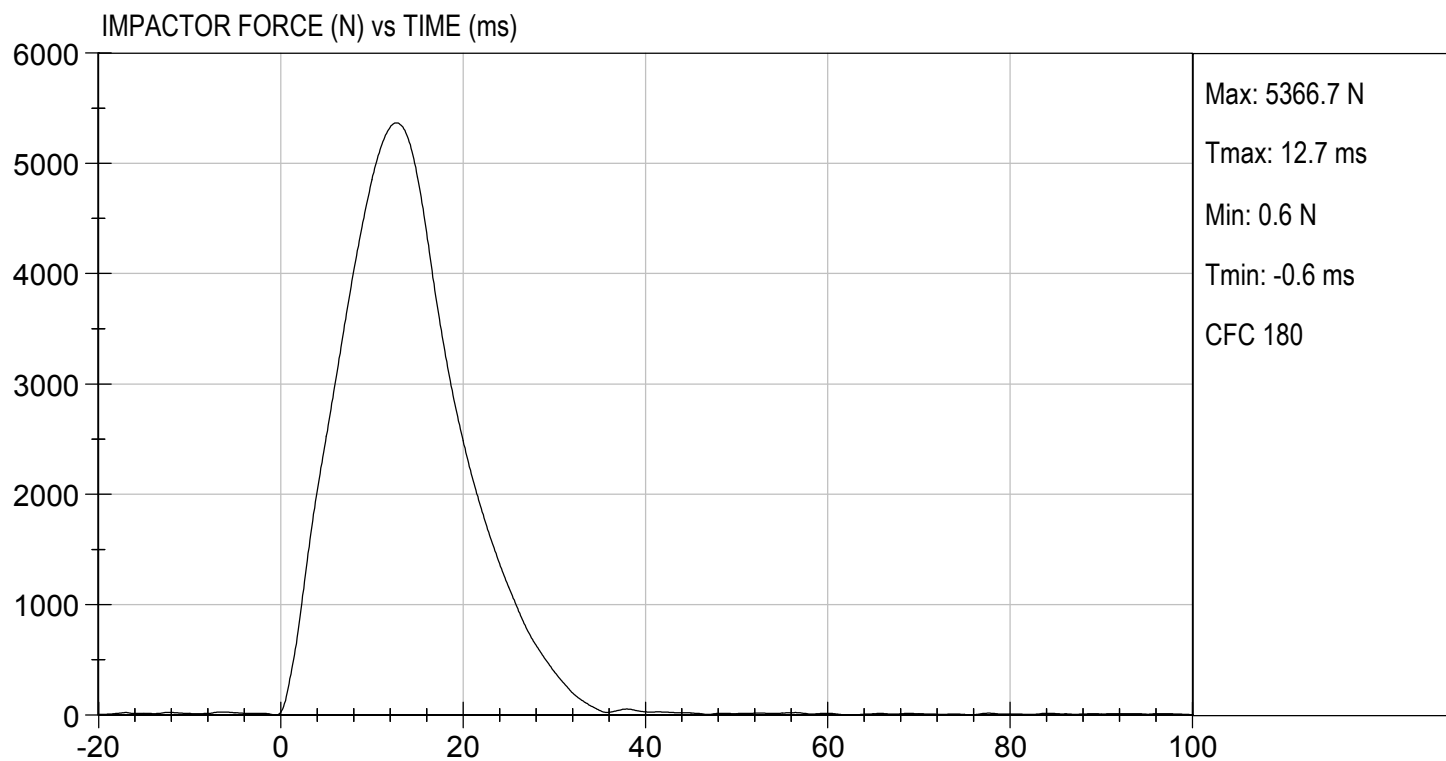
01/22/2019
Test Date


Approved By



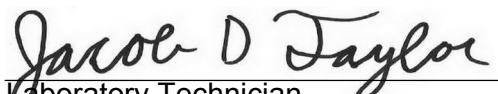
TEST DESC: PELVIS IMPACT
VELOCITY: 14.37 ft/s, 4.38 m/s

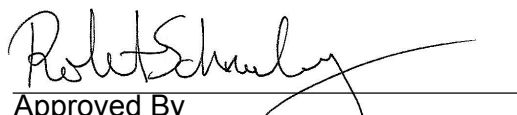
TEST DATE: 01/22/2019
TEST #: D190269



MGA RESEARCH CORPORATION**THORAX IMPACT TEST****ES-2re DUMMY**ATD Serial No: 032Test I.D: D190260

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	5.40 to 5.60	5.52	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5957	Pass
Upper Rib Displacement	mm	34.0 to 41.0	37.7	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.1	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.2	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

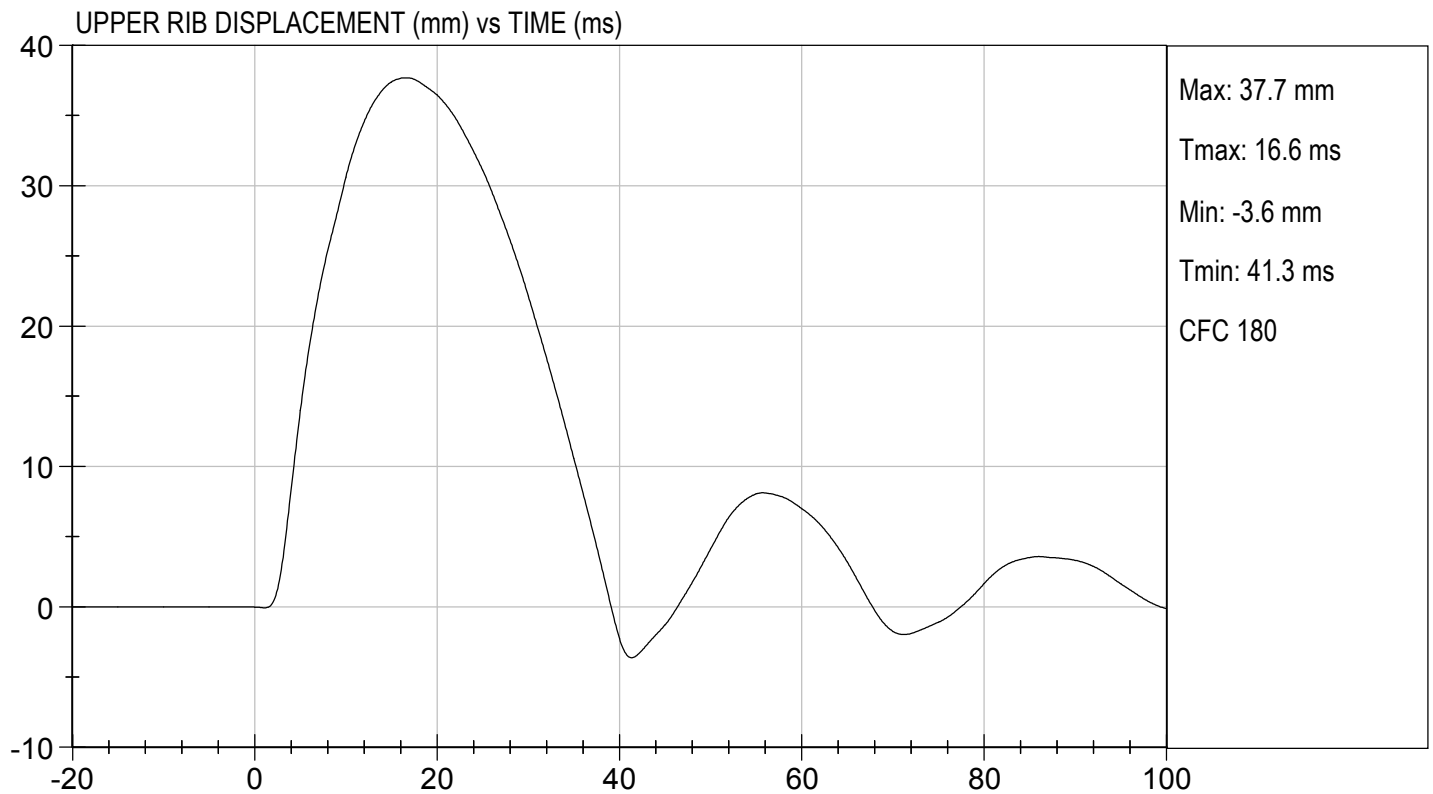
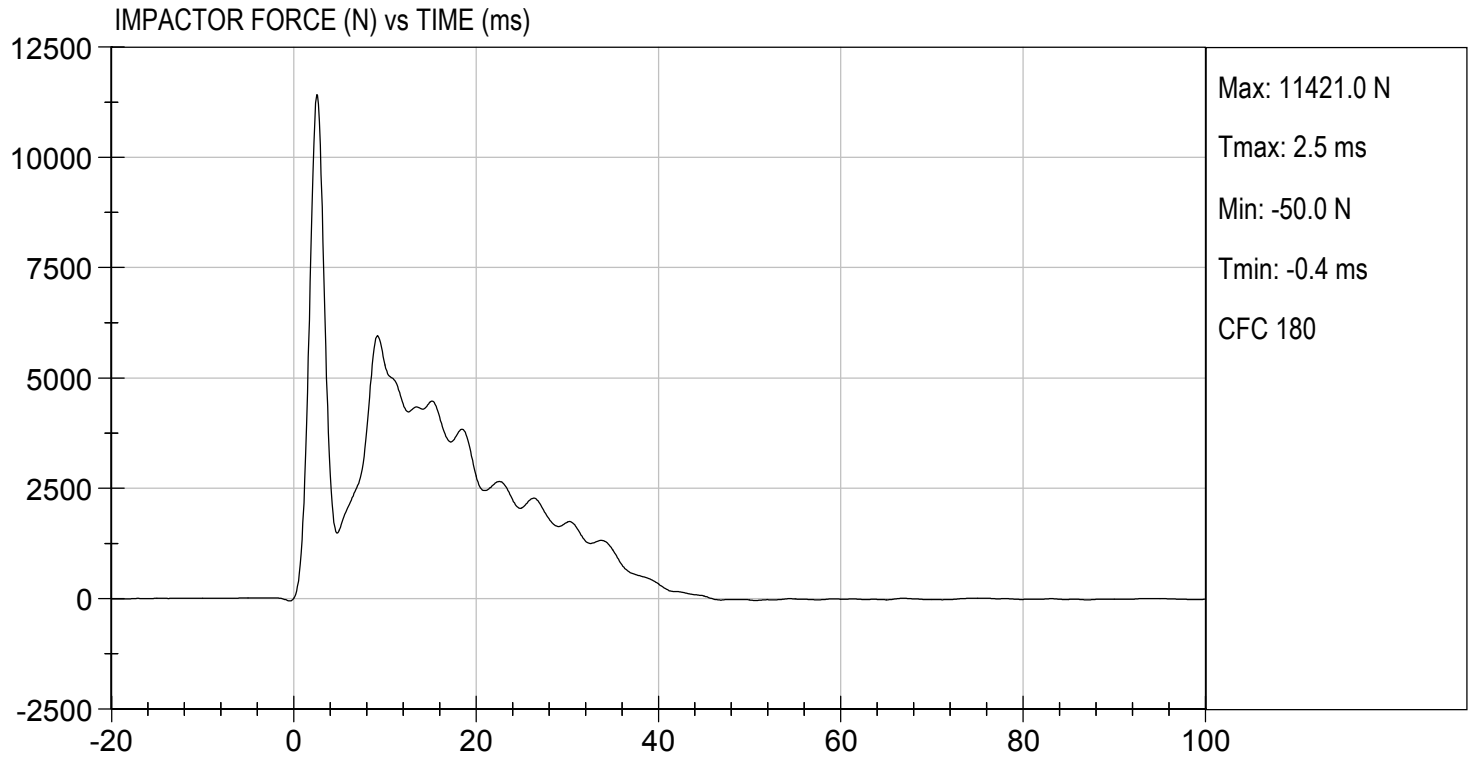
01/22/2019

Test Date



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

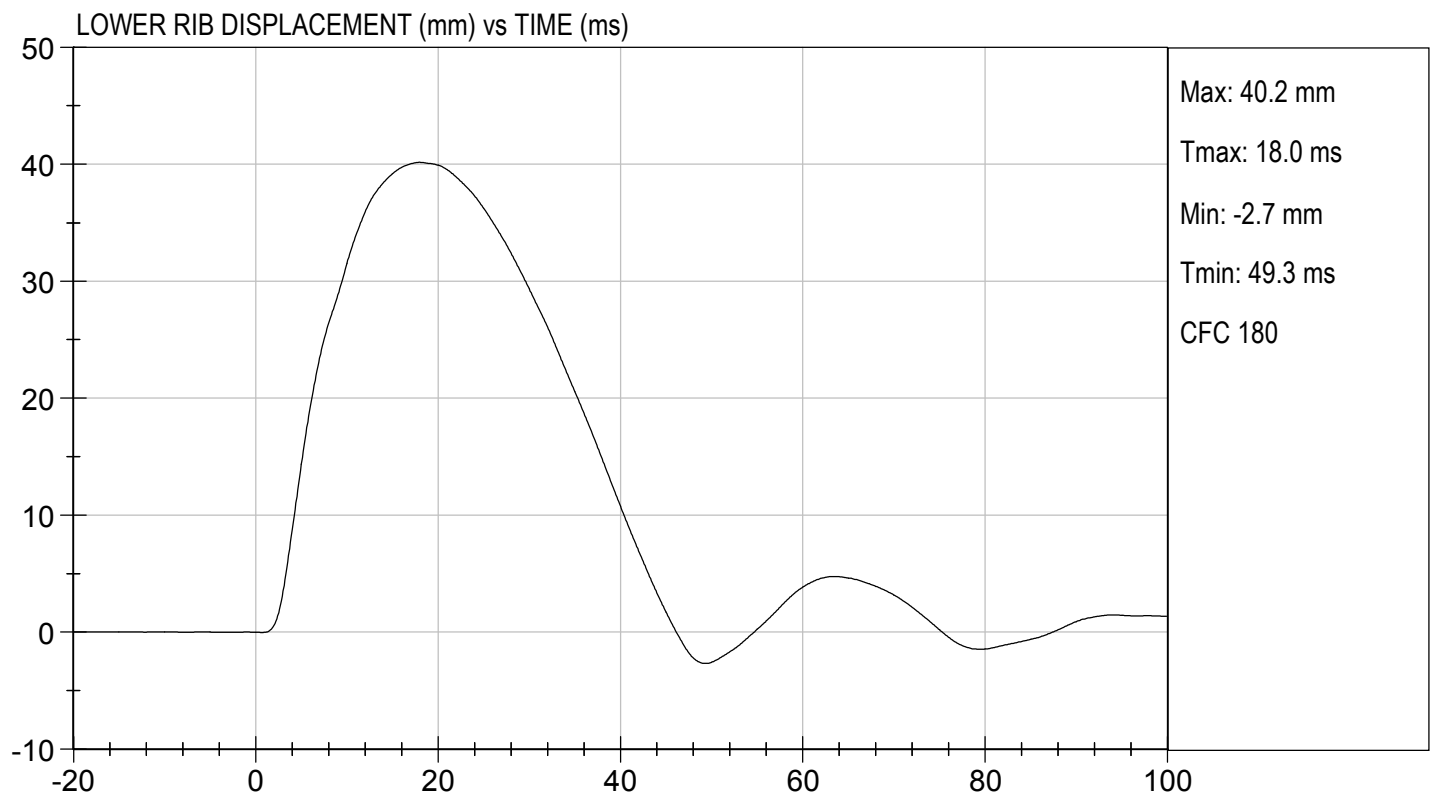
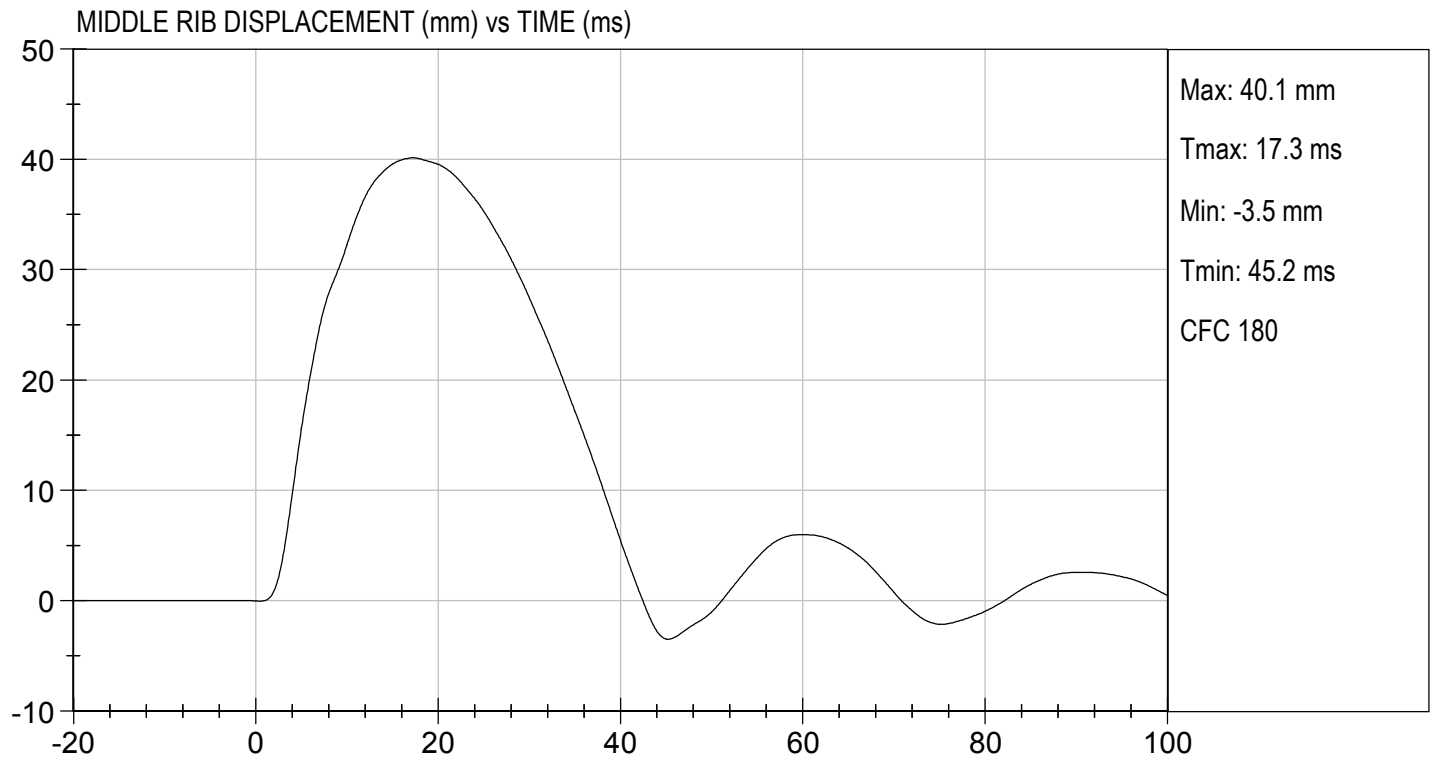
TEST DATE: 01/22/2019
TEST #: D190260





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

TEST DATE: 01/22/2019
TEST #: D190260



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

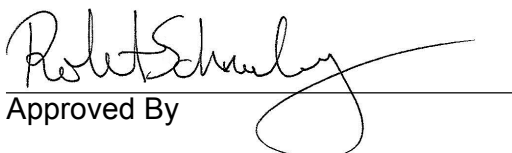
ATD Serial No: 306

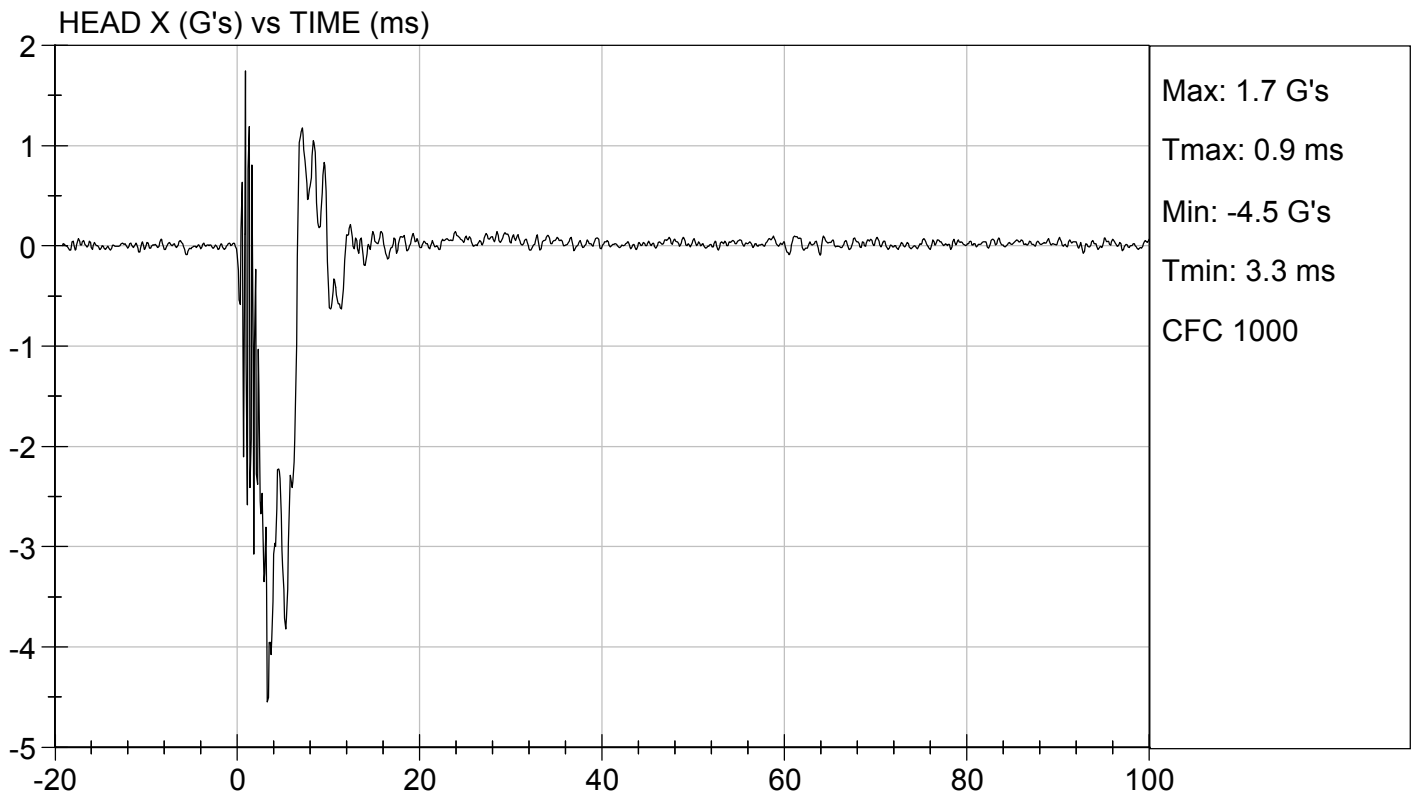
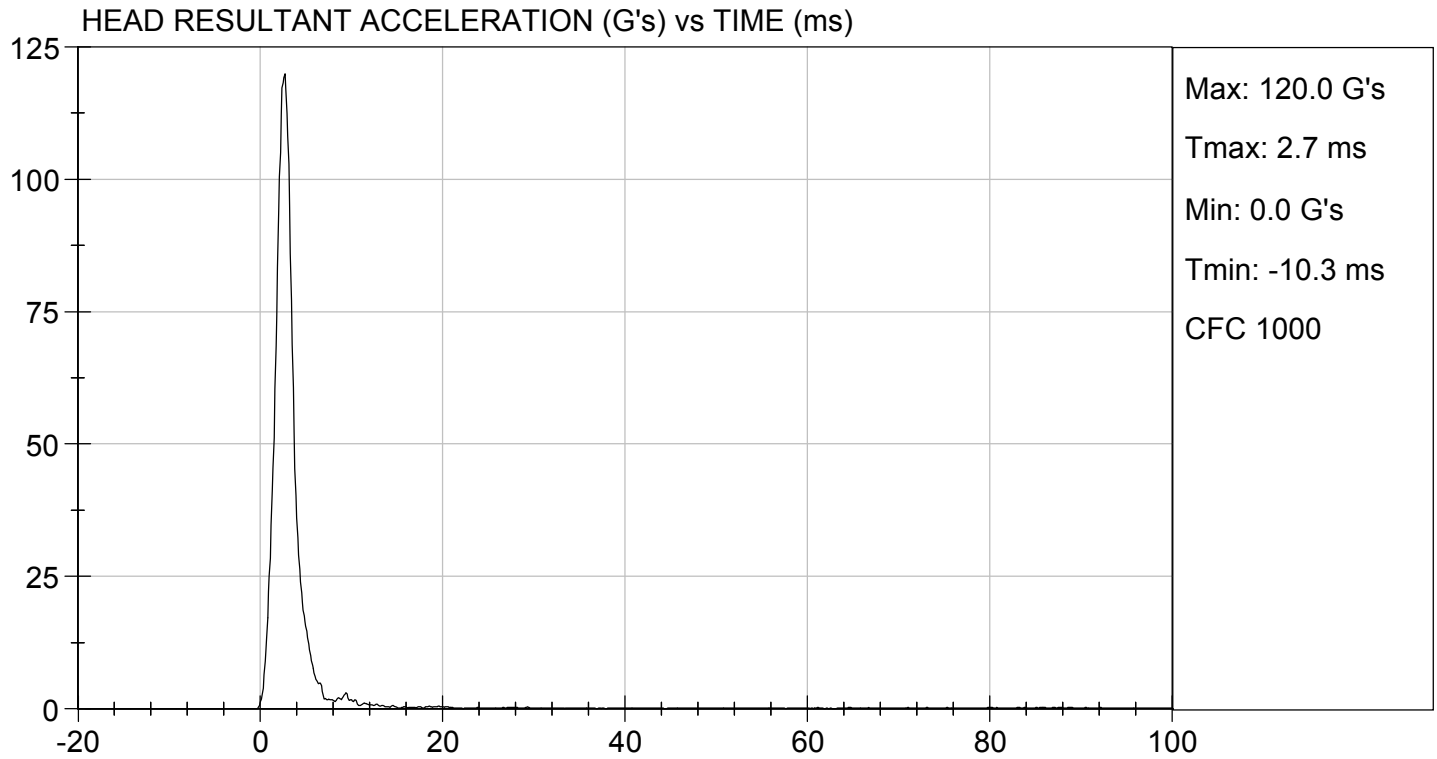
Test ID: D190161

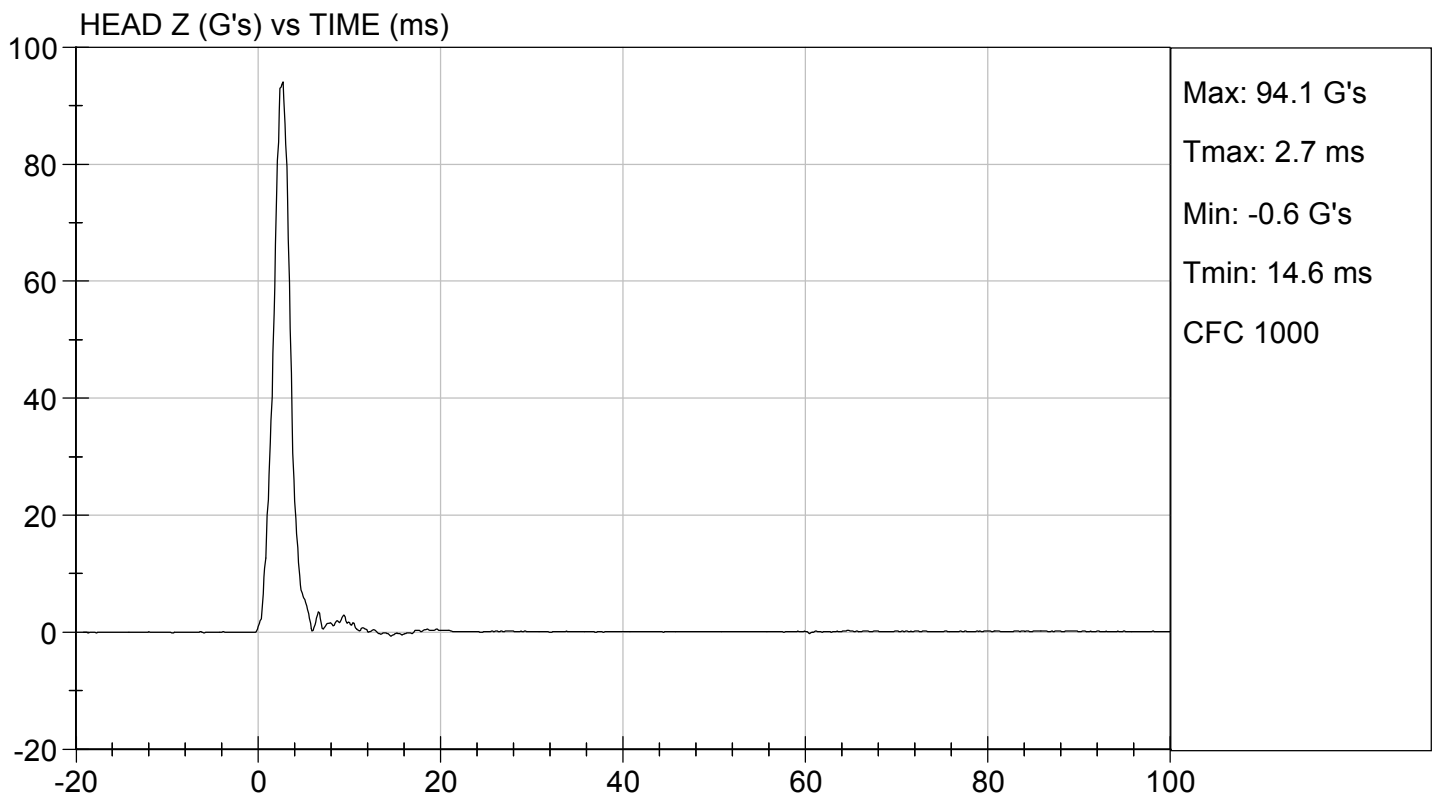
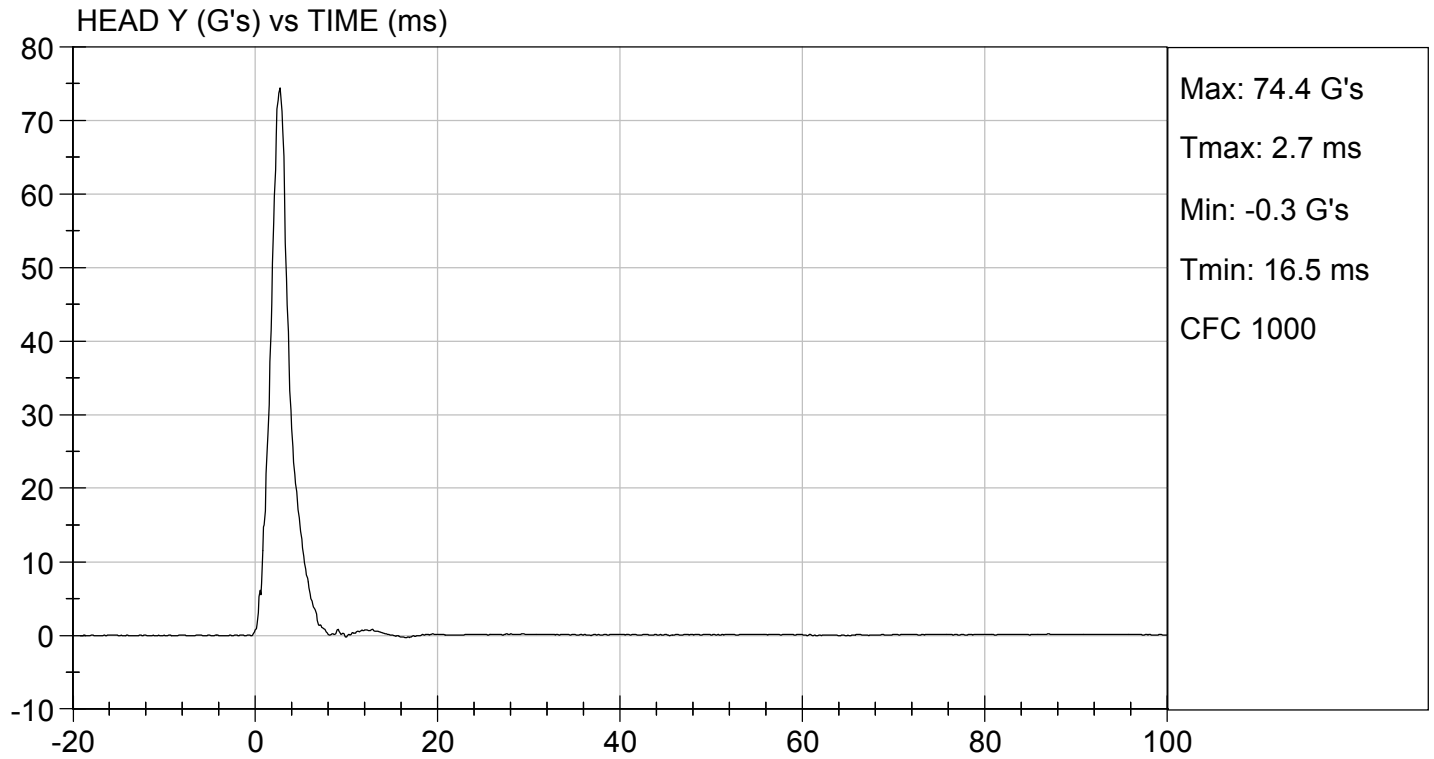
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	21.4	Pass
Peak Resultant Acceleration	G's	115 to 137	120	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-4.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
			Overall Test Results	Pass


Laboratory Technician

01/11/2019
Test Date


Approved By



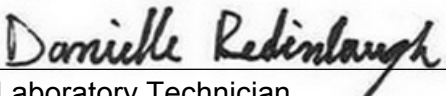


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

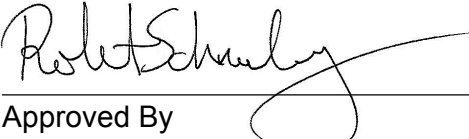
Test I.D: D190162

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.9	Pass
Humidity		%	10 to 70	21.4	Pass
Impact Velocity		m/s	5.51 to 5.63	5.52	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.46	Pass
	15 ms	m/s	3.30 to 4.10	3.63	Pass
	20 ms	m/s	4.40 to 5.40	5.08	Pass
	25 ms	m/s	5.40 to 6.10	5.66	Pass
	25-100 ms	m/s	5.50 to 6.20	5.66	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	59	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	106	Pass
Overall Test Results					Pass


 Laboratory Technician

01/11/2019

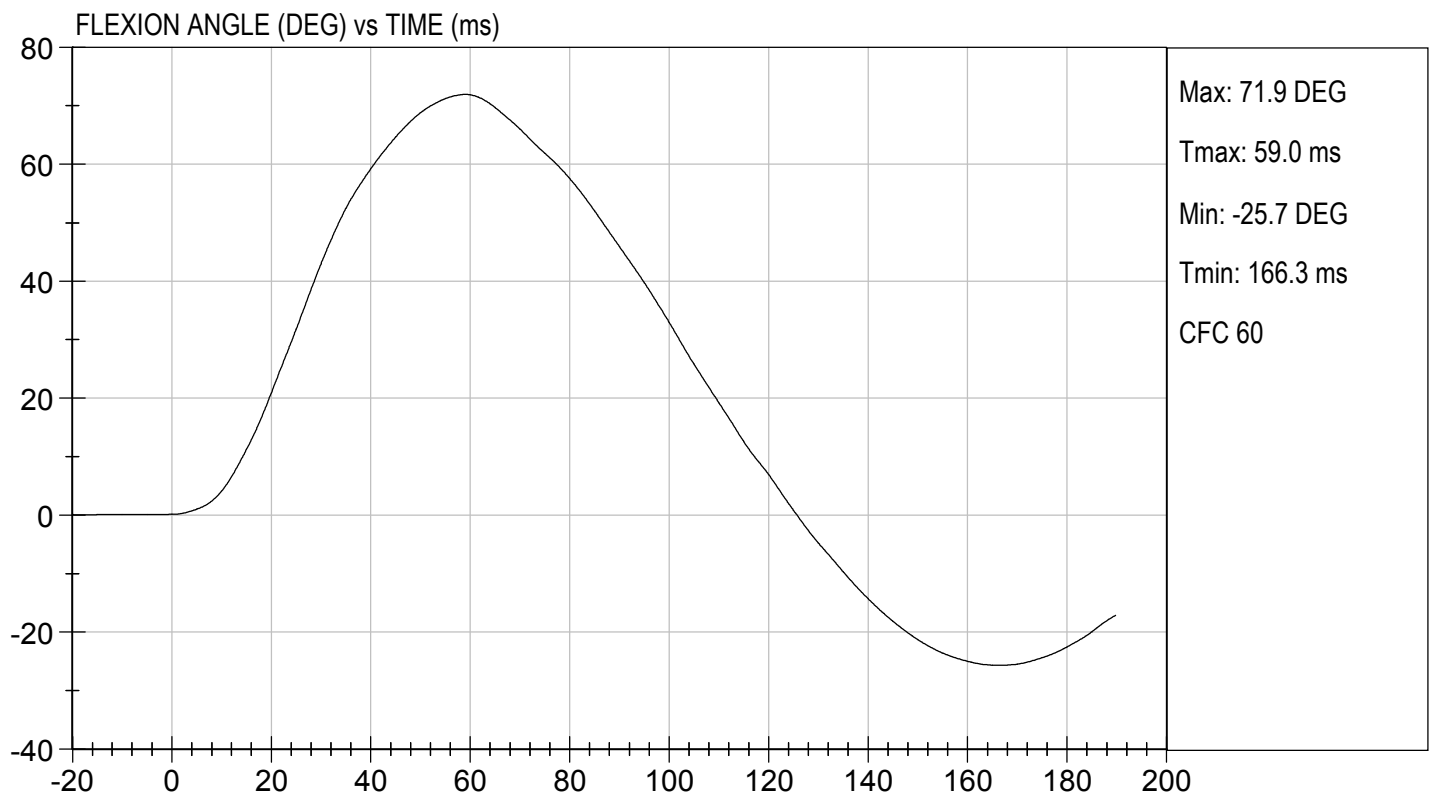
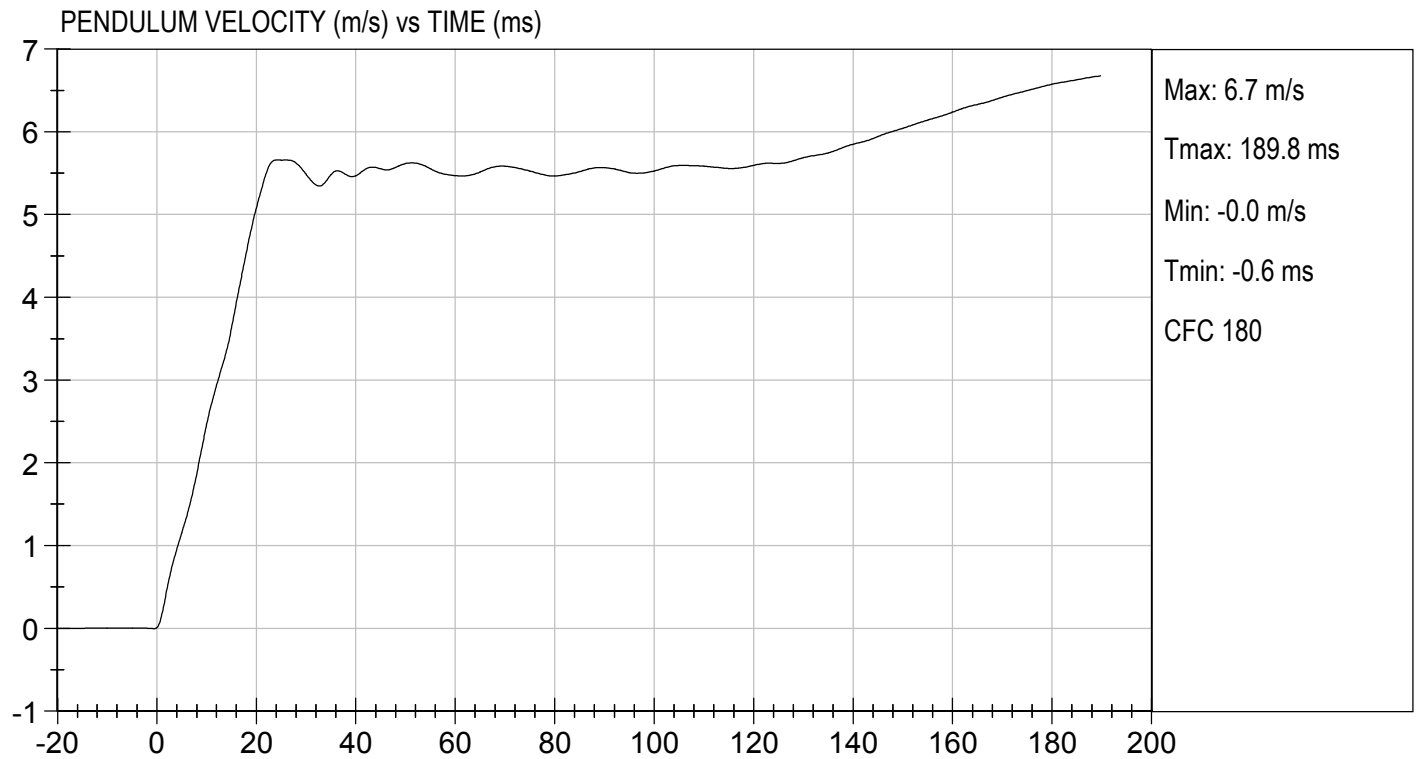
Test Date


 Approved By



TEST DESC: NECK BENDING
VELOCITY: 18.10 ft/s, 5.52 m/s

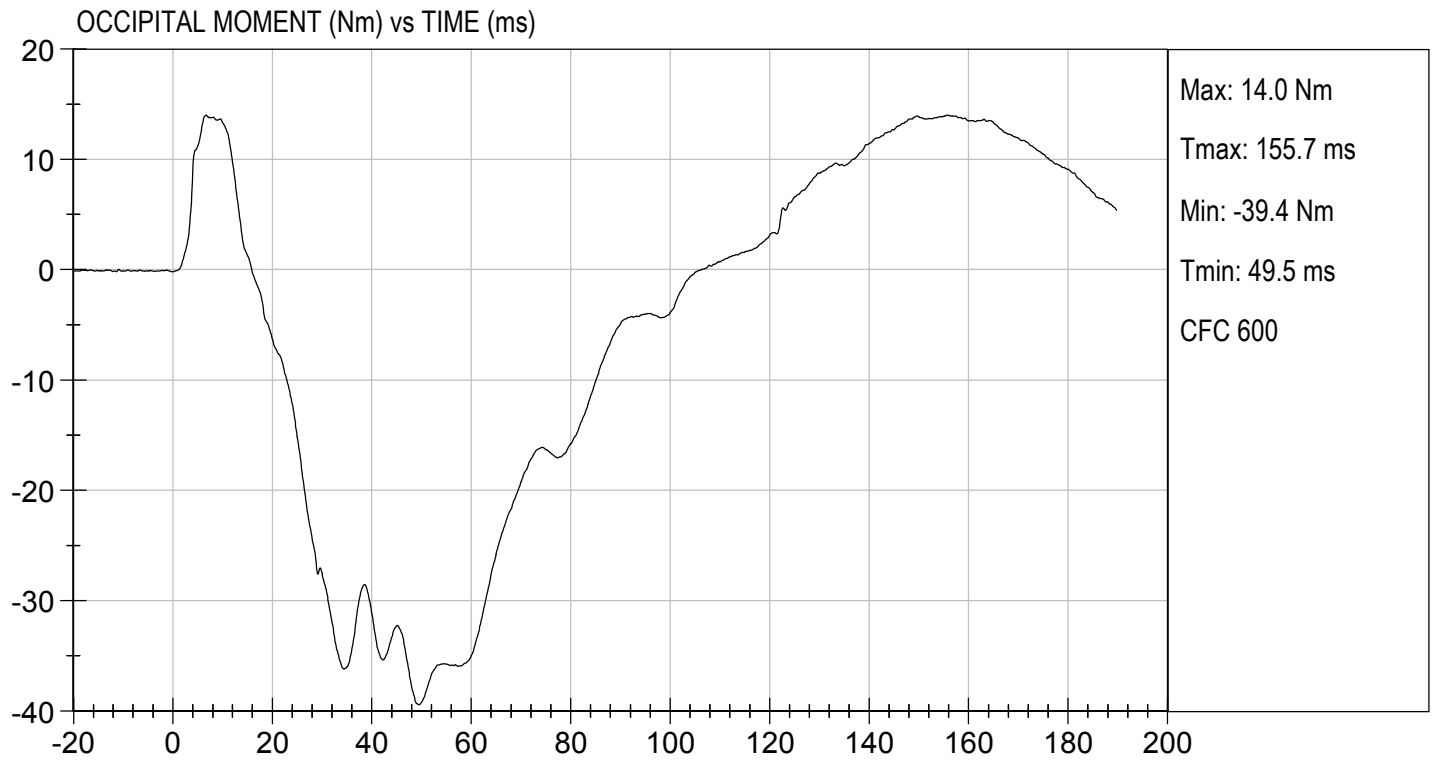
TEST DATE: 01/11/2019
TEST #: D190162





TEST DESC: NECK BENDING
VELOCITY: 18.10 ft/s, 5.52 m/s

TEST DATE: 01/11/2019
TEST #: D190162

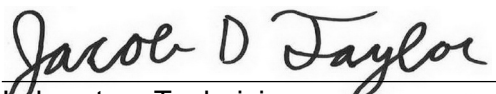


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

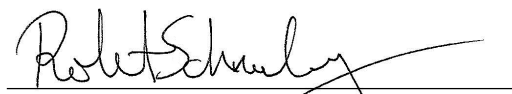
Test ID: D190163

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	4.20 to 4.40	4.39	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	21	Pass
			Overall Test Results	Pass


Laboratory Technician

01/14/2019

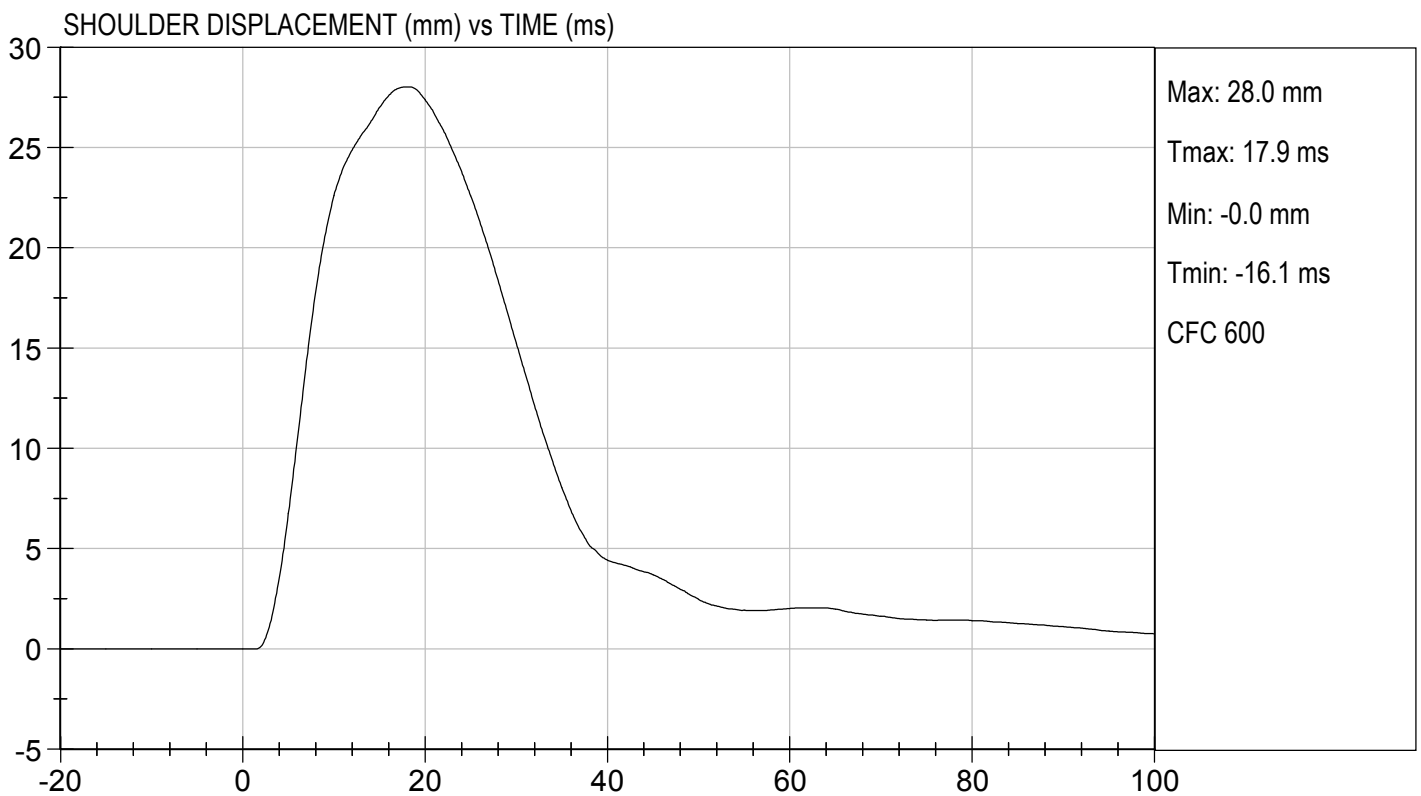
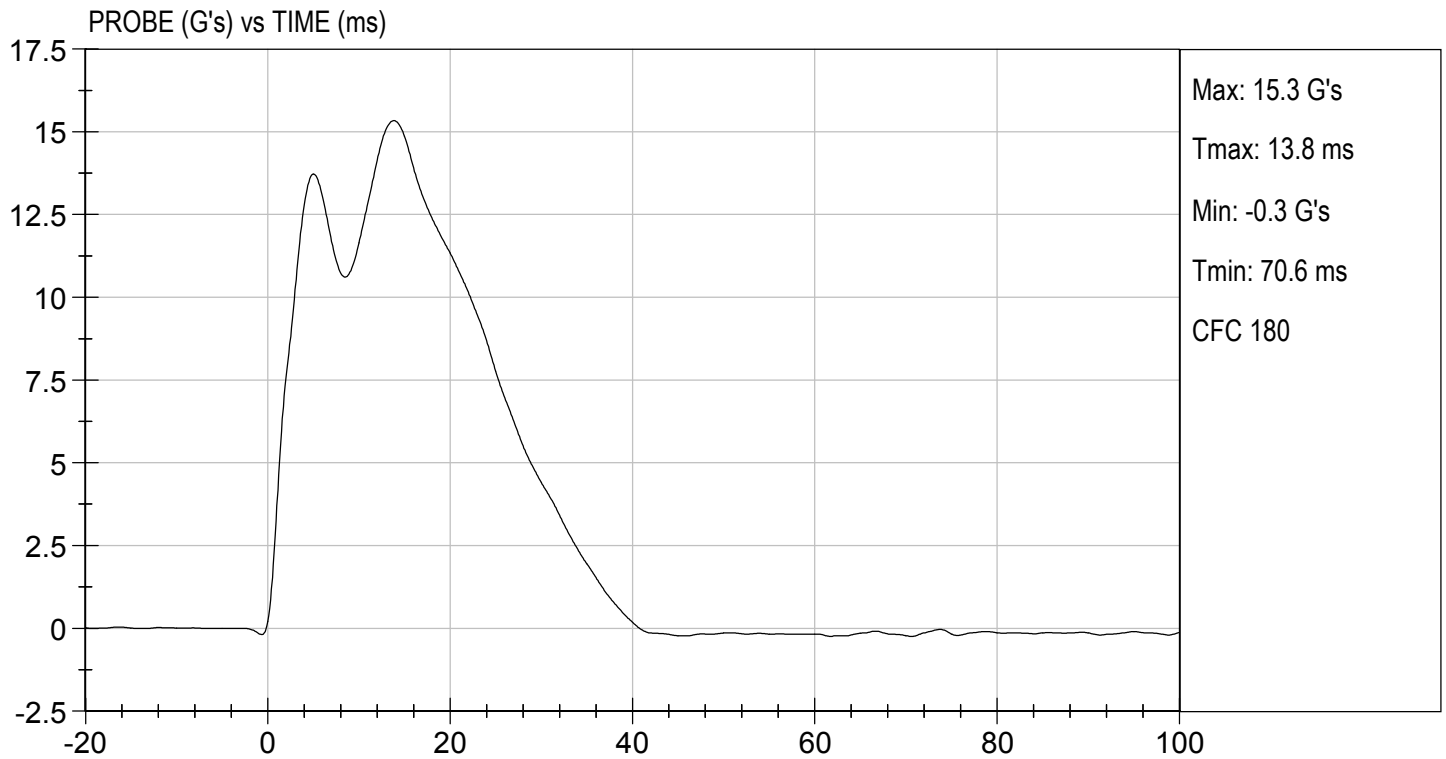
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.4 ft/s, 4.39 m/s

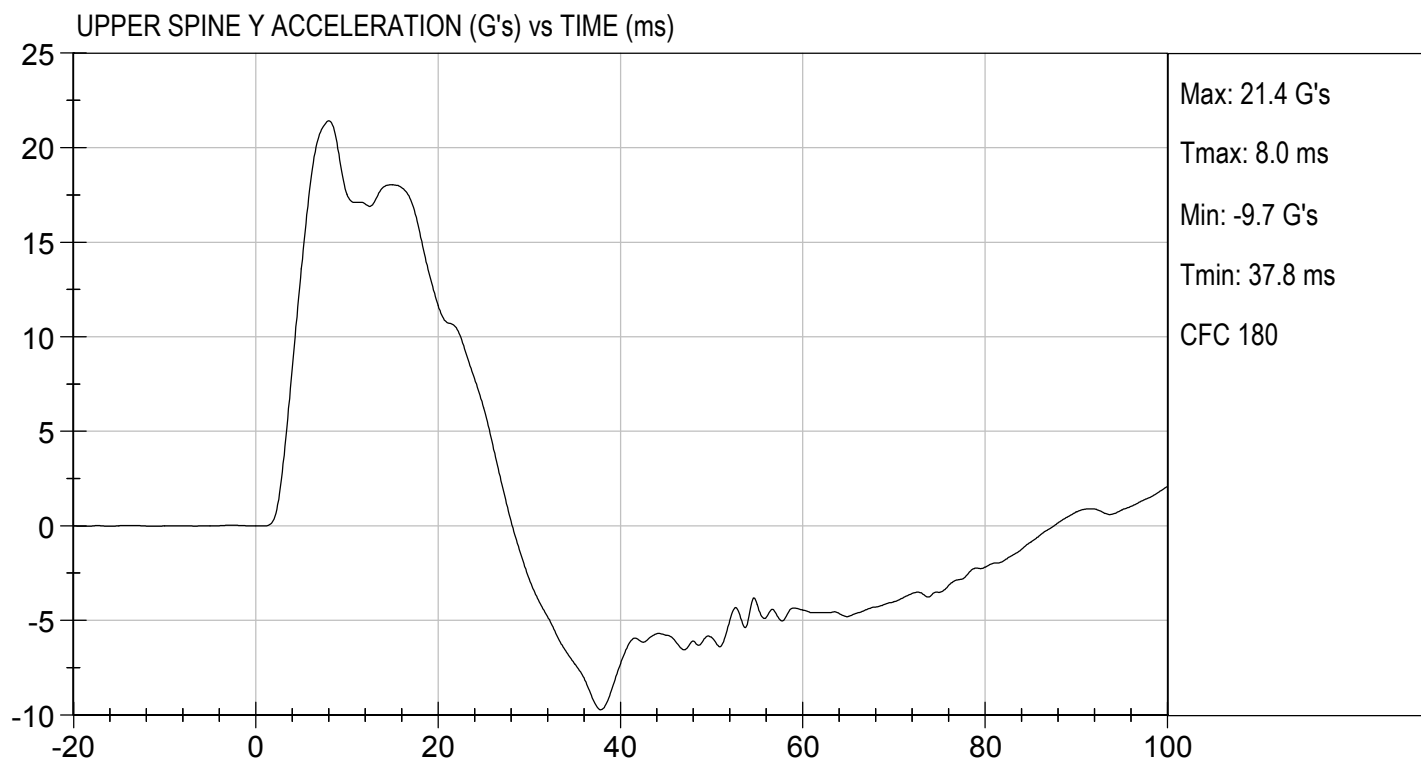
TEST DATE: 01/16/2019
TEST #: D190163





TEST DESC: SHOULDER IMPACT
VELOCITY: 14.4 ft/s, 4.39 m/s

TEST DATE: 01/16/2019
TEST #: D190163

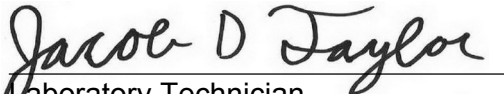


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

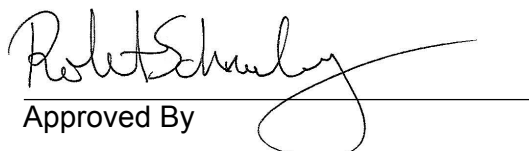
Test I.D: D190164

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	35	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	42	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	35	Pass
Overall Test Results				Pass


Laboratory Technician

01/14/2019

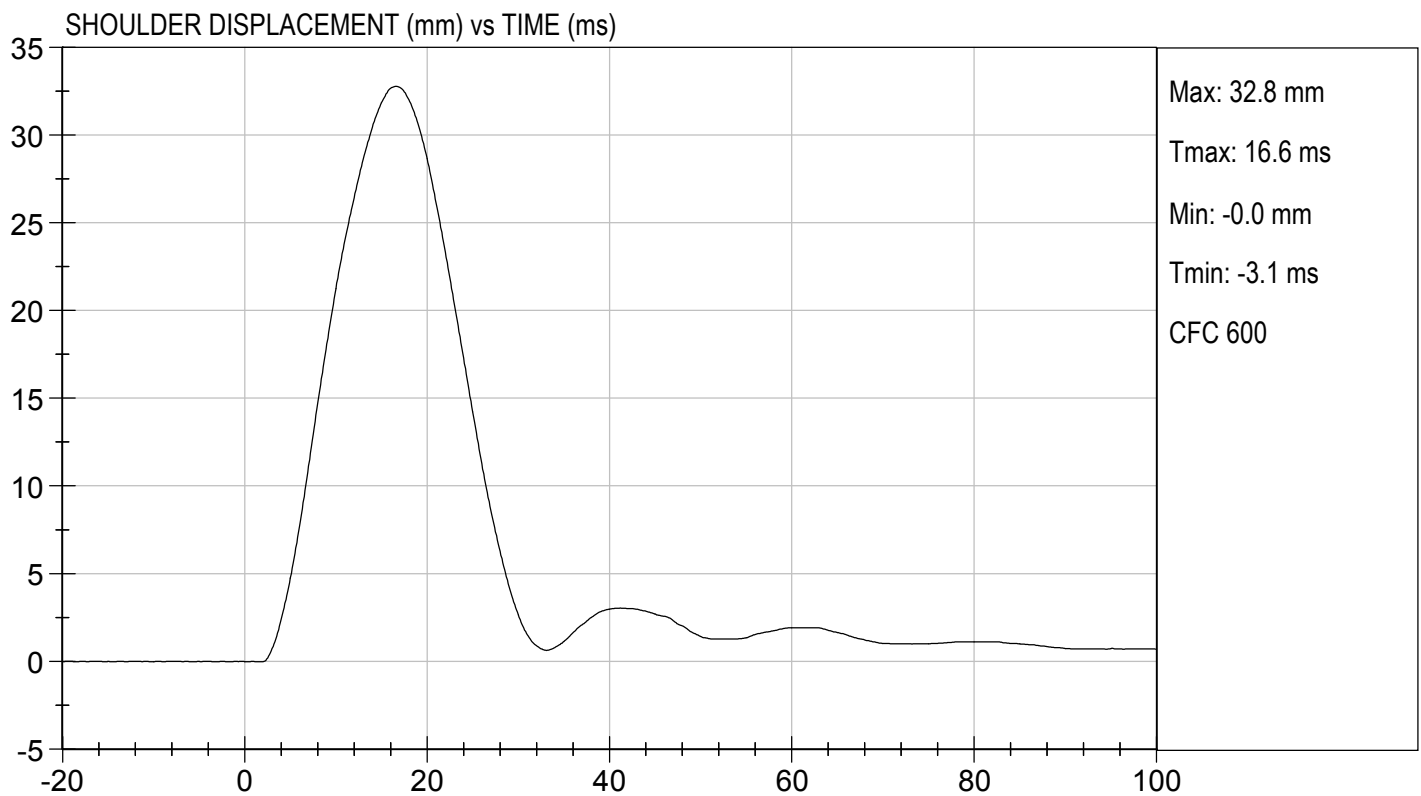
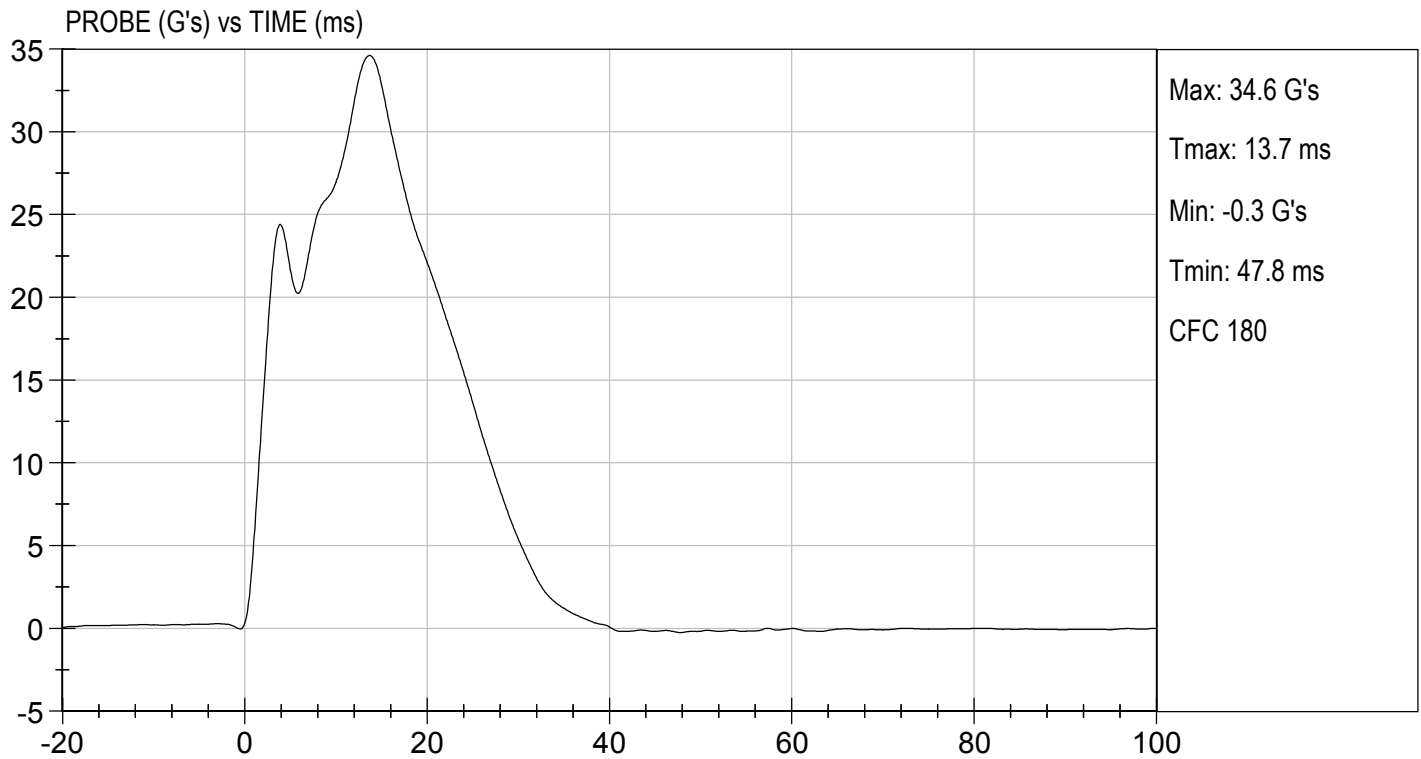
Test Date

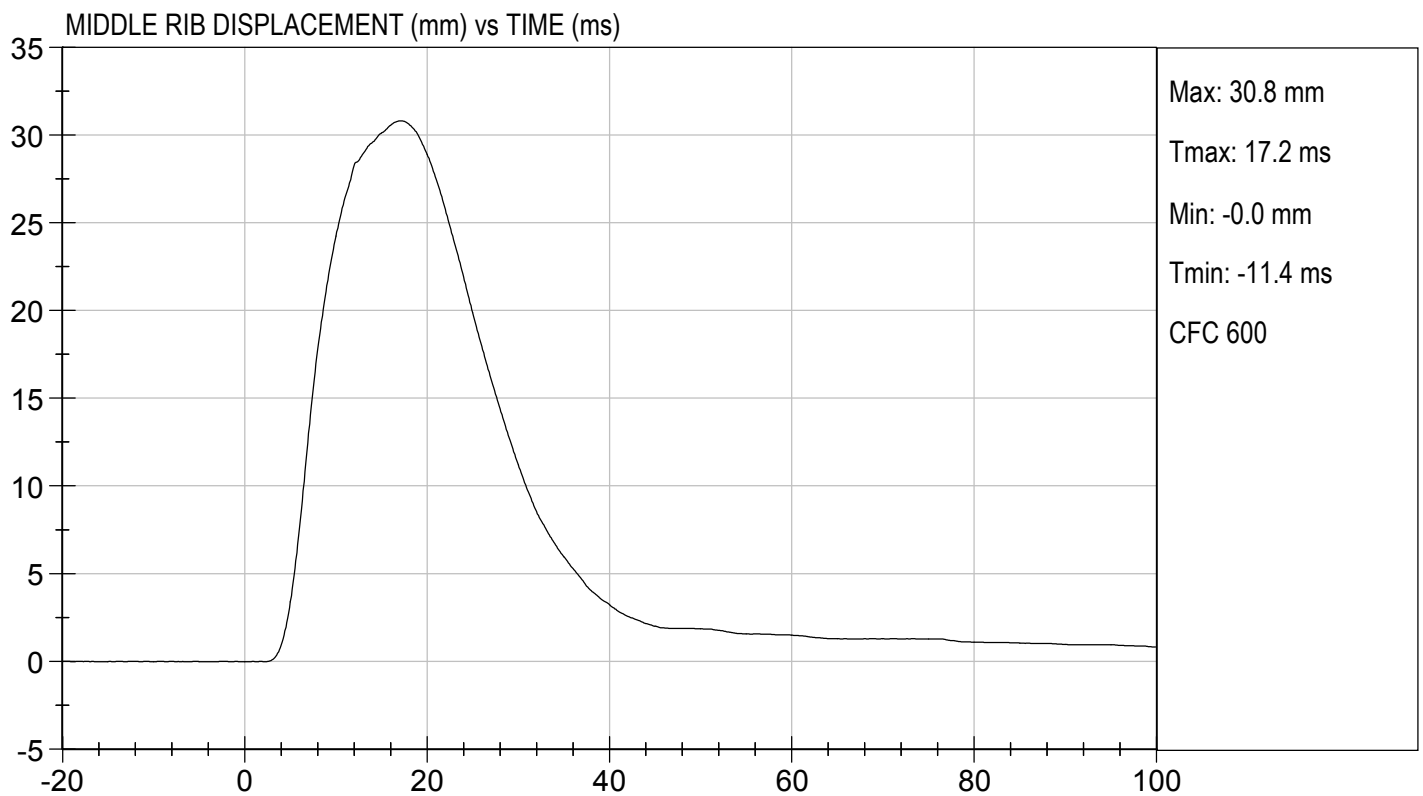
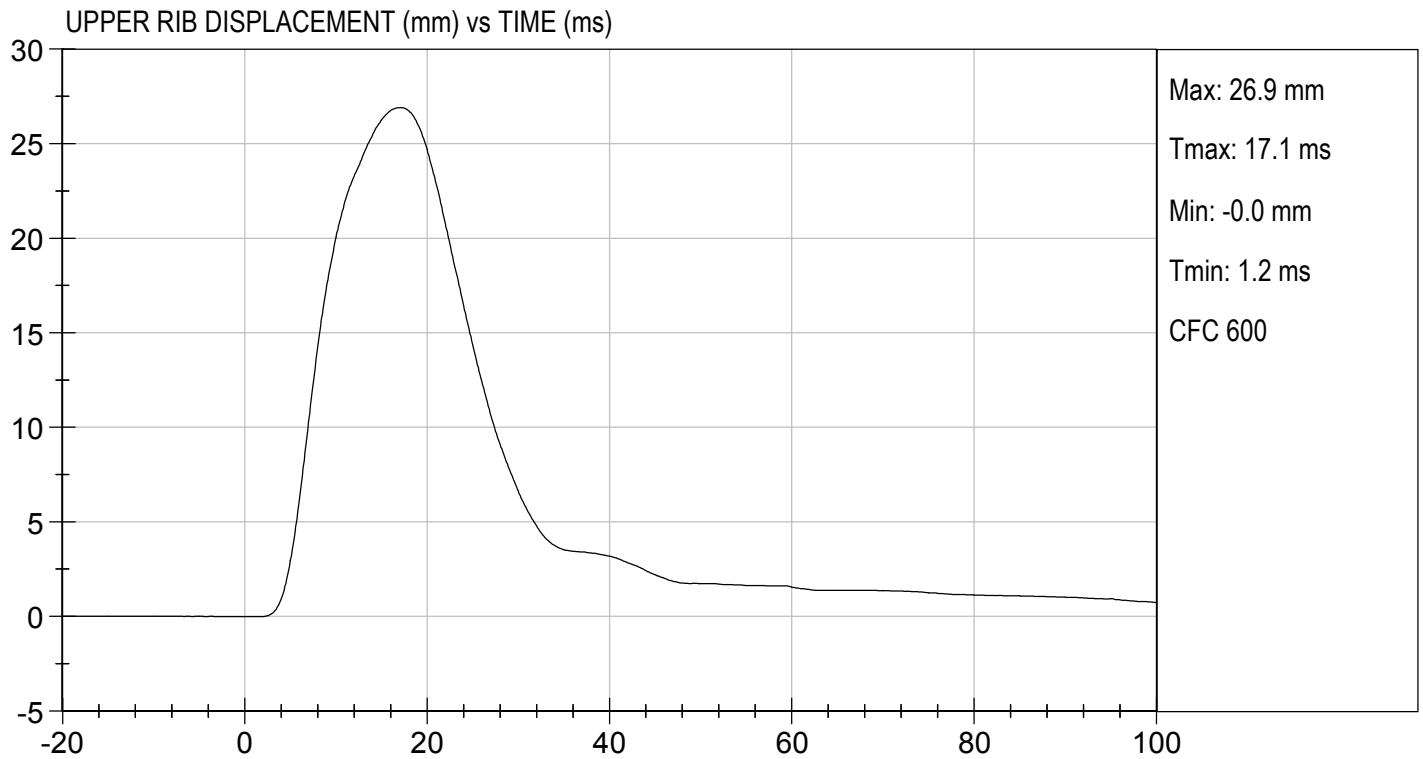

Approved By



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

TEST DATE: 01/14/2019
TEST #: D190164

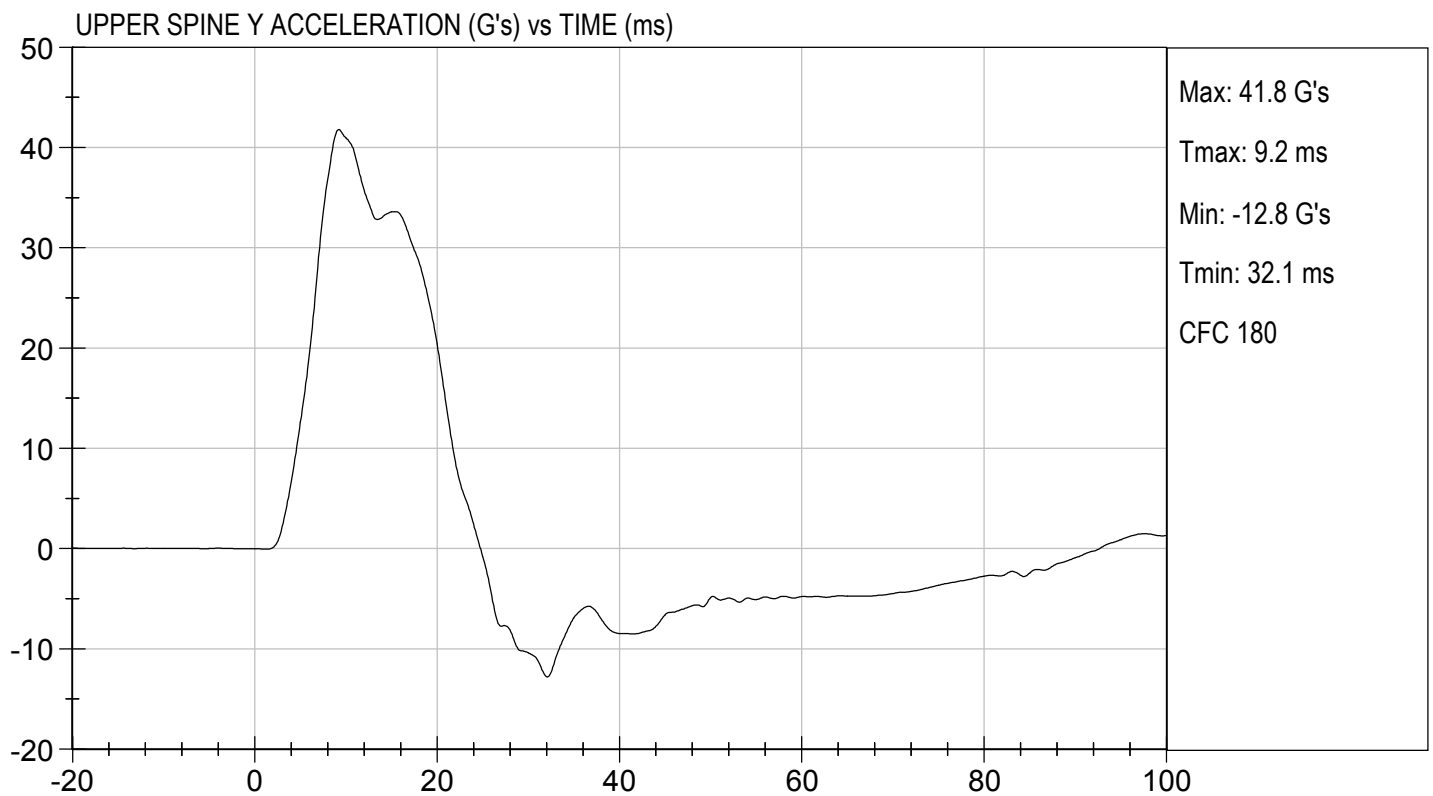
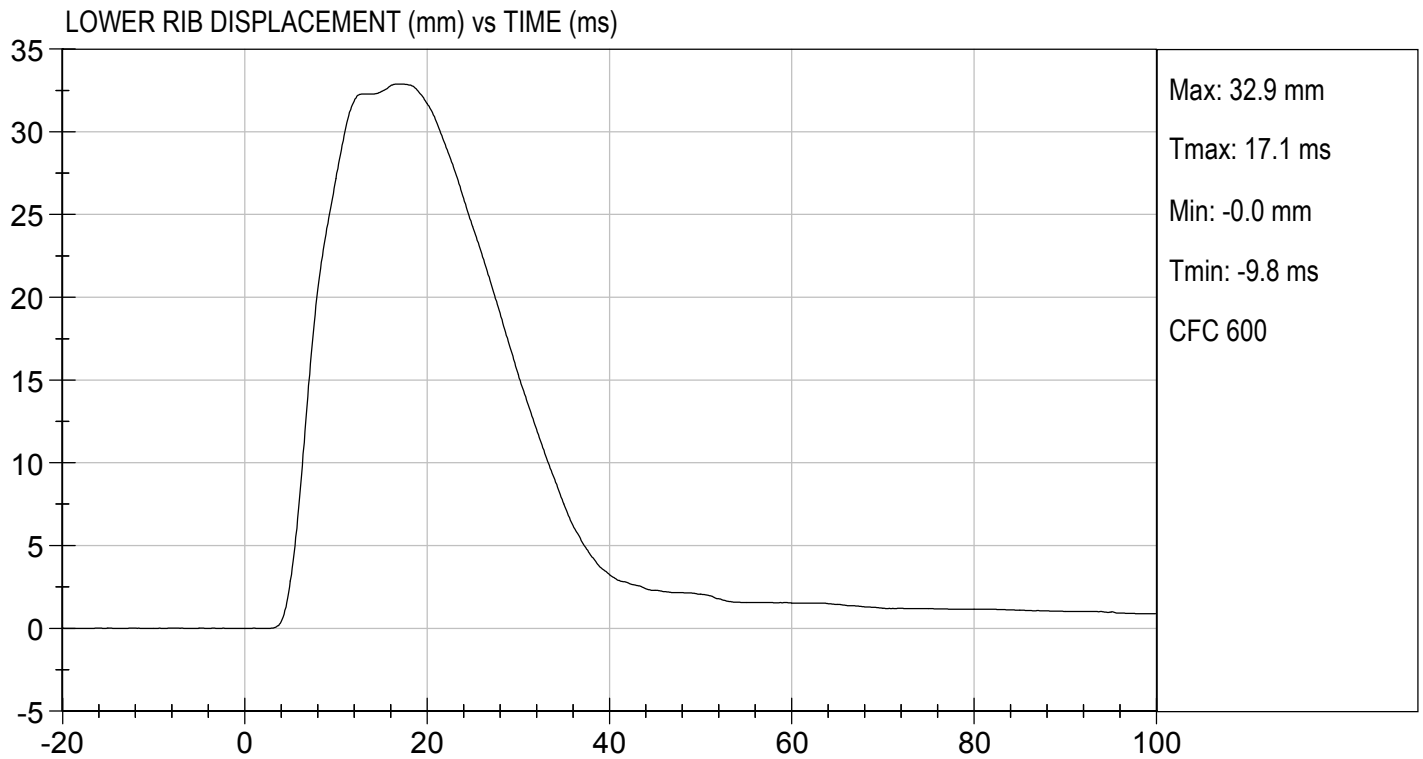






TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

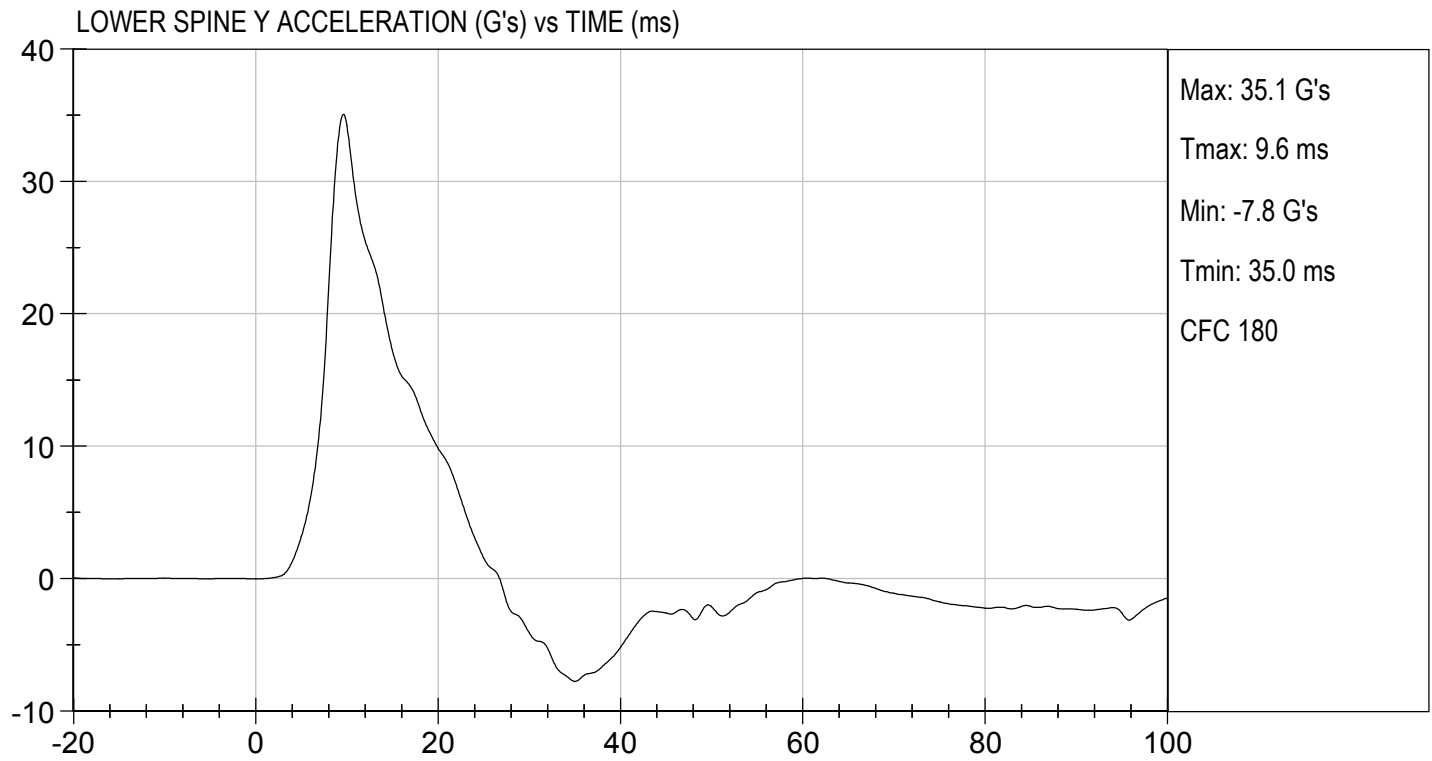
TEST DATE: 01/14/2019
TEST #: D190164





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

TEST DATE: 01/14/2019
TEST #: D190164

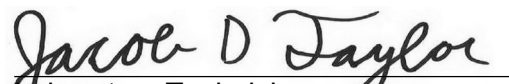


MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D190165

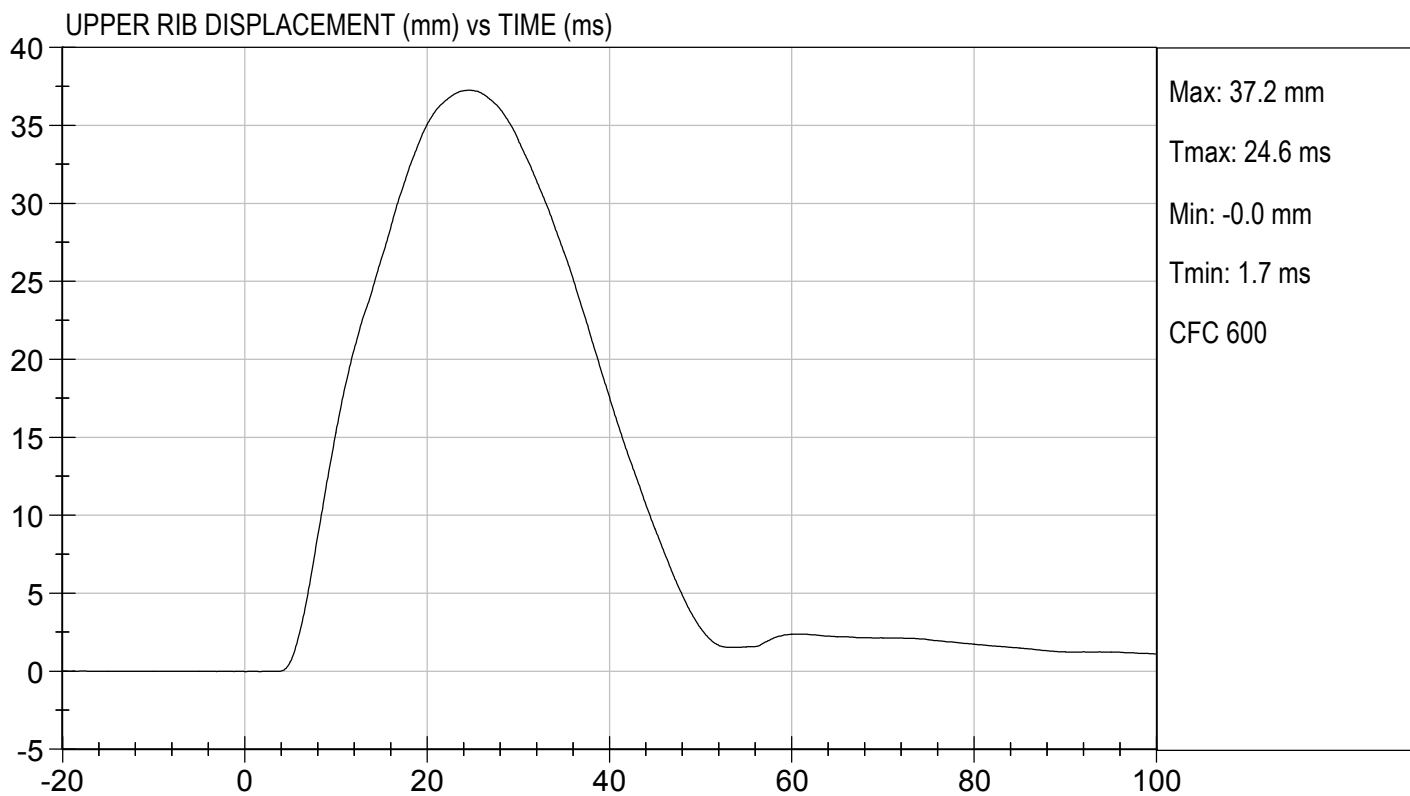
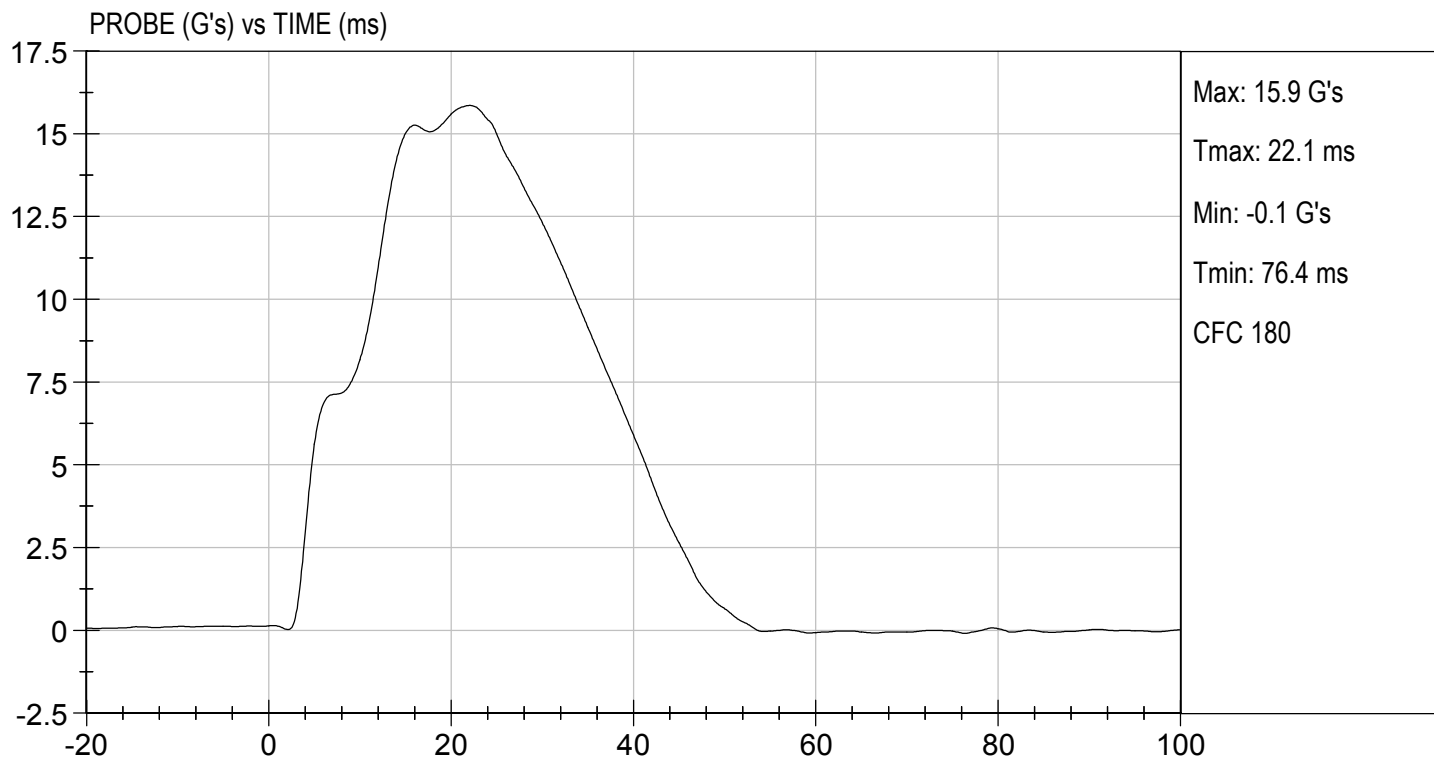
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	14 to 18	16	Pass
Upper Rib Displacement	mm	32 to 40	37	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	39	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
			Overall Test Results	Pass

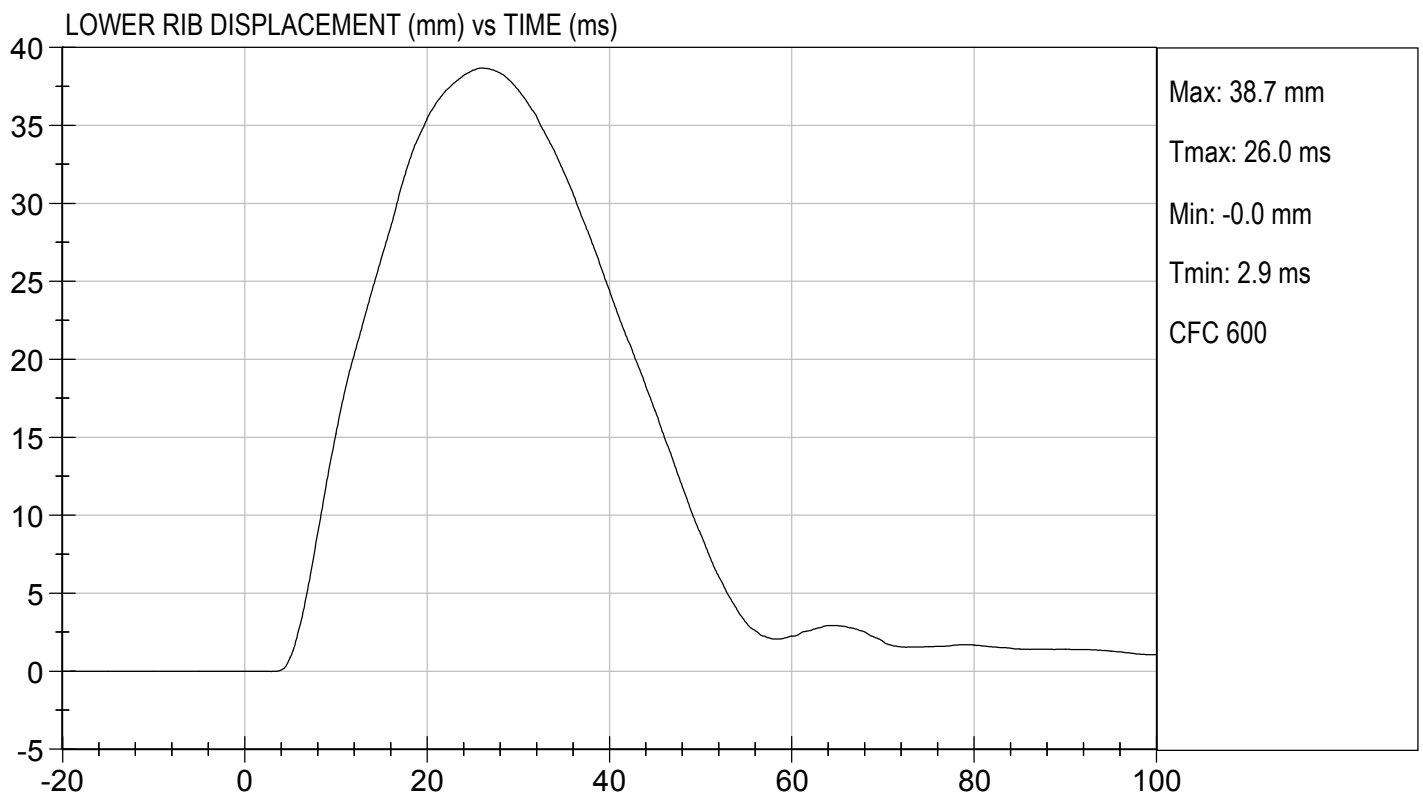
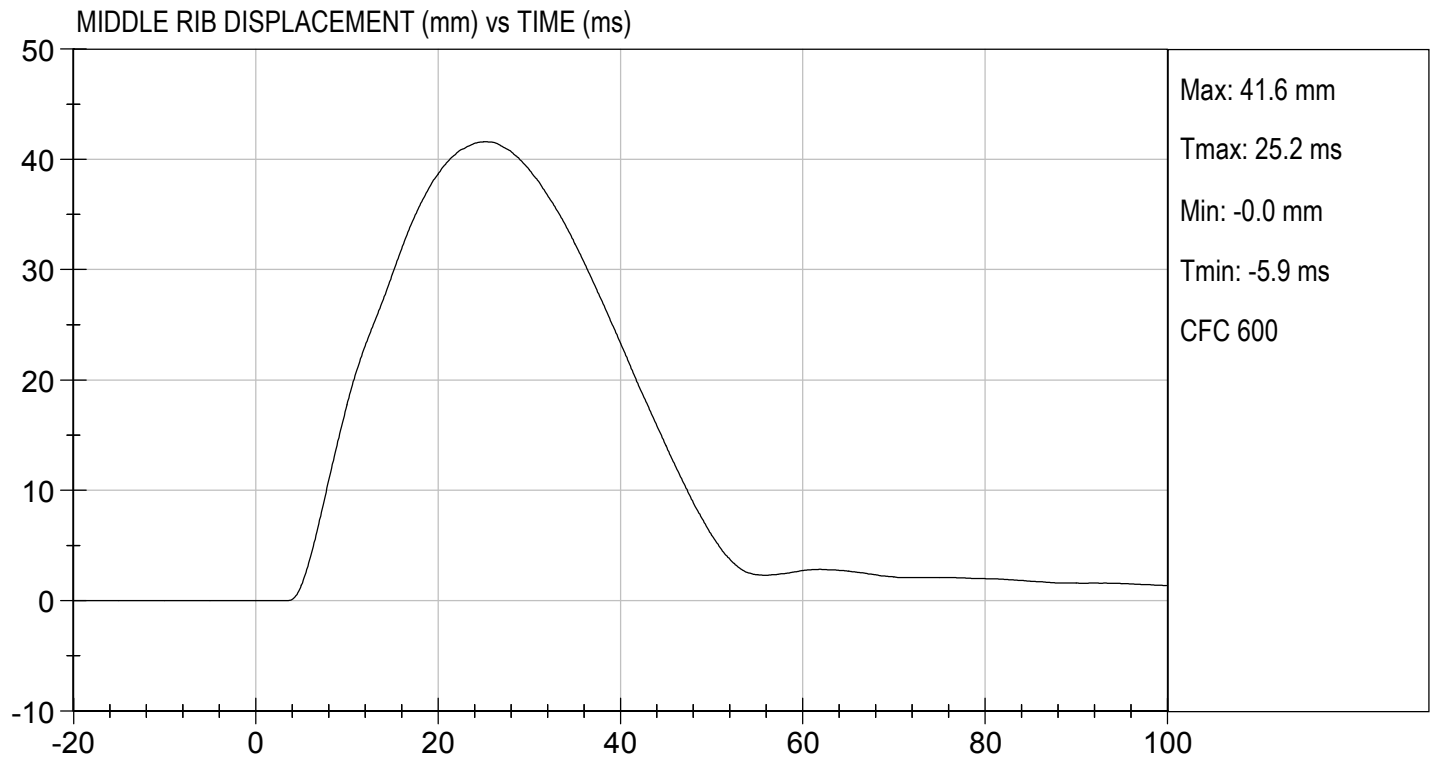

Laboratory Technician

01/14/2019

Test Date


Approved By

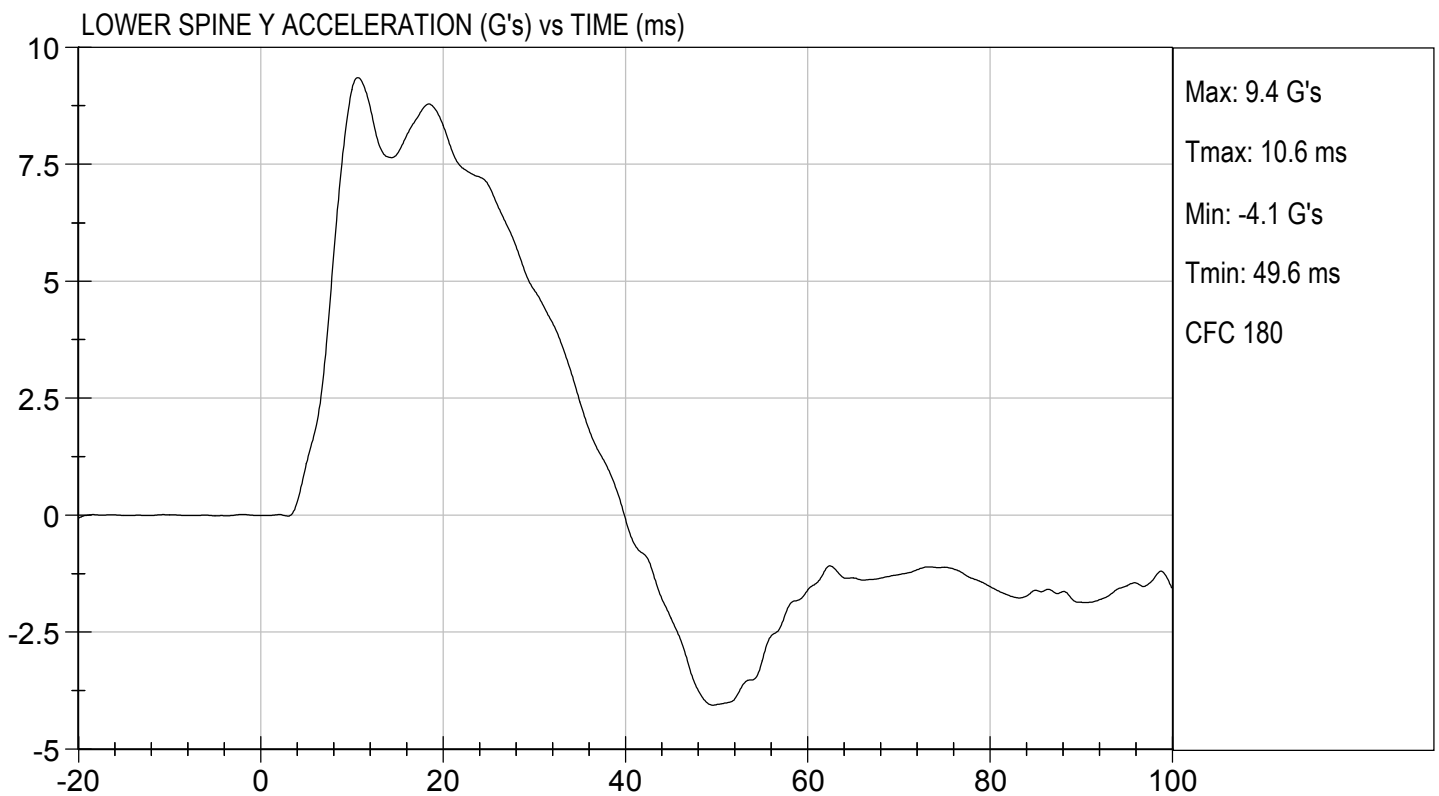
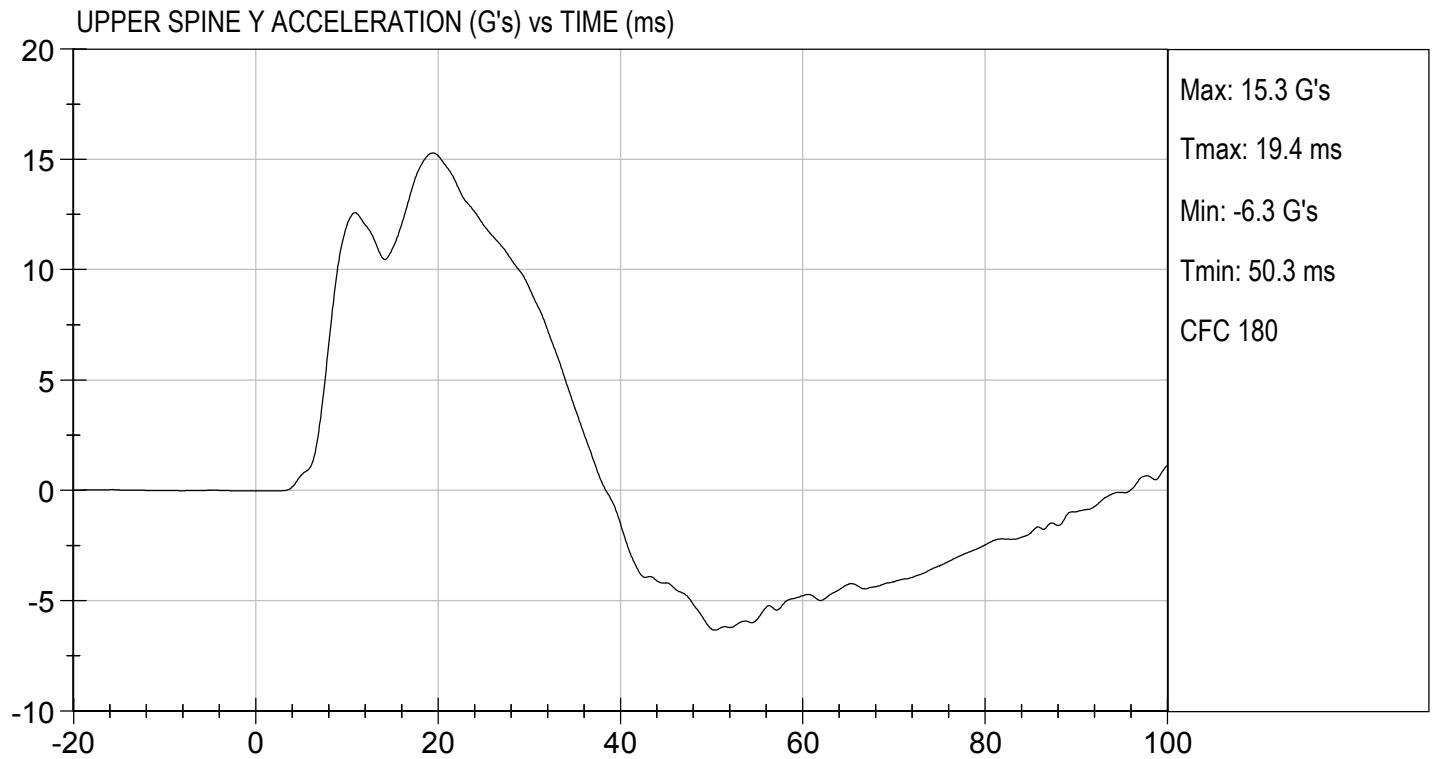






TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 01/14/2019
TEST #: D190165



MGA RESEARCH CORPORATION

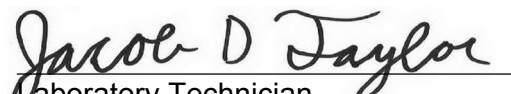
ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

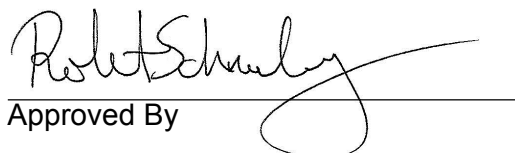
Test I.D: D190166

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	43	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	41	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass


Laboratory Technician

01/14/2019

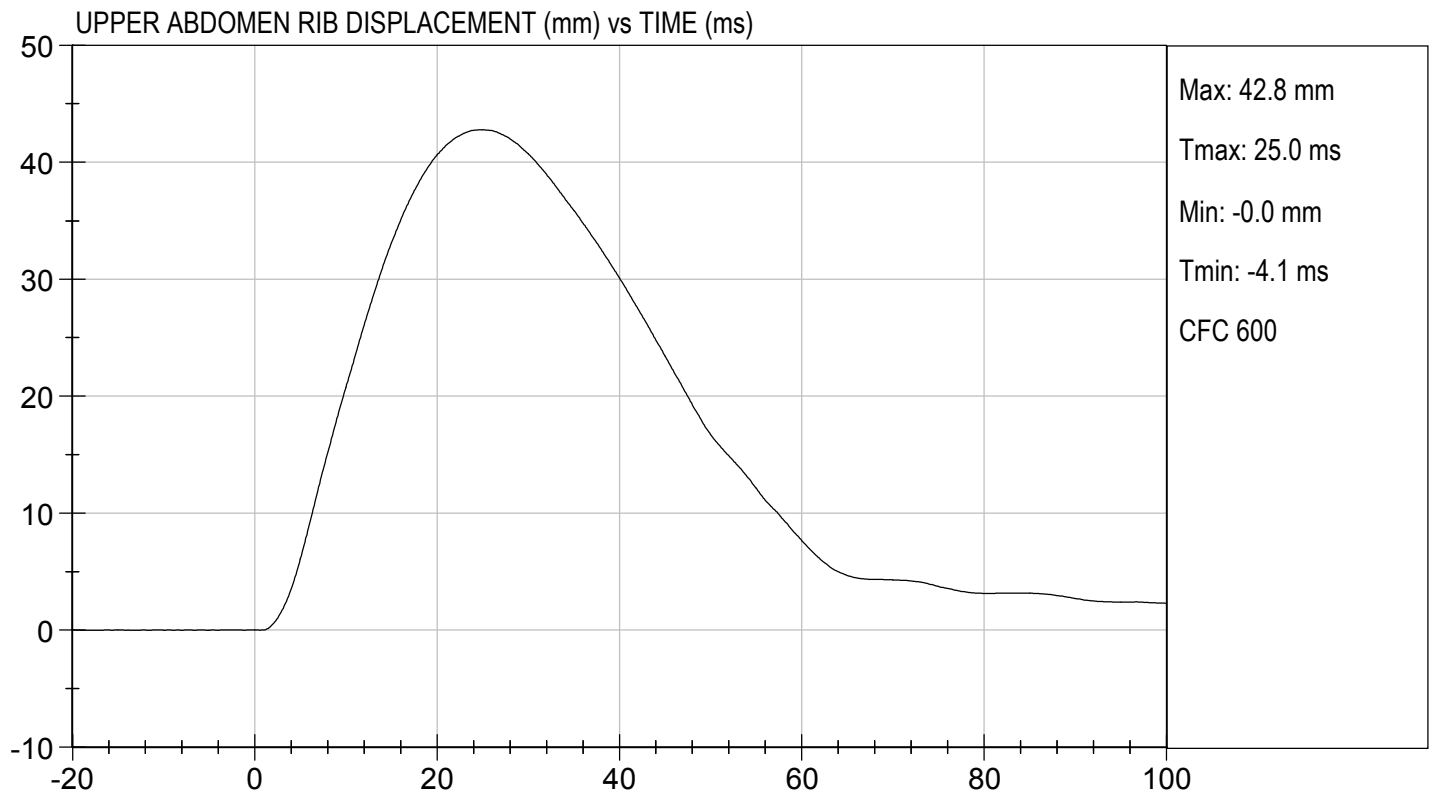
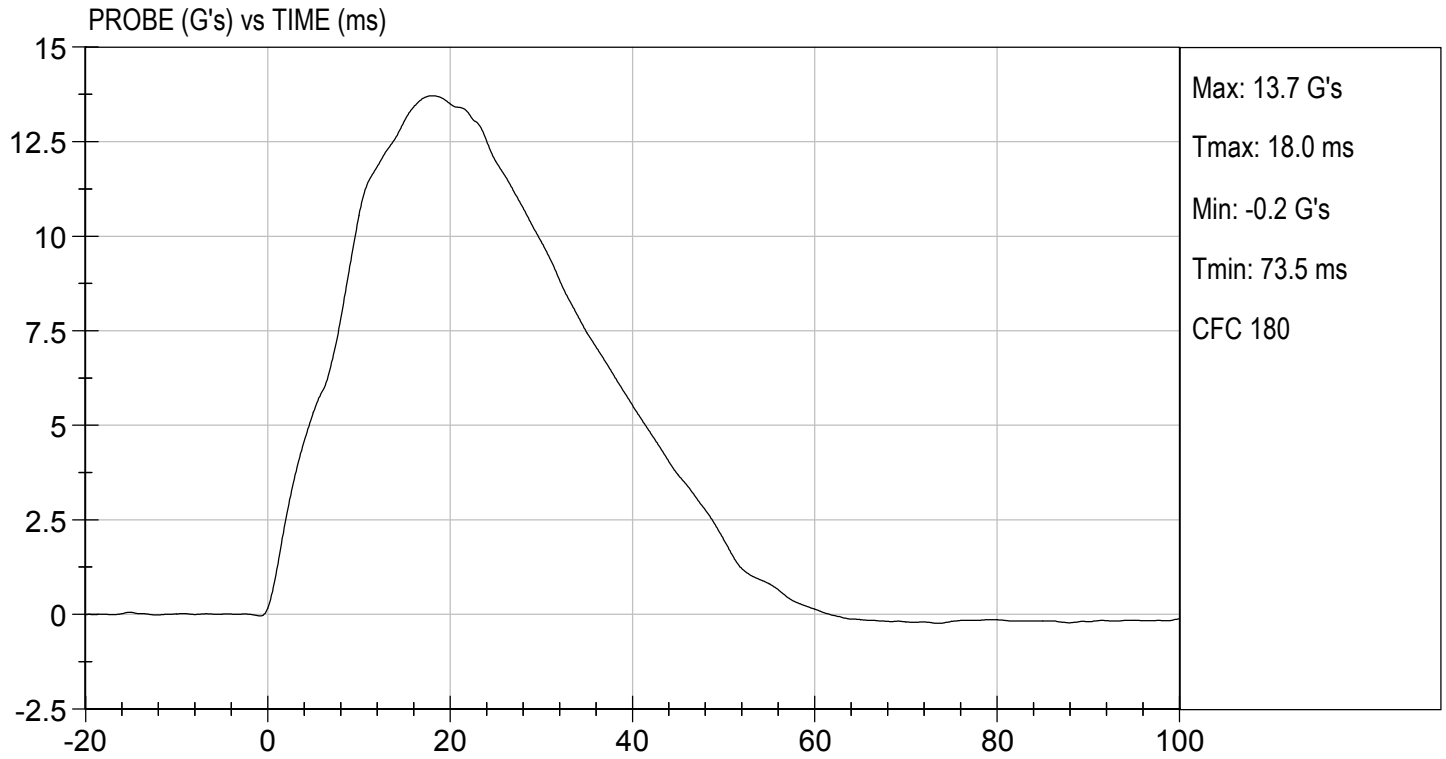
Test Date


Approved By



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

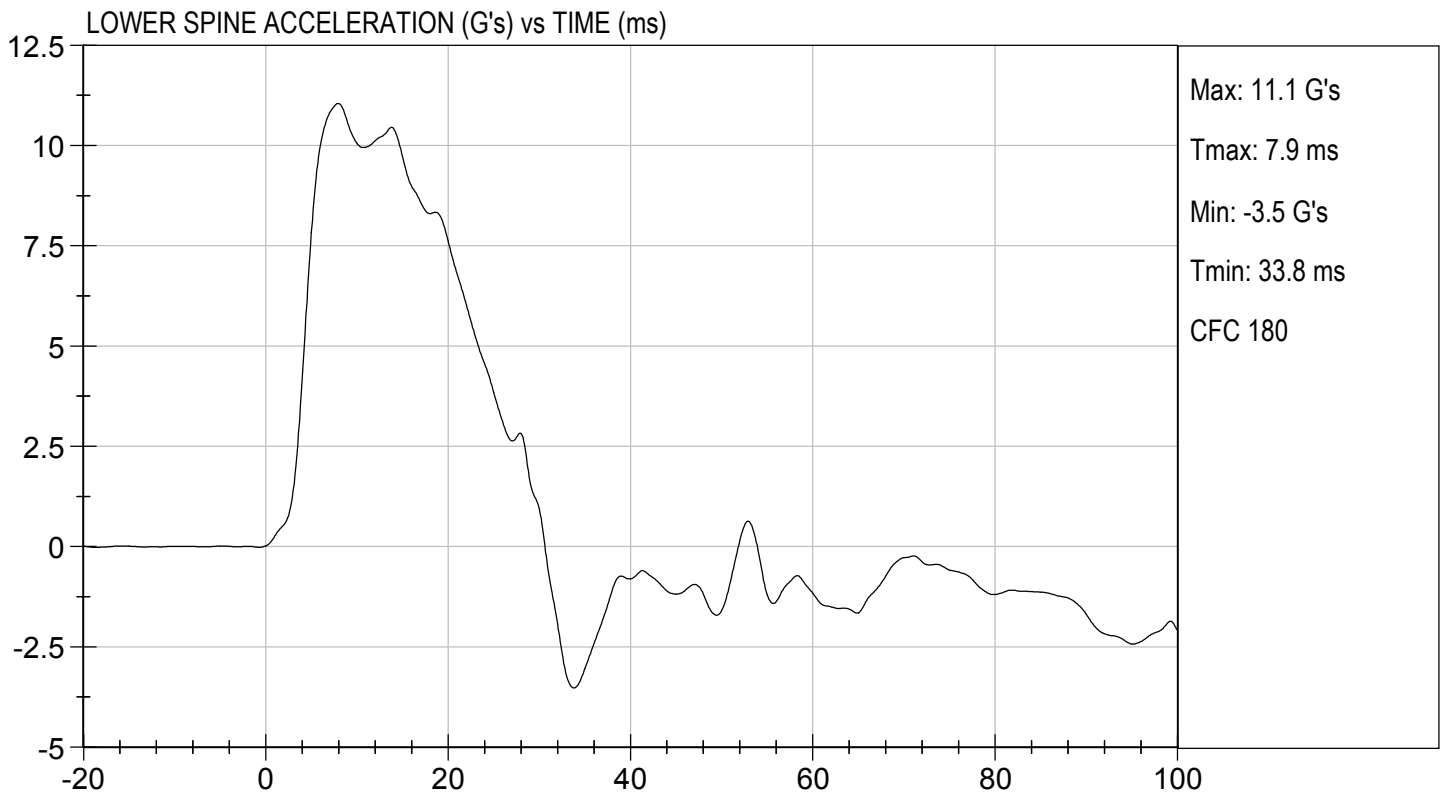
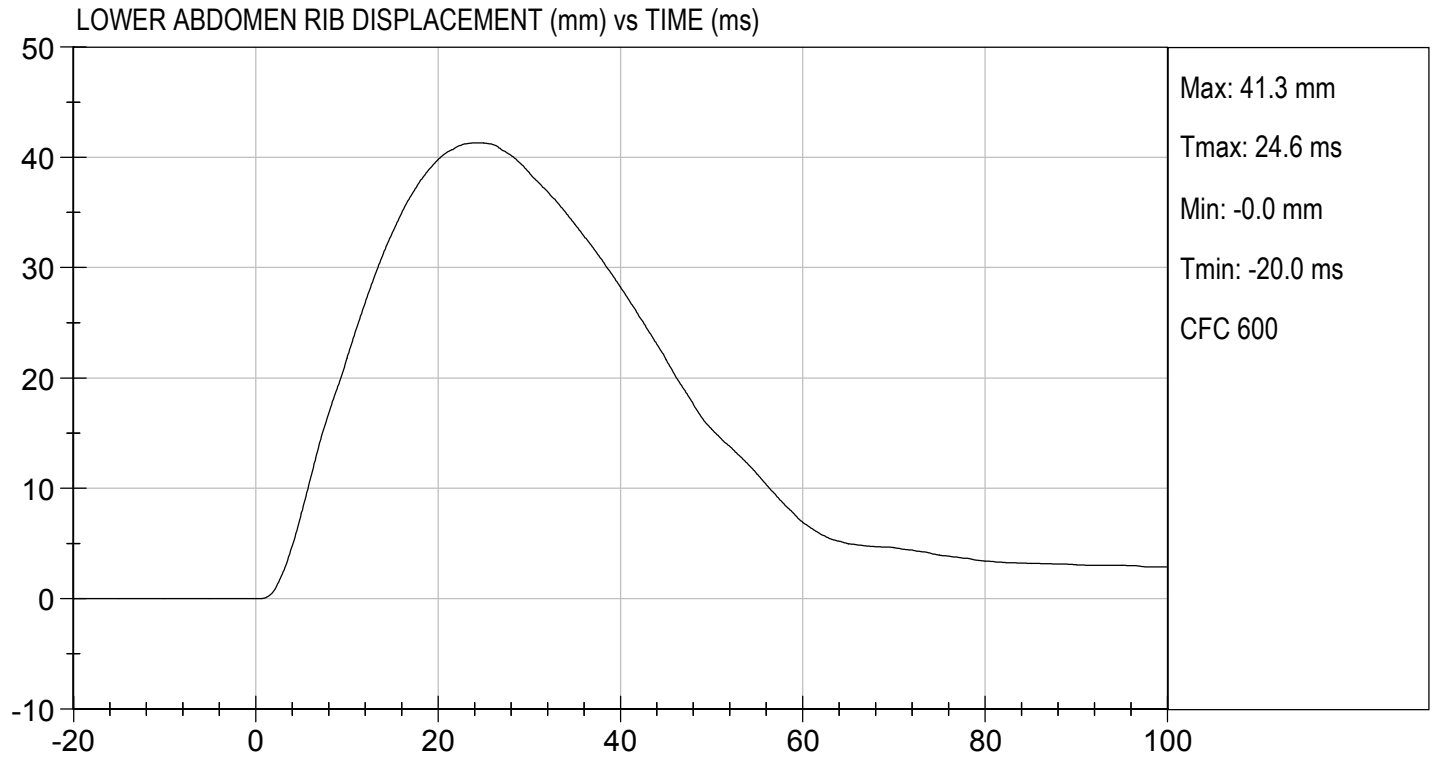
TEST DATE: 1/14/19
TEST #: D190166





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

TEST DATE: 1/14/19
TEST #: D190166



MGA RESEARCH CORPORATION

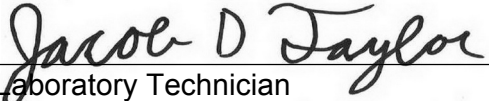
PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D19AB7

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	38 to 47	45	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	40	Pass
Peak Acetabulum Force	N	3600 to 4300	4,263	Pass
Overall Test Results				Pass


Laboratory Technician

01/15/2019

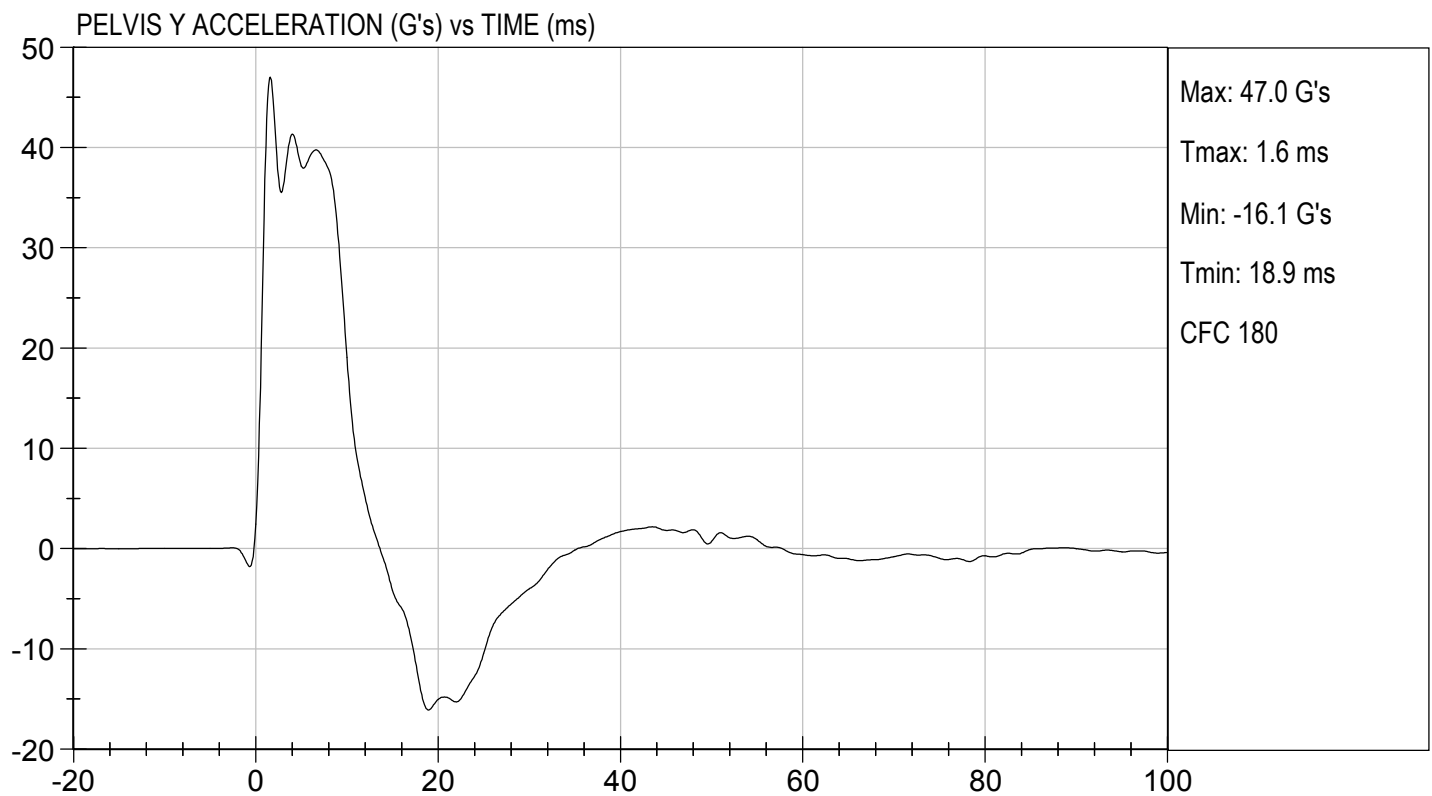
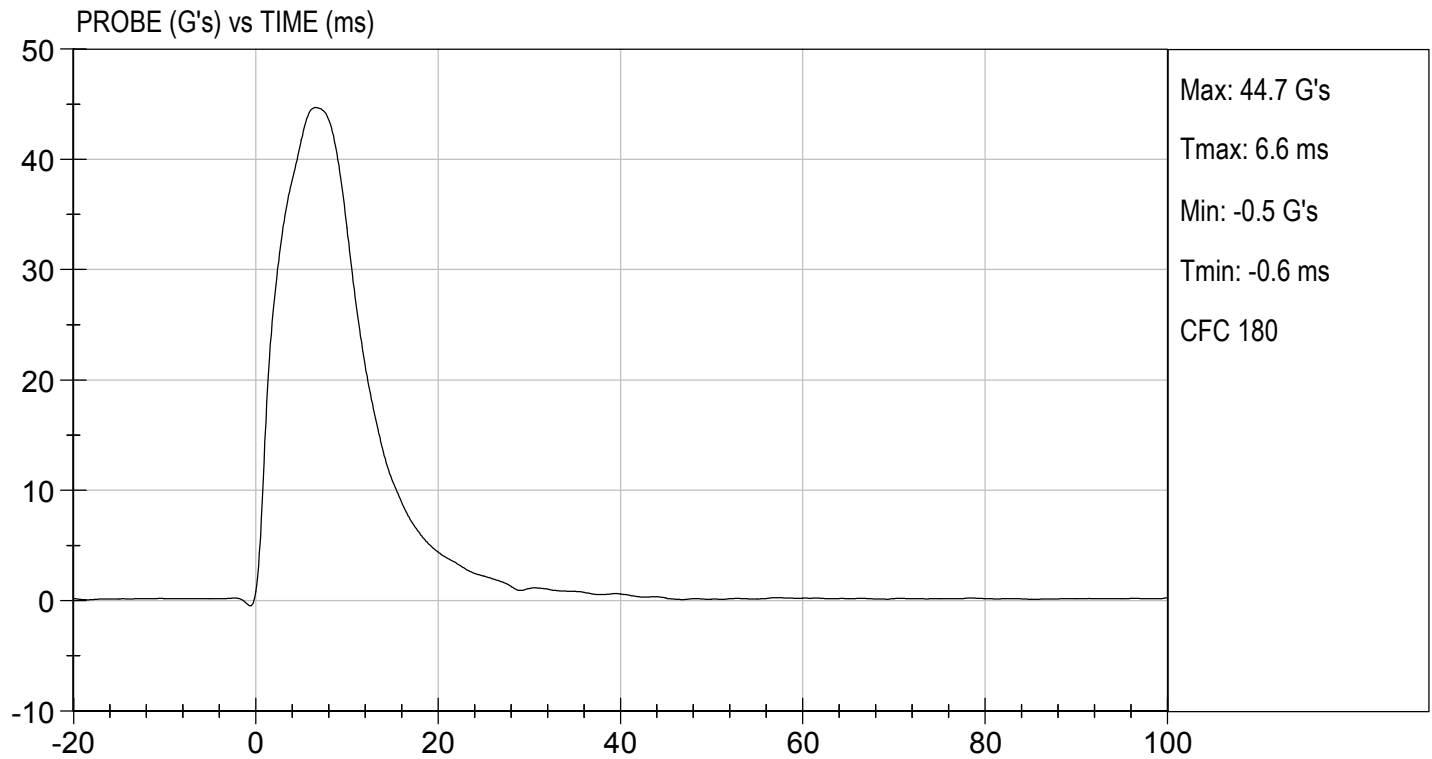
Test Date


Approved By



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

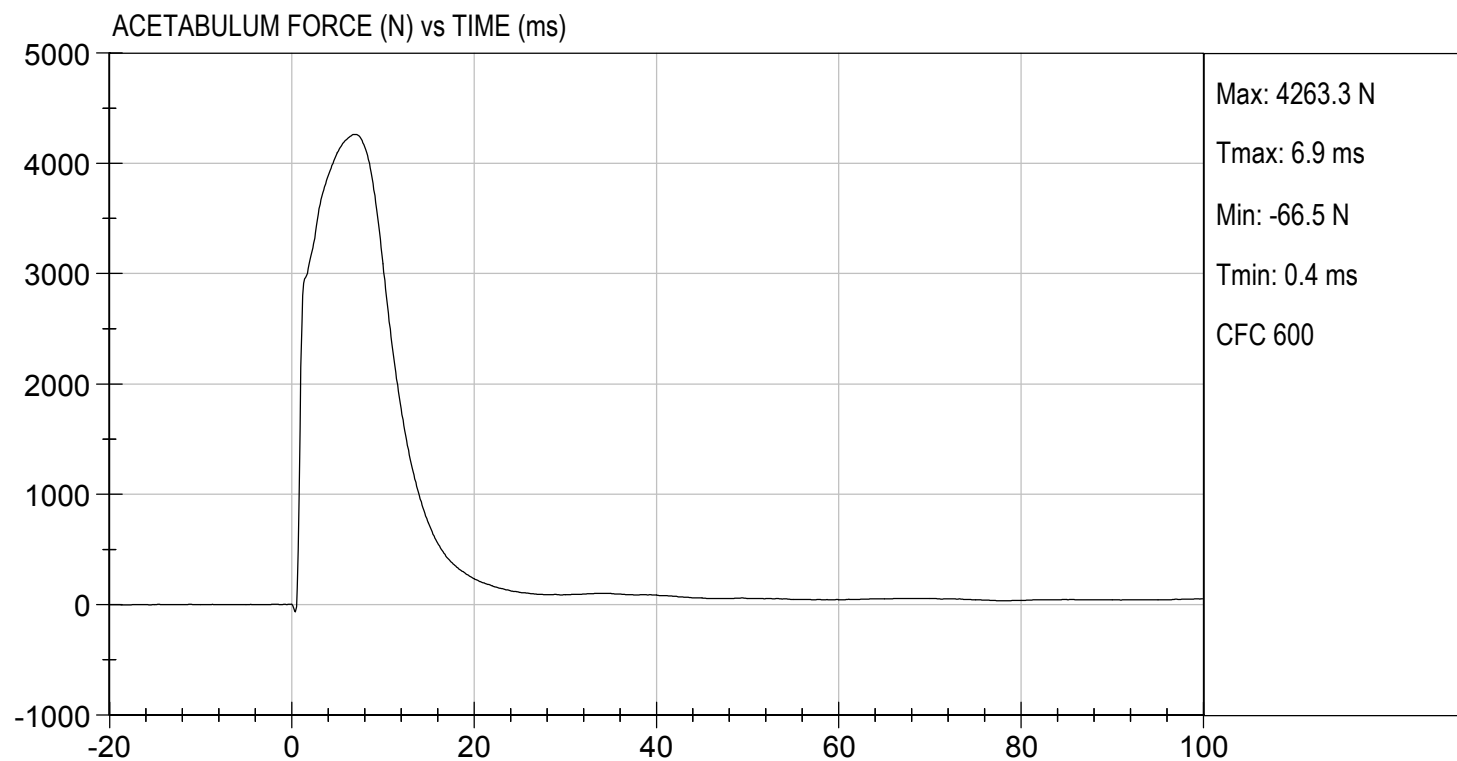
TEST DATE: 01/15/2019
TEST #: D19AB7





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

TEST DATE: 01/15/2019
TEST #: D19AB7



MGA RESEARCH CORPORATION

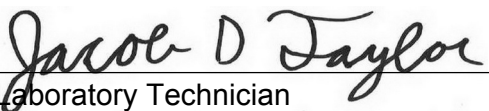
ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

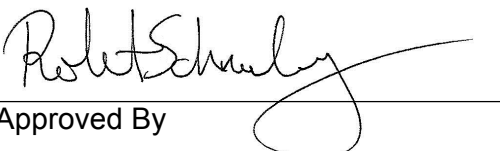
Test I.D: D19AB8

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	4.20 to 4.40	4.39	Pass
Maximum Probe Acceleration	G's	36 to 45	43	Pass
Pelvis Y Acceleration	G's	28 to 39	34	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,777	Pass
Overall Test Results				Pass


Laboratory Technician

01/15/2019

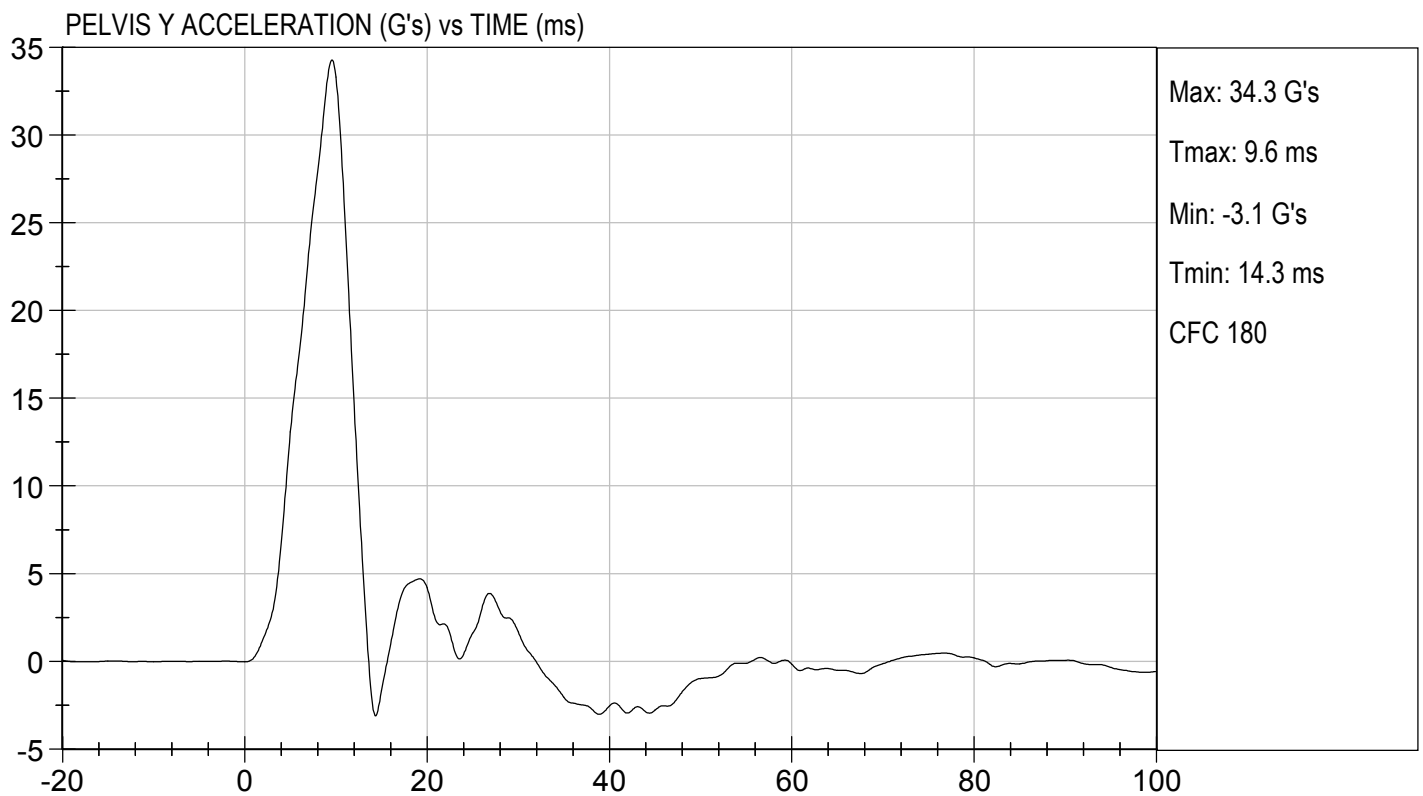
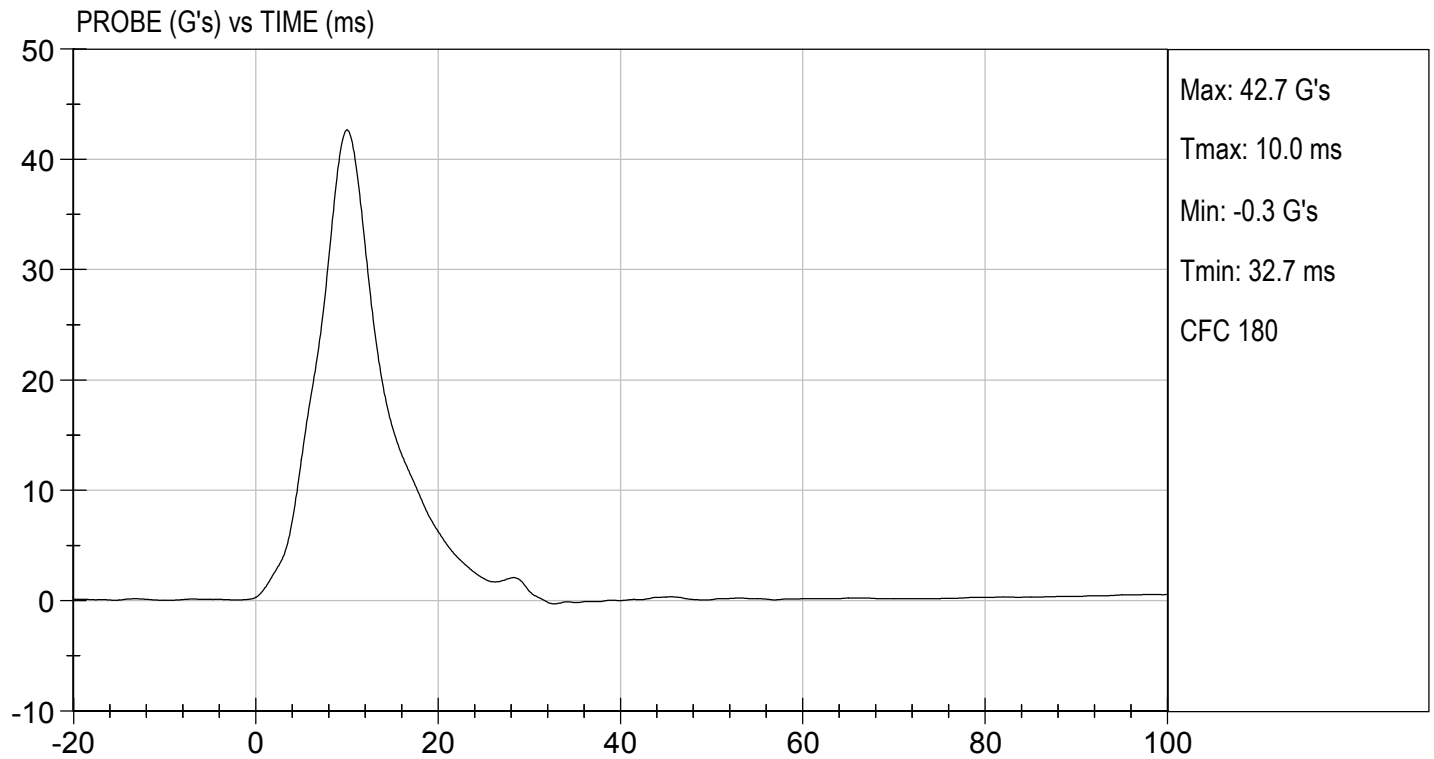
Test Date


Approved By



TEST DESC: ILLIAC
VELOCITY: 14.40 ft/s, 4.39 m/s

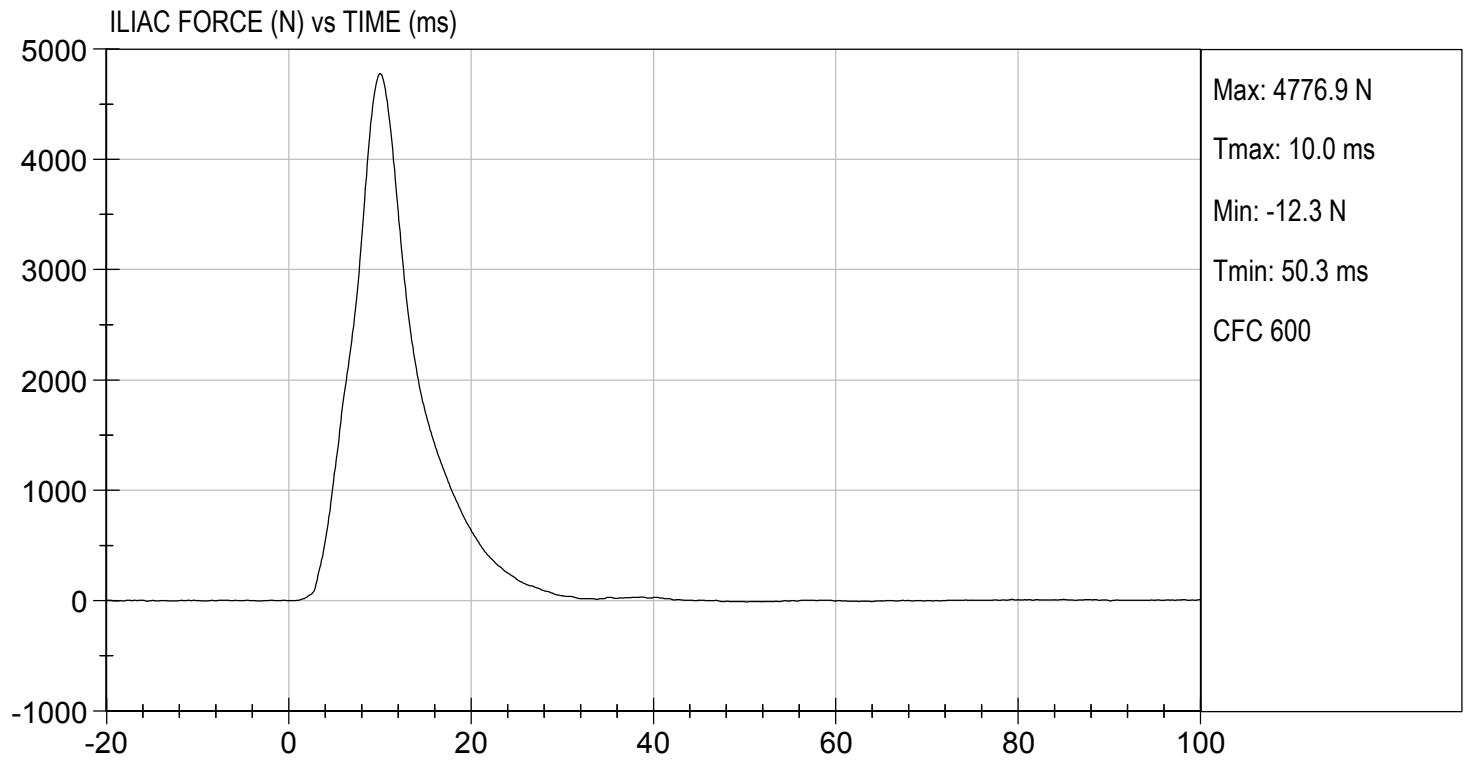
TEST DATE: 01/15/2019
TEST #: D19AB8





TEST DESC: ILLIAC
VELOCITY: 14.40 ft/s, 4.39 m/s

TEST DATE: 01/15/2019
TEST #: D19AB8



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

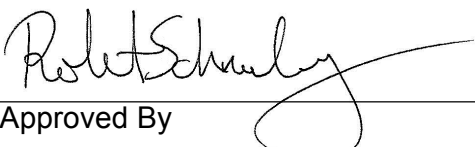
Test ID: D190271

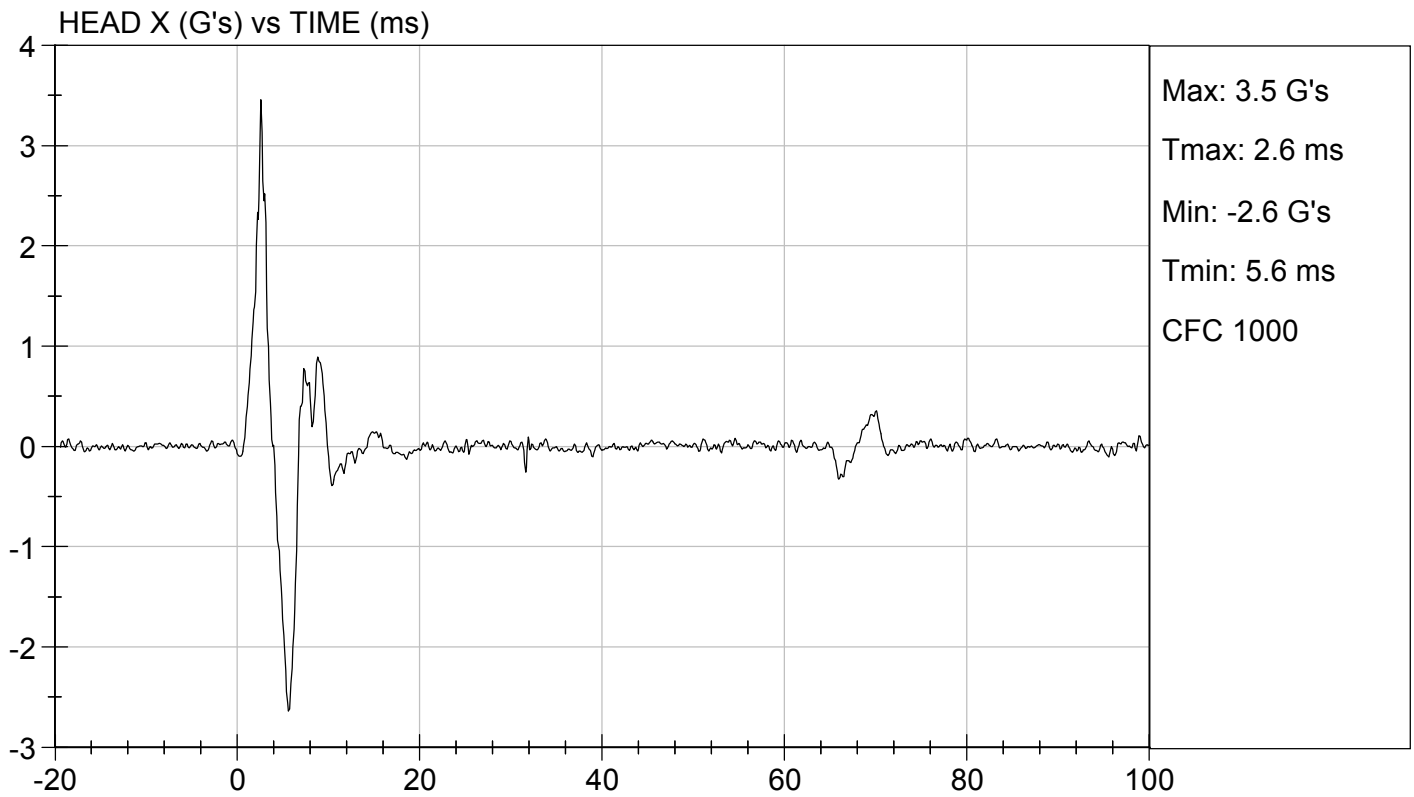
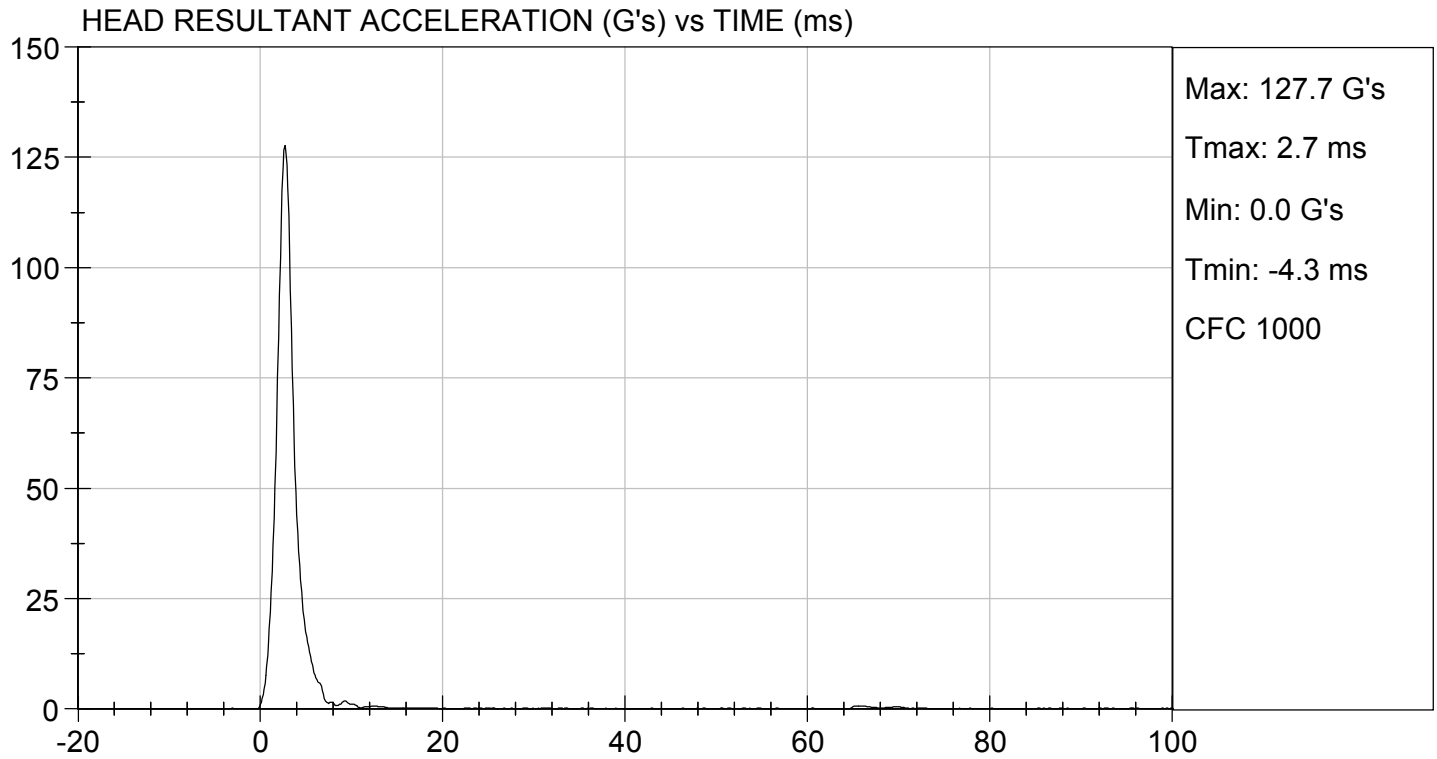
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Peak Resultant Acceleration	G's	115 to 137	128	Pass
Peak Longitudinal Acceleration	G's	+/- 15	3.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results			Pass	

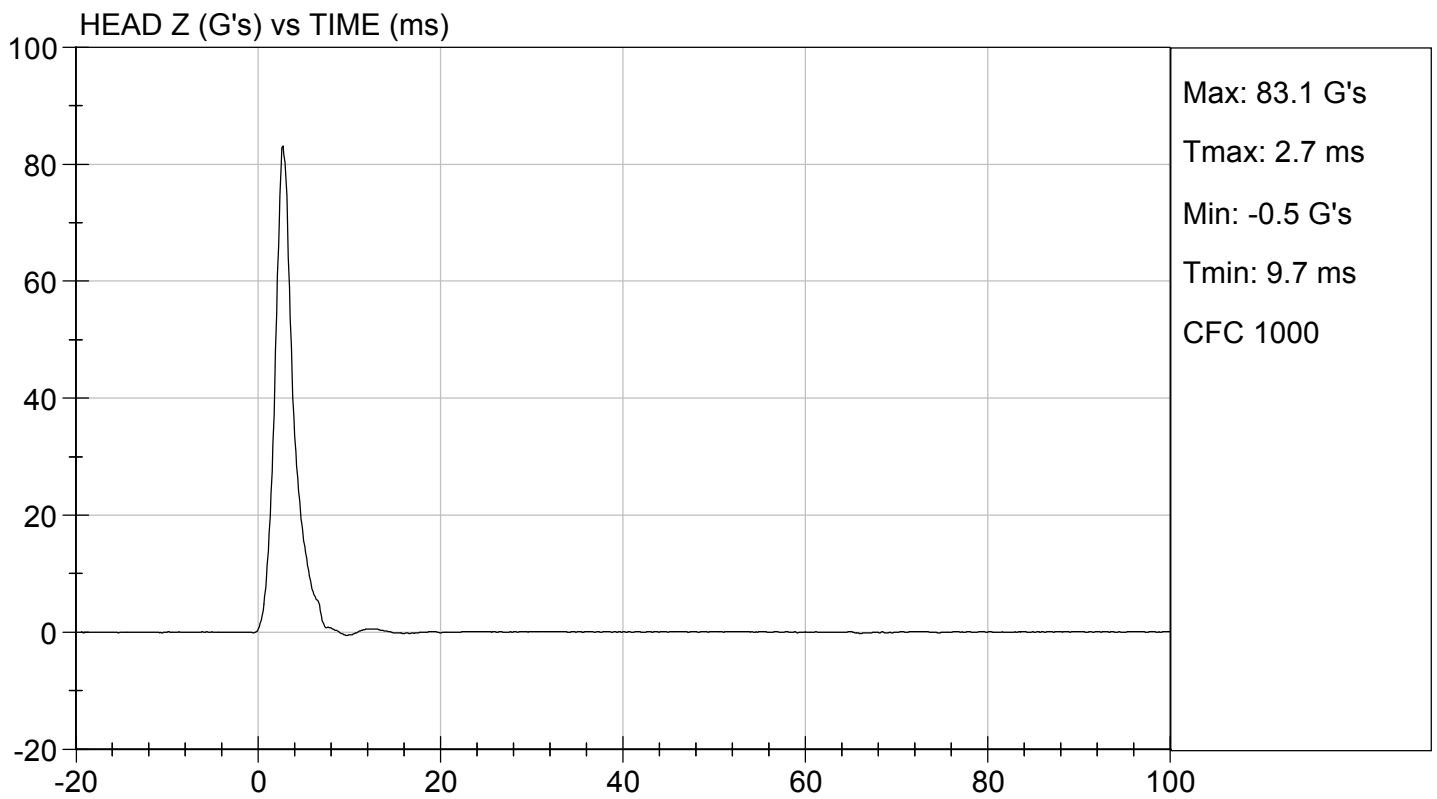
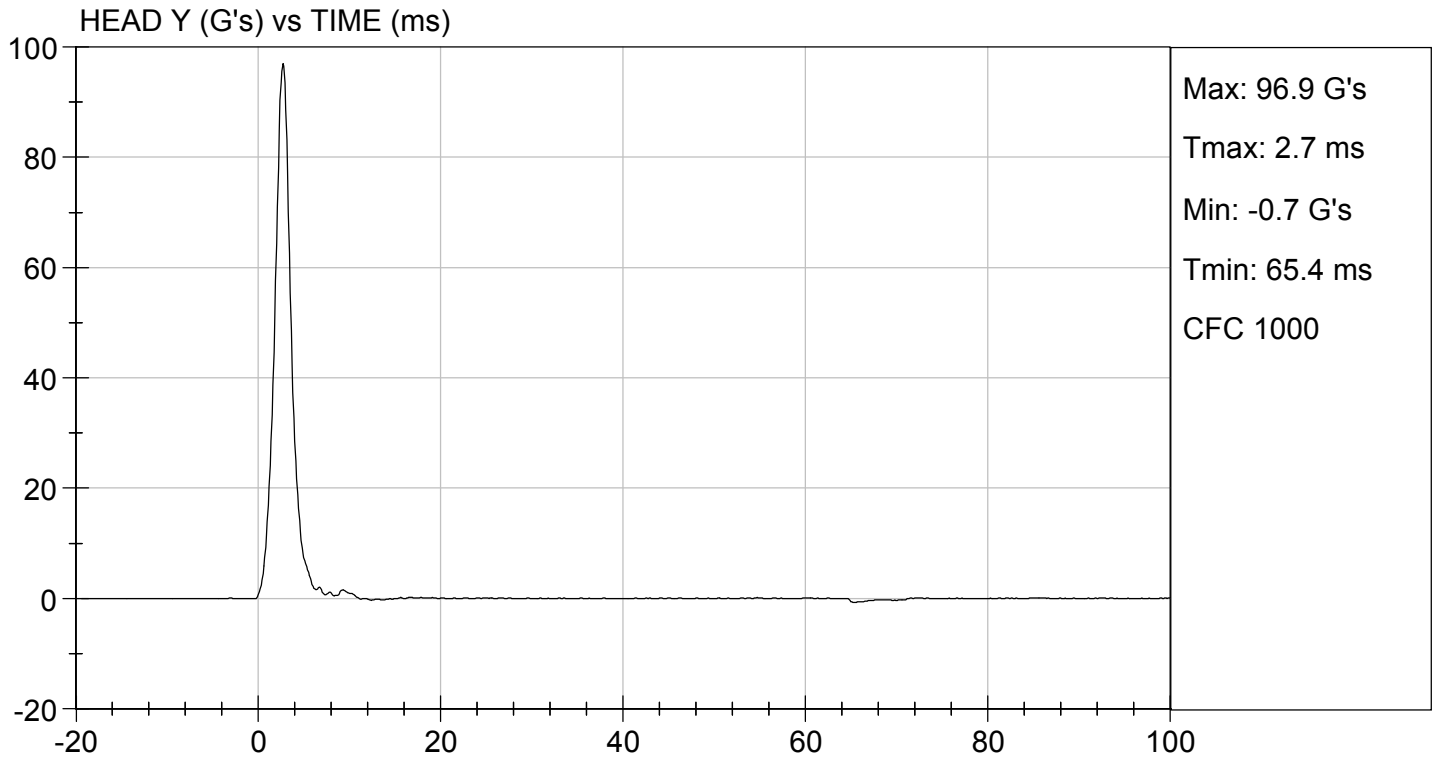

Laboratory Technician

01/22/2019

Test Date


Approved By



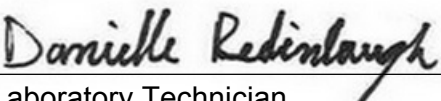


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

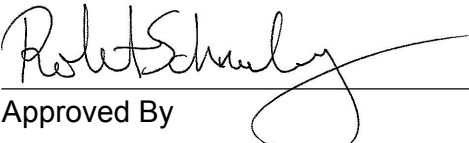
Test I.D: D190272

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21	Pass
Humidity		%	10 to 70	19	Pass
Impact Velocity		m/s	5.51 to 5.63	5.61	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.60	Pass
	15 ms	m/s	3.30 to 4.10	3.76	Pass
	20 ms	m/s	4.40 to 5.40	5.23	Pass
	25 ms	m/s	5.40 to 6.10	5.82	Pass
	25-100 ms	m/s	5.50 to 6.20	5.82	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	59	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-44	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	107	Pass
Overall Test Results					Pass


 Laboratory Technician

01/22/2019

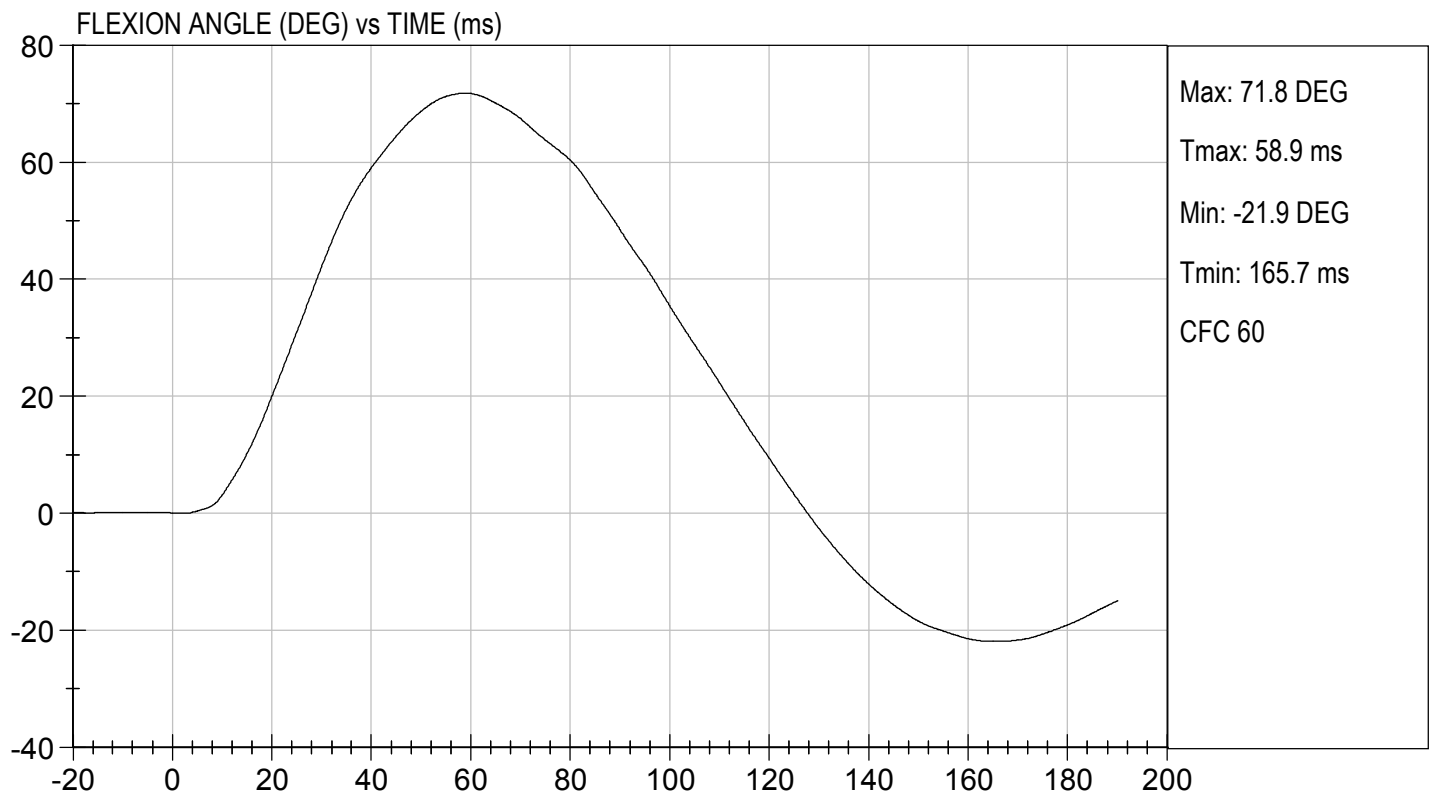
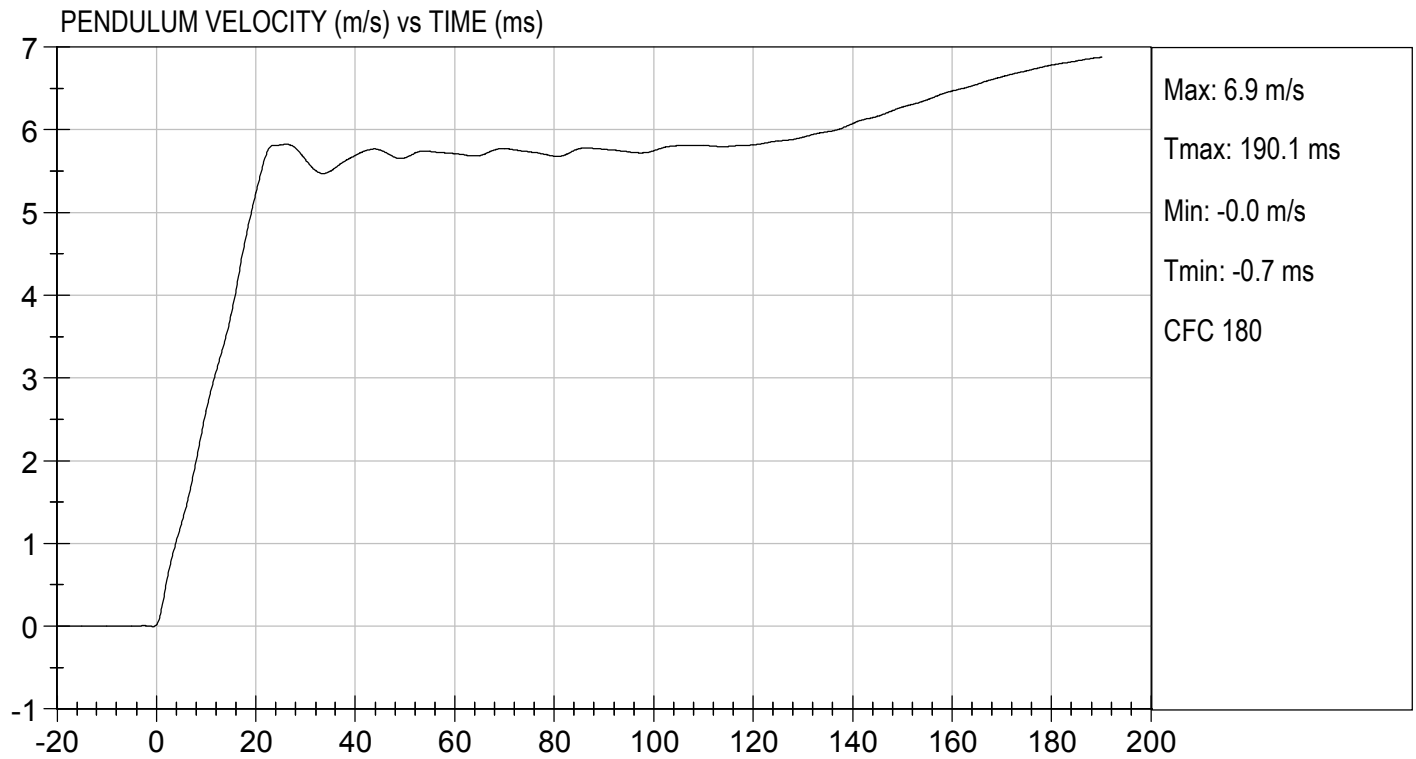
Test Date


 Approved By



TEST DESC: NECK BENDING
VELOCITY: 18.40 ft/s, 5.61 m/s

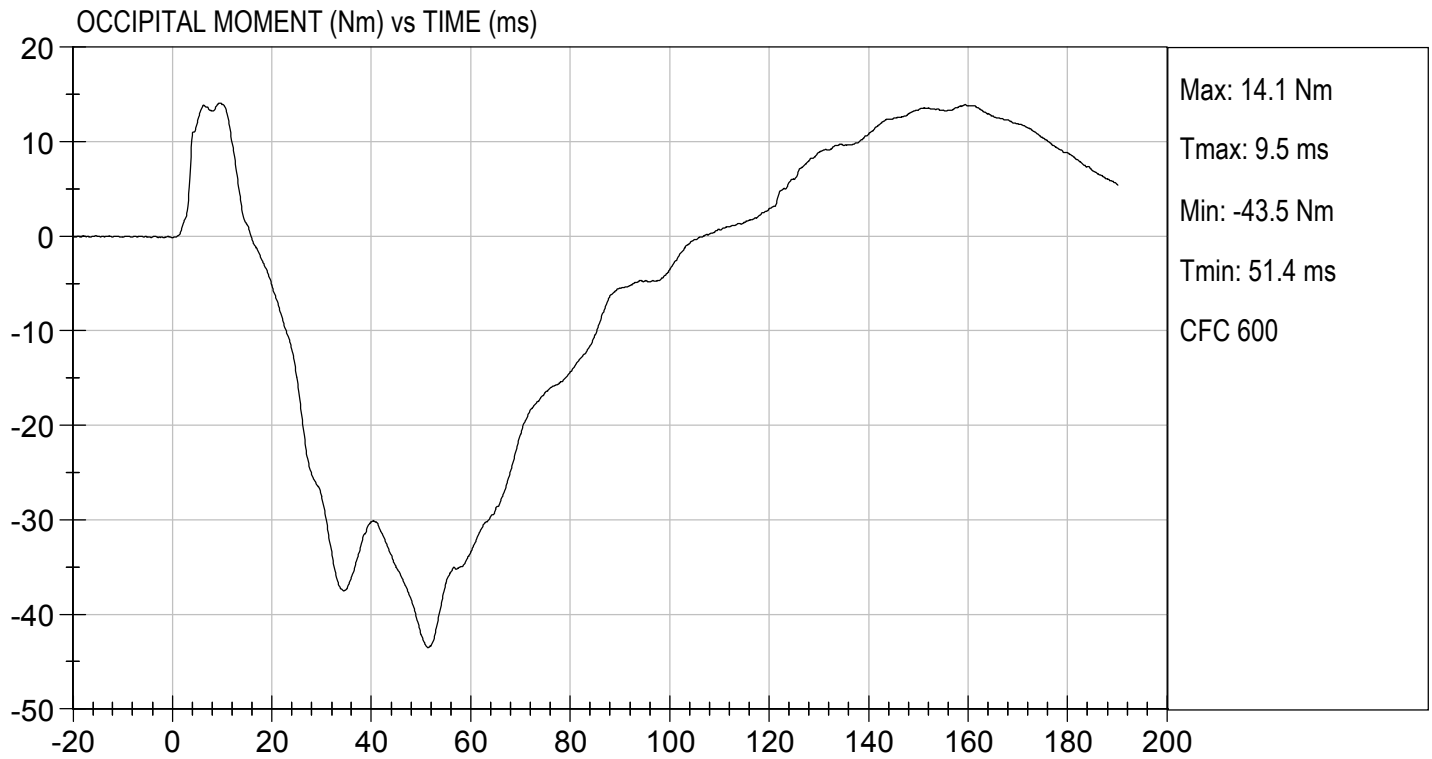
TEST DATE: 01/22/2019
TEST #: D190272





TEST DESC: NECK BENDING
VELOCITY: 18.40 ft/s, 5.61 m/s

TEST DATE: 01/22/2019
TEST #: D190272



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

ATD Serial No: 306

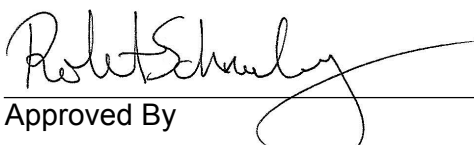
Test ID: D190273

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	17	Pass
Impact Velocity	m/s	4.20 to 4.40	4.36	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	22	Pass
Overall Test Results			Pass	


Laboratory Technician

01/21/2019

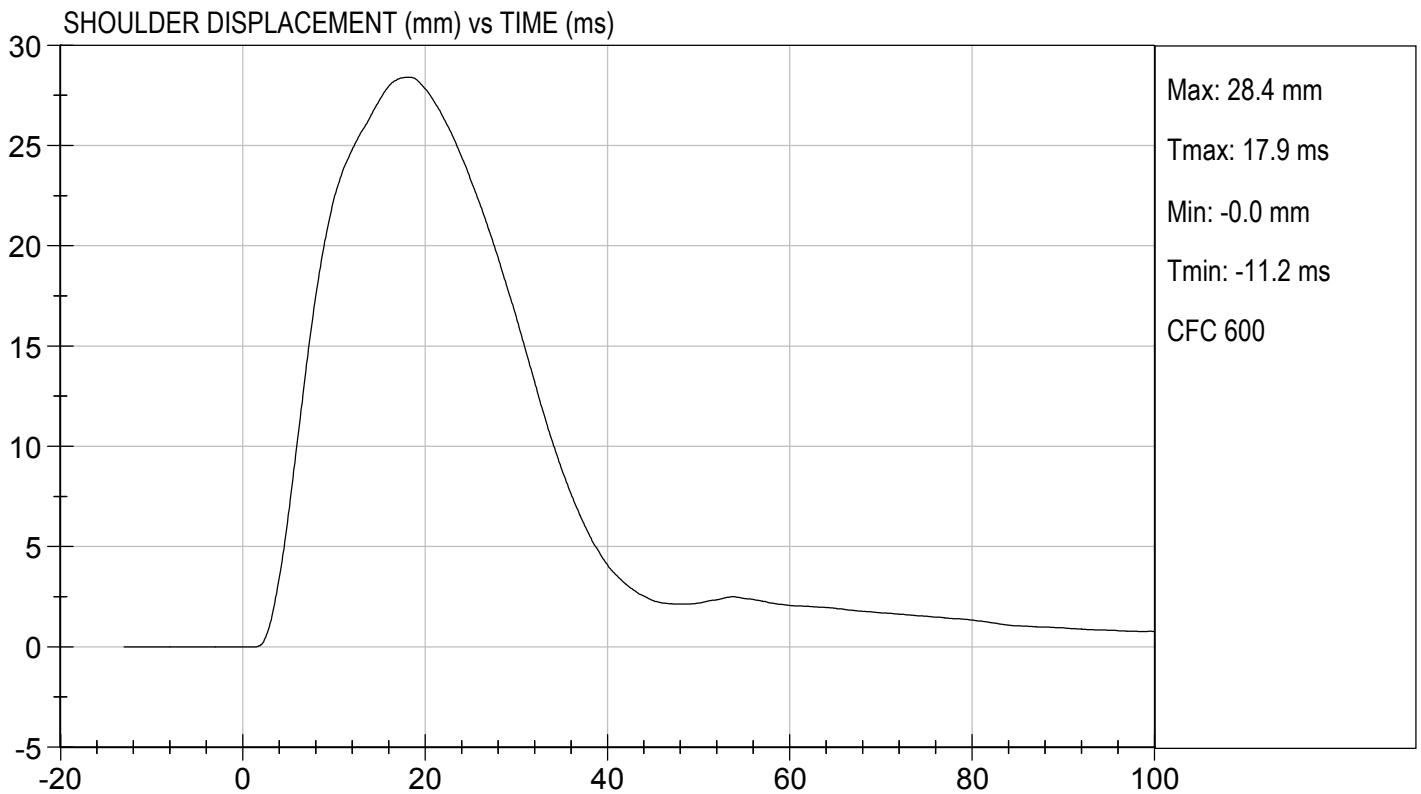
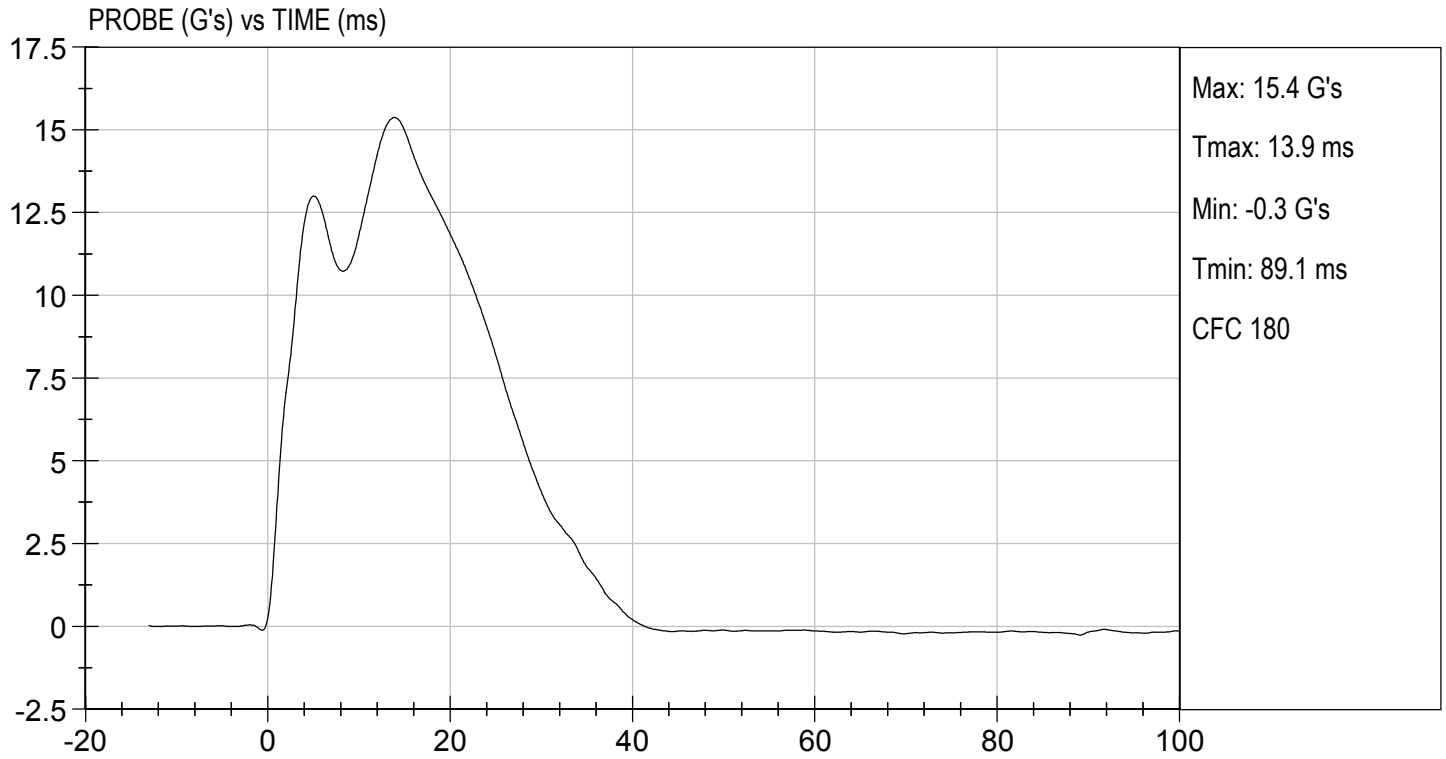
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.30 ft/s, 4.36 m/s

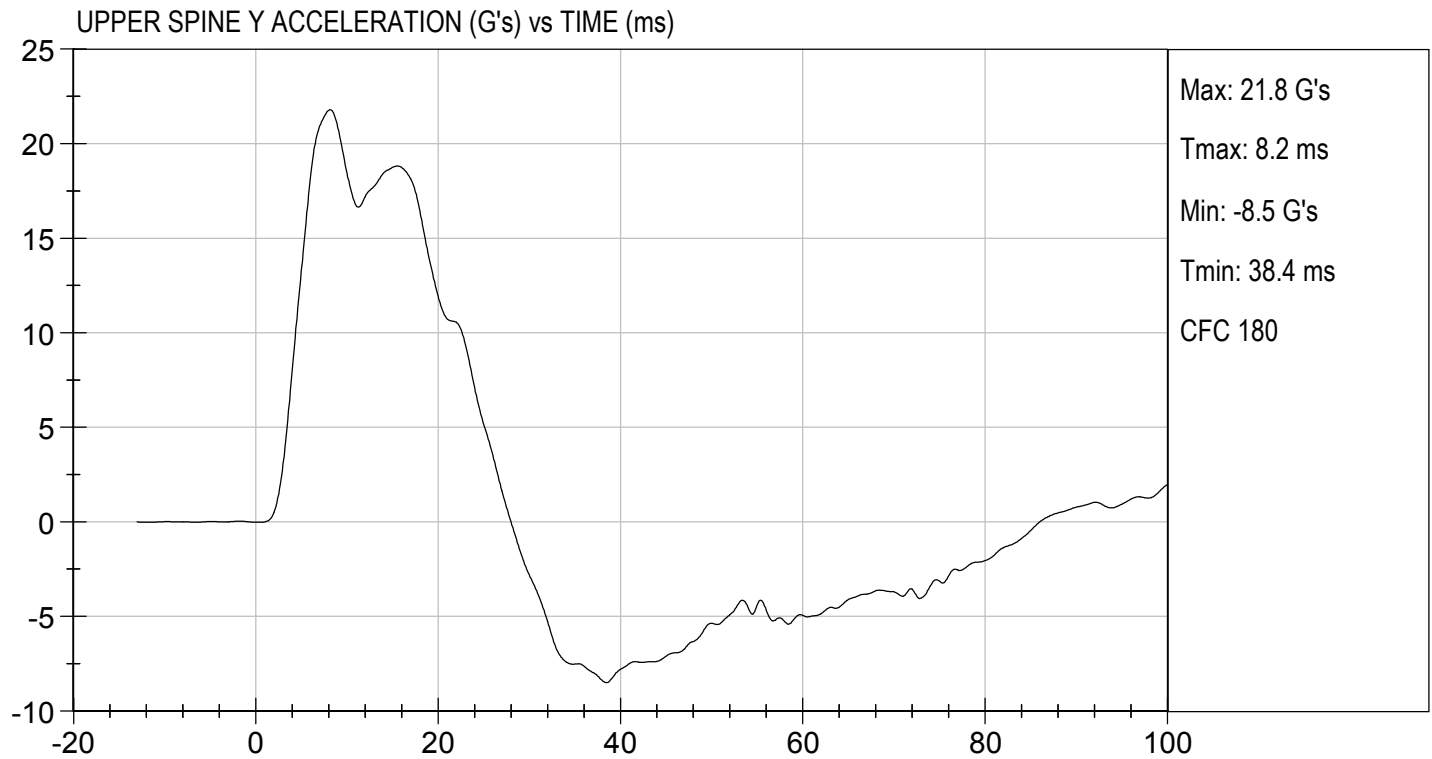
TEST DATE: 01/21/2019
TEST #: D190273





TEST DESC: SHOULDER IMPACT
VELOCITY: 14.30 ft/s, 4.36 m/s

TEST DATE: 01/21/2019
TEST #: D190273

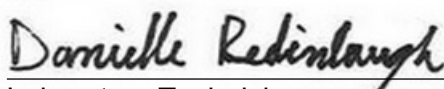


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

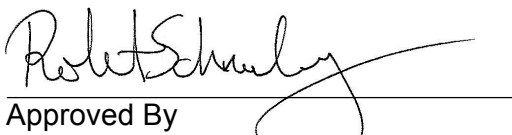
Test I.D: D190274

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	17	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	35	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	30	Pass
Lower Rib Displacement	mm	32 to 38	32	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	41	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	35	Pass
Overall Test Results				Pass


Laboratory Technician

01/21/2019

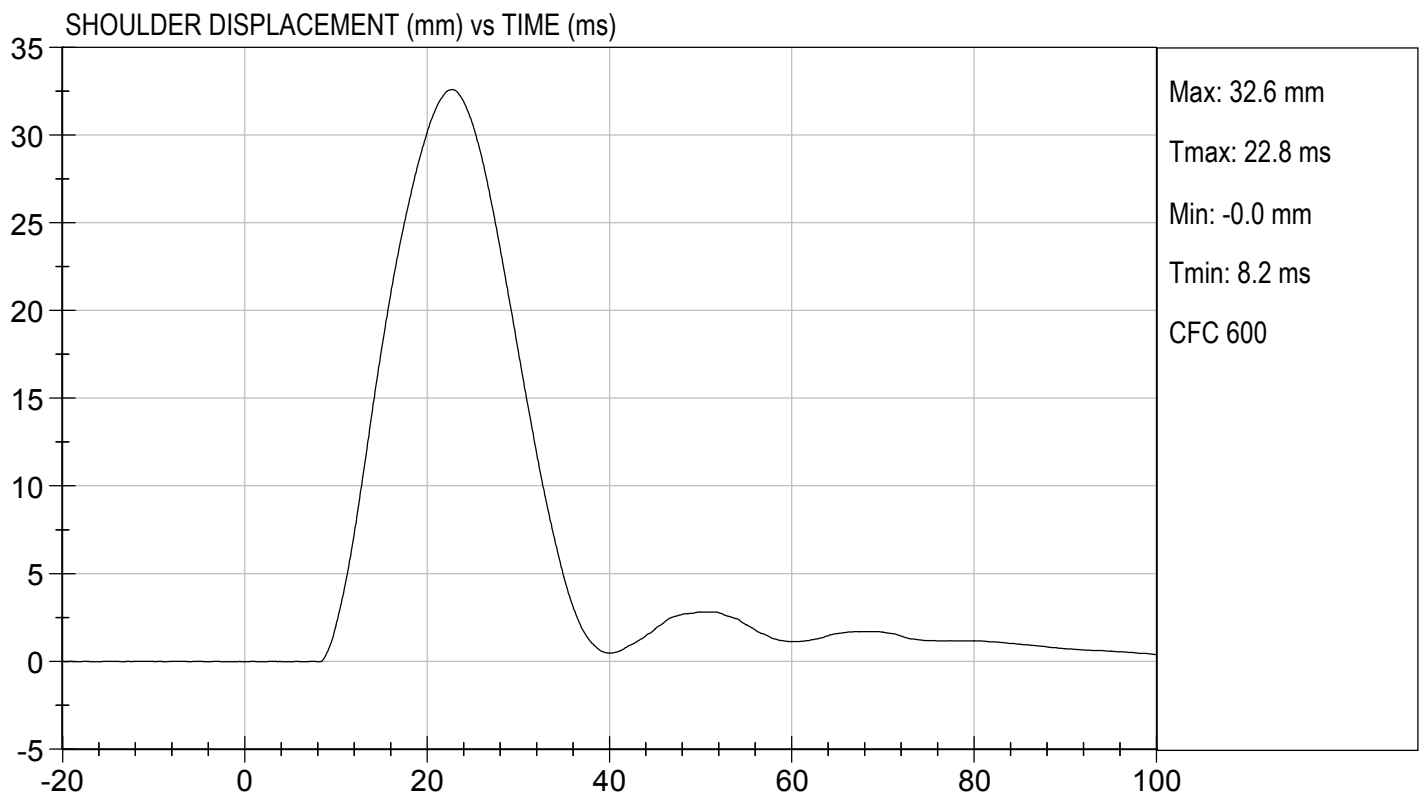
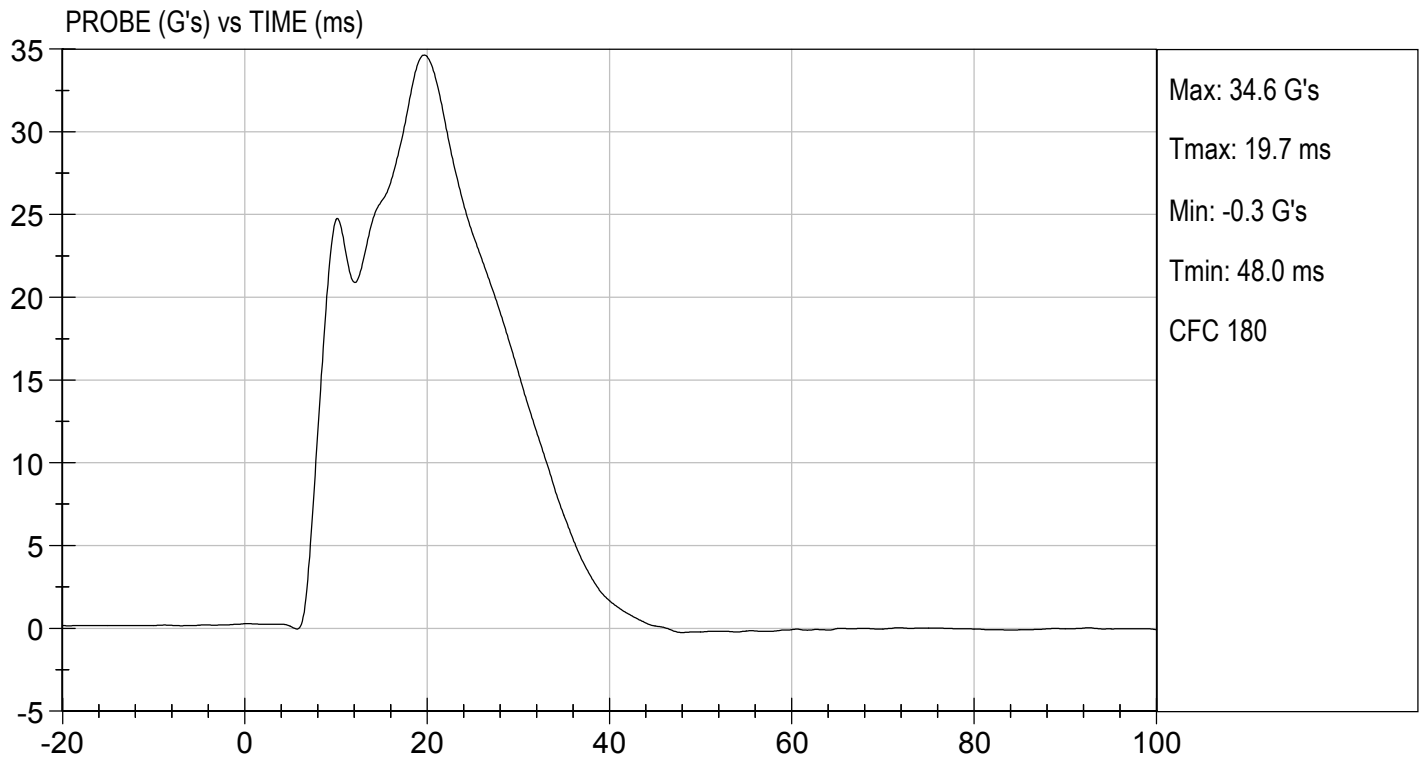
Test Date


Approved By



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

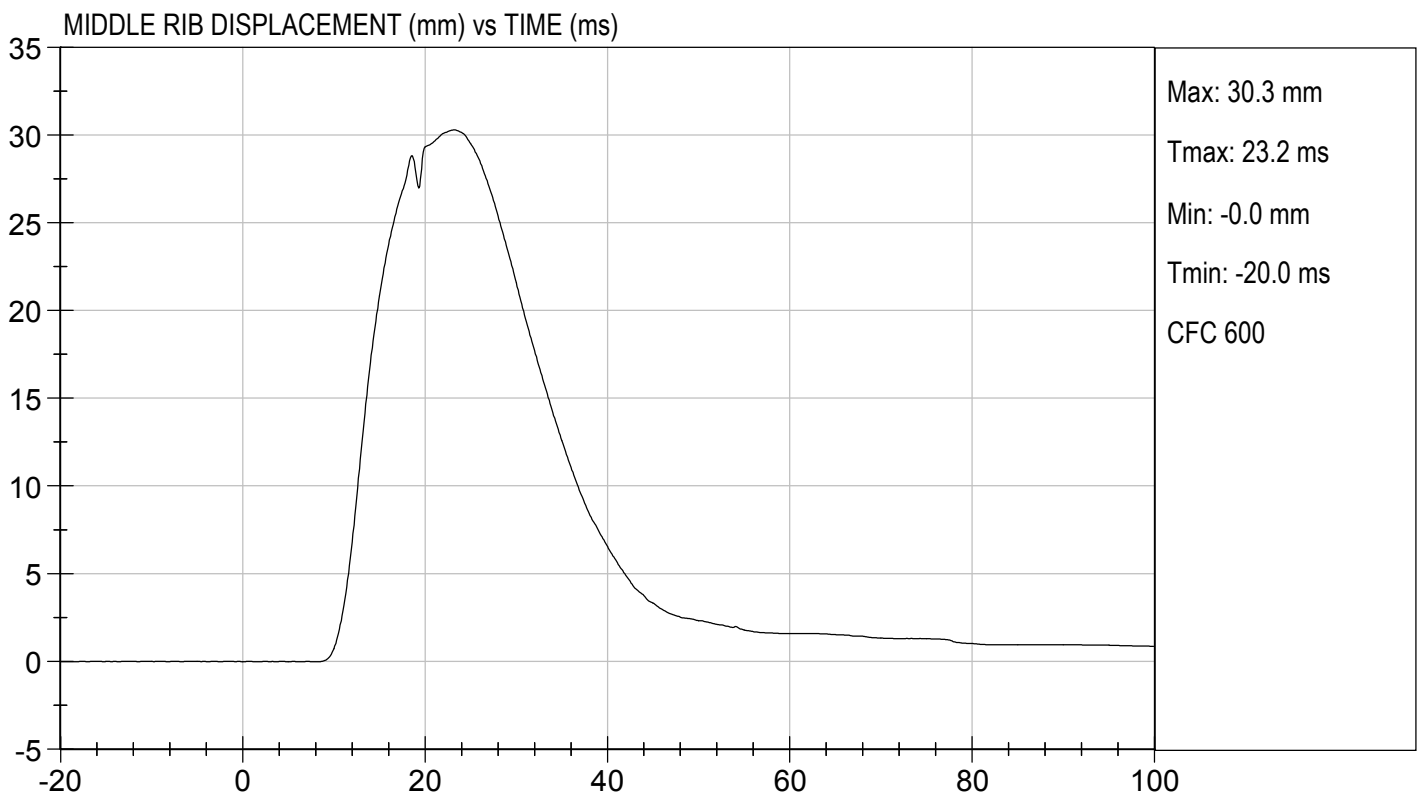
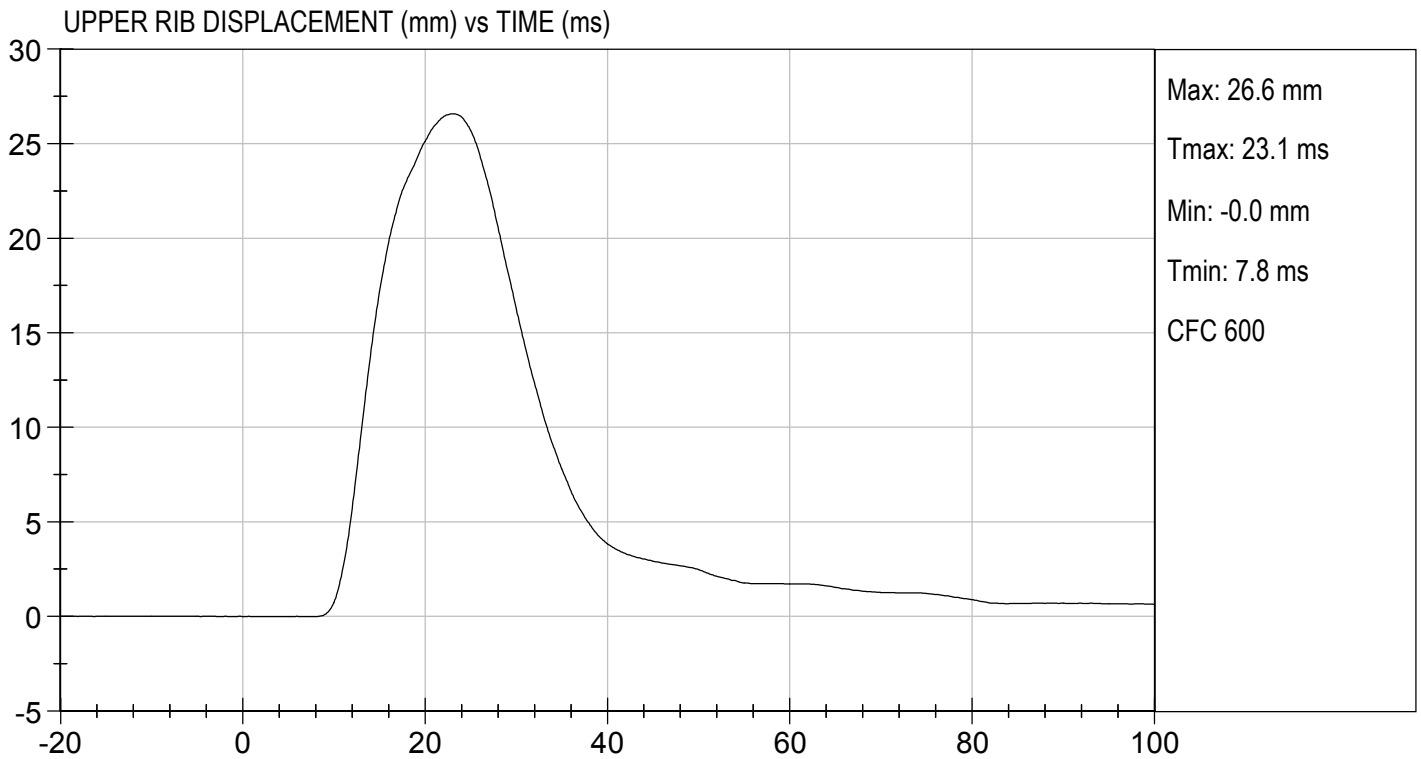
TEST DATE: 01/21/2019
TEST #: D190274





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

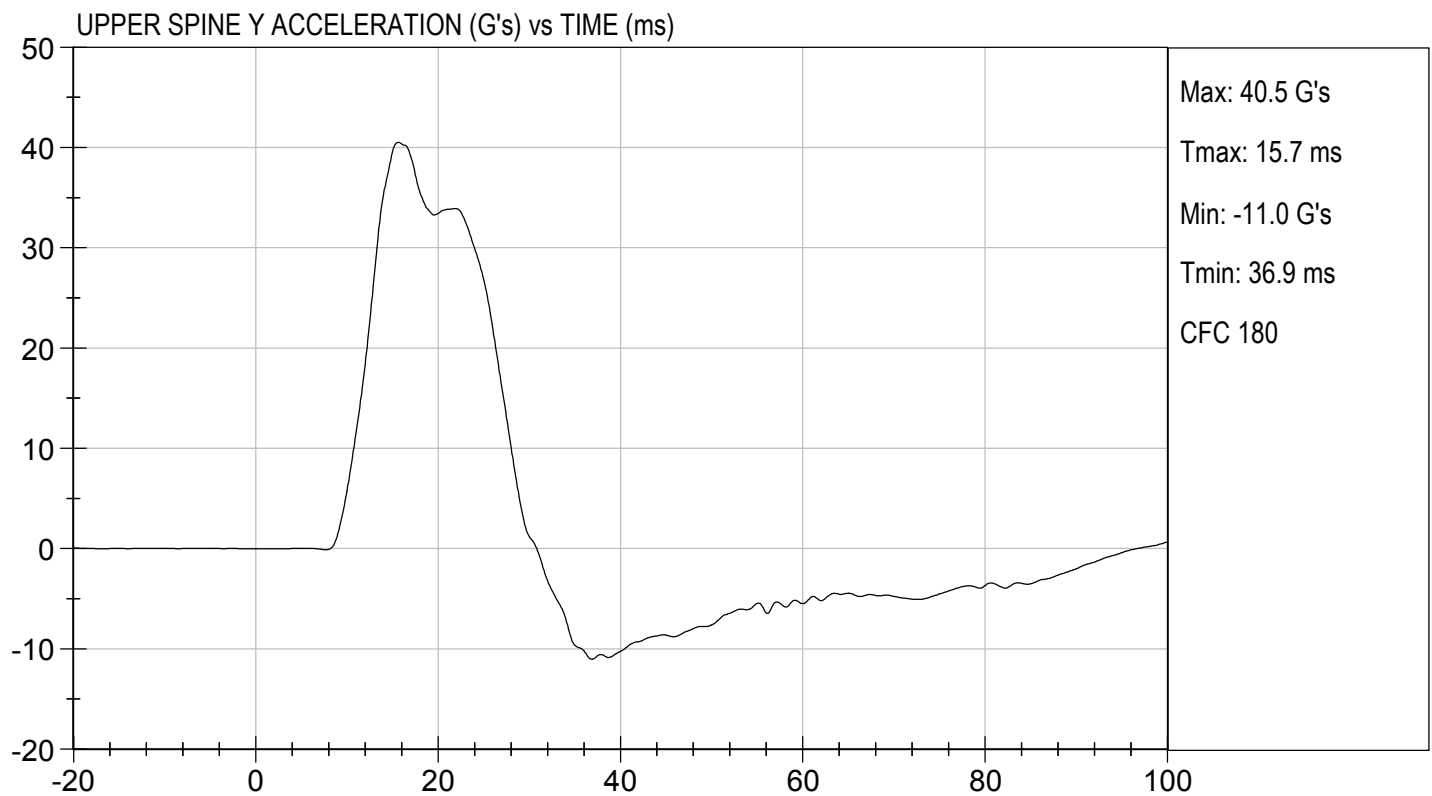
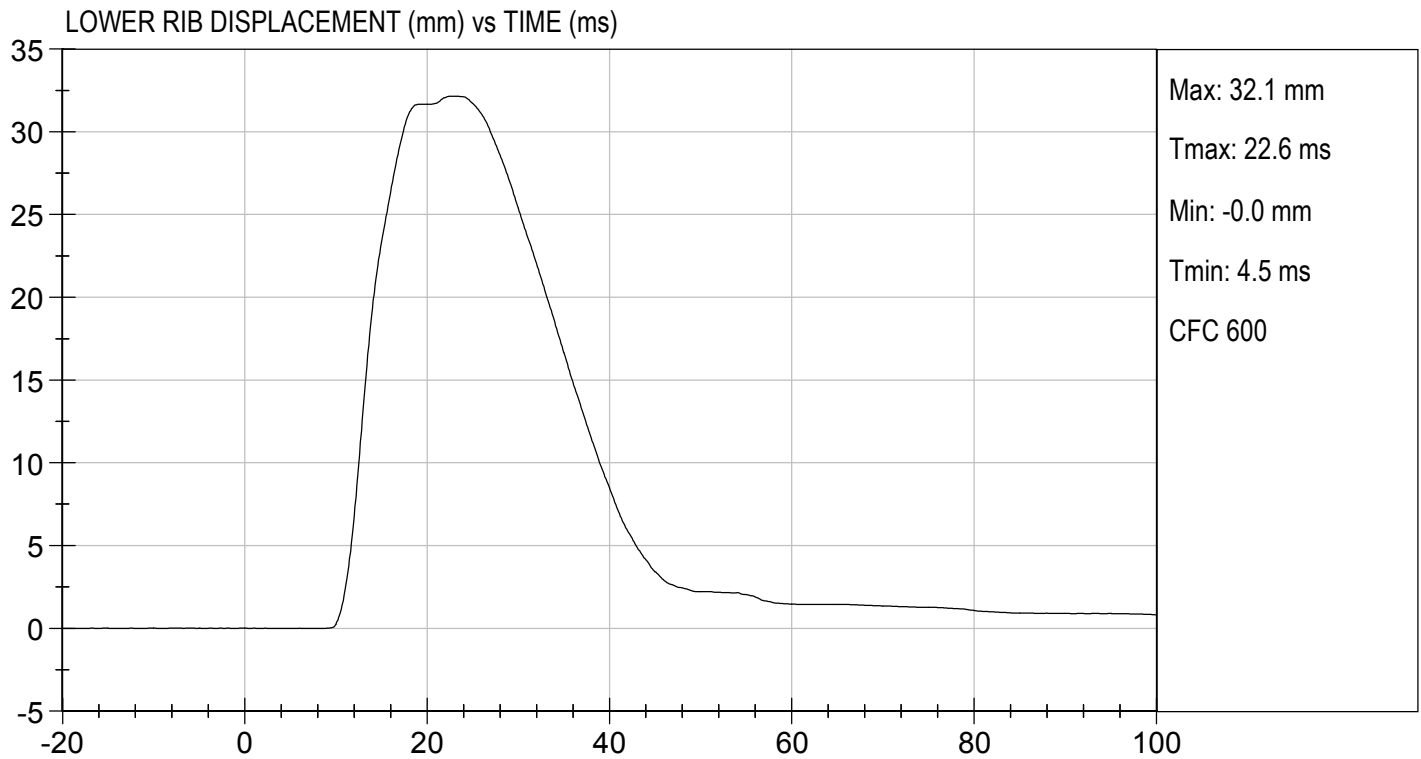
TEST DATE: 01/21/2019
TEST #: D190274





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

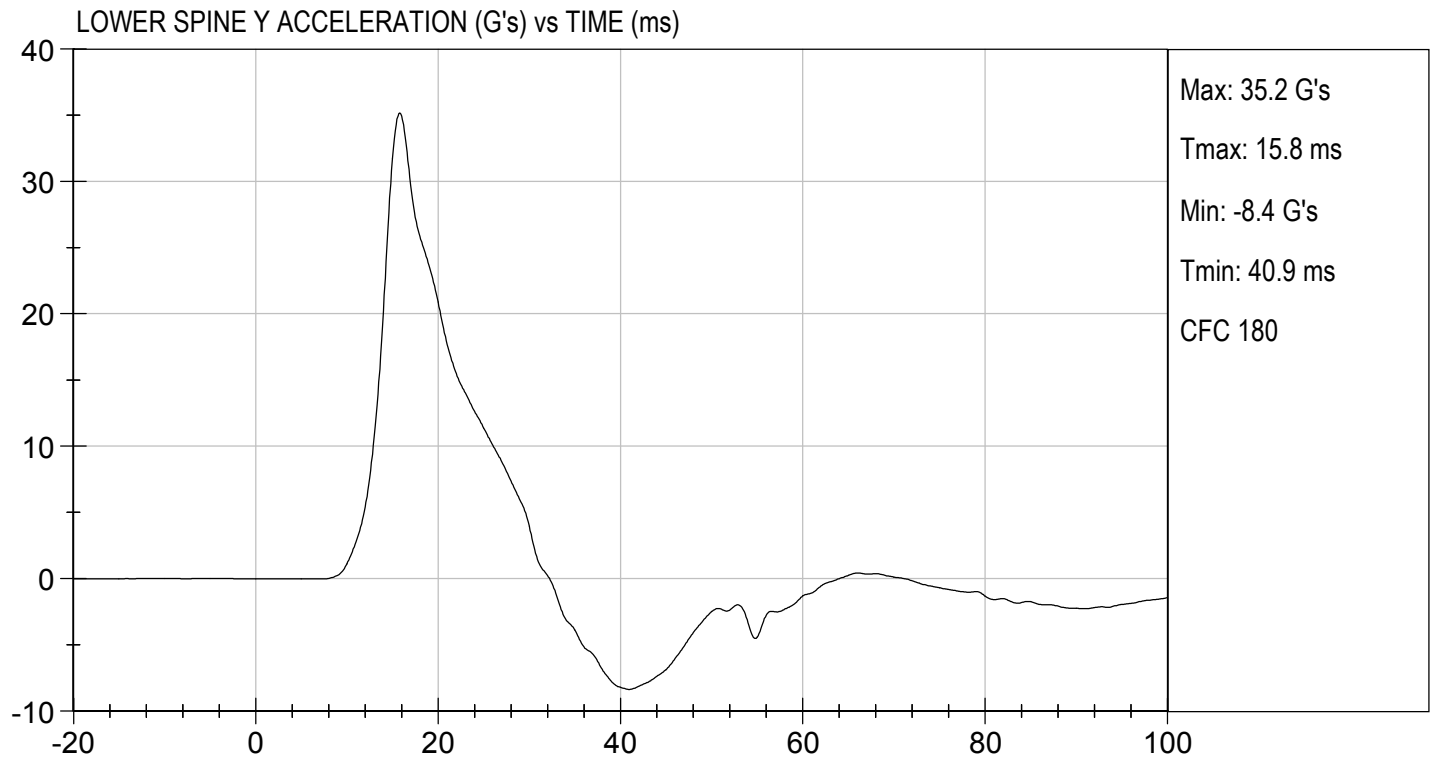
TEST DATE: 01/21/2019
TEST #: D190274





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

TEST DATE: 01/21/2019
TEST #: D190274



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

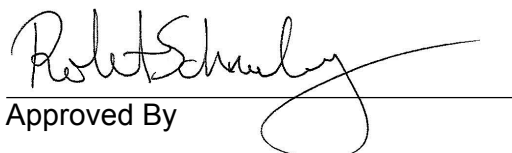
ATD Serial No: 306

Test I.D: D190275

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	17	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	37	Pass
Middle Rib Displacement	mm	39 to 45	40	Pass
Lower Rib Displacement	mm	35 to 43	36	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
			Overall Test Results	Pass


Laboratory Technician

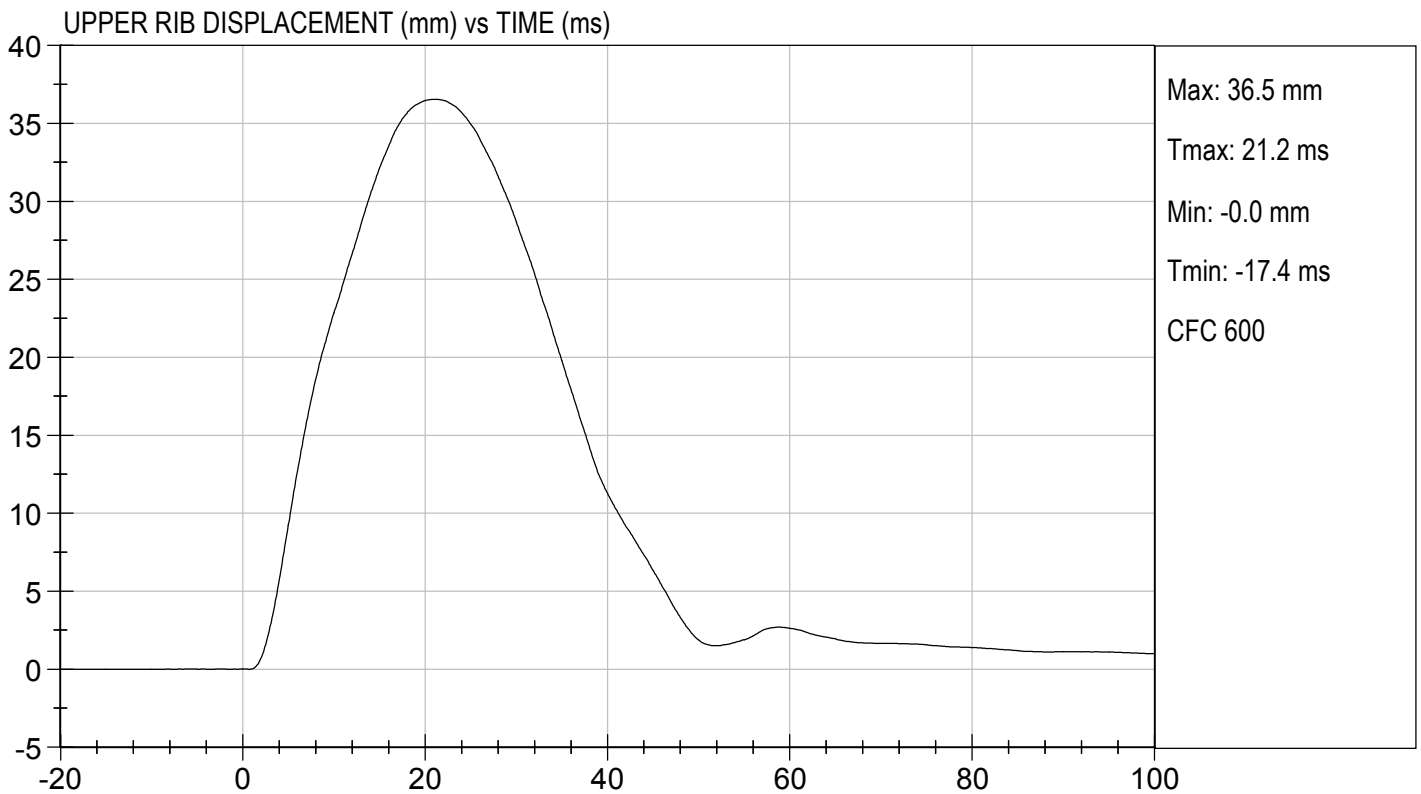
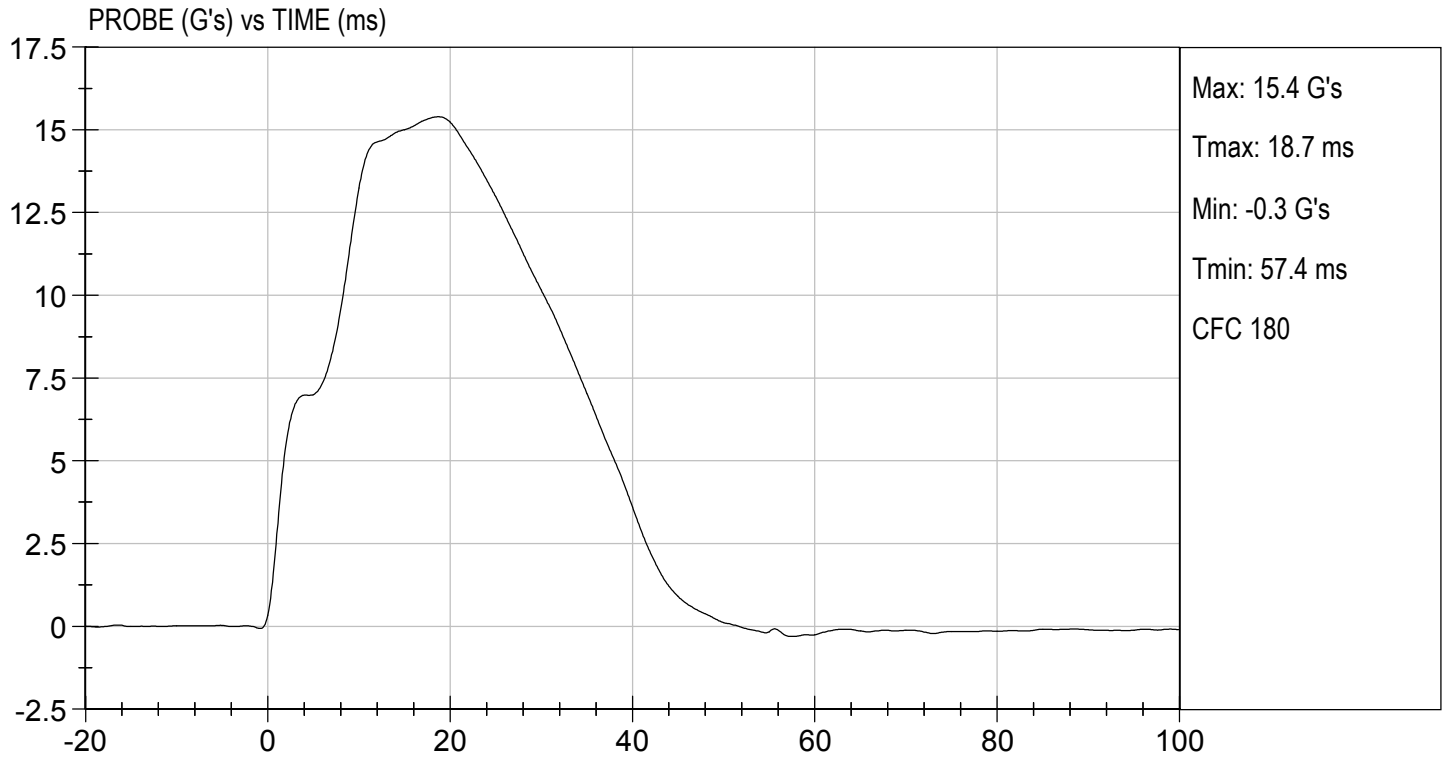
01/21/2019
Test Date


Approved By



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

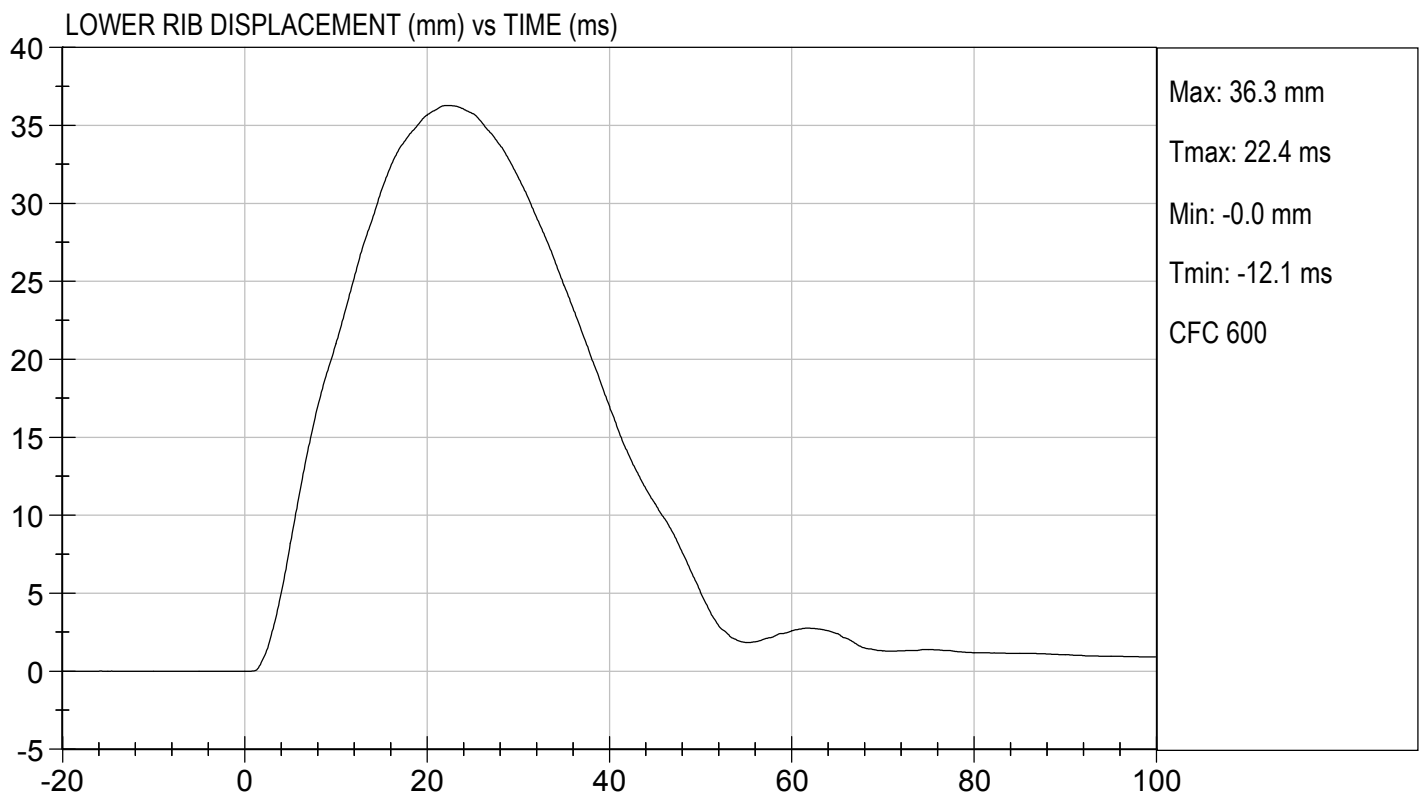
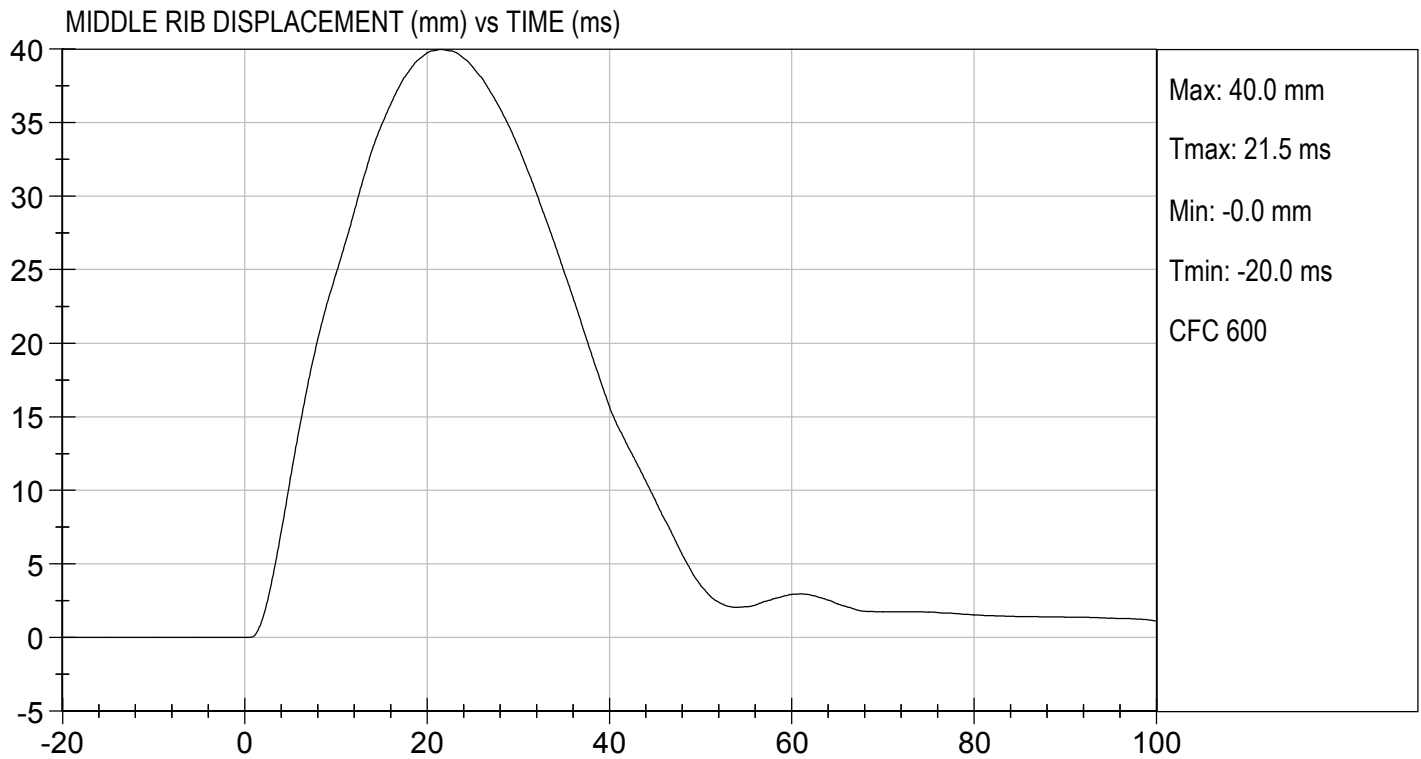
TEST DATE: 01/21/2019
TEST #: D190275





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

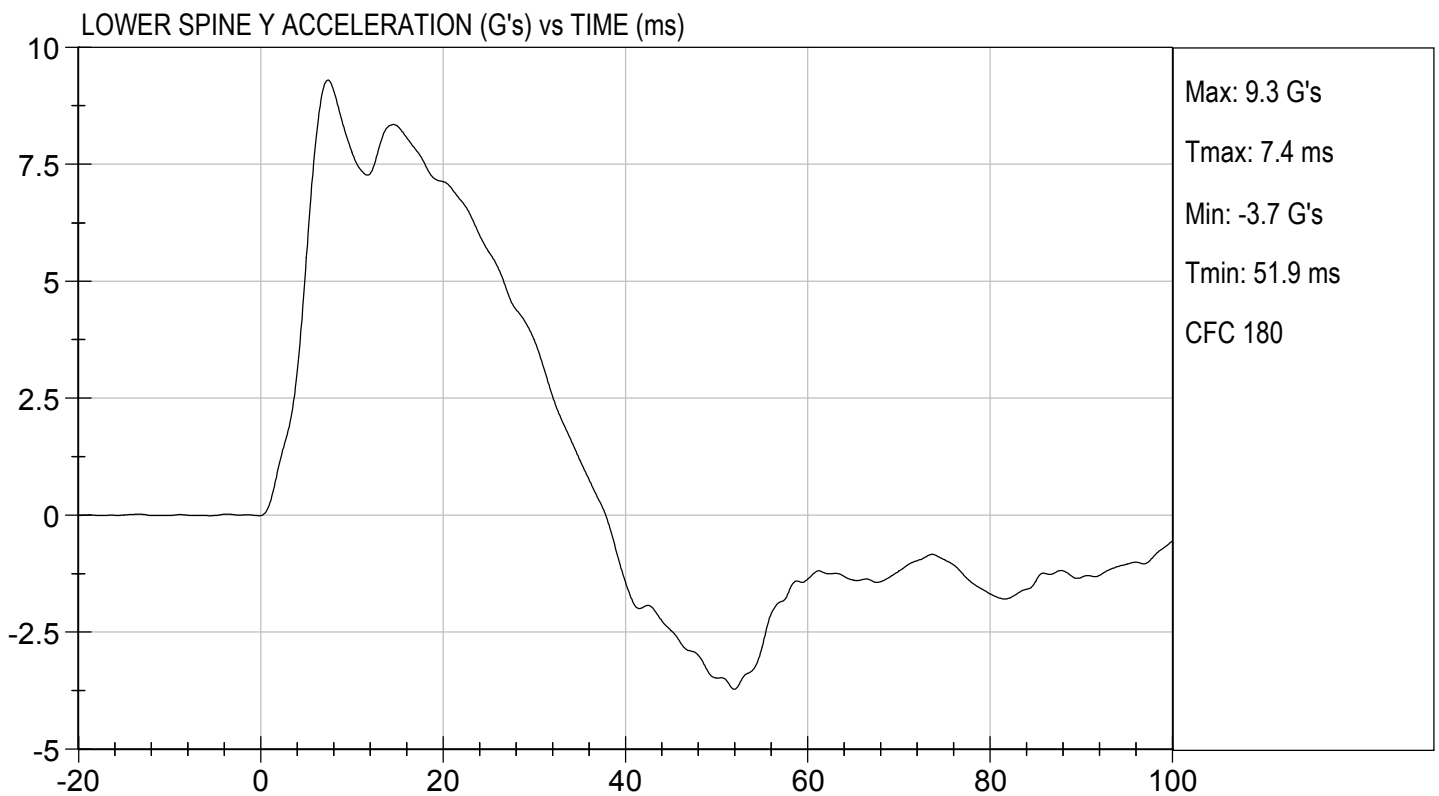
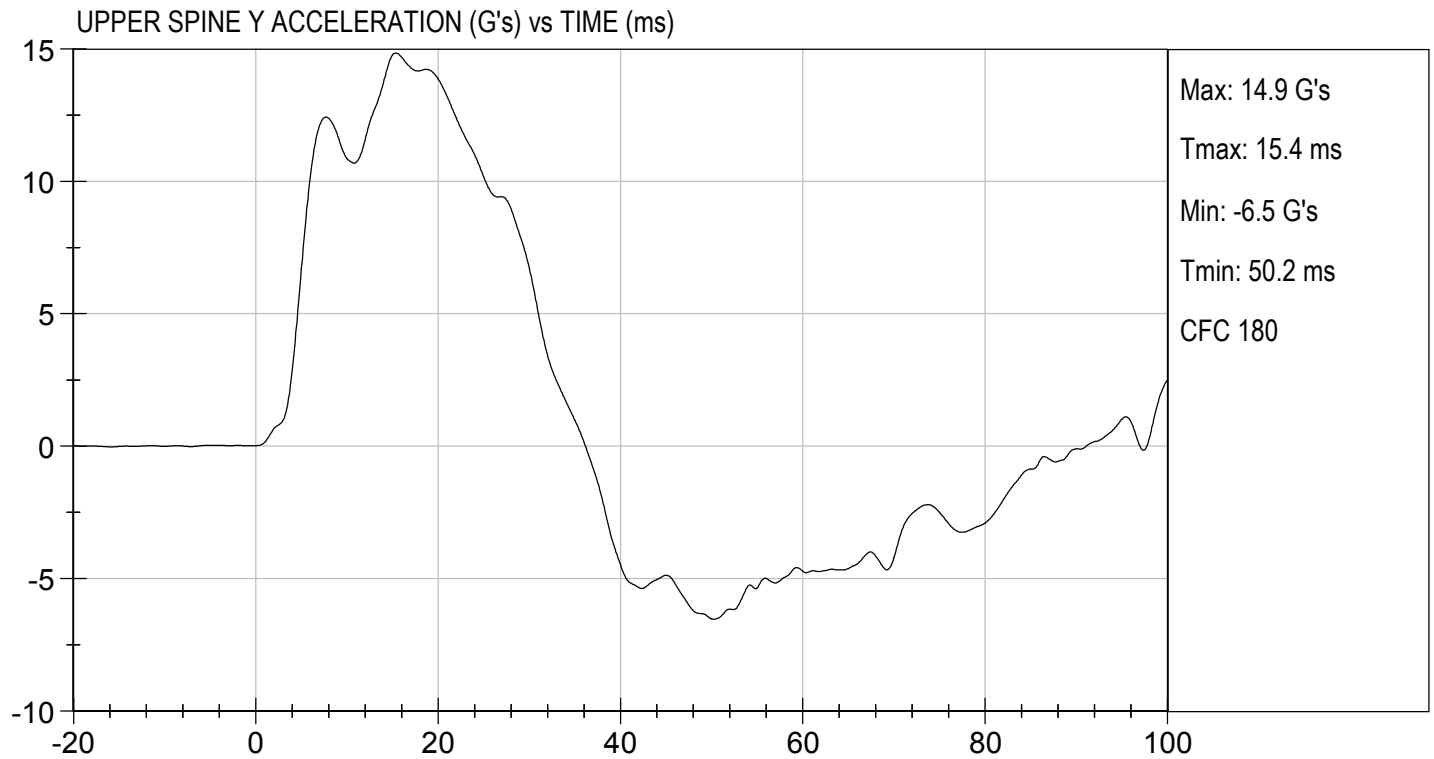
TEST DATE: 01/21/2019
TEST #: D190275





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

TEST DATE: 01/21/2019
TEST #: D190275



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

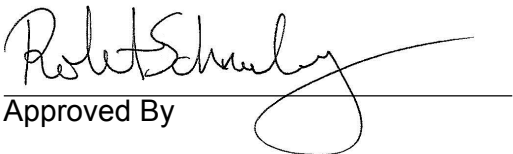
Test I.D: D190276

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	17	Pass
Impact Velocity	m/s	4.20 to 4.40	4.21	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	43	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	40	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass


Laboratory Technician

01/21/2019

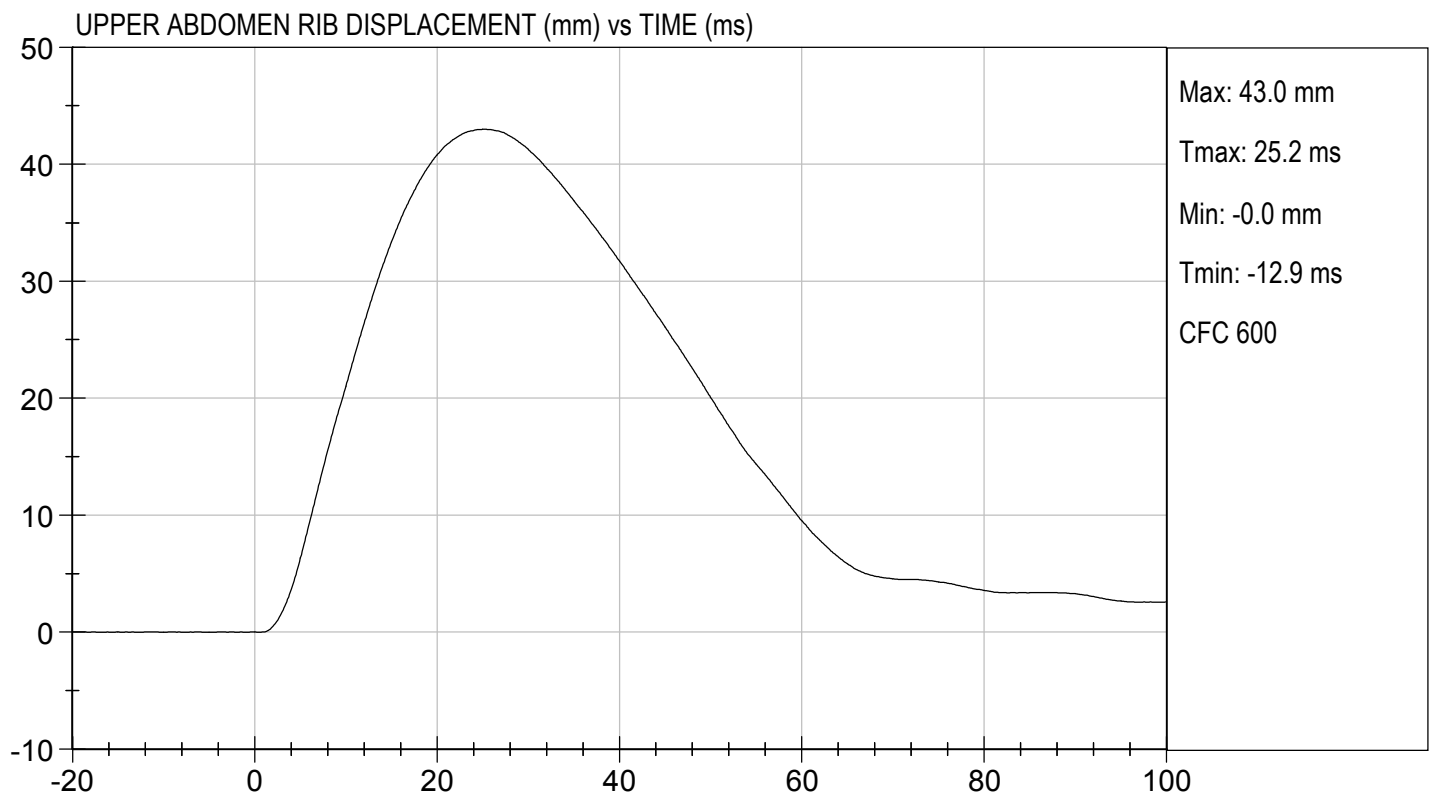
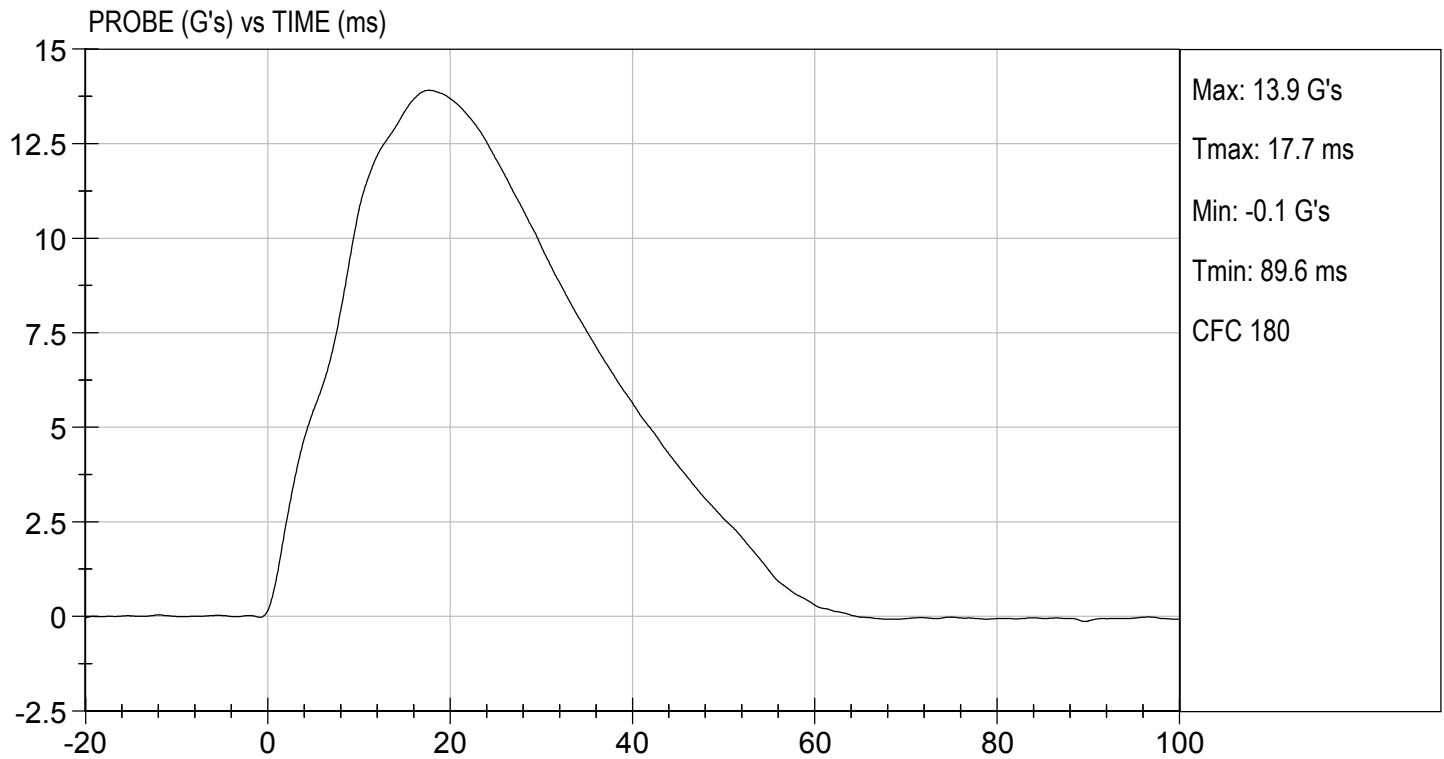
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.80 ft/s, 4.21 m/s

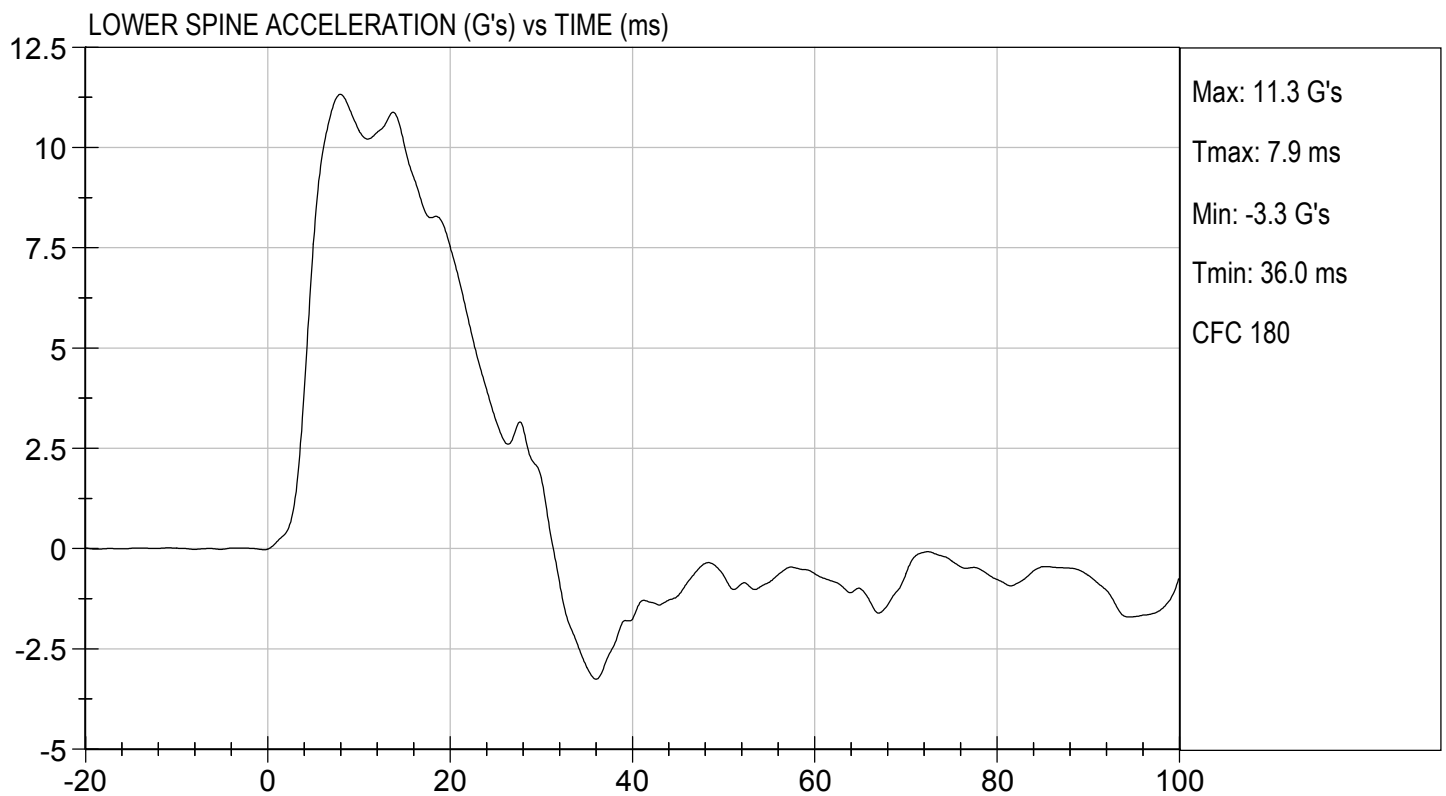
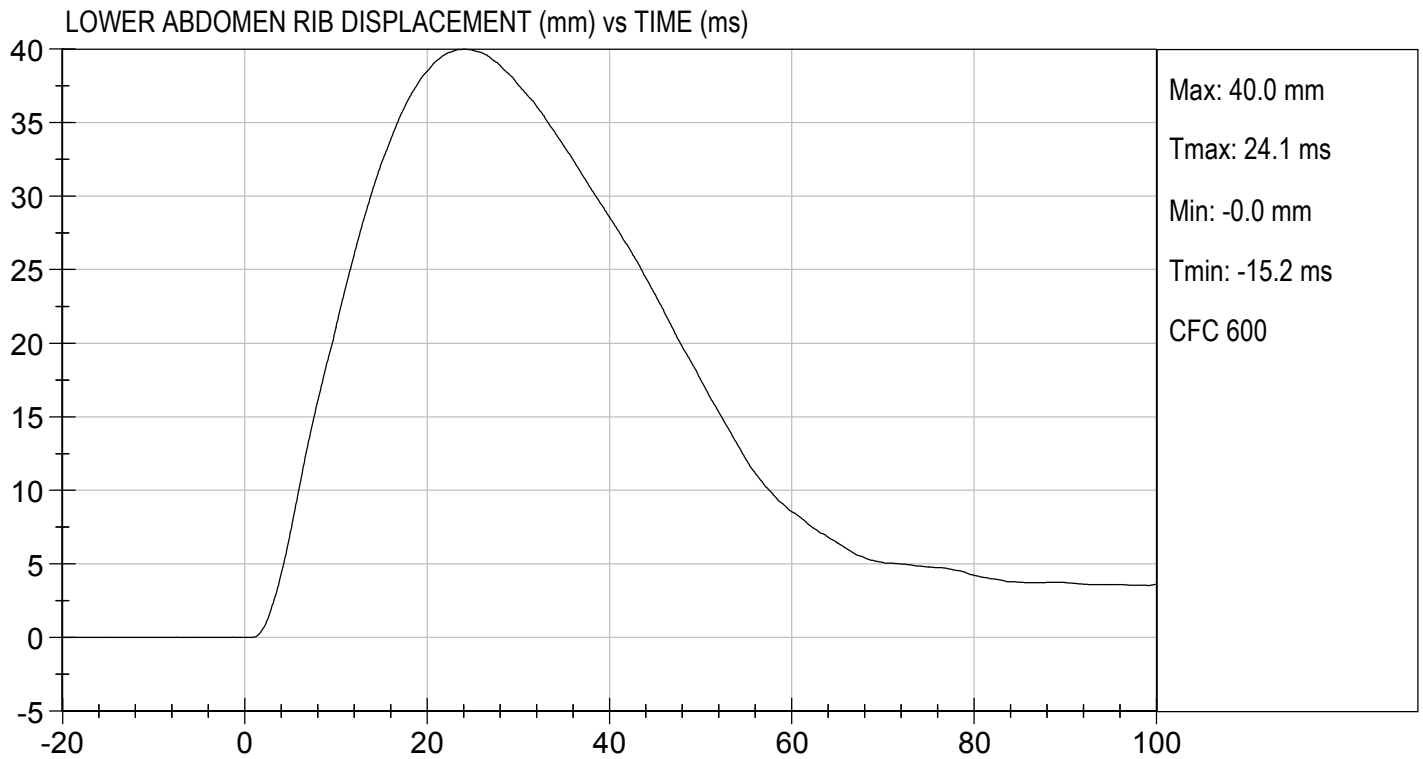
TEST DATE: 01/21/2019
TEST #: D190276





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.80 ft/s, 4.21 m/s

TEST DATE: 01/21/2019
TEST #: D190276



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

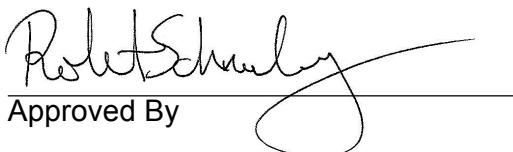
Test I.D: D190277

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	17	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	42	Pass
Peak Acetabulum Force	N	3600 to 4300	4,196	Pass
Overall Test Results				Pass


Laboratory Technician

01/21/2019

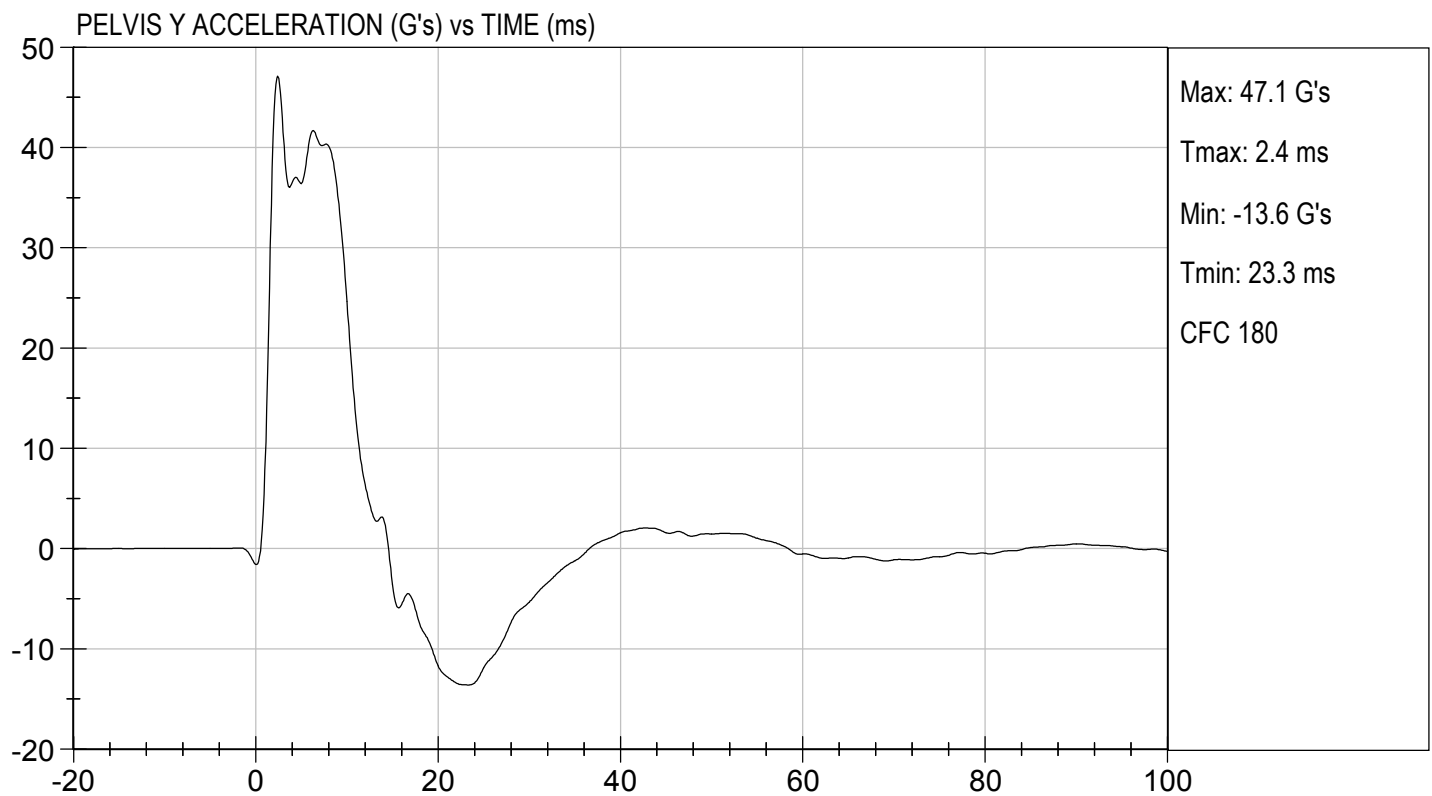
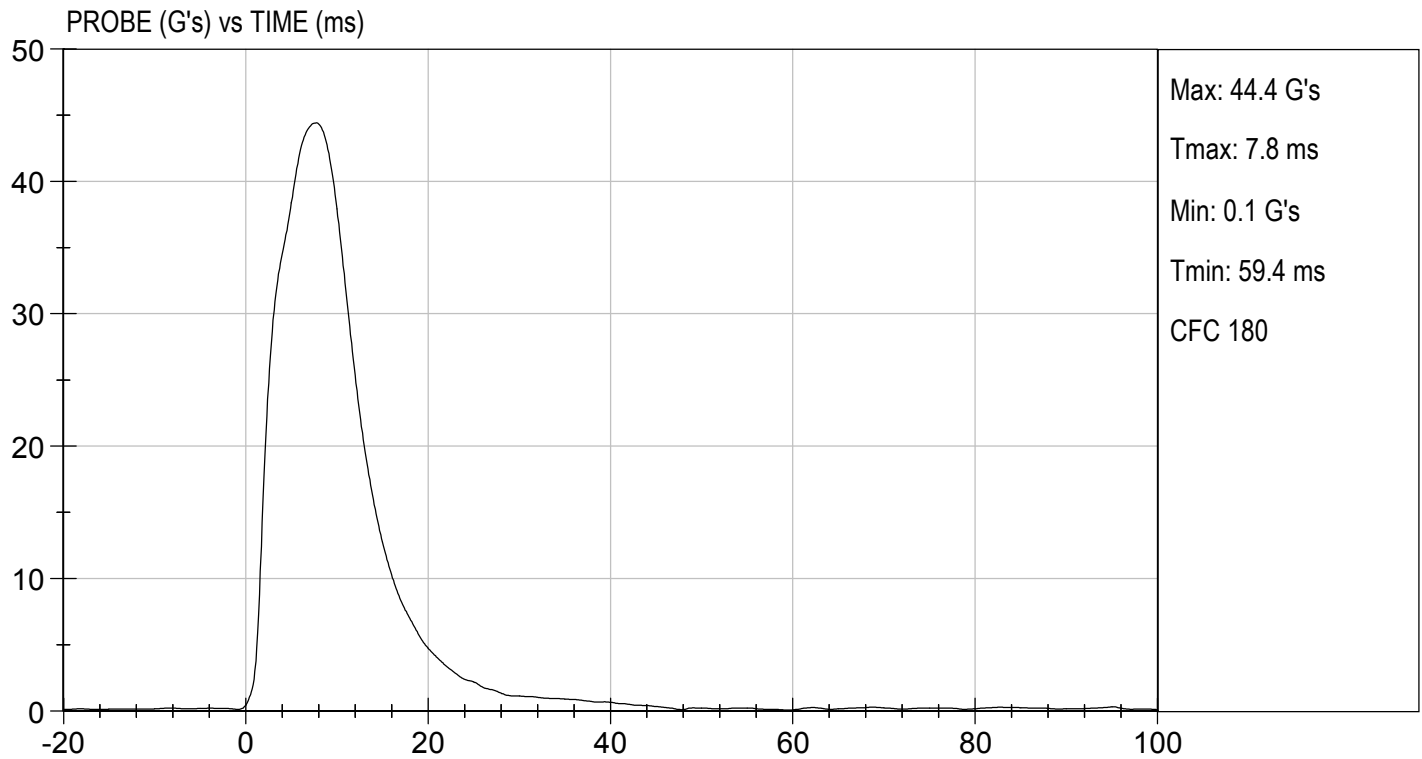
Test Date


Approved By



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

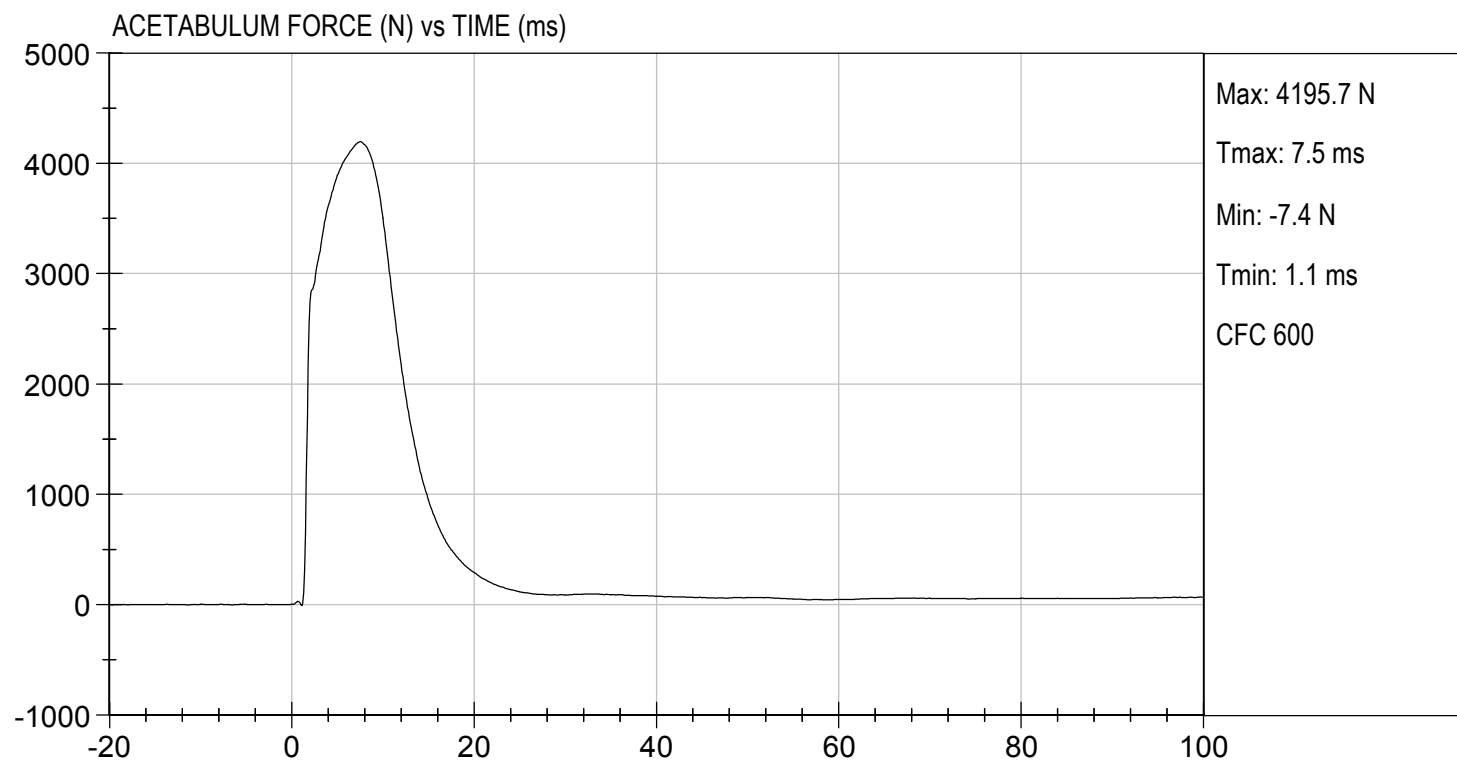
TEST DATE: 01/21/2019
TEST #: D190277





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

TEST DATE: 01/21/2019
TEST #: D190277



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

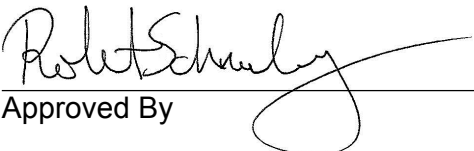
Test I.D: D190278

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	17	Pass
Impact Velocity	m/s	4.20 to 4.40	4.36	Pass
Maximum Probe Acceleration	G's	36 to 45	44	Pass
Pelvis Y Acceleration	G's	28 to 39	37	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,956	Pass
Overall Test Results				Pass


Laboratory Technician

01/21/2019

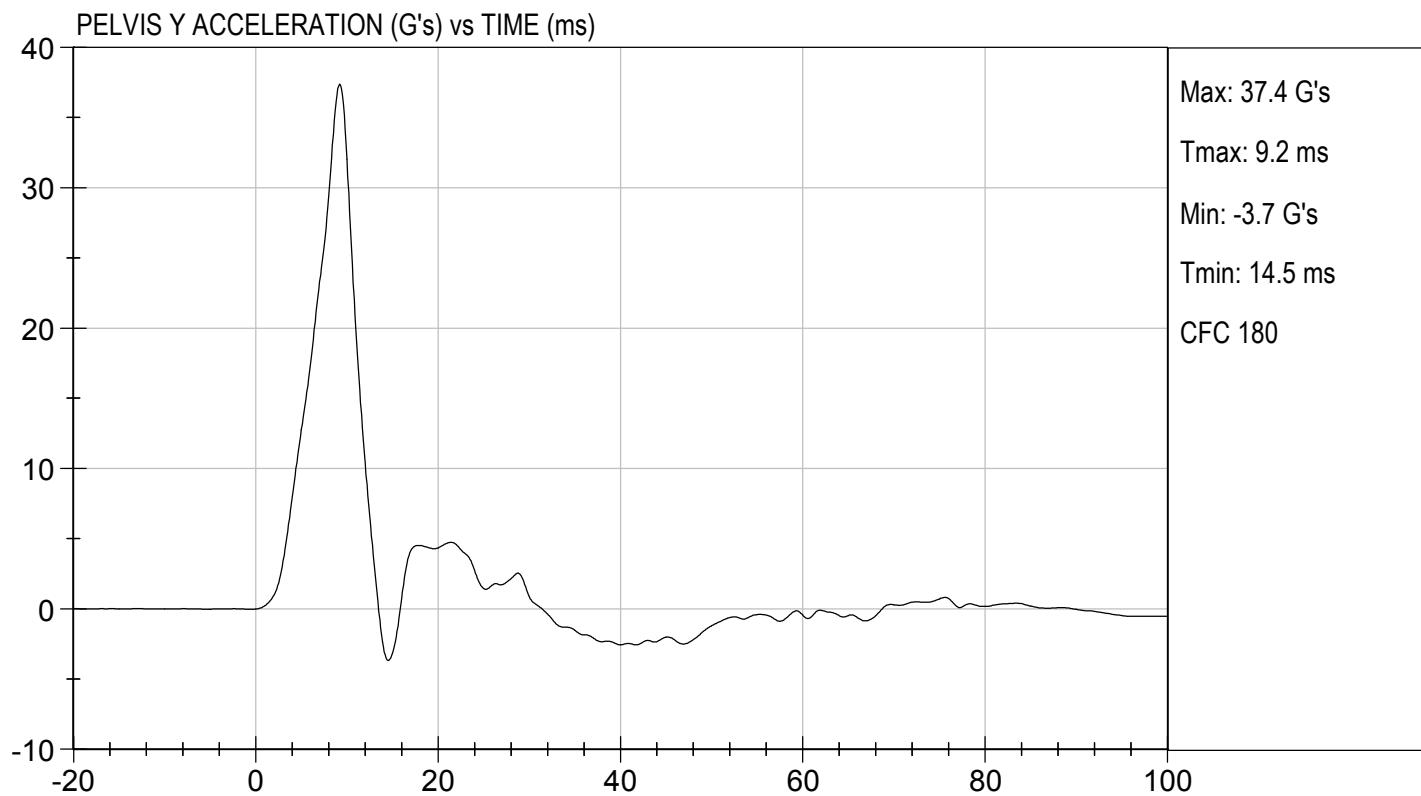
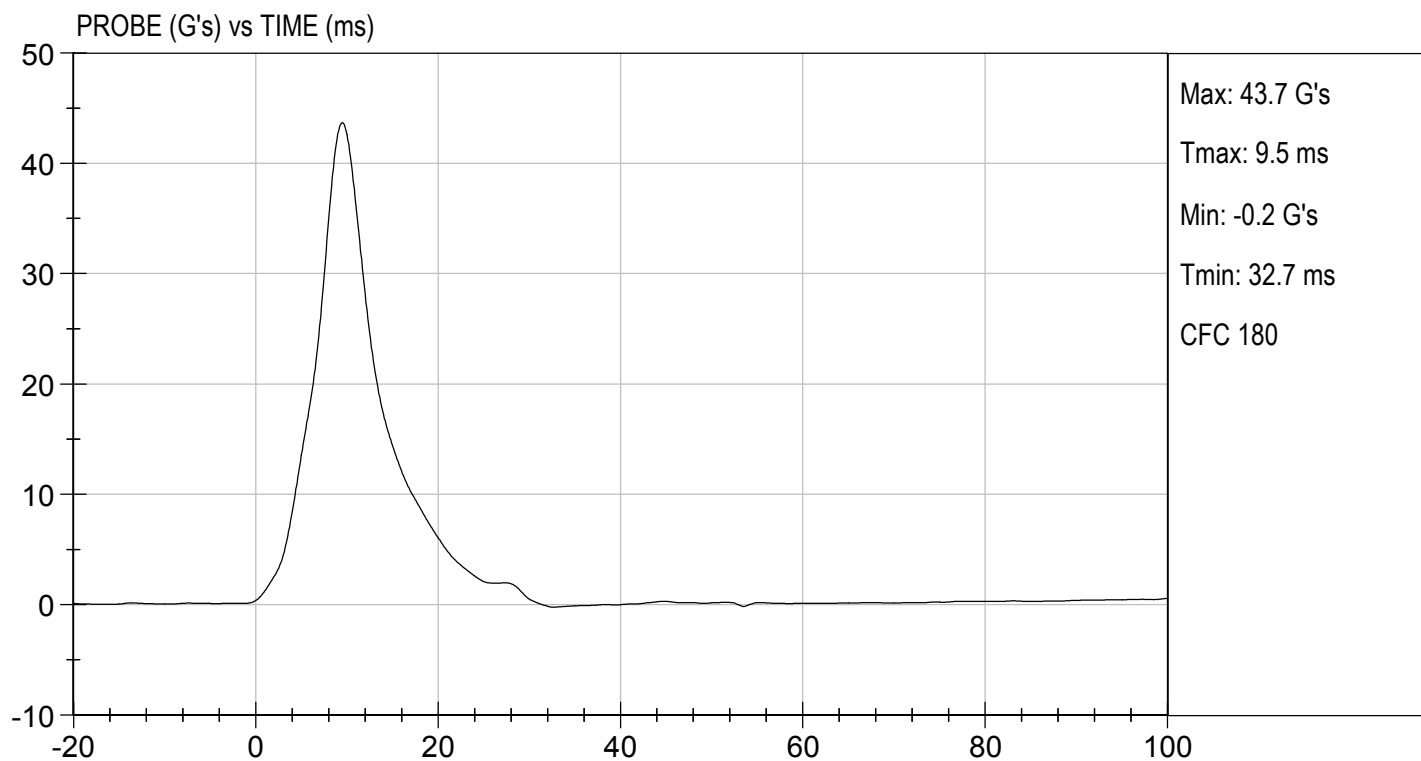
Test Date


Approved By



TEST DESC: ILLIAC
VELOCITY: 14.30 ft/s, 4.36 m/s

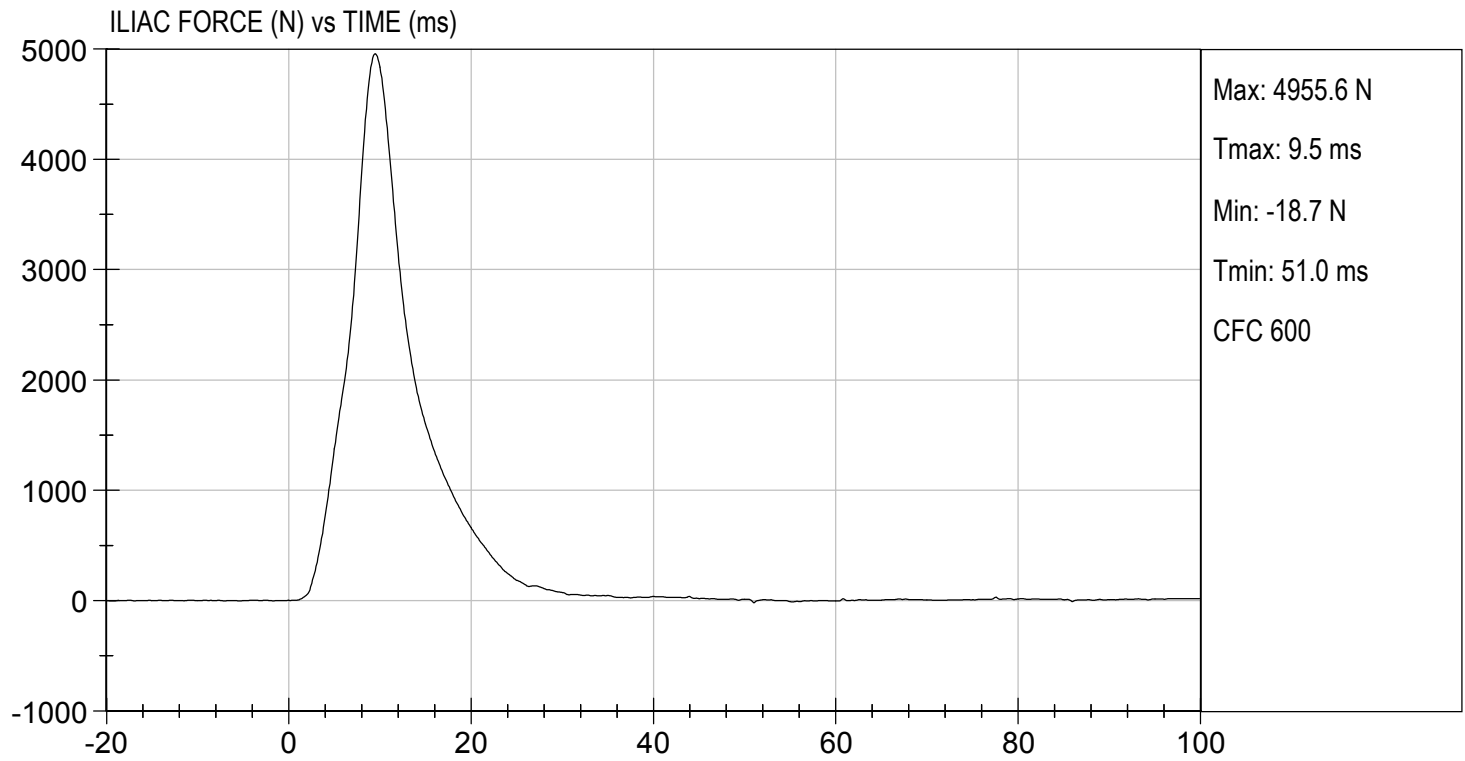
TEST DATE: 01/21/2019
TEST #: D190278





TEST DESC: ILLIAC
VELOCITY: 14.30 ft/s, 4.36 m/s

TEST DATE: 01/21/2019
TEST #: D190278





SID-IIs Pelvis Plug Certification Test

Plug S/N 12132

Test Number 6491

Report Number 6506

Test Date 2/28/2018 9:53:20 AM

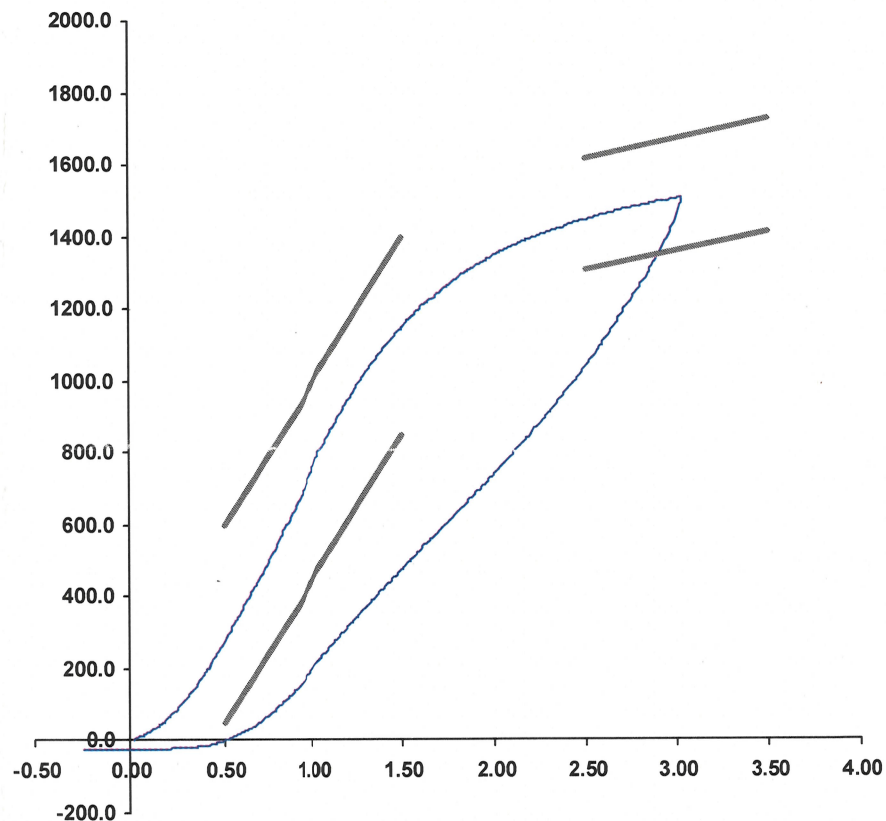
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	271.61	50.00	600.00
Force @ 1.5 mm (N)	1,148.89	850.00	1,400.00
Force @ 2.5 mm (N)	1,446.75	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,507.88	1,361.00	1,673.00

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 12123

Part Number 180-4450

Template No 107

28-Feb-18

SACO Research

By :

DC

Date :

2/28/18

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



SID-IIs Pelvis Plug Certification Test

Plug S/N 12155

Test Number 6514

Report Number 6529

Test Date 2/28/2018 10:18:58 AM

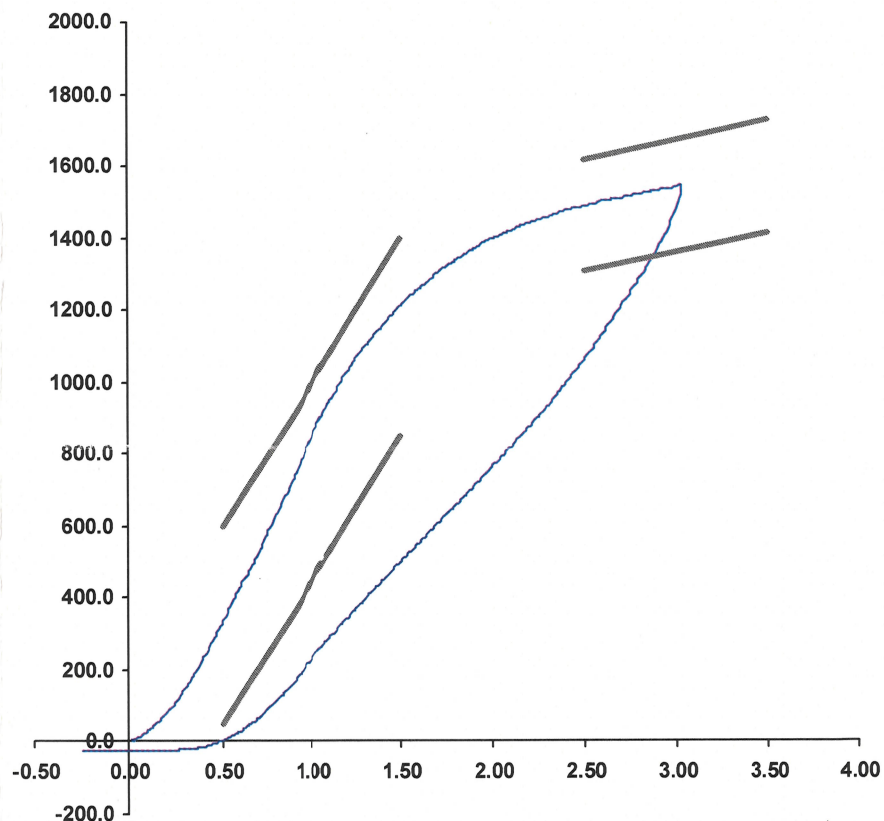
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	335.88	50.00	600.00
Force @ 1.5 mm (N)	1,213.92	850.00	1,400.00
Force @ 2.5 mm (N)	1,487.33	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,542.71	1,361.00	1,673.00

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 12123

Part Number 180-4450

Template No 107 28-Feb-18
SACO Research

By : DC

Date : 2/28/18

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	07/19/18
		Y	P79712	Endevco	07/19/18
		Z	P88170	Endevco	07/19/18
		Xr	P79750	Endevco	07/19/18
		Yr	P79751	Endevco	07/19/18
		Zr	P79753	Endevco	07/19/18
Thorax Rib Displacement Potentiometers	Upper	Y	G176	Honeywell	07/31/18
	Middle	Y	G169	Honeywell	07/31/18
	Lower	Y	G164	Honeywell	07/31/18
Abdomen Load Cells	Forward	Y	ABG1513FY	Denton	09/12/18
	Middle	Y	ABG1531FY	Denton	09/12/18
	Rear	Y	ABG1536FY	Denton	09/12/18
Lower Spine Accelerometers (T12)		X	P79574	Endevco	07/19/18
		Y	P82097	Endevco	07/19/18
		Z	P82603	Endevco	07/19/18
Public Symphysis Load Cell		Y	PG462FY	Denton	09/12/18

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 296			
				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	07/08/14
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	ACG268FY	Denton	12/04/18
Iliac Wing Load Cell				Y	IWG273FY	Denton	12/04/18
Pelvis Plug (struck side)					12132	SACO	02/28/18
Pelvis Plug (non-struck side)					12155	SACO	02/28/18

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	PCB1145	PCB	01/09/19
	Vehicle Center of Gravity	Y	PCB878	PCB	08/02/18
	Vehicle Center of Gravity	Z	PCB912	PCB	10/01/18
2	Right Sill at Front Seat	X	PCB1384	PCB	08/20/18
	Right Sill at Front Seat	Y	PCB1366	PCB	08/20/18
	Right Sill at Front Seat	Z	PCB1206	PCB	01/09/19
3	Right Sill at Rear Seat	X	PCB1047	PCB	10/01/18
	Right Sill at Rear Seat	Y	PCB1187	PCB	12/04/18
	Right Sill at Rear Seat	Z	PCB1204	PCB	12/04/18
4	Left Sill at Front Door	Y	PCB896	PCB	01/09/19
5	Left Sill at Rear Door	Y	PCB897	PCB	01/09/19
6	Left A-Post Lower	Y	PCB1283	PCB	01/09/19
7	Left A-Post Middle	Y	PCB1168	PCB	01/09/19
8	Left B-Post Lower	Y	PCB1334	PCB	01/09/19
9	Left B-Post Middle	Y	PCB1329	PCB	01/09/19
10	Front Seat Track	Y	PCB1240	PCB	01/09/19
11	Rear Seat Track or Structure	Y	T11193	Endevco	10/01/18
12	Right Rear Occ. Compartment	Y	PCB1314	PCB	12/28/18
13	Engine Block	X	PCB1239	PCB	12/28/18
	Engine Block	Y	PCB1159	PCB	12/28/18
14	Rear Floorpan Above Axle	X	PCB1103	PCB	10/01/18
	Rear Floorpan Above Axle	Y	PCB1020	PCB	09/25/18
	Rear Floorpan Above Axle	Z	PCB1277	PCB	01/09/19

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	PCB511D	PCB	9/24/2018
MDB Center of Gravity	Y	PCB753D	PCB	9/24/2018
MDB Center of Gravity	Z	PCB557D	PCB	9/24/2018
Left Frame at Rear Axle Centerline	X	PCB660D	PCB	9/26/2018
Left Frame at Rear Axle Centerline	Y	PCB659D	PCB	9/26/2018