

REPORT NUMBER: SINCAP-KAR-19-012

**NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST**

**FCA US LLC
2019 DODGE GRAND CARAVAN SE 5-DOOR MINIVAN**

NHTSA No: M20190304

**PREPARED BY:
APPLUS IDIADA KARCO ENGINEERING, LLC.
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ADELANTO, CA 92301**




JANUARY 4, 2019

FINAL REPORT

**PREPARED FOR:
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, D.C. 20590**

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Approval Date: January 4, 2019

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Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. SINCAP-KAR-19-012	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact MDB Testing of a 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304		5. Report Date January 4, 2019
		6. Performing Organization Code KAR
7. Authors Mr. Robert S. Ramos, Program Manager, Applus IDIADA KARCO Mr. Steven D. Matsusaka, Engineering Manager, Applus IDIADA KARCO		8. Performing Organization Report No. TR-P38296-01-NC
		10. Work Unit No.
9. Performing Organization Name and Address Applus IDIADA KARCO Engineering, LLC. 9270 Holly Rd. Adelanto, CA 92301		11. Contract or Grant No. DTNH22-14-D-00355L
		13. Type of Report and Period Covered Final Test Report, December 18, 2018 - January 4, 2019
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave., SE, Room W43-410 Washington, D.C. 20590		14. Sponsoring Agency Code NRM-110
		15. Supplementary Notes

16. Abstract

A 55 / 28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2019 Dodge Grand Caravan SE 5-door minivan in accordance with the specifications of the Office of Crash Worthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on December 18, 2018.

The impact velocity of the Moving Deformable Barrier was 61.90 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 20.0°C. The target vehicle's maximum post-test static crush was 270 mm located at level 2. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	38.1
Maximum Thoracic Rib Deflection	mm	44	25
Total Abdominal Force	N	2500	896
Pubic Symphysis Force	N	6000	1443

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	110.5
Resultant Lower Spine Acceleration	g	82	38
Total Pelvic Force (Sum of Acetubular and Iliac Forces)	N	5525	3739
Maximum Thoracic Rib Deflection	mm	38*	5
Maximum Abdominal Rib Deflection	mm	45*	1

Both the left front driver and left rear passenger doors were jammed shut. The doors on the struck side of the vehicle did not separate from the body at the hinges or latches. The opposite side doors did not open during the side impact event.

* Proposed IARV

17. Key Words New Car Assessment Program (NCAP) Side Impact Moving Deformable Barrier (MDB) ES-2re SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave., SE Washington, DC 20590 e-mail: tis@hhtsa.dot.gov FAX 202-493-2833	
19. Security Classification of this report UNCLASSIFIED	20. Security Classification of this page UNCLASSIFIED	21. No. of Pages 151	22. Price

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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 number DTNH22-14-D-00355L. The purpose of this test is to generate comparative side impact performance in a 2019 Dodge Grand Caravan SE 5-door minivan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated October 2015.

SECTION 2

SUMMARY OF TEST RESULTS

A 2019 Dodge Grand Caravan SE 5-door minivan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.90 km/h (38.46 mph). 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 Applus IDIADA KARCO Engineering, LLC. in Adelanto, California, on December 18, 2018. Pre- and post-test photographs of the test vehicle, the MDB and the dummy (ES-2re and SID-IIs) are included in Appendix A of this report.

The dummies were placed in the driver and left rear designated seating position according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated October 2015. The side impact event was documented by 11 cameras. Camera locations are included in Data Sheet No. 5 of this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

Primary and redundant head CG tri-axial accelerometers

Chest upper rib, middle rib and lower rib y-axis displacement potentiometers

Abdomen forward, middle, and rear y-axis load cells

Lower spine (12) tri-axial accelerometers

Pubic symphysis y-axis load cell

PASSENGER ATD (SID-IIs)

Primary and redundant head CG tri-axial accelerometers

Chest upper rib, middle rib and lower rib y-axis displacement potentiometers

Abdomen upper rib and lower rib y-axis displacement potentiometers

Lower spine (12) tri-axial accelerometers

Acetabulum and iliac wing y-axis load cells

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

Dummy injury readings were recorded as follows:

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	38.1
Maximum Thoracic Rib Deflection	mm	44	25
Combined Abdominal Force	N	2500	896
Pubic Symphysis Force	N	6000	1443

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	110.5
Lower Spine (T12) Resultant Acceleration	g	82	38
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3739
Maximum Thoracic Rib Deflection	mm	38*	5
Maximum Abdominal Rib Deflection	mm	45*	1

*Proposed IARV

Supplemental restraint information is given below:

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Airbag 1 (Curtain)	Yes	Yes	Yes	Yes
Side Airbag 2 (Torso/Pelvis)	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	Yes	No	
Other (Active Head Restraint)	Yes	Yes	No	

GENERAL COMMENTS

The doors on the struck side of the vehicle remained closed and latched. There was no separation at the hinges or latches. The doors on the non-struck side remained closed and latched. There was no ATD value that exceeded its limit.

SECTION 3

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.574
Pressure	Tire Pressures	lbf/in ²	kPa	6.895
Temperature	General Use	°F	°C	$=(T_f - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	M20190304
Model Year	2019
Make	Dodge
Model	Grand Caravan SE
Body Style	5-Door Minivan
VIN	2C4RDGBG8KR547041
Body Color	Octane Red Pearl
Odometer Reading (km / mi)	153 / 95
Engine Displacement (L)	3.6
Type / No. of Cylinders	V6
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes

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

Does Owner's Manual provide instructions to turn off automatic door locks? No

DATA FROM CERTIFICATION LABEL

Manufactured By	FCA US LLC
Date of Manufacture	Sep-18
Vehicle Type	MPV

GVWR (kg)	2745
GAWR Front (kg)	1339
GAWR Rear (kg)	1407

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity	2	2	3	7
Capacity Weight (VCW) (kg)				521.0
DSC x 68.04 (kg)				476.3
Cargo Weight (RCLW) (kg)				44.7

A
B
A-B

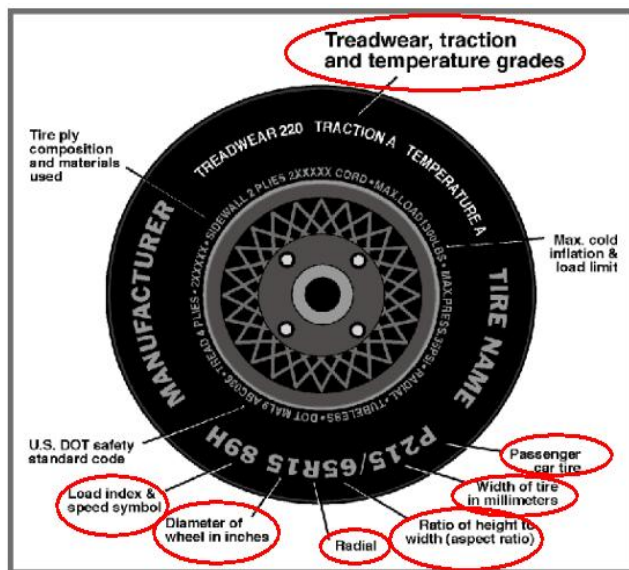
VEHICLE SEAT TYPE

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

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	300	300
Cold Pressure (kPa)	250	250
Recommended Tire Size	P225/65R17	P225/65R17
Tire Size on Vehicle	P225/65R17	P225/65R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Energy Saver A/S	Energy Saver A/S
Treadware	400	400
Traction Grade	A	A
Temperature Grade	B	B
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 1 Polyamide, 2 Steel	1 Polyester, 1 Polyamide, 2 Steel
Load Index/Speed Symbol	100T	100T
Tire Material	Polyester, Polyamide, Steel	Polyester, Polyamide, Steel
DOT Safety Code Left	M33T 00KX 3218	M33T 00KX 3218
DOT Safety Code Right	M33T 00KX 3218	M33T 00KX 3218

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

TIRE PRESSURES

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

MDB TIRE SPECIFICATIONS

	Units	Requirement	LF	RF	LR	RR
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	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	588.0	431.0		644.0	498.5		633.5	501.5	
Right	kg	547.5	435.0		543.5	477.5		550.0	488.0	
Ratio	%	56.7%	43.3%	100.0%	54.9%	45.1%	100.0%	54.5%	45.5%	100.0%
Total	kg	1135.5	866.0	2001.5	1187.5	976.0	2163.5	1183.5	989.5	2173.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2001.5	A
Actual Weight of 2 P572 ATD Used	kg	125.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	44.7	C
Calculated Vehicle Target Wt (TVTW)	kg	2171.2	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 -9.0 kg)? Yes No

TEST VEHICLE ATTITUDE AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement***
LF	mm	790	782	Yes
RF	mm	793	783	Yes
LR	mm	793	787	Yes
RR	mm	787	791	Yes
Vehicle CG (Aft of Front Axle)	mm	1401	1388	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	37	47	

***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. Indicate "Yes" or "No" for "Meets Requirement"

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Rear Trunk Trim and Spare Tire Tools	10.0
Ballast / Equipment Added	49.0

Test Height Adjustable Setting (If Applicable)	
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DATA SHEET NO. 2

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

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

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 rearmost, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	Fixed	Fixed	Fixed
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat			

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCR Height (mm)	SCR Height Position	SCR Height (mm)		
				Rearmost	Mid Fore/Aft	Forwardmost
Driver Seat	Fixed	300	Max			
			Mid	288	300	310
			Min			
Front Passenger Seat	Fixed	305	Max			
			Mid	295	305	315
			Min			
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat			Max			
			Mid			
			Min			

DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

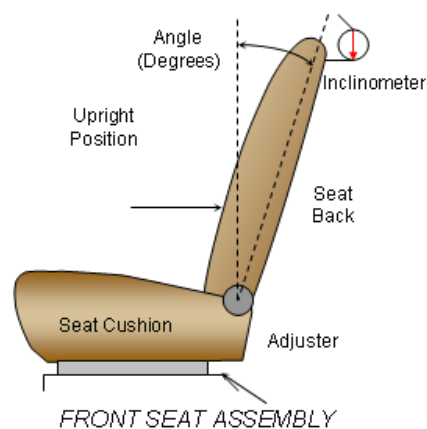
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	222	32	111	16
Front Passenger Seat	220	32	110	16
Front Center Seat				
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat				

*Detent zero (0) is the forward most detent

SEAT BACK ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The right front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is fixed. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck side rear seat back. Seat back angle is measured using the outboard head restraint post.



SEAT BACK POSITION

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/ Seated Dummy	54.4	22	8.7	6
Front Passenger Seat	67.0	31	8.7	6
Front Center Seat				
Struck Side Rear Seat w/Seated Dummy	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat				

*Detent zero (0) is the forward most detent

DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. The positions are marked H, M3, M2, M1, L from top to bottom.

	Total No. of Positions	Placed in Position
Driver Seat	5	H
Rear Seat	5	H

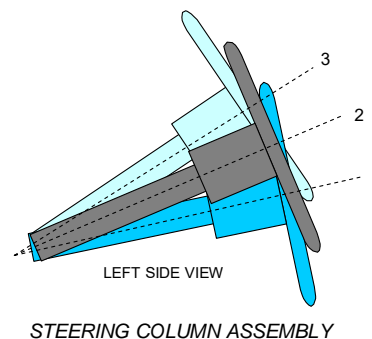
HEAD RESTRAINT ADJUSTMENT

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 No. of Positions	Placed in Position
Driver Seat	3	H
Rear Seat	Fixed	Fixed

STEERING COLUMN ADJUSTMENT

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



	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	21.0	110
Geometric Center - Position 2	24.0	128
Uppermost - Position 3	27.0	145
Telescoping Steering Wheel Travel		35
Test Position	24.0	128

DATA SHEET NO. 2 ... (CONTINUED)

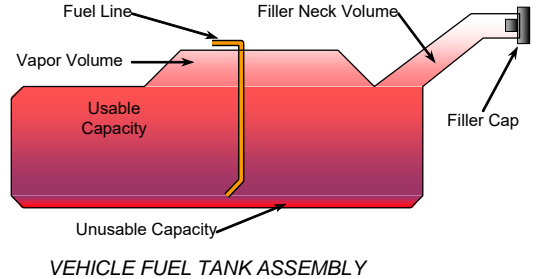
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

FUEL PUMP

The vehicle is equipped with an electronic fuel pump. The fuel pump starts pumping fuel when the key is in the "ON" position.



FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	75.70
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	75.70
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	70.40
Actual amount of Solvent Used in Test	70.40
1/3 of Usable Capacity	25.23

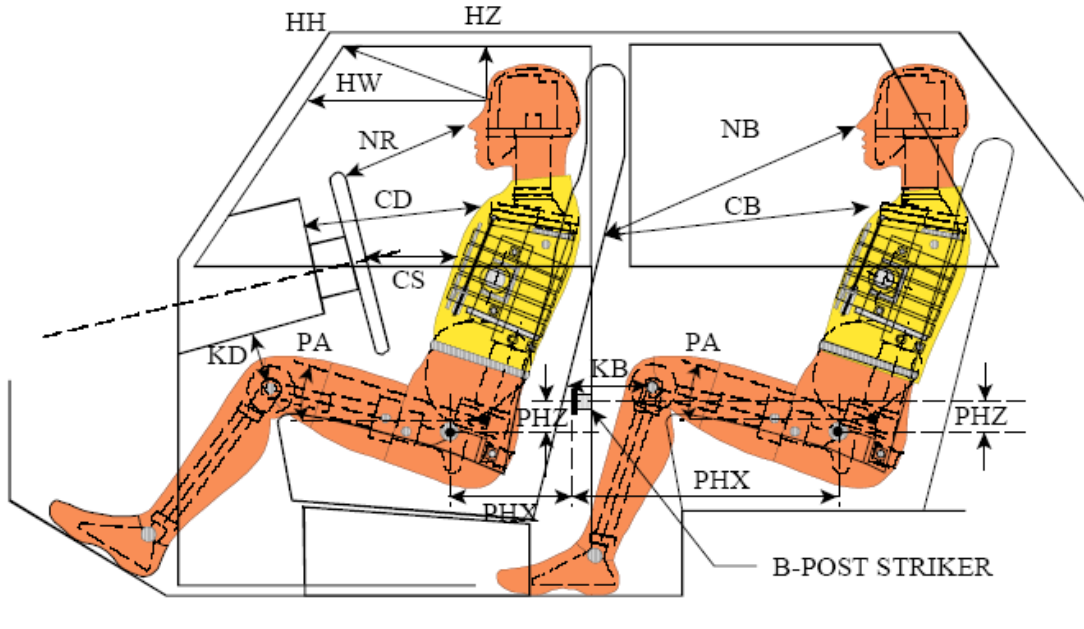
Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in the Form No. 1? **Yes** **No**

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



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

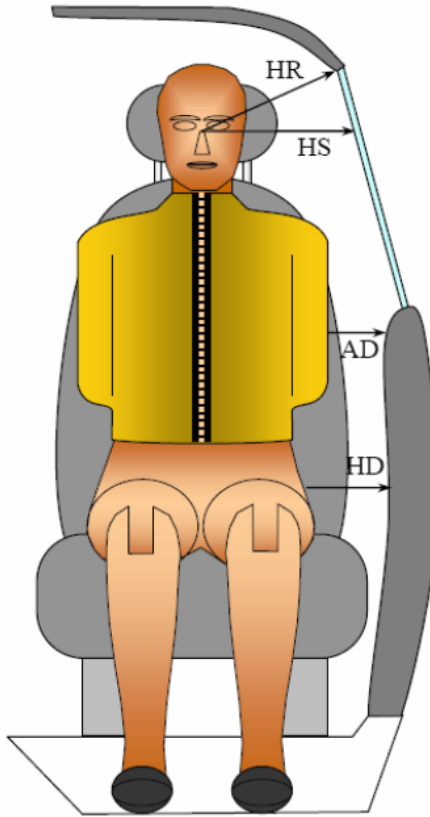
Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	382			
HW		Head to Windshield	594			
HZ	HZ	Head to Roof	153		263	
NR	NB	Nose to Rim/Seat Back	418		542	
CD	CB	Chest to Dash/Seat Back	566		552	
CS		Chest to Steering Wheel	347			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	119	38.0	290	22
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	109	41.4	282	18.2
PAX°	PAX°	Pelvic Tilt Angle X		16.3		18.4
	PAY°	Pelvic Tilt Angle Y		0.2		0.1
PHX	PHX	Hip Point to Striker (x-axis)	220		428	
PHZ	PHZ	Hip Point to Striker (z-axis)	16		79	

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

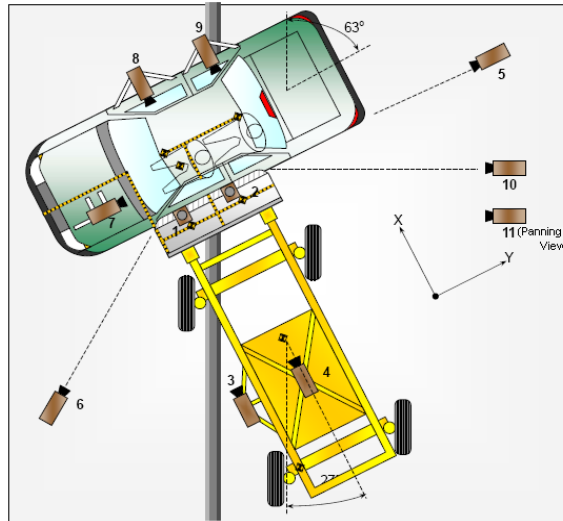
Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	235	262
HS	Head to Side Window	mm	395	465
AD	Arm to Door	mm	131	226
HD	H-Point to Door	mm	149	276

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



CAMERA LOCATIONS AND DATA

No.	View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	1220	2287	-5486	14	1000
2	Overhead Close-Up	609	2287	-5102	35	1000
3	Left Impact Point (MDB)	-2134	0	-1143	25	1000
4	Side Overall (MDB)	-3912	838	-1829	12.5	1000
5	Rear	-64	2485	-1348	85	1000
6	Left Front	-2266	-3564	-1475	24	1000
7	Driver Front (On-Board)	588	-730	-749	8.5	1000
8	Driver Side (On-Board)	1932	591	-440	8.5	1000
9	Passenger Side (On-Board)	1904	1634	-477	8.5	1000
10	Real Time Overall				Zoom	30
11	Real Time Inrun				Zoom	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

Driver Dummy Channels	16
Passenger Dummy Channels	19
Vehicle Structure Accelerometers	23
MDB Channels	7
Total	65

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2710	0	-460
2	Right Sill at Front Seat	3440	760	-400
3	Right Sill at Rear Seat	1790	650	-480
4	Left Sill at Front Door	2950	-710	-250
5	Left Sill at Rear Door	2020	-720	-270
6	A-Pillar Lower	3620	-860	-550
7	A-Pillar Middle	3700	-860	-740
8	B-Pillar Lower	2650	-740	-540
9	B-Pillar Middle	2650	-760	-890
10	Front Seat Track	2840	-600	-550
11	Rear Seat Structure	2080	500	-600
12	Right Rear Occupant Compartment	2080	200	-600
13	Engine Block	4360	0	-900
14	Rear Floorpan Above Axle	700	0	-620

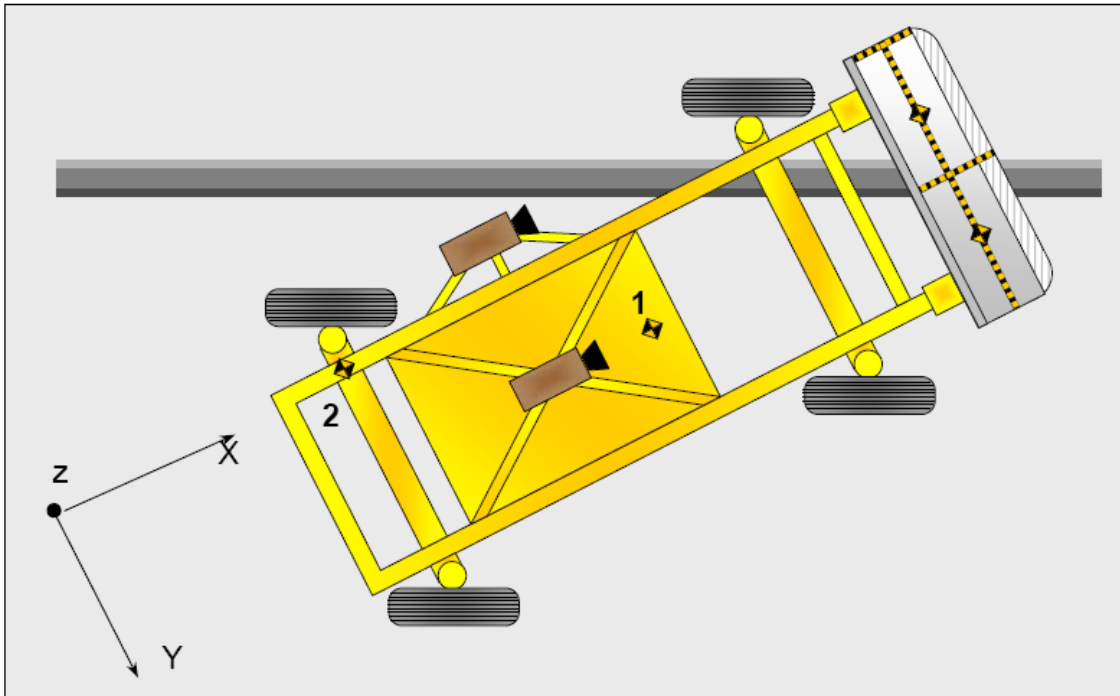
Reference: X – Rear surface of vehicle (+ forward)
 Y – Vehicle centerline (+ to right)
 Z – Ground plane (+ down)

DATA SHEET NO. 7

MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Measurement		
		X	Y	Z
1	MDB CG	-1195	0	-430
2	MDB Rear	-2642	-593	-608

Reference: X – Face of MDB (+ forward)
 Y – MDB centerline (+ to right)
 Z – Ground plane (+ down)

DATA SHEET NO. 8

POST-TEST OBSERVATIONS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

TEST DUMMY INFORMATION AND CONTACT POINTS

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

POST-TEST DOOR PERFORMANCE

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

DATA SHEET NO. 8 ... (CONTINUED)

POST-TEST OBSERVATIONS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No separation
Sill Separation	No separation
Windshield Damage	None
Side Window Damage	Broken
Other Notable Effects	None

DATA SHEET NO. 8 ... (CONTINUED)

POST-TEST OBSERVATIONS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side		Struck Side	
	Driver		Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Airbag 1 (Curtain)	Yes	Yes	Yes	Yes
Side Airbag 2 (Torso/Pelvis)	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	Yes	No	
Other (Active Head Restraint)	Yes	Yes	No	

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		3076
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		506
Actual Impact Point (Aft of Front Axle)	mm		515
Horizontal Offset (+ forward / - rearward)	mm	± 50 of Intended Impact Point	-9
Vertical Offset (+ down / - up)	mm	± 20 of Intended Impact Point	4

DATA SHEET NO. 9

MDB SUMMARY OF RESULTS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1251
Overall Length including Honeycomb Face	4115
Wheel Base of Framework Carriage	2595
CG location aft of Front Axle	1118

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	402.0	298.0	700.0
Right	kg	377.0	290.0	667.0
Ratio	%	57.0%	43.0%	100.0%
Totals	kg	779.0	588.0	1367.0

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.90
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.86
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.1
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	62.9
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.2

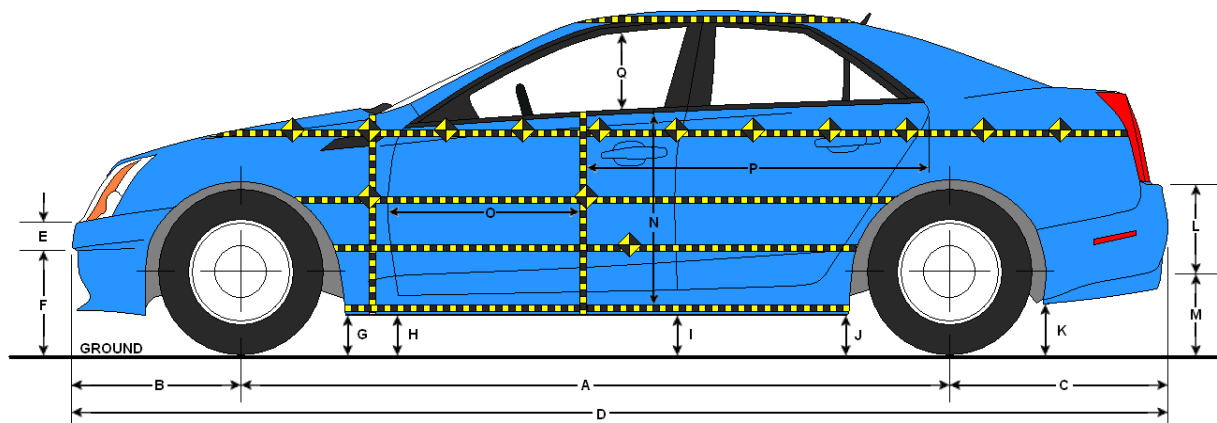
MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Left	219
B	Top of Bumper	533	800	Left	112
C	Mid Level	686	800	Left	109
D	Top of Stack	813	800	Left	131

DATA SHEET NO. 10

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	3076	3052	-24
B	Front Axle to FSOV	956	956	0
C	Rear Axle to RSOV	1114	1128	14
D	Total Length at Centerline	5145	5135	-10
E	Front Bumper Thickness	208	205	-3
F	Front Bumper Bottom to Ground	455	1004	549
G	Sill Height at Front Wheel Well	283	686	403
H	Sill Height at Front Door Leading Edge	286	679	393
I	Sill Height at B-Pillar	296	561	265
J1	Sill Height at Rear Wheel Well	268	405	137
J2	Pinch Weld Height at Rear Wheel Well	263	442	179
K	Sill Height Aft of Rear Wheel Well	307	372	65
L	Rear Bumper Thickness	132	127	-5
M	Rear Bumper Bottom to Ground	372	349	-23
N	Sill Height to Bottom of Front Window Sill	752	727	-25
O	Front Door Leading Edge to Impact CL	857	805	-52
P	Rear Door Trailing Edge to Impact CL	1355	1366	11
Q	Front Window Opening	572	518	-54
R	Right Side Length	3668	3653	-15
S	Left Side Length	3664	3634	-30
T	Vehicle Width at B-Pillar	1953	1809	-144

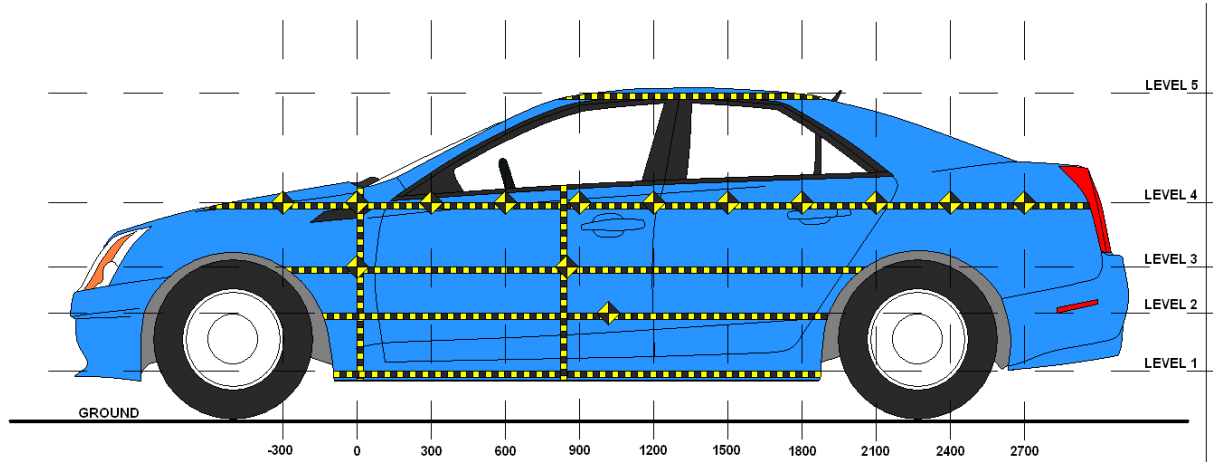
All measurements in mm with tolerance of ± 3 mm

DATA SHEET NO. 11

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



LEFT SIDE VIEW

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	282	24	300
2	Occupant H-Point	778	270	1350
3	Mid-Door	722	269	1350
4	Window Sill	1018	154	1050
5	Window Top	1670	30	1050

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

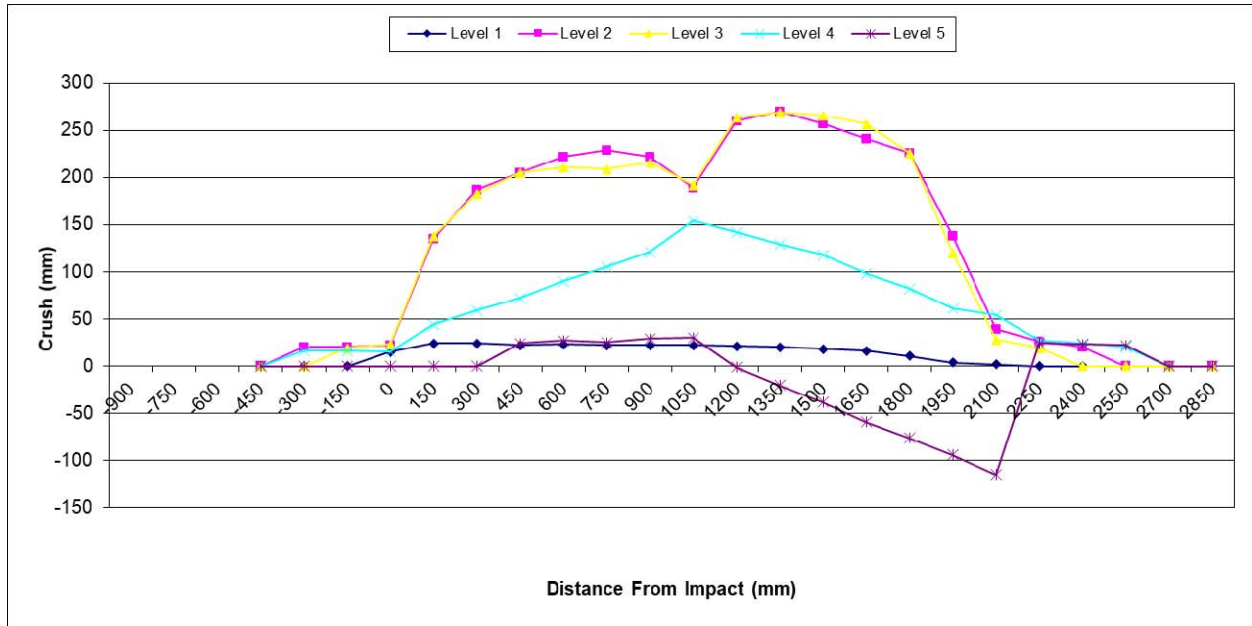
	Pre-Test (mm)					Post-Test (mm)					Difference (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300		531		598			551		614			20		16	
-150		545	537	583			565	556	599			20	19	16	
0	586	539	541	568		601	561	564	583		15	22	23	15	
150	582	534	535	557		606	669	673	601		24	135	138	44	
300	576	528	530	548		600	715	713	607		24	187	183	59	
450	572	524	526	542	757	594	729	731	614	781	22	205	205	72	24
600	569	522	523	537	750	592	744	734	627	777	23	222	211	90	27
750	567	520	522	534	766	589	749	731	639	791	22	229	209	105	25
900	565	519	521	530	762	587	741	737	651	791	22	222	216	121	29
1050	565	519	522	530	761	587	708	714	684	791	22	189	192	154	30
1200	566	521	523	531	761	587	781	787	673	760	21	260	264	142	-1
1350	568	522	525	530	761	588	792	794	659	741	20	270	269	129	-20
1500	571	524	527	532	762	589	781	793	650	724	18	257	266	118	-38
1650	573	527	530	535	764	589	768	787	633	705	16	241	257	98	-59
1800	576	531	534	537	765	587	757	760	619	689	11	226	226	82	-76
1950	580	536	539	542	768	584	674	659	603	674	4	138	120	61	-94
2100	584	542	545	546	773	586	581	573	600	658	2	39	28	54	-115
2250		539	531	552	781		565	550	579	805		26	19	27	24
2400		525		560	787		545		584	810		20		24	23
2550				566	788				586	810				20	22
2700															
2850															

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

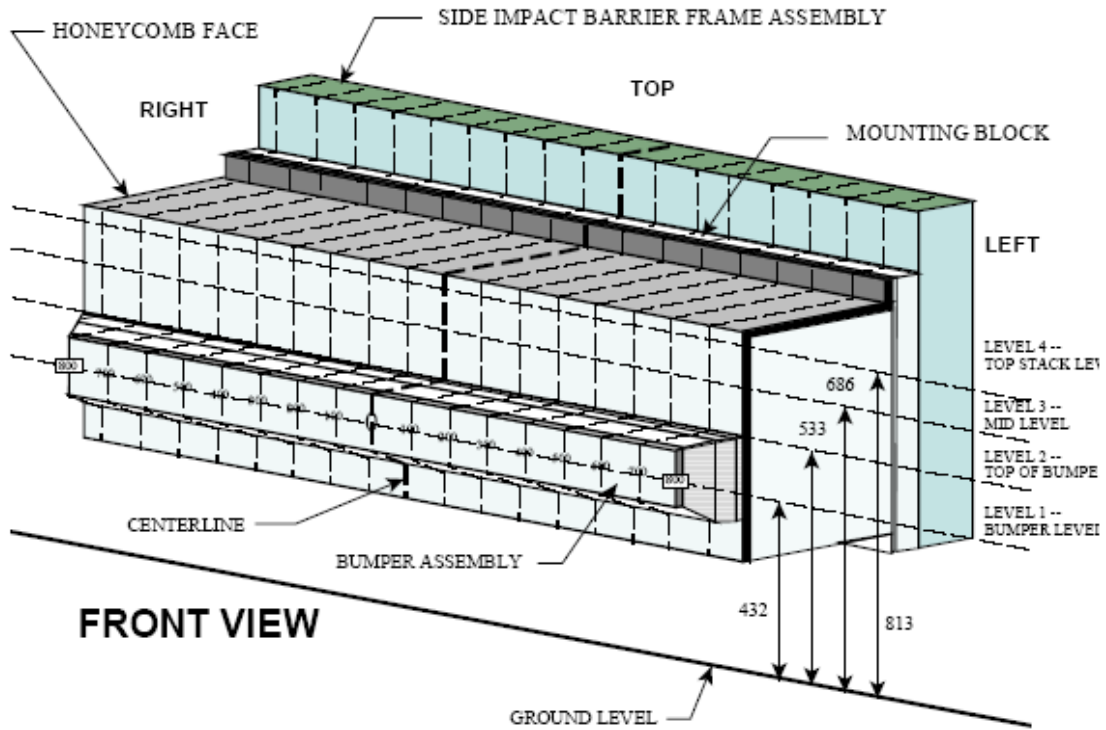


DATA SHEET NO. 12

MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



NOTE: Dimensions are shown in millimeters, mm

DEFORMABLE BARRIER STATIC CRUSH

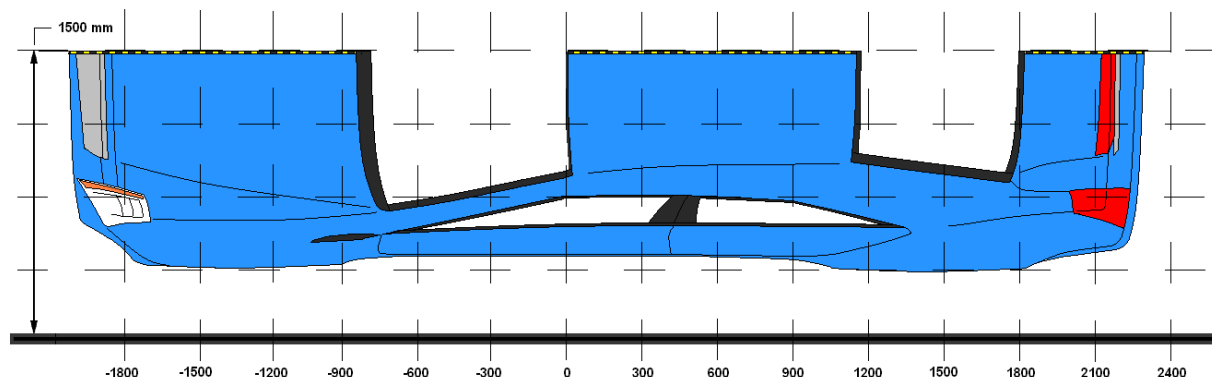
Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
1	209	194	192	199	177	189	215	214	200	200	197	193	199	199	206	197	219
2	107	109	92	89	94	92	93	88	90	90	96	102	105	107	107	104	112
3	72	57	50	48	49	42	52	92	72	57	53	57	57	58	72	84	109
4	108	87	70	57	43	40	66	107	97	72	57	66	80	88	96	110	131

All dimensions in millimeters.

DATA SHEET NO. 13

VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304
 Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2550	5	788	810	22
2	1950	2	536	674	138
3	1350	2	522	792	270
4	900	2	519	741	222
5	300	2	528	715	187
6	-300	2	531	551	20

MDB DAMAGE PROFILE DISTANCES

DPD	From MDB Centerline		Level	Crush (mm)
	Distance (mm)	Direction		
1	800	Left	1	219
2	500	Left	1	199
3	200	Left	1	197
4	200	Right	1	215
5	500	Right	1	199
6	800	Right	1	209

DATA SHEET NO. 14

FMVSS NO. 301 STATIC ROLLOVER RESULTS

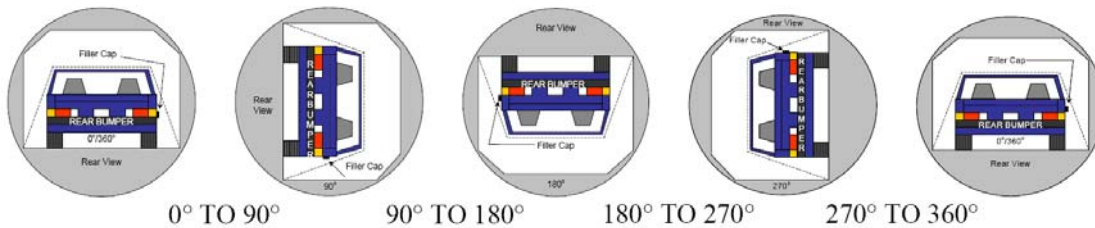
Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18

Temperature at Time of Impact: 20.0 °C

Test Time: 12:41 P.M.

- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)
- D. Spillage Details: There was no Stoddard solvent spillage.



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	80	300	380
90° To 180°	86	300	386
180° To 270°	76	300	376
270° To 360°	82	300	382

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

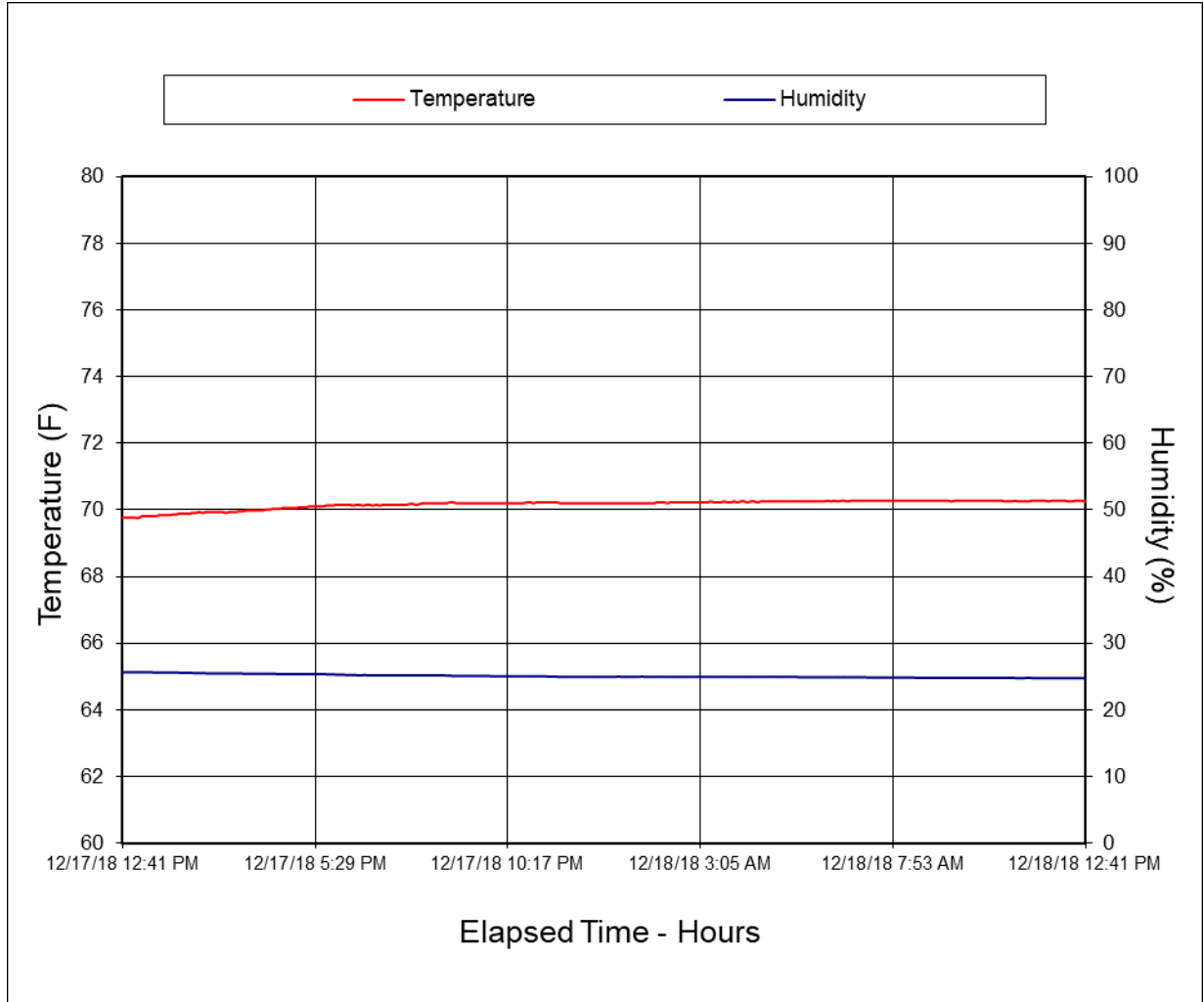
Test Phase	Spillage Location
0° To 90°	N/A
90° To 180°	N/A
180° To 270°	N/A
270° To 360°	N/A

DATA SHEET NO. 15

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan NHTSA No. M20190304

Test Program: NCAP MDB Side Impact Test Test Date: 12/18/18



**APPENDIX A
PHOTOGRAPHS**

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97	FMVSS No. 301 Static Rollover 90 Degrees	A-49
98	FMVSS No. 301 Static Rollover 180 Degrees	A-49
99	FMVSS No. 301 Static Rollover 270 Degrees	A-50
100	FMVSS No. 301 Static Rollover 360 Degrees	A-50
101	Impact Event	A-51
102	Monroney Label	A-51
103	Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-52
104	Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-52



FIGURE 1. As-Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 2. As-Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 3. Pre-Test Frontal View of Test Vehicle

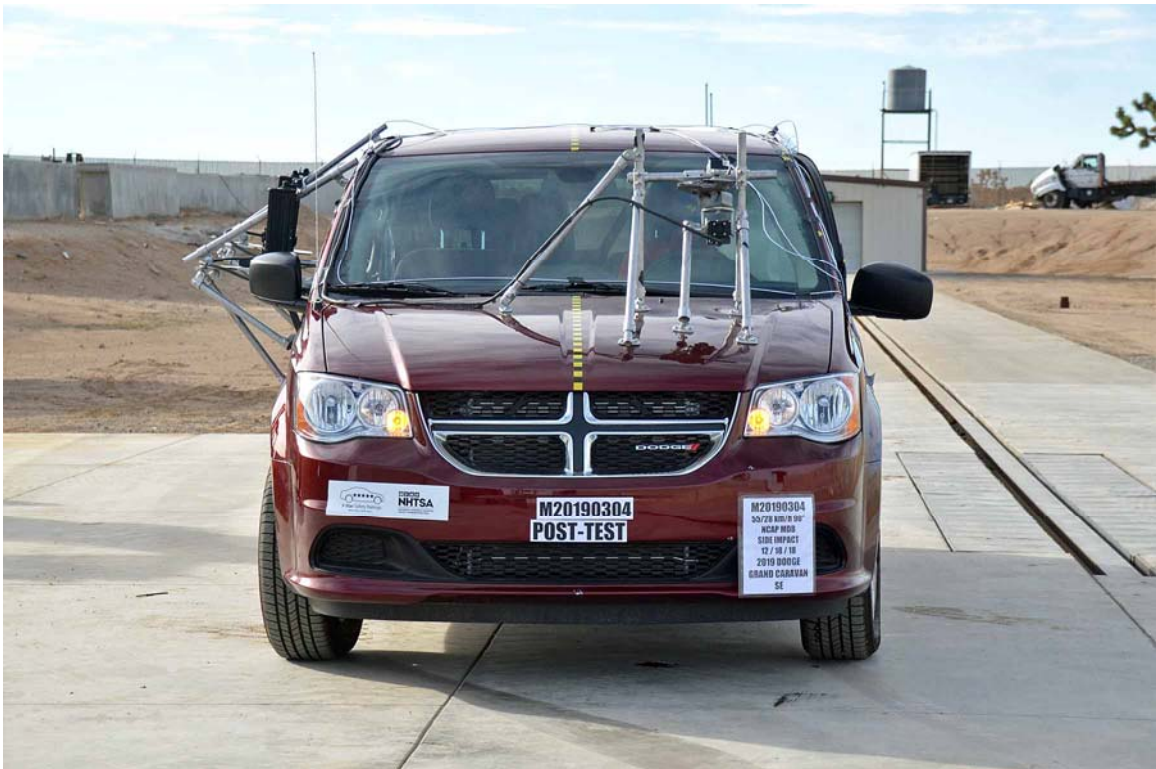


FIGURE 4. Post-Test Frontal View of Test Vehicle



FIGURE 5. Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 6. Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 7. Pre-Test Left Side View of Test Vehicle



FIGURE 8. Post-Test Left Side View of Test Vehicle



FIGURE 9. Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 10. Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 11. Pre-Test Rear View of Test Vehicle



FIGURE 12. Post-Test Rear View of Test Vehicle



FIGURE 13. Pre-Test Right Side View of Test Vehicle



FIGURE 14. Post-Test Right Side View of Test Vehicle



FIGURE 15. Pre-Test Overhead View of Test Area

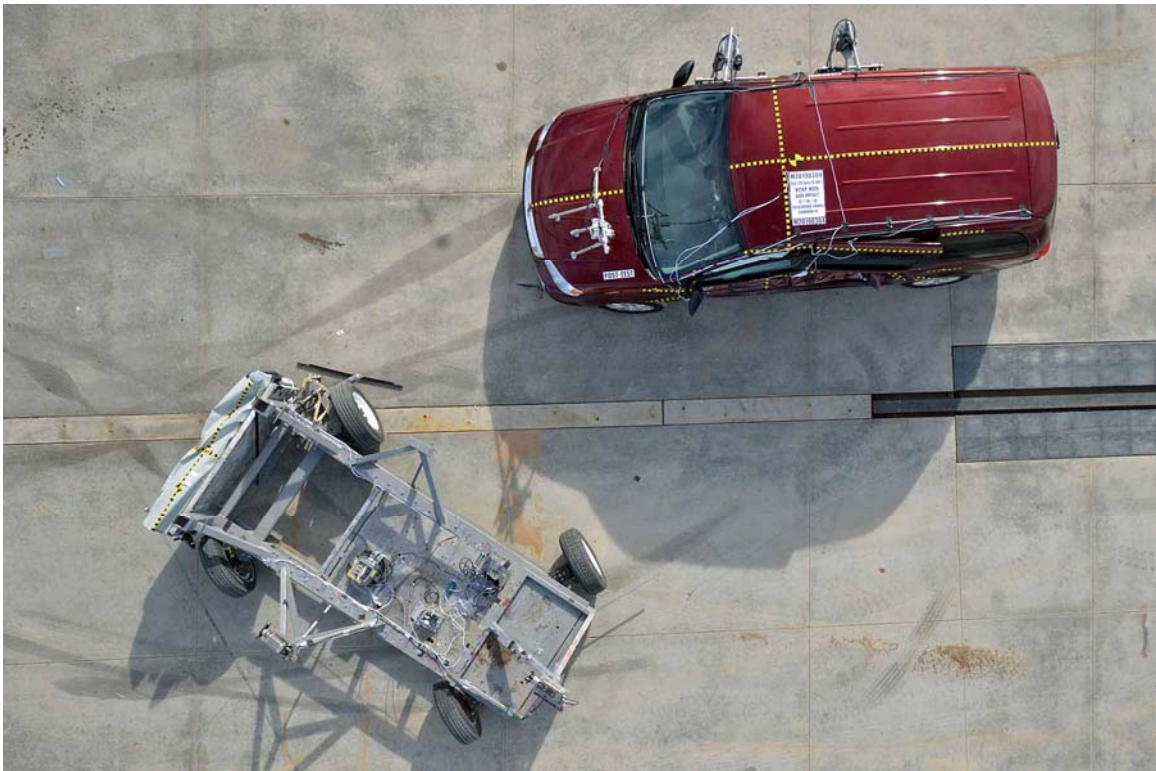


FIGURE 16. Post-Test Overhead View of Test Area



FIGURE 17. Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



FIGURE 18. Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle



FIGURE 19. Pre-Test Close-Up View of Impact Point Target



FIGURE 20. Post-Test Close-Up View of Impact Point Target



FIGURE 21. Pre-Test Left Front Door Latch Close-Up



FIGURE 22. Post-Test Left Front Door Latch Close-Up



FIGURE 23. Pre-Test Left Rear Door Latch Close-Up



FIGURE 24. Post-Test Left Rear Door Latch Close-Up



FIGURE 25. Pre-Test Front Close-Up View of Driver Dummy



FIGURE 26. Post-Test Front Close-Up View of Driver Dummy



FIGURE 27. Pre-Test Left Side View of Driver Dummy
Showing Belt and Chalking



FIGURE 28. Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



FIGURE 29. Post-Test Left Side View of Driver Dummy Shoulder and Door Top View

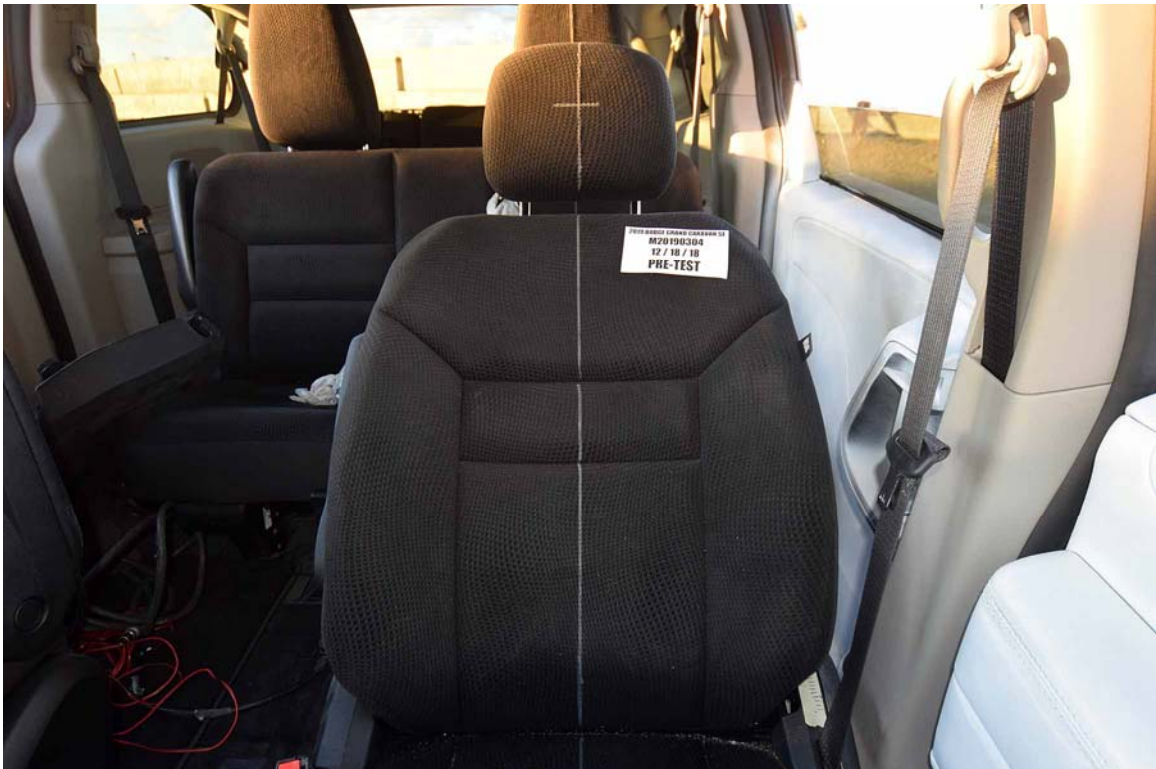


FIGURE 30. Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



FIGURE 31. Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



FIGURE 32. Pre-Test Overhead View of Driver Seat Pan Prior to Dummy Positioning



FIGURE 33. Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



FIGURE 34. Pre-Test Placement of Driver Dummy's Feet



FIGURE 35. Pre-Test View of Belt Anchorage for Driver Dummy

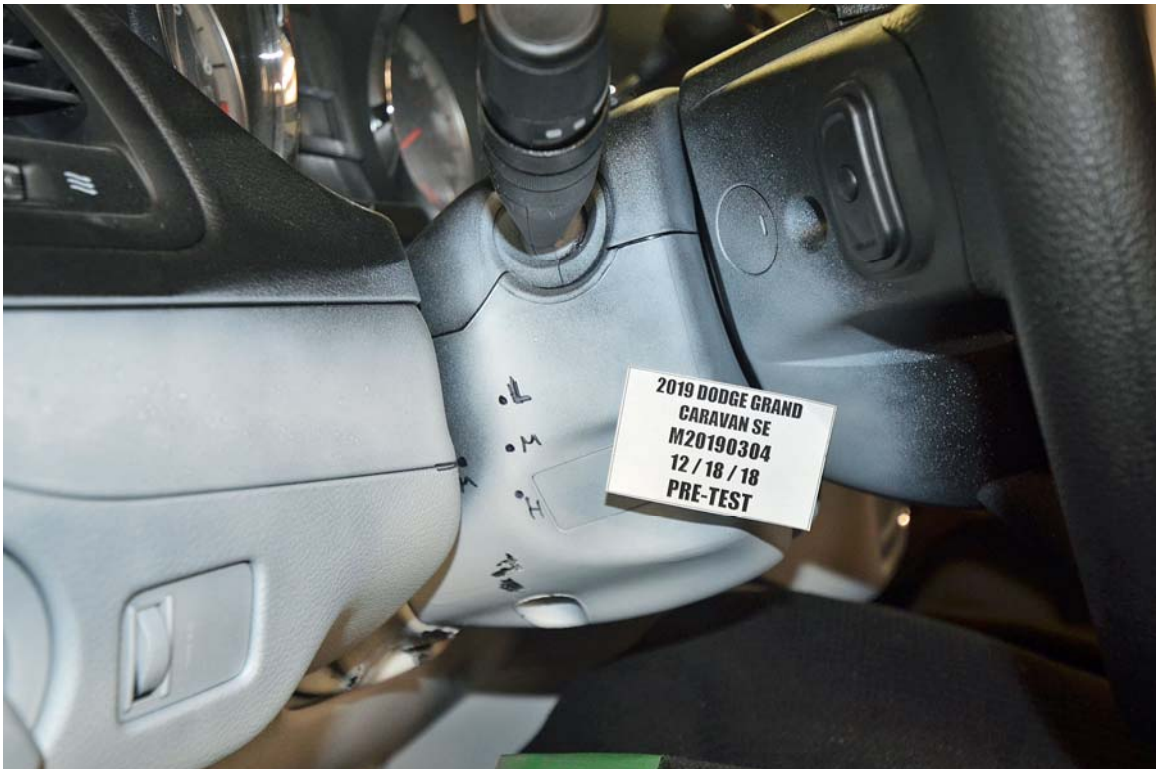


FIGURE 36. Pre-Test Left Side View of Steering Wheel



FIGURE 37. View of Disengaged Parking Brake



FIGURE 38. Pre-Test View of Parking Brake



FIGURE 39. Pre-Test Close-Up Left Side View of Driver Seat Track

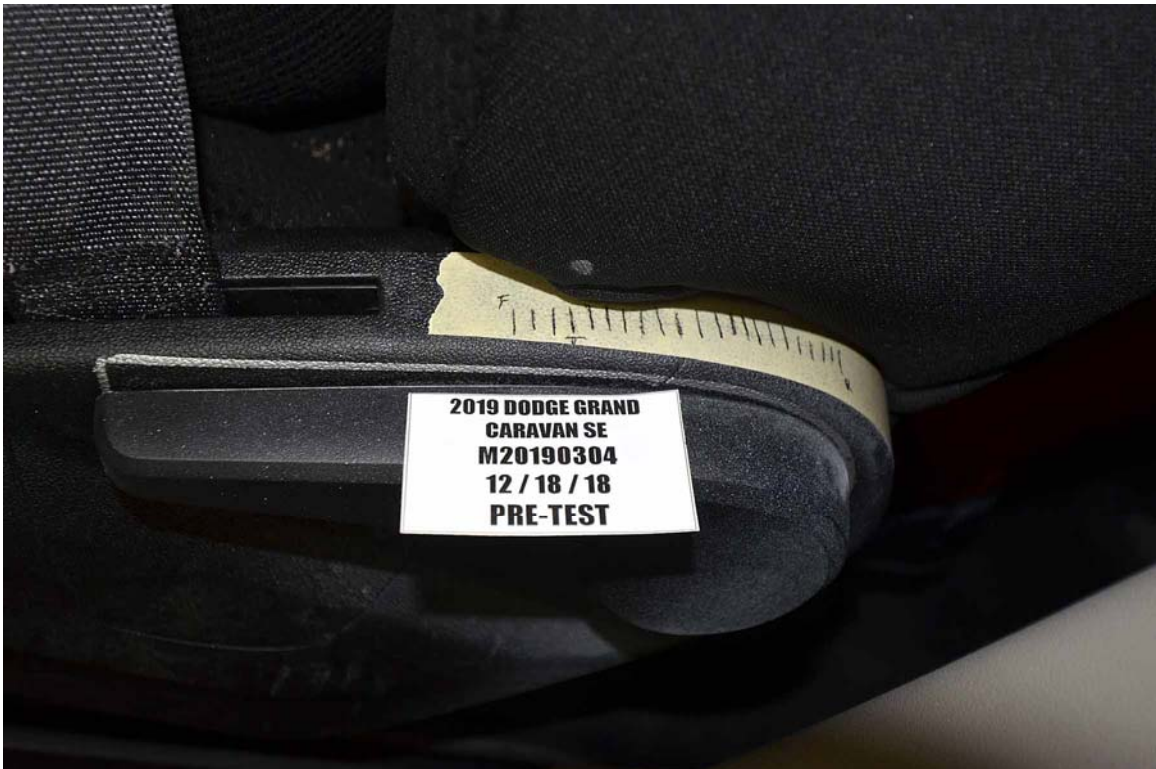


FIGURE 40. Pre-Test Close-Up Left Side View of Driver Seat Back



FIGURE 41. Pre-Test Close-Up View of Driver Seat Back or Head Restraint



FIGURE 42. Pre-Test Driver Dummy and Door Clearance View



FIGURE 43. Post-Test Driver Dummy and Door Clearance View



FIGURE 44. Pre-Test Right Side View of Driver Dummy
and Front Seat Occupant Compartment



FIGURE 45. Post-Test Right Side View of Driver Dummy and Front Seat Occupant Compartment



FIGURE 46. Pre-Test Driver Inner Door Panel View



FIGURE 47. Post-Test Driver Inner Door Panel View
Showing Driver Dummy Contact Locations



FIGURE 48. Post-Test Driver Dummy Close-Up Head Contact
with Vehicle Interior View

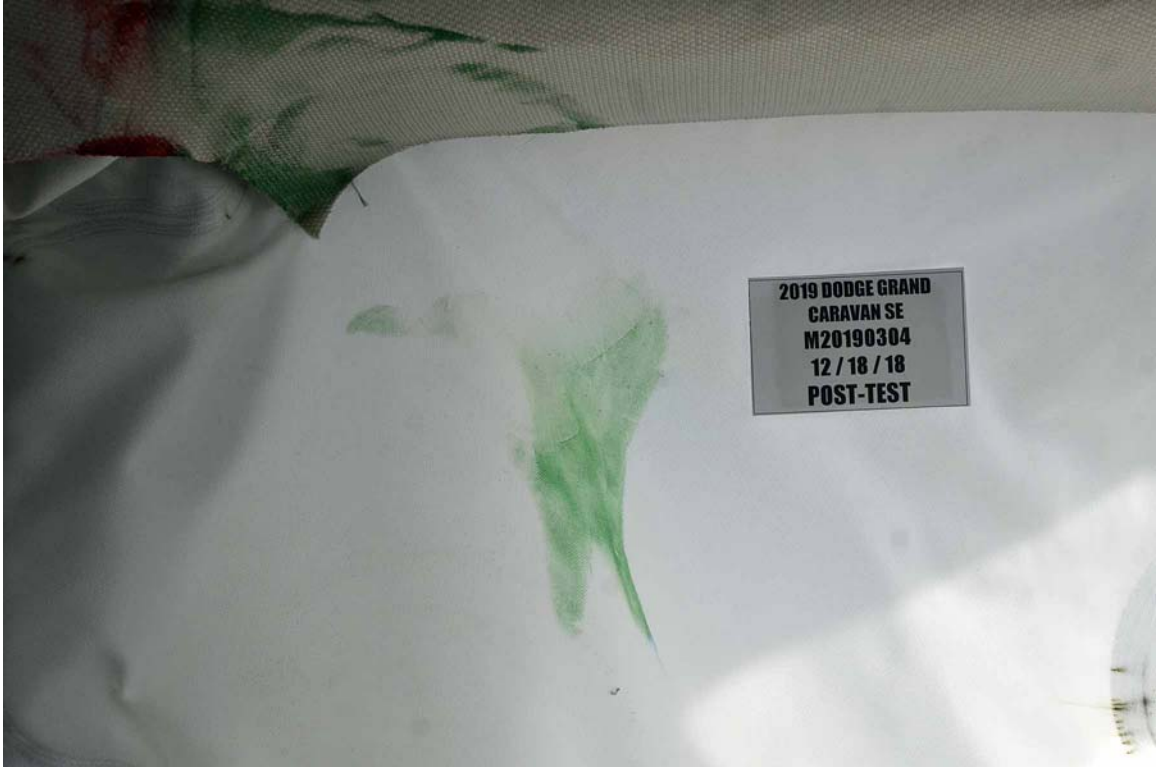


FIGURE 49. Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View



FIGURE 50. Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View



FIGURE 51. Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View



FIGURE 52. Post-Test Driver Dummy Close-Up Pelvis Contact with Vehicle Interior View



FIGURE 53. Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View



FIGURE 54. Post-Test Driver Dummy Close-Up Knee Contact View



FIGURE 55. Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking



FIGURE 56. Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



FIGURE 57. Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



FIGURE 58. Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



FIGURE 59. Pre-Test Frontal View of Rear Passenger Dummy
Head and Shoulders in Relation to Head Restraint



FIGURE 60. Pre-Test Overhead View of Rear Passenger
Seat Pan Prior to Dummy Positioning



FIGURE 61. Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



FIGURE 62. Pre-Test View of Rear Passenger Dummy's Neck
Showing Position of Adjustable Neck Bracket



FIGURE 63. Pre-Test View of Rear Passenger Dummy's Head
Showing Dummy's Head is Level



FIGURE 64. Pre-Test Placement of Rear Passenger Dummy's Feet



FIGURE 65. Pre-Test View of Belt Anchorage for Rear Passenger Dummy



FIGURE 66. Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



FIGURE 67. Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



FIGURE 68. Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint



FIGURE 71. Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



FIGURE 72. Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



FIGURE 73. Pre-Test Rear Passenger Inner Door Panel View



FIGURE 74. Post-Test Rear Passenger Inner Door Panel View
Showing Rear Passenger Dummy Contact Locations



FIGURE 75. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Vehicle Interior View



FIGURE 76. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Side Airbag View



FIGURE 77. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Vehicle Interior View

Photograph Not Applicable

Vehicle Not Equipped with Rear Passenger Side Airbag

FIGURE 78. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Side Airbag View



FIGURE 79. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Vehicle Interior View

Photograph Not Applicable

Vehicle Not Equipped with Rear Passenger Side Airbag

FIGURE 80. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Side Airbag View

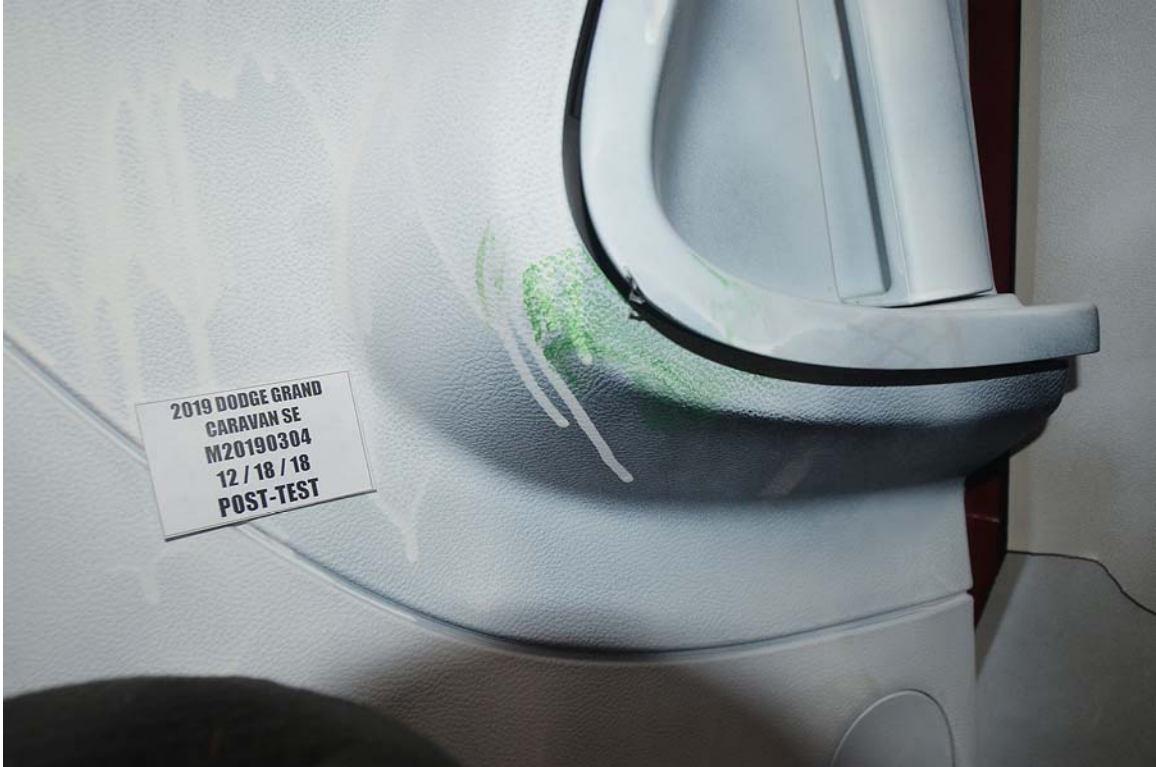


FIGURE 81. Post-Test Rear Passenger Dummy Close-Up Knee Contact View



FIGURE 82. Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 83. Post-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 84. Pre-Test Front View of MDB Impactor Face



FIGURE 85. Post-Test Front View of MDB Impactor Face



FIGURE 86. Pre-Test Top View of MDB Impactor Face



FIGURE 87. Post-Test Top View of MDB Impactor Face



FIGURE 88. Pre-Test Left Side View of MDB Impactor Face



FIGURE 89. Post-Test Left Side View of MDB Impactor Face



FIGURE 90. Pre-Test Right Side View of MDB Impactor Face



FIGURE 91. Post-Test Right Side View of MDB Impactor Face



FIGURE 92. Close-Up View of Vehicle's Certification Label

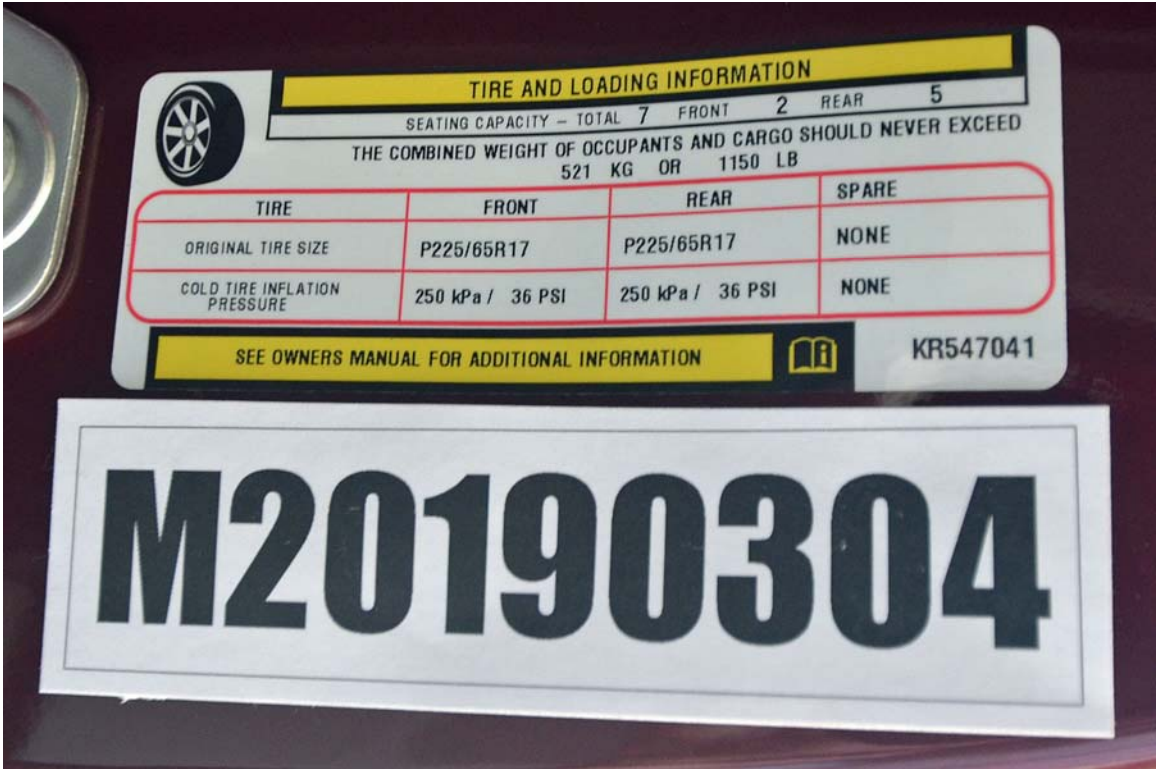


FIGURE 93. Close-Up View of Vehicle's Tire Information Placard or Label

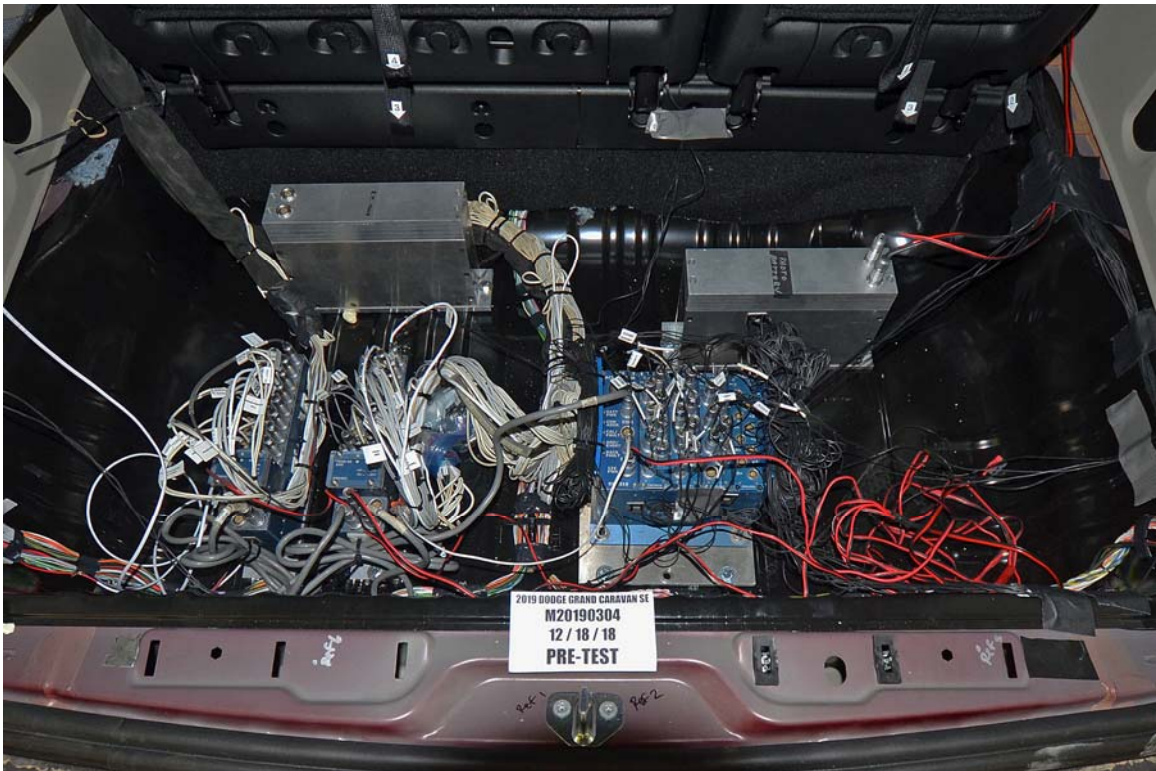


FIGURE 94. Pre-Test Ballast View



FIGURE 95. Post-Test Primary and Redundant Speed Trap Read-Out

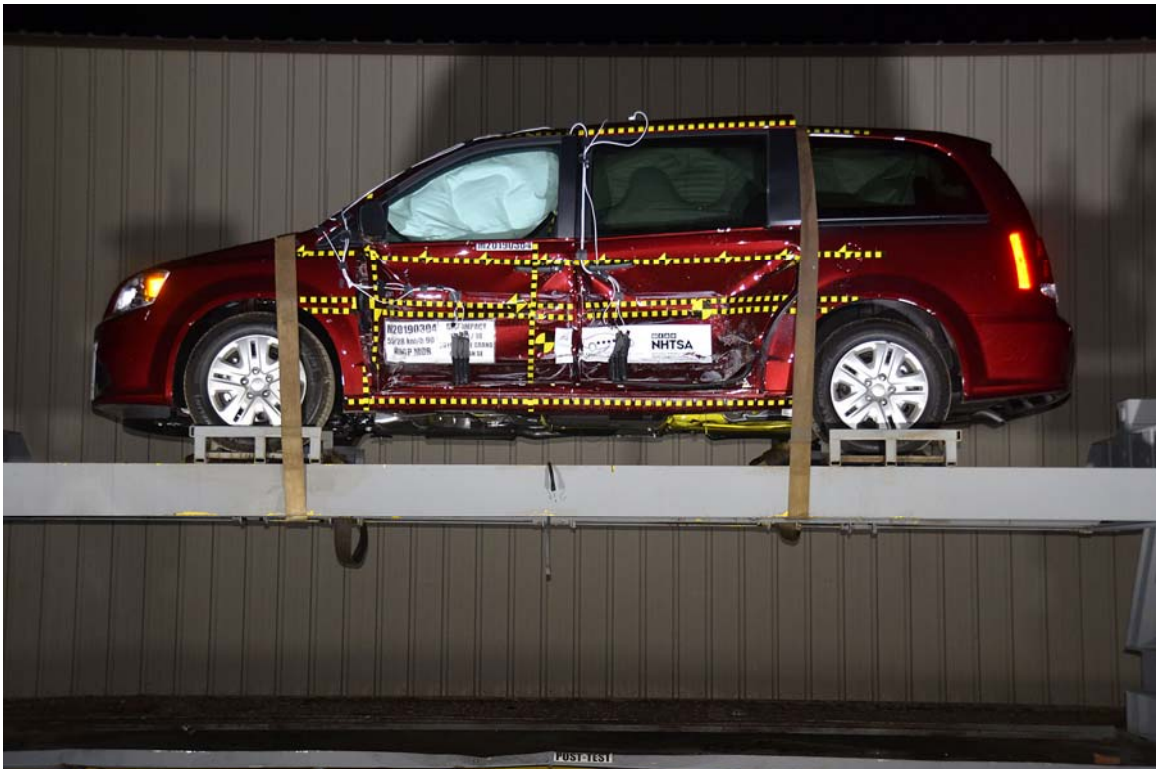


FIGURE 96. FMVSS No. 301 Static Rollover 0 Degrees



FIGURE 97. FMVSS No. 301 Static Rollover 90 Degrees



FIGURE 98. FMVSS No. 301 Static Rollover 180 Degrees

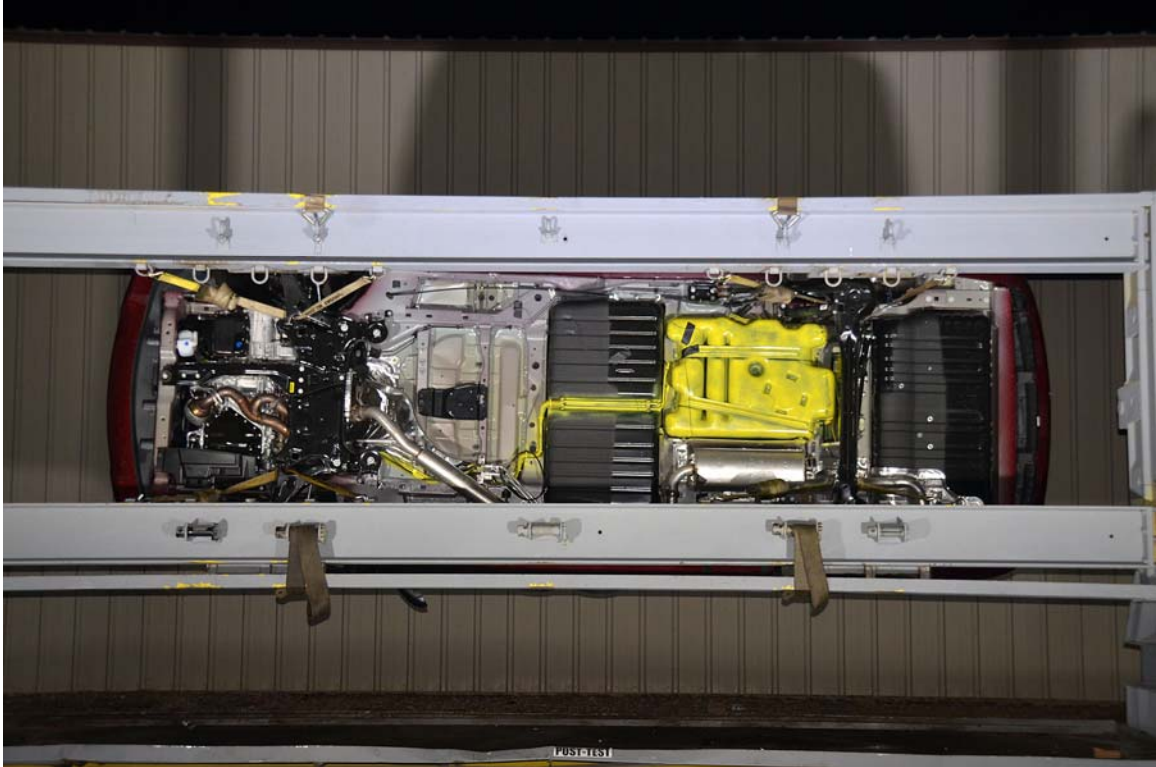


FIGURE 99. FMVSS No. 301 Static Rollover 270 Degrees

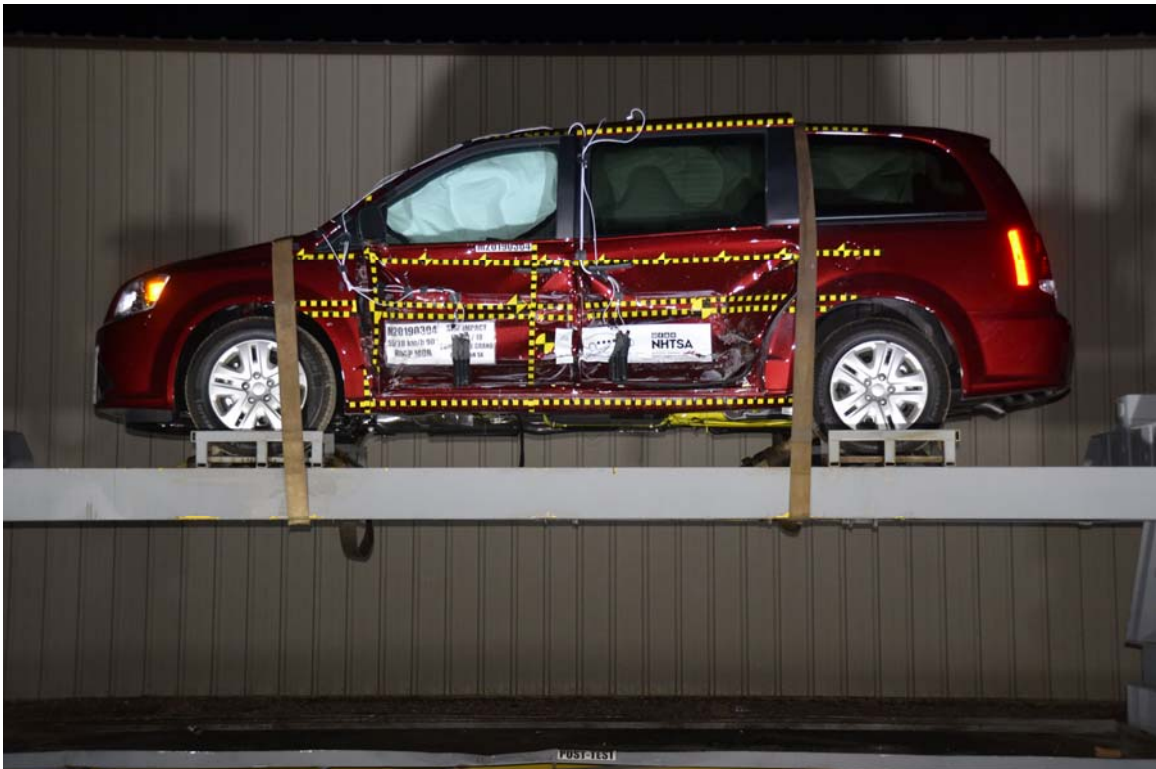


FIGURE 100. FMVSS No. 301 Static Rollover 360 Degrees



FIGURE 101. Impact Event

2019 DODGE GRAND CARAVAN SE

THIS VEHICLE IS MANUFACTURED TO MEET SPECIFIC UNITED STATES REQUIREMENTS. THIS VEHICLE IS NOT MANUFACTURED FOR SALE OR REGISTRATION OUTSIDE OF THE UNITED STATES.

MANUFACTURER'S SUGGESTED RETAIL PRICE OF THIS MODEL INCLUDING DEALER PREPARATION

Base Price: \$26,650

DODGE GRAND CARAVAN SE
 Exterior Color: Octane Red Pearl-Coat Exterior Paint
 Interior Color: Black Light Gray/Stone Interior Colors
 Interior: Cloth Low-Back Bucket Seats
 Engine: 3.6-Liter V6 Gasoline VVT Engine
 Transmission: 6-Speed Automatic RCTE Transmission

STANDARD EQUIPMENT (UNLESS REPLACED BY OPTIONAL EQUIPMENT)

FUNCTIONAL SAFETY FEATURES
 Advanced Multistage Front Airbags
 Supplemental Side-Curtain Airbags in All Rows
 Supplemental Front Seat-Mounted Side Airbags
 Driver Inflation Knee-Bolster Airbag
 LATCH Ready Child Seat Anchor System
 Daytime Running Lamps
 Anti-Lock 4-Wheel Heavy-Duty Disc Brakes
 Electronic Stability Control
 Tire Pressure Monitoring System
 ParkView® Rear Back-Up Camera
 Speed Control
 Keyless Entry with Immobilizer
 Sliding Door Alert Warning
 Power Door Locks
 29-Gallon Fuel Tank
 Fuel Economy
 Trailer Sway Damping
 Tire Inflation Kit (No Compact Spare)

INTERIOR FEATURES
 2nd Row Bench w/3rd Row 60-40 Split w/ 90th Bench
 Steering Wheel Mounted Audio Controls
 8.5-inch Touchscreen Display
 6 Speakers
 Auto-Dimming Rear View Mirror
 TR / Telescope Steering Column
 12-Volt DC Front and Rear Power Outlets
 12-Volt Auxiliary Power Outlet
 Power Windows with Driver's One-Touch-Down Feature
 Second-Row Power Windows
 Power Third-Row Vented Windows
 3-Zone Manual Temperature Control

Assembly Point of Entry: WINDSOR, ONTARIO, CANADA

204-R00568KR-047041

For more information visit: www.dodge.com or call 1-800-4ADODGE FCA US LLC

EPA DOT Fuel Economy and Environment

Fuel Economy These estimates reflect new EPA methods beginning with 2017 models. Midrange range from 19 to 32 MPG. The best vehicle rates 136 MPGe. Values are based on gasoline and do not reflect performance and ratings based on E85.

20 MPG combined city/hwy
17 city **25 highway** **5.0** gallons per 100 miles

Driving Range
 Estimated 230 miles

You spend \$2,500 more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel Cost \$1,900

Fuel Economy & Greenhouse Gas Rating (Multiple only) Smog Rating (Multiple only)

This vehicle emits 443 grams CO2 per mile. The best emits 0 grams per mile (electric only). Producing and transporting fuel also produces greenhouse gases.

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 cost \$2,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.50 per gallon. This is a fuel related estimate. Actual results may vary. Gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
 Calculate personalized estimates and compare vehicles

GOVERNMENT 5-STAR SAFETY RATINGS

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

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

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

Side Crash	Front seat	Not Rated
	Rear seat	Not Rated

Based on the risk of injury in a side impact.

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

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

The safety ratings above are based on Federal Government tests of particular vehicles equipped with certain features and options. The performance of this vehicle may differ.

PARTS CONTENT INFORMATION FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 76% MAJOR SOURCES OF FOREIGN PARTS CONTENT: 15%
NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE:
 FINAL ASSEMBLY POINT: WINDSOR, ONTARIO, CANADA
 COUNTRY OF ORIGIN: UNITED STATES
 ENGINE: UNITED STATES
 TRANSMISSION: UNITED STATES

VEHICLE PROTECTION
 MOPAR. A PRODUCT OF FCA US LLC
 Ask for Mopar Vehicle Protection for your vehicle. We built it. We back it.

FIGURE 102. Monroney Label

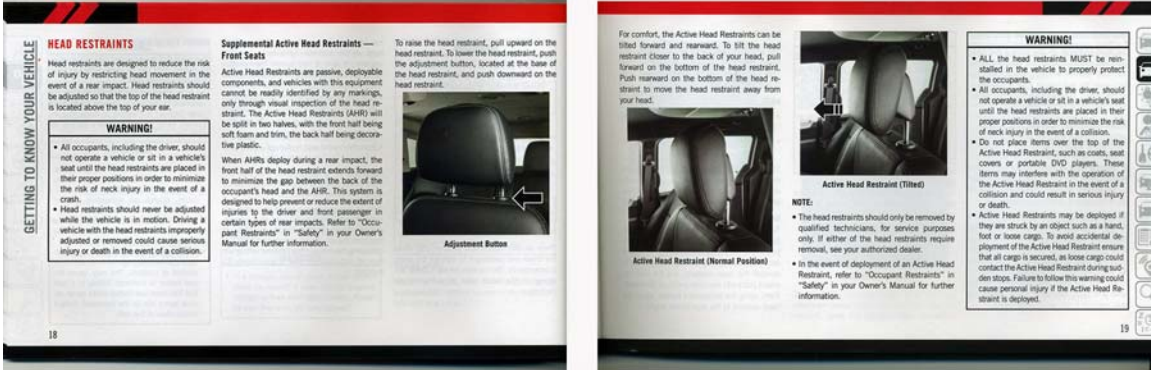


FIGURE 103. Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



FIGURE 104. Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

Plot		Page
1	Driver Head Acceleration (X) Primary vs. Time	B-1
2	Driver Head Acceleration (Y) Primary vs. Time	B-1
3	Driver Head Acceleration (Z) Primary vs. Time	B-1
4	Driver Head Resultant Acceleration Primary vs. Time	B-1
5	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-2
6	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-2
7	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-2
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9	Driver Anterior Abdominal Force (Y) vs. Time	B-3
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11	Driver Posterior Abdominal Force (Y) vs. Time	B-3
12	Driver Total Abdominal Force (Y) vs. Time	B-3
13	Driver Pubic Symphysis Force (Y) vs. Time	B-4
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15	Passenger Head Acceleration (Y) vs. Time Primary	B-5
16	Passenger Head Acceleration (Z) vs. Time Primary	B-5
17	Passenger Head Resultant Acceleration Primary vs. Time	B-5
18	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-6
19	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-6
20	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-6
21	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-6
22	Passenger Iliac Force on Impact Side (Y) vs. Time	B-7
23	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
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 (www.NHTSA.dot.gov)

Additional Driver & Passenger Dummy Instrumentation Data

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 Structure 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)

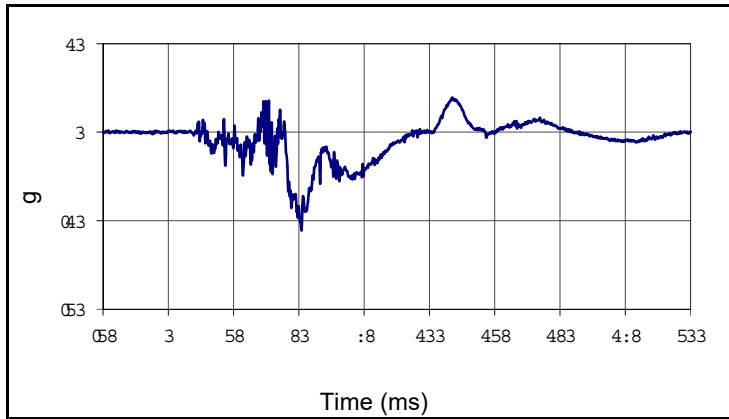
MDB Rear Acceleration (Y)

Left MDB Contact Switch

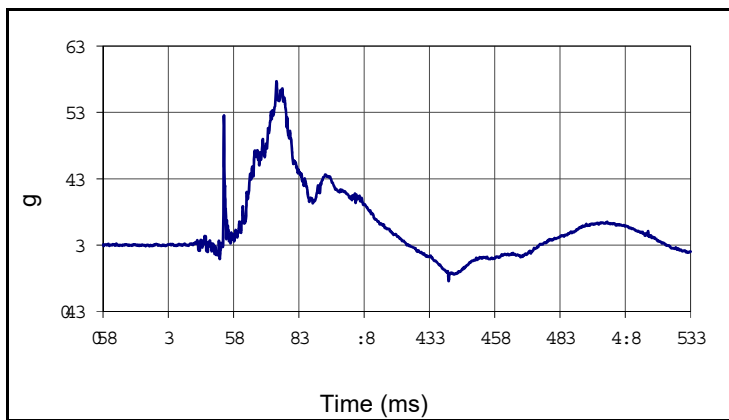
Right MDB Contact Switch

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan
 Test Program: NCAP MDB Side Impact Test

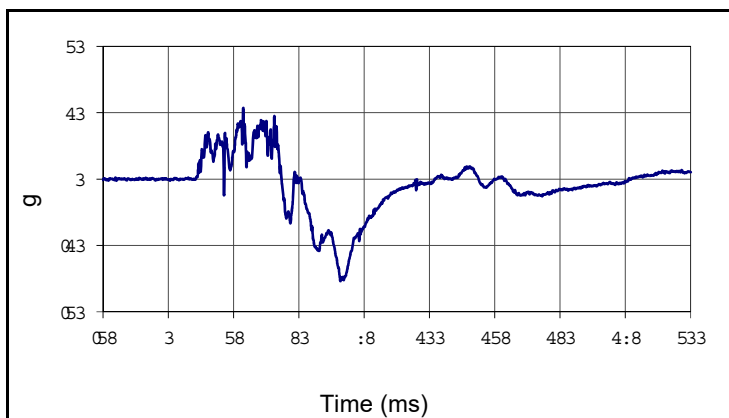
NHTSA No.: M20190304
 Test Date: 12/18/2018



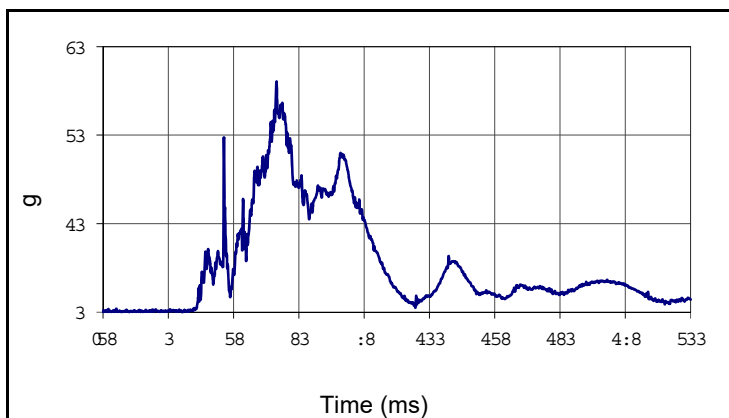
Curve Description			
Driver Head Acceleration X Primary			
Plot No.		SAE Class	Units
001		1000	g
Max	Time	Min	Time
3.9	108.8	-11.1	51.0



Curve Description			
Driver Head Acceleration Y Primary			
Plot No.		SAE Class	Units
002		1000	g
Max	Time	Min	Time
24.7	41.4	-5.4	107.3



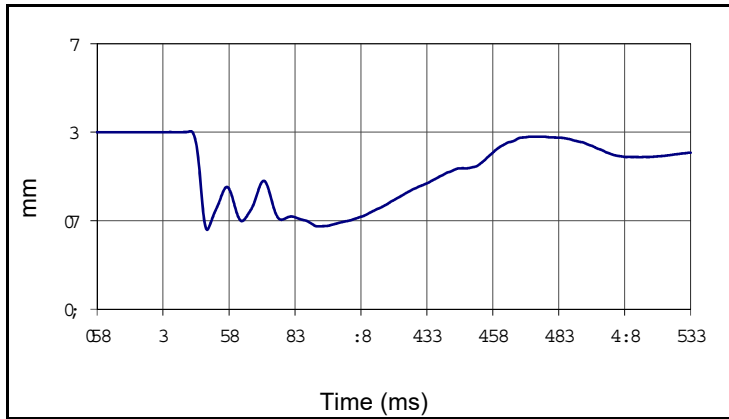
Curve Description			
Driver Head Acceleration Z Primary			
Plot No.		SAE Class	Units
003		1000	g
Max	Time	Min	Time
10.7	28.7	-15.4	65.9



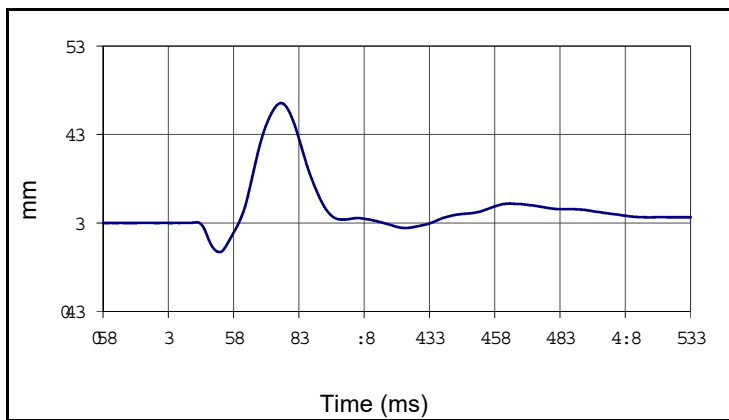
Curve Description			
Driver Head Resultant Acceleration Primary			
Plot No.		SAE Class	Units
004		1000	g
Max	Time	Min	Time
26.1	41.4	0.0	5.2

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan
 Test Program: NCAP MDB Side Impact Test

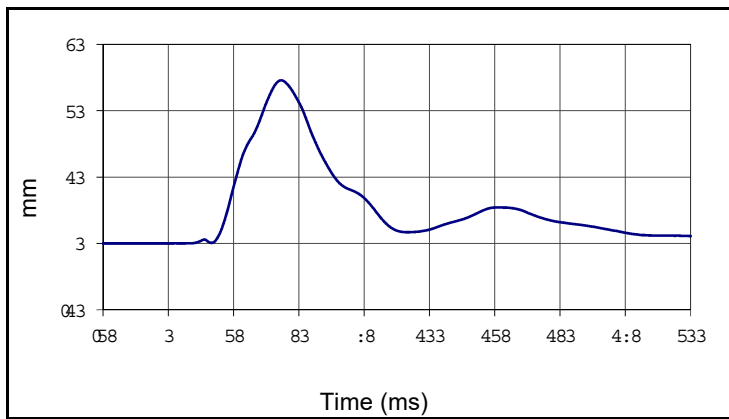
NHTSA No.: M20190304
 Test Date: 12/18/2018



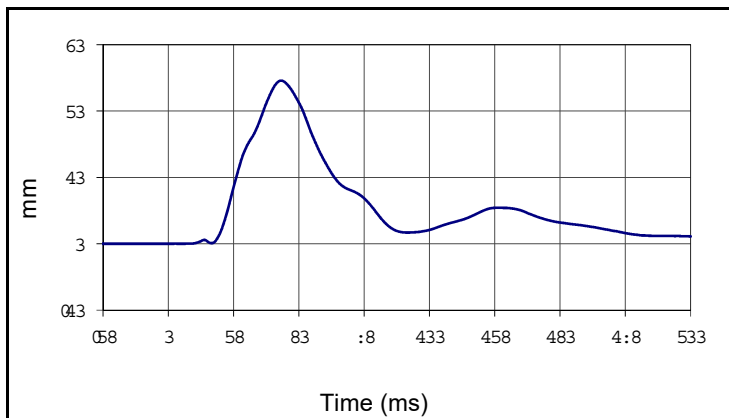
Curve Description			
Driver Upper Thorax Rib Deflection Y			
Plot No.		SAE Class	Units
005		180	mm
Max	Time	Min	Time
0.0	10.5	-4.4	16.7



Curve Description			
Driver Middle Thorax Rib Deflection Y			
Plot No.		SAE Class	Units
006		180	mm
Max	Time	Min	Time
13.6	43.2	-3.3	19.7



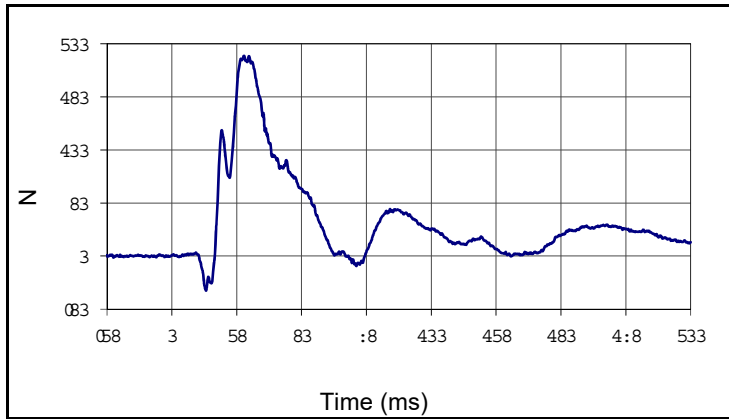
Curve Description			
Driver Lower Thorax Rib Deflection Y			
Plot No.		SAE Class	Units
007		180	mm
Max	Time	Min	Time
24.6	43.2	0.0	0.6



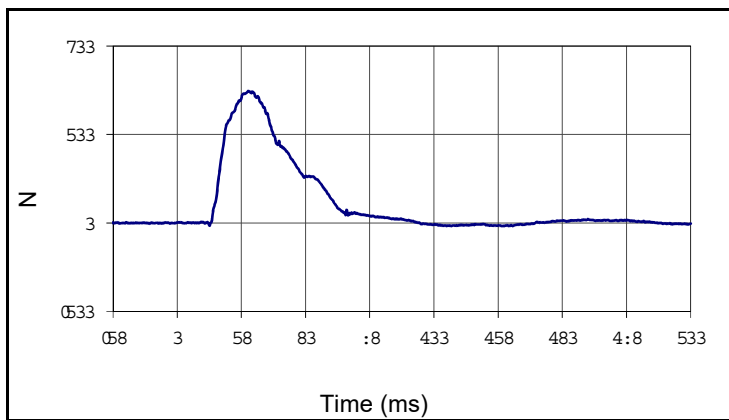
Curve Description			
Driver Thorax Rib Deflection Maximum Y			
Plot No.		SAE Class	Units
008		180	mm
Max	Time	Min	Time
24.6	43.2	0.0	0.6

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan
 Test Program: NCAP MDB Side Impact Test

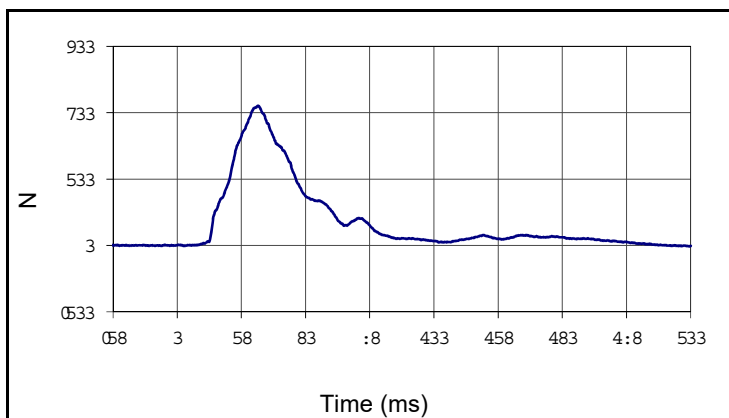
NHTSA No.: M20190304
 Test Date: 12/18/2018



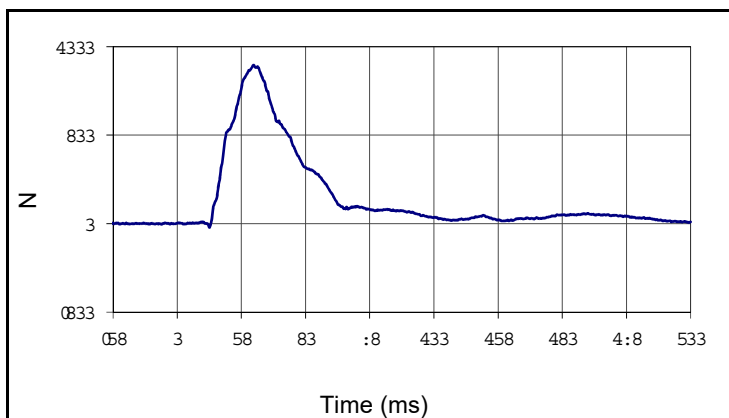
Curve Description			
Driver Anterior Abdominal Force Y			
Plot No.		SAE Class	Units
009		600	N
Max	Time	Min	Time
188.6	27.8	-32.6	13.2



Curve Description			
Driver Middle Abdominal Force Y			
Plot No.		SAE Class	Units
010		600	N
Max	Time	Min	Time
298.4	27.8	-7.1	126.4



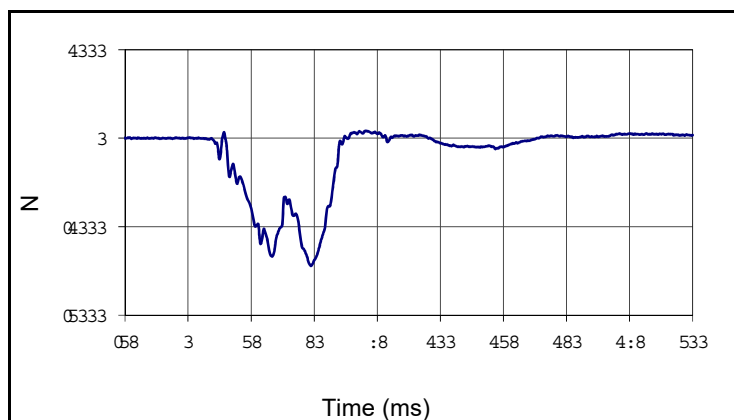
Curve Description			
Driver Posterior Abdominal Force Y			
Plot No.		SAE Class	Units
011		600	N
Max	Time	Min	Time
421.0	31.5	-2.8	199.5



Curve Description			
Driver Total Abdominal Force			
Plot No.		SAE Class	Units
012		600	N
Max	Time	Min	Time
896.4	29.8	-21.9	12.6

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan
 Test Program: NCAP MDB Side Impact Test

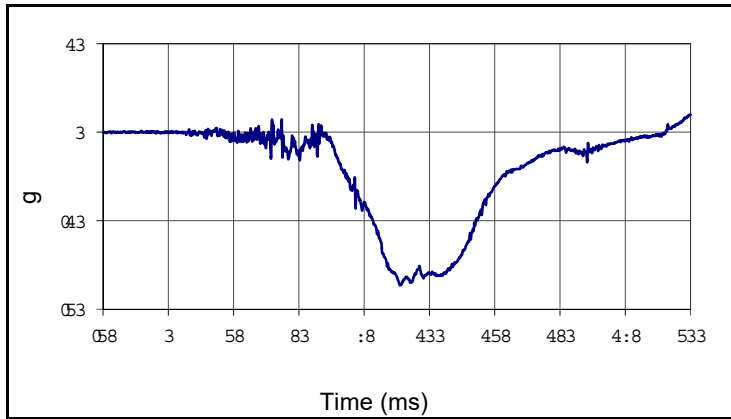
NHTSA No.: M20190304
 Test Date: 12/18/2018



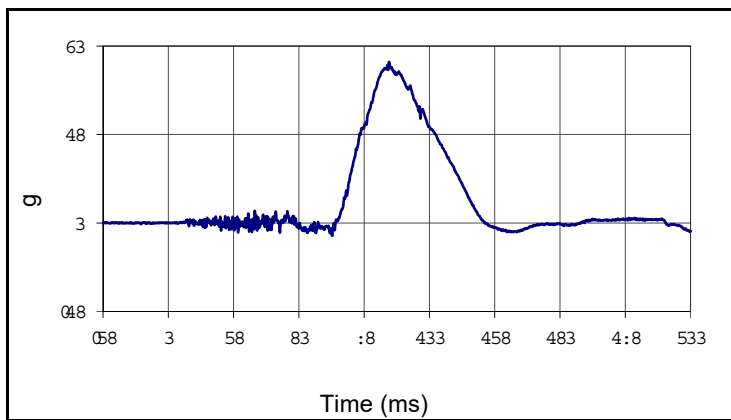
Curve Description			
Driver Pubic Symphysis Force Y			
Plot No.		SAE Class	Units
013		600	N
Max	Time	Min	Time
82.2	70.7	-1442.9	48.7

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan
 Test Program: NCAP MDB Side Impact Test

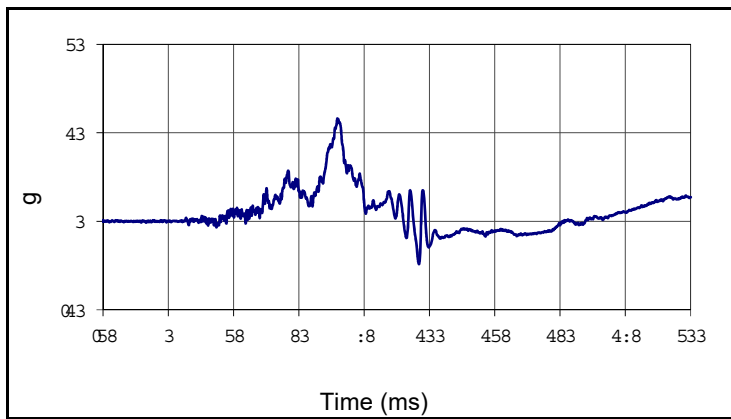
NHTSA No.: M20190304
 Test Date: 12/18/2018



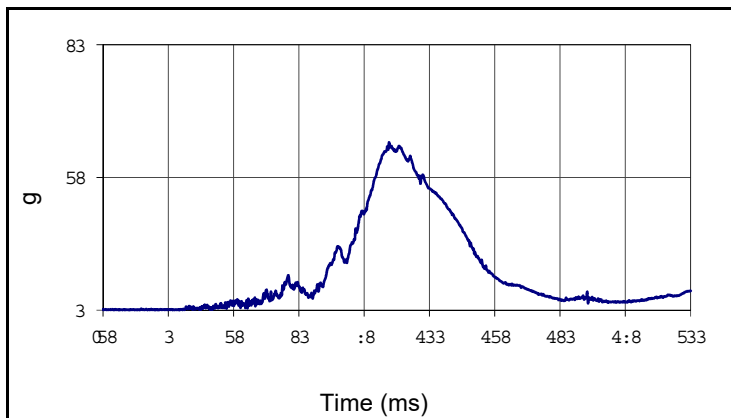
Curve Description			
Passenger Head Acceleration X Primary			
Plot No.		SAE Class	Units
014		1000	g
Max	Time	Min	Time
2.0	199.9	-17.3	88.7



Curve Description			
Passenger Head Acceleration Y Primary			
Plot No.		SAE Class	Units
015		1000	g
Max	Time	Min	Time
27.3	84.5	-2.2	62.7



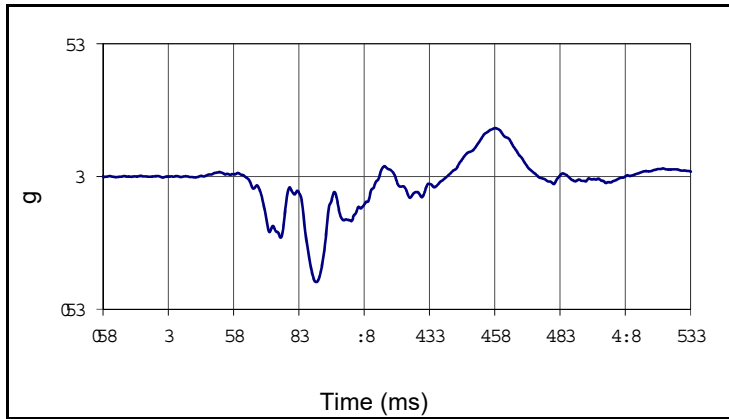
Curve Description			
Passenger Head Acceleration Z Primary			
Plot No.		SAE Class	Units
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Max	Time	Min	Time
11.6	64.7	-4.8	96.0



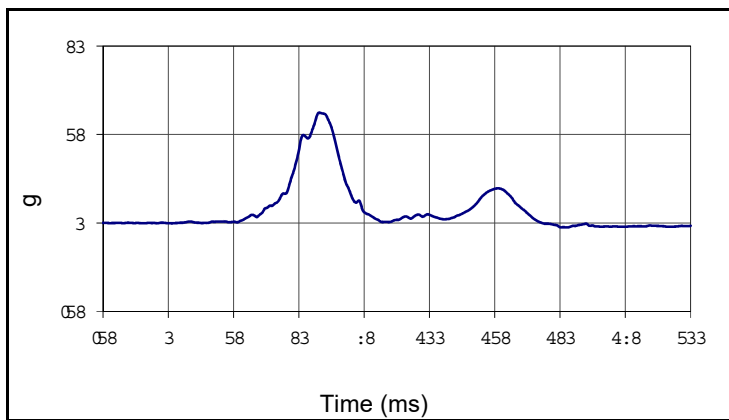
Curve Description			
Passenger Head Acceleration Resultant Primary			
Plot No.		SAE Class	Units
017		1000	g
Max	Time	Min	Time
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Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan
 Test Program: NCAP MDB Side Impact Test

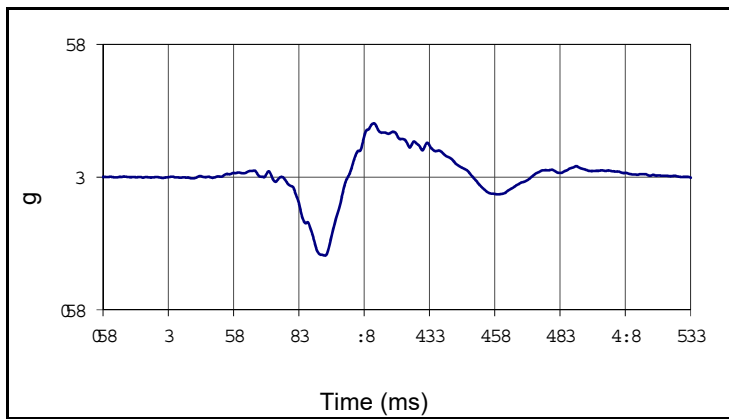
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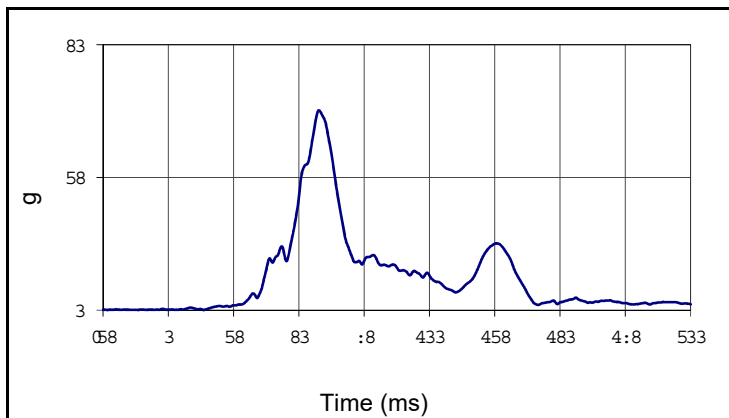
Curve Description			
Passenger Lower Spine T12 Acceleration X			
Plot No.		SAE Class	Units
018		180	g
Max	Time	Min	Time
7.3	125.2	-15.9	56.7



Curve Description			
Passenger Lower Spine T12 Acceleration Y			
Plot No.		SAE Class	Units
019		180	g
Max	Time	Min	Time
31.2	57.8	-1.3	152.5



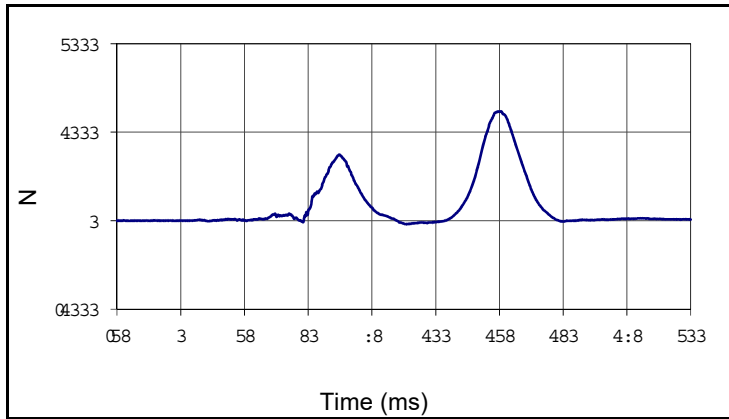
Curve Description			
Passenger Lower Spine T12 Acceleration Z			
Plot No.		SAE Class	Units
020		180	g
Max	Time	Min	Time
10.1	78.7	-14.8	60.0



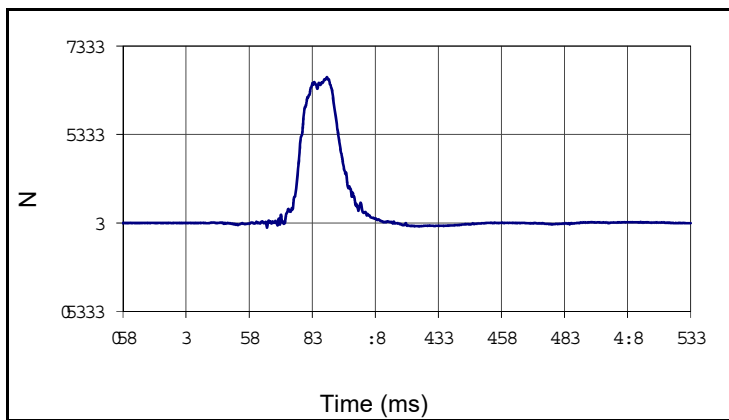
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Passenger Lower Spine T12 Acceleration Res.			
Plot No.		SAE Class	Units
021		180	g
Max	Time	Min	Time
37.6	57.6	0.0	13.5

Test Vehicle: 2019 Dodge Grand Caravan SE 5-Door Minivan
 Test Program: NCAP MDB Side Impact Test

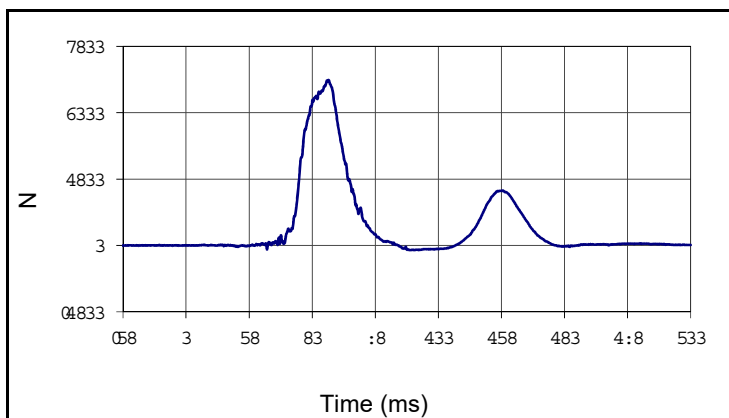
NHTSA No.: M20190304
 Test Date: 12/18/2018



Curve Description			
Passenger Iliac Force on Impact Side Y			
Plot No.		SAE Class	Units
022		600	N
Max	Time	Min	Time
1236.4	125.6	-40.6	88.5



Curve Description			
Passenger Acetabulum Force on Impact Side Y			
Plot No.		SAE Class	Units
023		600	N
Max	Time	Min	Time
3297.2	55.8	-105.7	32.1



Curve Description			
Passenger Total Pelvic Force			
Plot No.		SAE Class	Units
024		600	N
Max	Time	Min	Time
3739.5	56.5	-106.2	90.5

APPENDIX C
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
PRE-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA
LEFT SIDE CONFIGURATION




ATD Serial No.: F035

Test Date: 2018-12-14

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
1 - Sitting Height	mm	900	918	907	Pass
2 - Seat to Shoulder Joint	mm	558	572	563	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	352	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	100	Pass
5 - Sole to Seat, Sitting	mm	433	451	439	Pass
6 - Head Width	mm	152	158	154	Pass
7 - Shoulder/Arm Width	mm	461	479	469	Pass
8 - Thorax Width	mm	322	332	324	Pass
9 - Abdomen Width	mm	273	287	283	Pass
10 - Pelvis Lap Width	mm	359	373	367	Pass
11 - Head Depth	mm	196	206	201	Pass
12 - Thorax Depth	mm	262	272	269	Pass
13 - Abdomen Depth	mm	194	204	199	Pass
14 - Pelvis Depth	mm	235	245	241	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	154	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	604	Pass
				Overall Test Results	Pass

Technician: 
 J. Hernandez

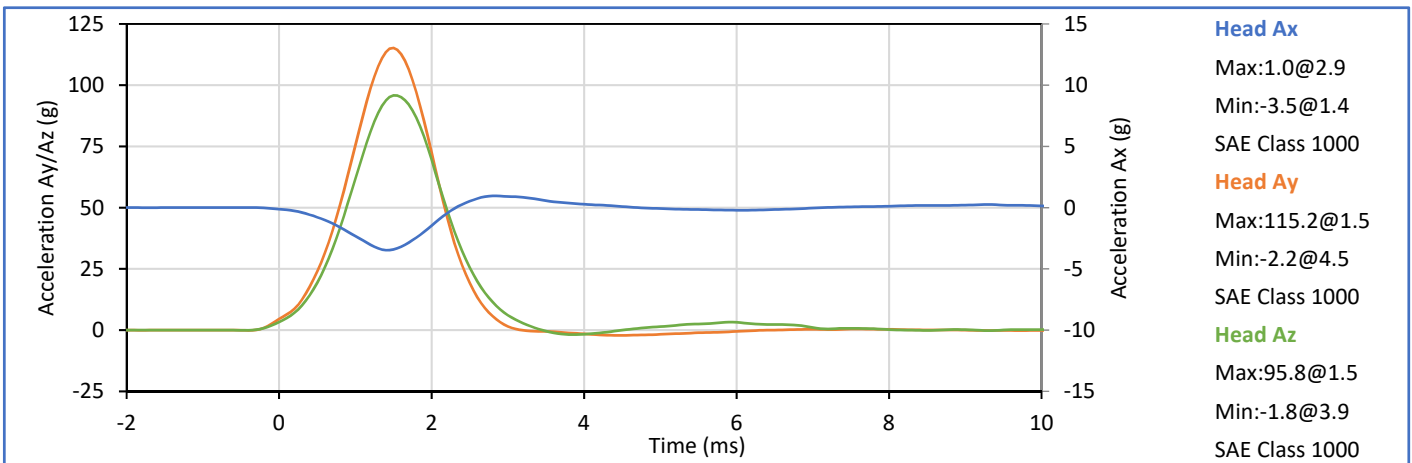
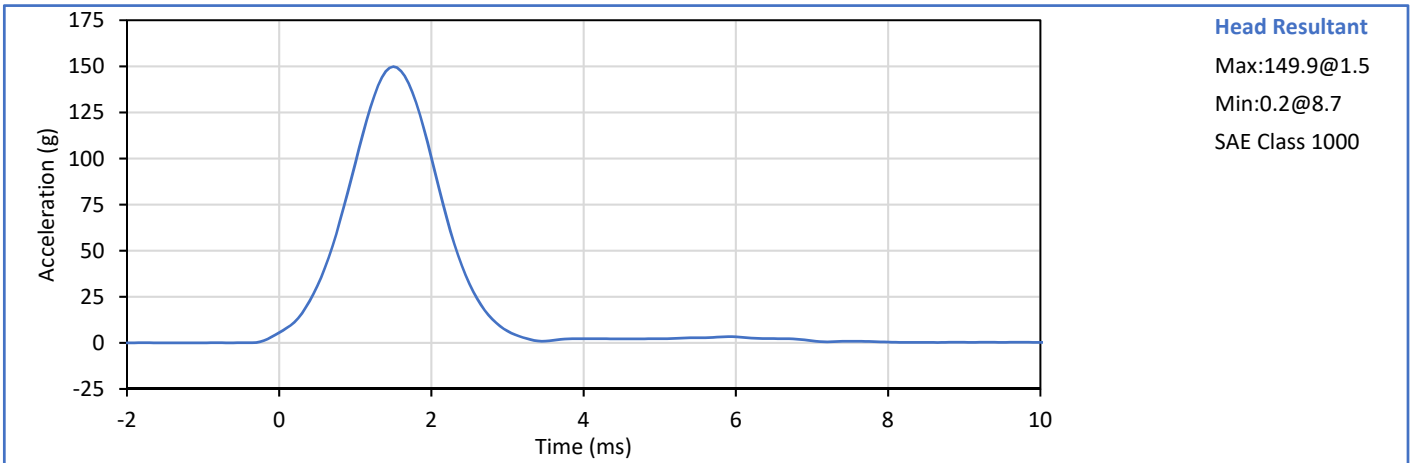
Approved By: 
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.6	Pass
Laboratory Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	125.0	155.0	149.9	Pass
Peak Head Ax	g	-15.0	15.0	1.0	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.2	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

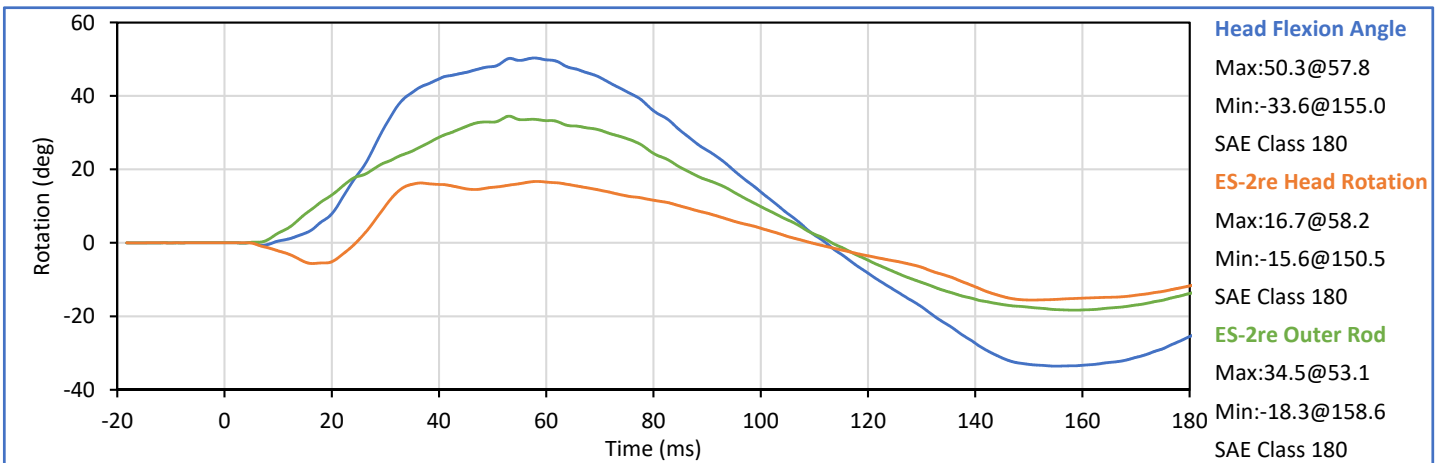
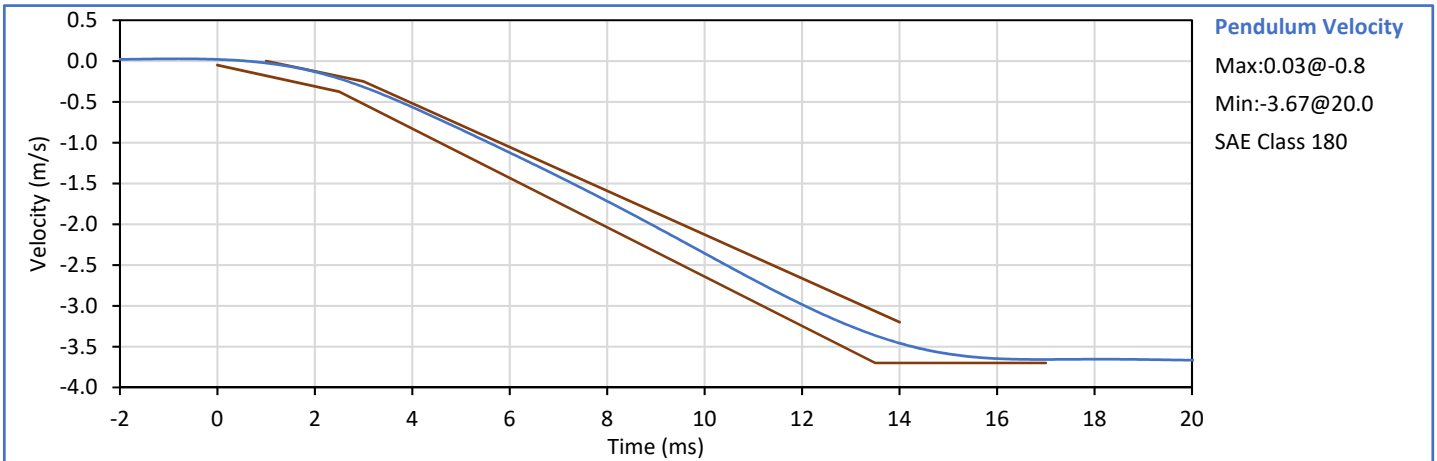
Approved By:
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	3.30	3.50	3.46	Pass
Peak Headform Flexion	deg	49.0	59.0	50.3	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	57.8	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	54.4	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

Approved By:
 P. Puzzuto



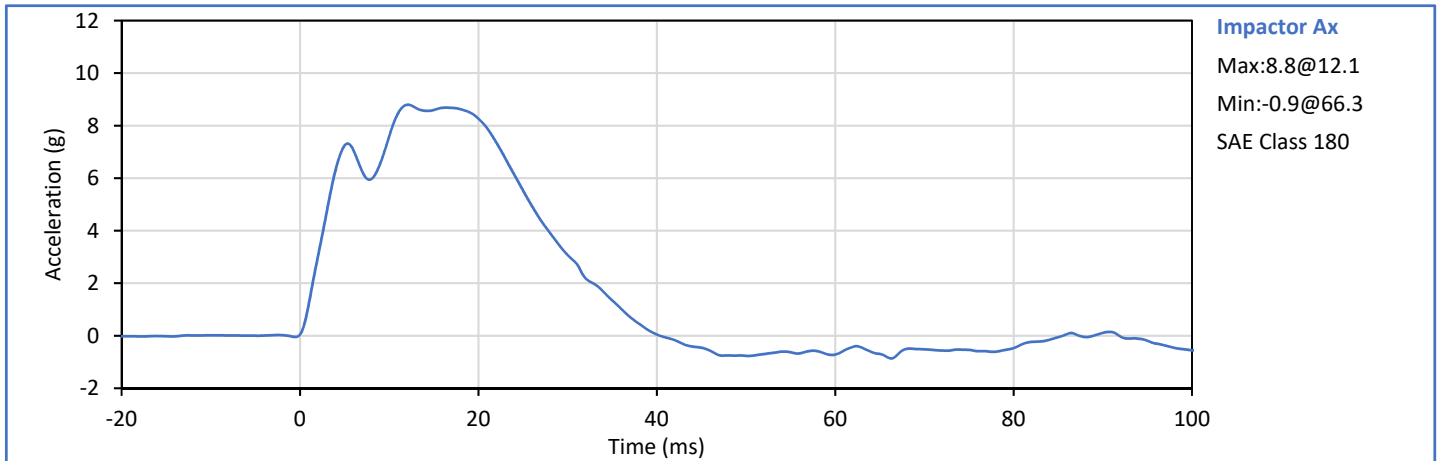
9270 Holly Road, Adelanto, CA 92301
Tel: +1 760 246 1672 Fax: +1 760 246 8112
Info@karco.com www.karco.com

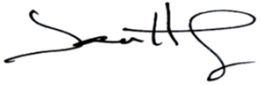
ES-2re 50th Male Side Impact ATD Shoulder Impact Test


ATD Serial No.: F035

Test Date: 2018-12-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.5	Pass
Laboratory Humidity	%	10	70	32	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Impactor Ax	g	7.5	10.5	8.8	Pass
Overall Test Results					Pass



Technician: 
J. Hernandez

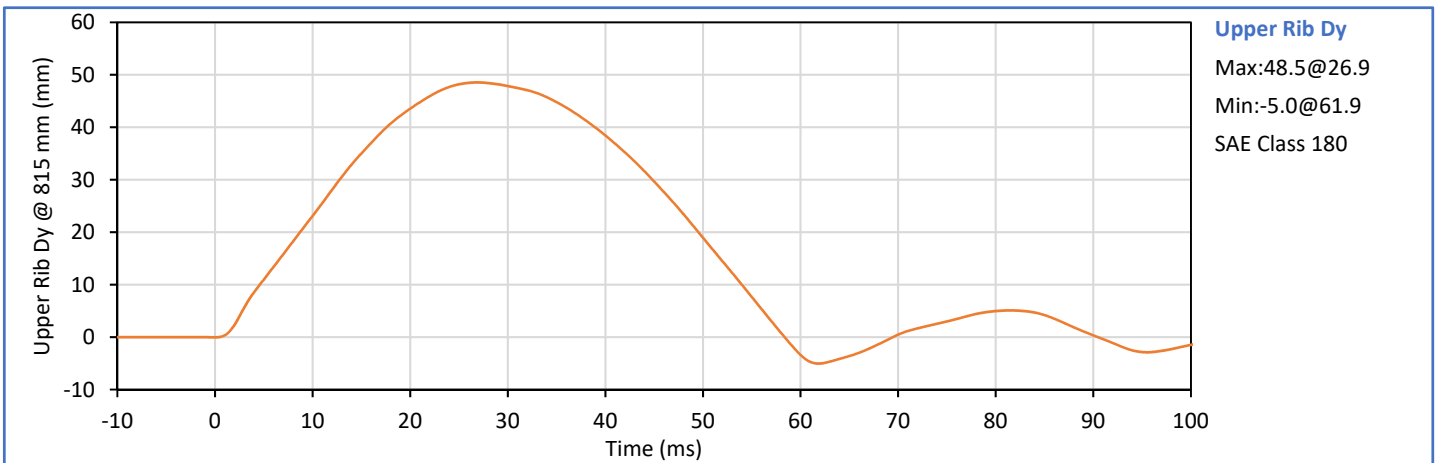
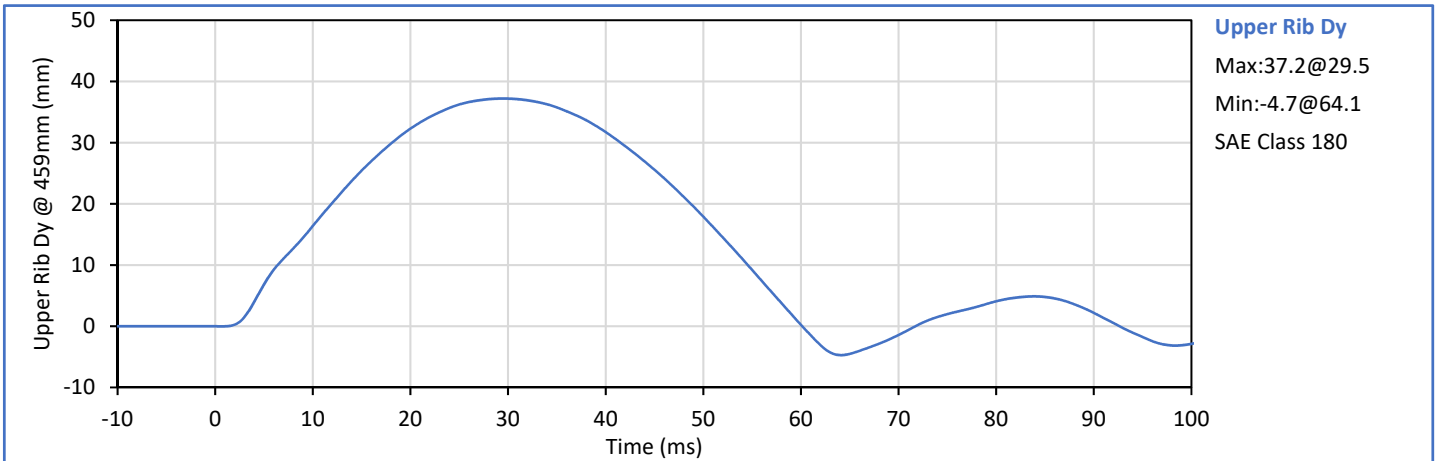
Approved By: 
P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	30	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	37.2	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	48.5	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
J. Hernandez

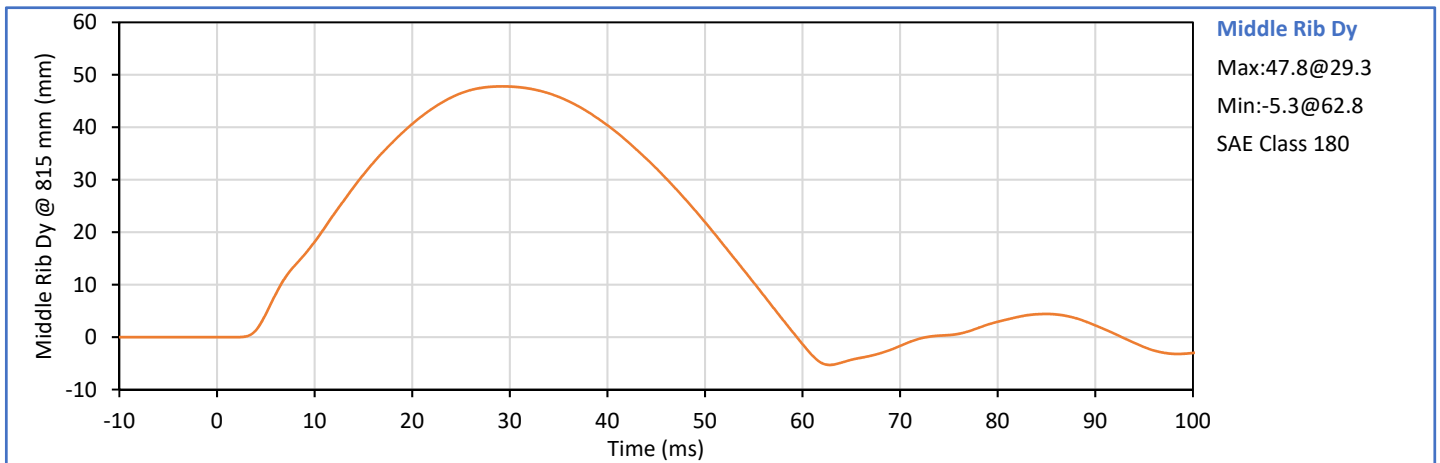
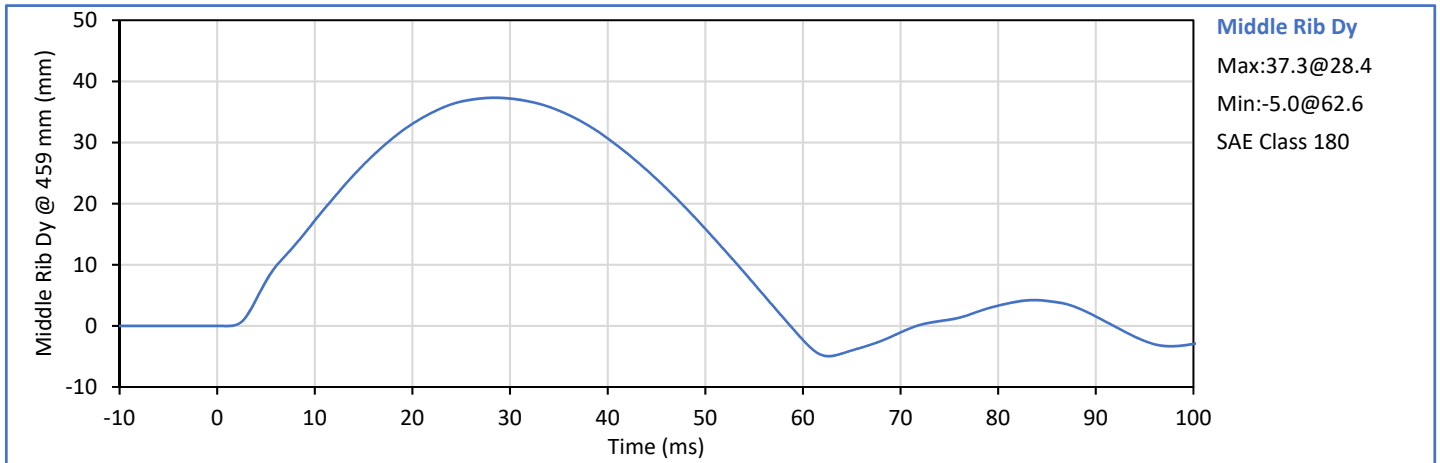
Approved By: *P. Puzzuto*
P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	30	Pass
Middle Rib Dy @ 459mm	mm	36.0	40.0	37.3	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	47.8	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
 J. Hernandez

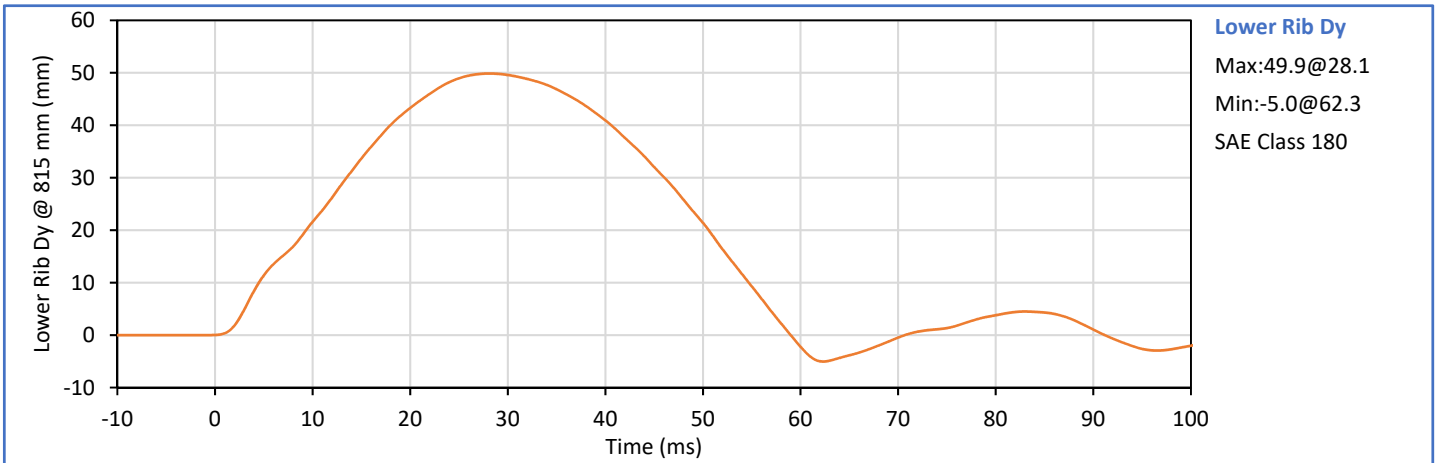
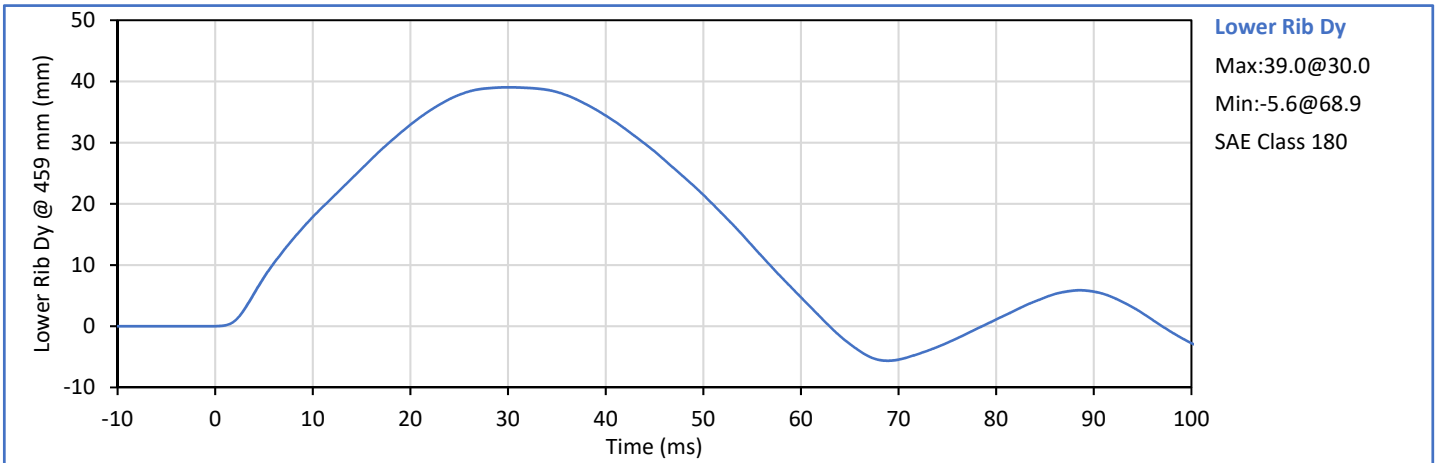
Approved By: *P. Puzzuto*
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	39.0	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	49.9	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
 J. Hernandez

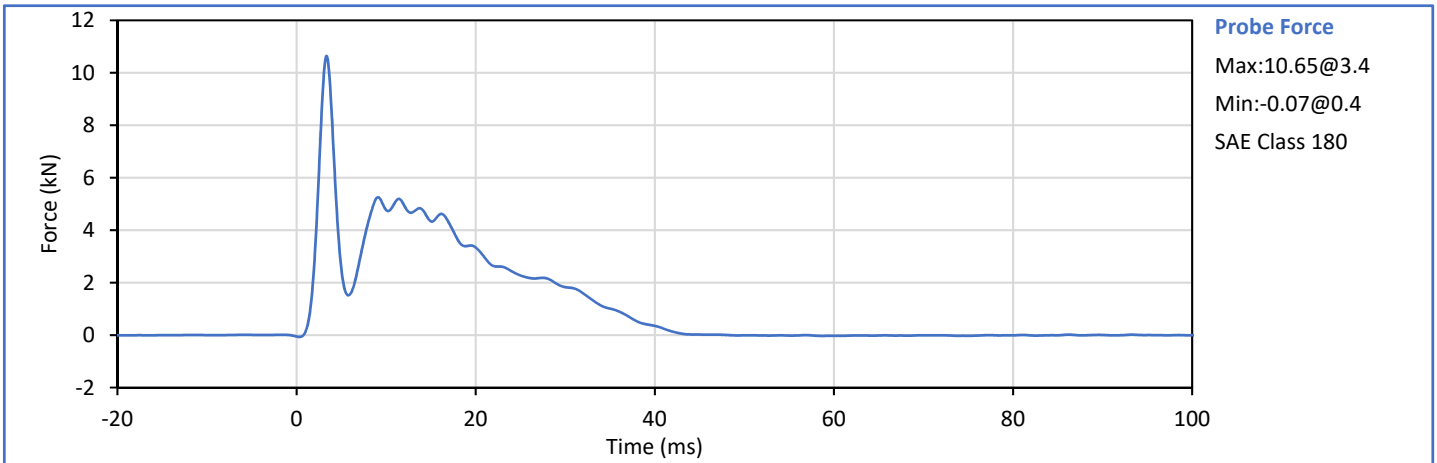
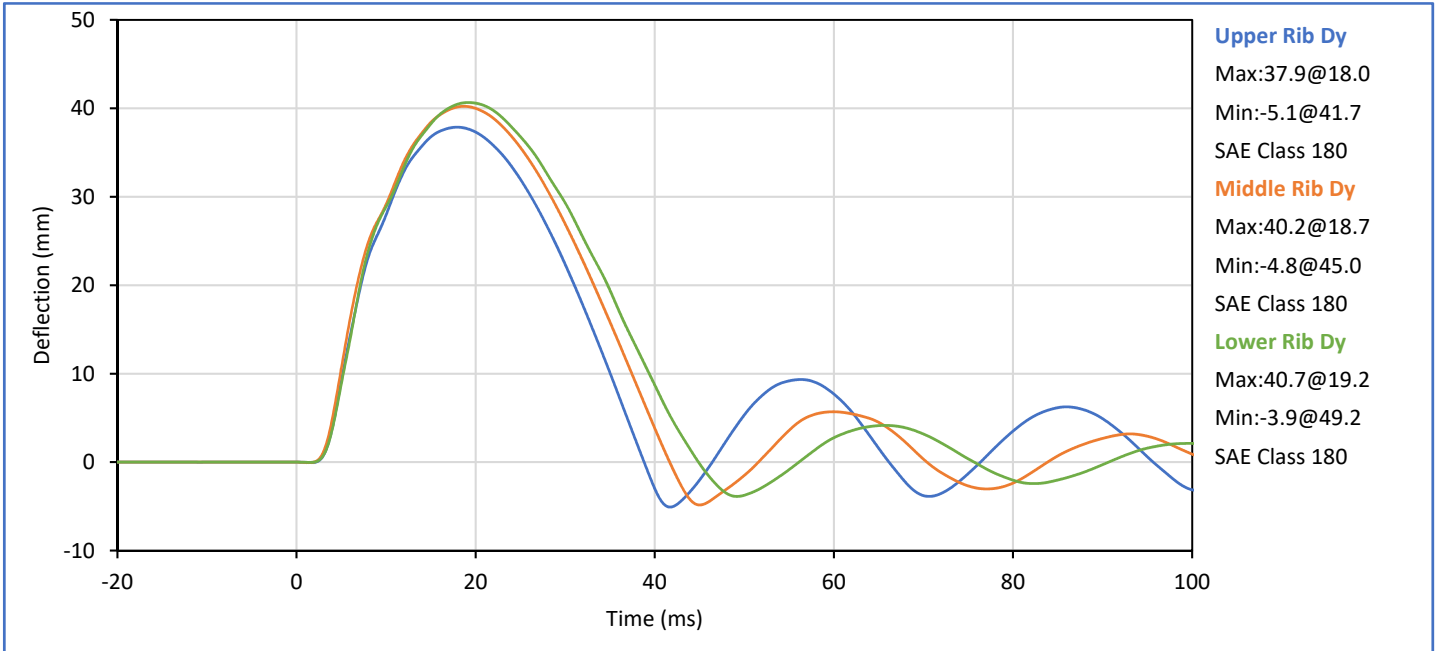
Approved By: *P. Puzzuto*
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	5.40	5.60	5.42	Pass
Peak Upper Rib Dy	mm	34.0	41.0	37.9	Pass
Peak Middle Rib Dy	mm	37.0	45.0	40.2	Pass
Peak Lower Rib Dy	mm	37.0	44.0	40.7	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	5.26	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

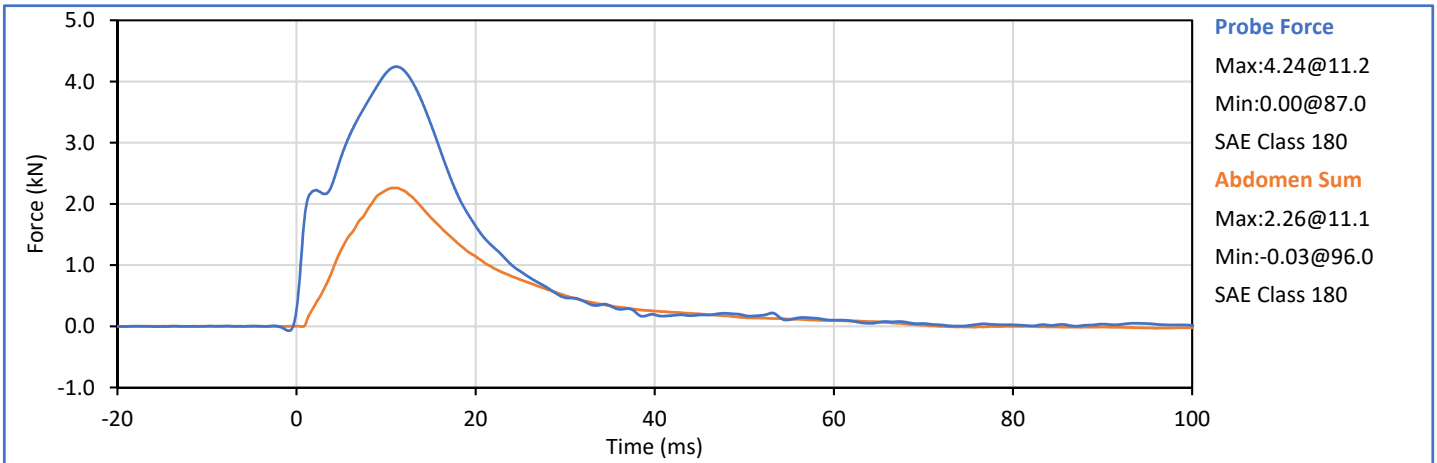
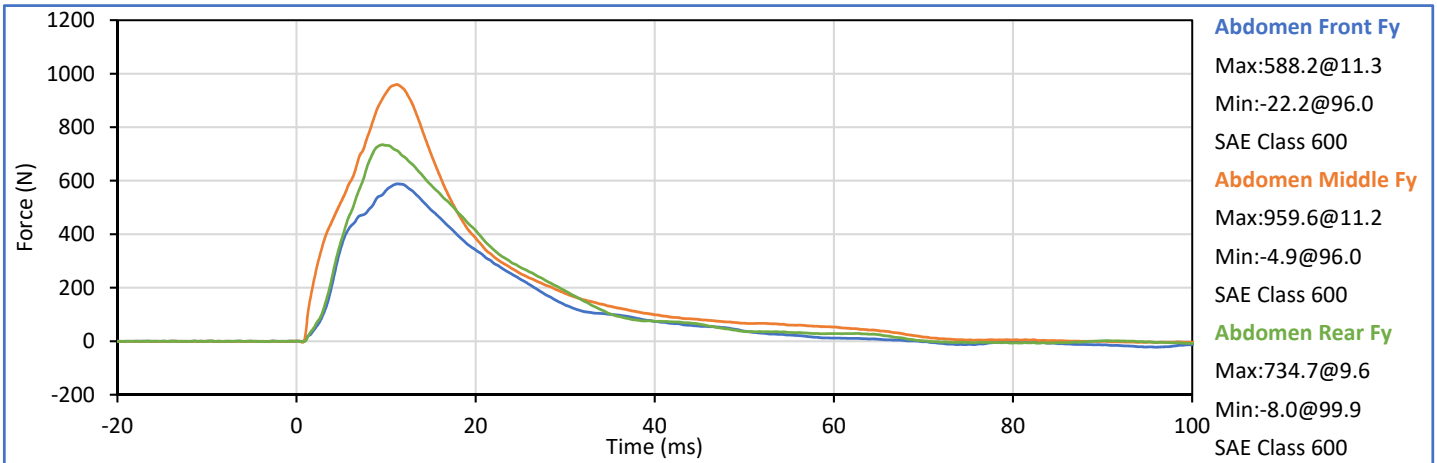
Approved By:
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Humidity	%	10	70	28	Pass
Impactor Velocity	m/s	3.90	4.10	4.02	Pass
Peak Impactor Force	kN	4.00	4.80	4.24	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.2	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.26	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	11.1	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

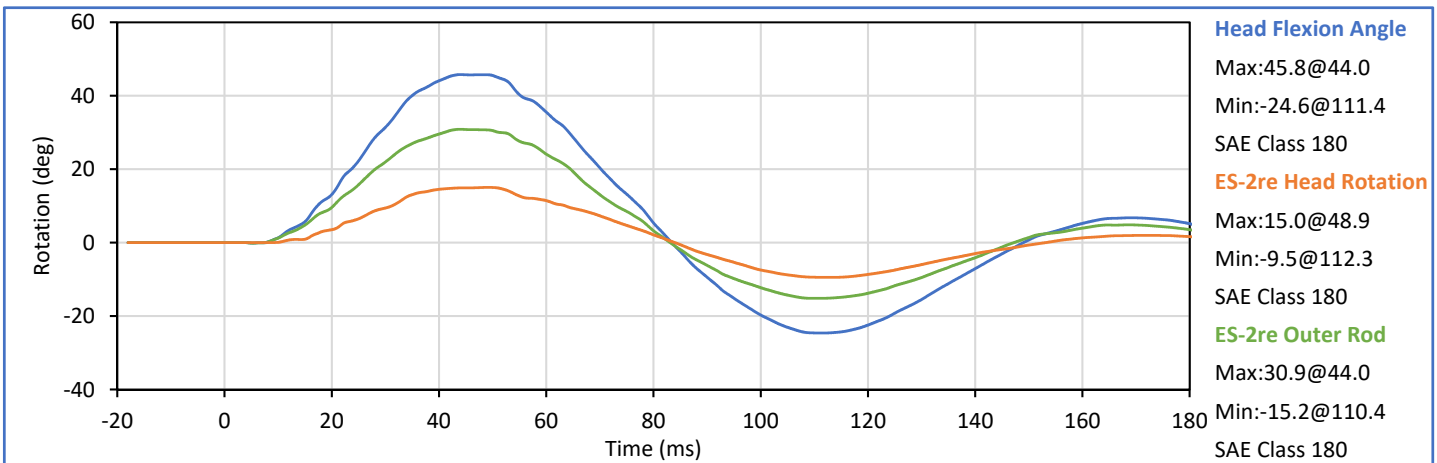
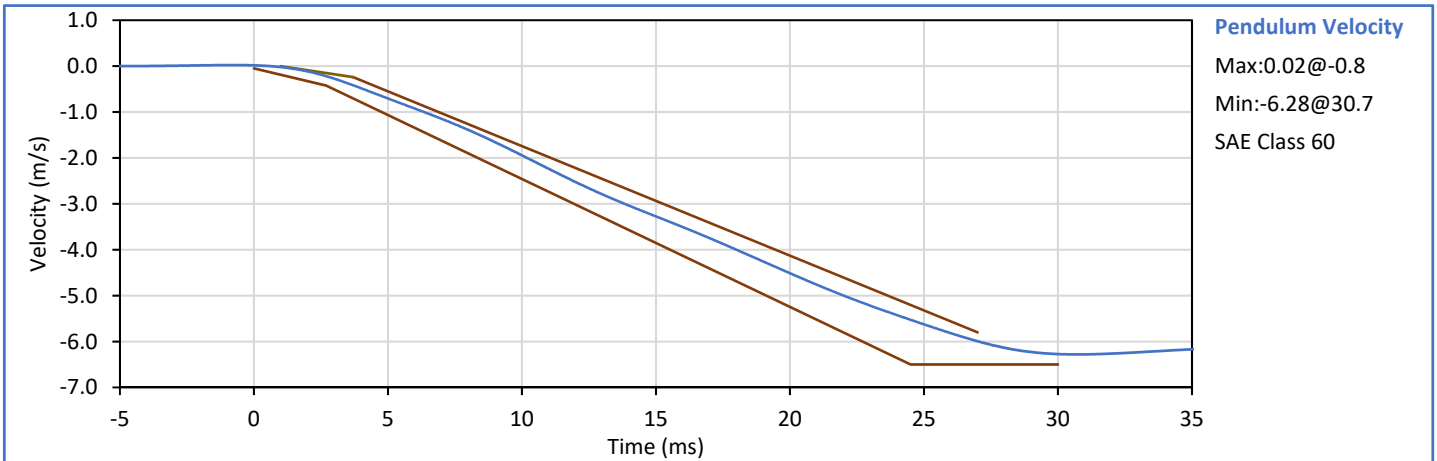
Approved By:
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.95	6.15	6.10	Pass
Peak Headform Flexion	deg	45.0	55.0	45.8	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	44.0	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	39.4	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
 J. Hernandez

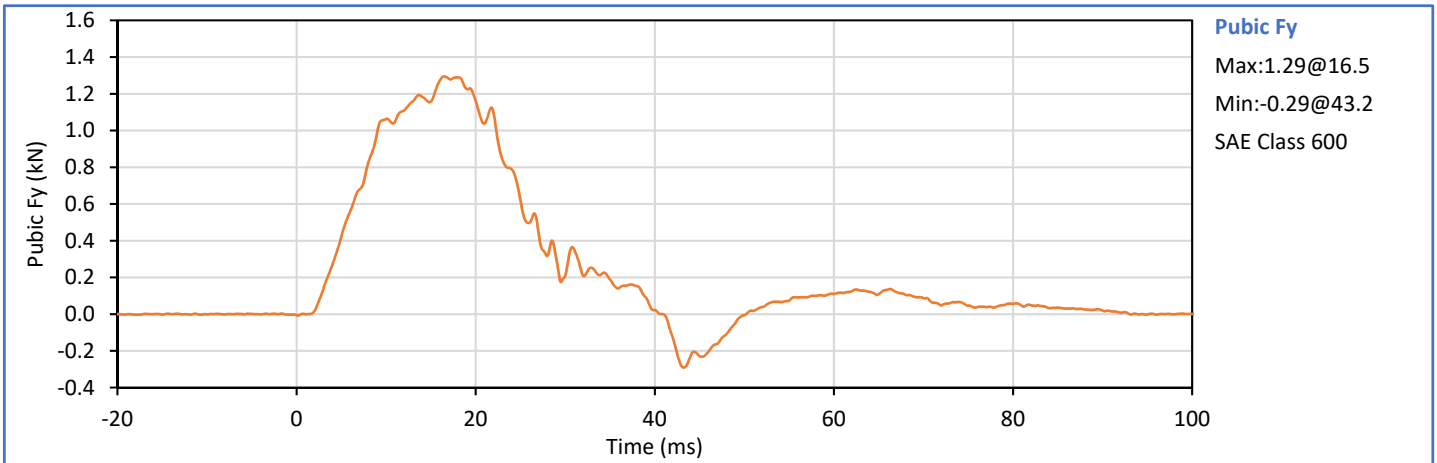
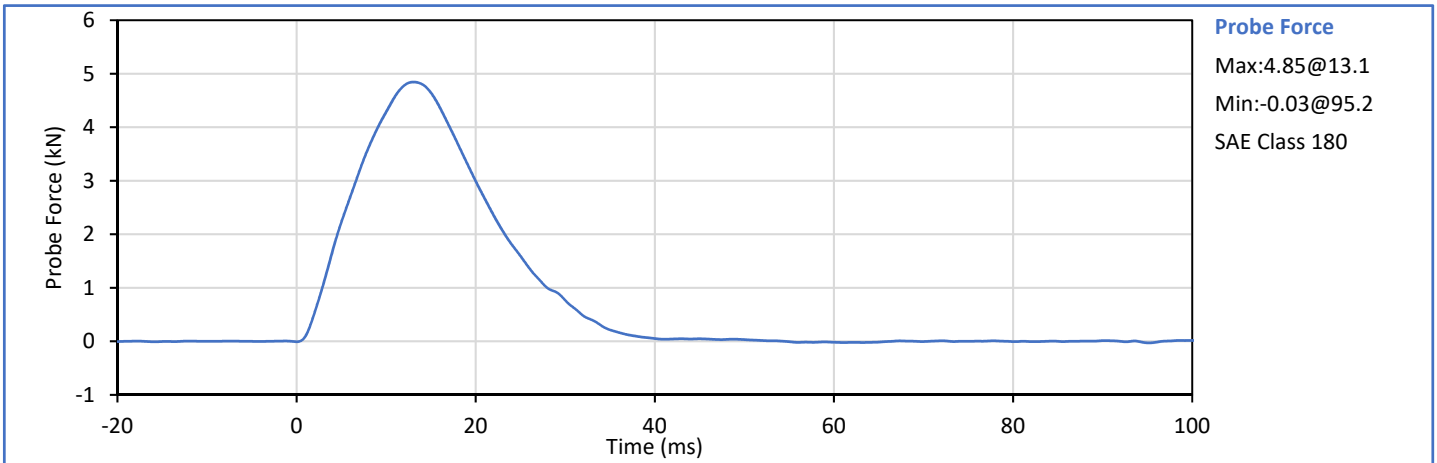
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 P. Puzzuto

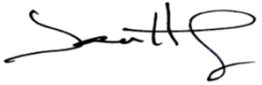



ATD Serial No.: F035

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.35	Pass
Peak Impactor Force	kN	4.70	5.40	4.85	Pass
Time of Peak Impactor Force	ms	11.8	16.1	13.1	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.29	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	16.5	Pass
Overall Test Results					Pass



Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto

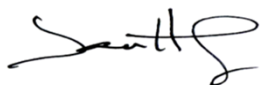



**SID-IIs Small Side Impact ATD
 External Measurements**

ATD Serial No.: 308

Test Date: 2018-12-13

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
A - Sitting Height	mm	772	788	778	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	85	Pass
D - H Point From Seatback	mm	141	151	146	Pass
E - Shoulder Pivot From Backline	mm	97	107	106	Pass
F - Thigh Clearance	mm	119	135	127	Pass
G - Head Breadth	mm	140	148	145	Pass
H - Head Back From Backline	mm	40	46	43	Pass
I - Head Depth	mm	178	188	185	Pass
J - Head Circumference	mm	541	551	547	Pass
K - Buttock To Knee Length	mm	514	540	525	Pass
L - Popliteal Height	mm	343	369	355	Pass
K - Knee Pivot To Floor Height	mm	392	409	401	Pass
N - Buttock Popliteal Length	mm	416	442	430	Pass
O - Chest Depth W/O Jacket	mm	195	211	206	Pass
P - Foot Length	mm	216	232	225	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	318	Pass
R - Arm Length	mm	249	259	256	Pass
S - Knee Joint To Seatback	mm	477	493	488	Pass
V - Shoulder Width	mm	341	357	346	Pass
W - Foot Width	mm	78	94	86	Pass
Y - Chest Circumference W/Jacket	mm	851	881	855	Pass
Z - Waist Circumference	mm	761	791	779	Pass
Overall Test Results					Pass

Technician: 
 J. Hernandez

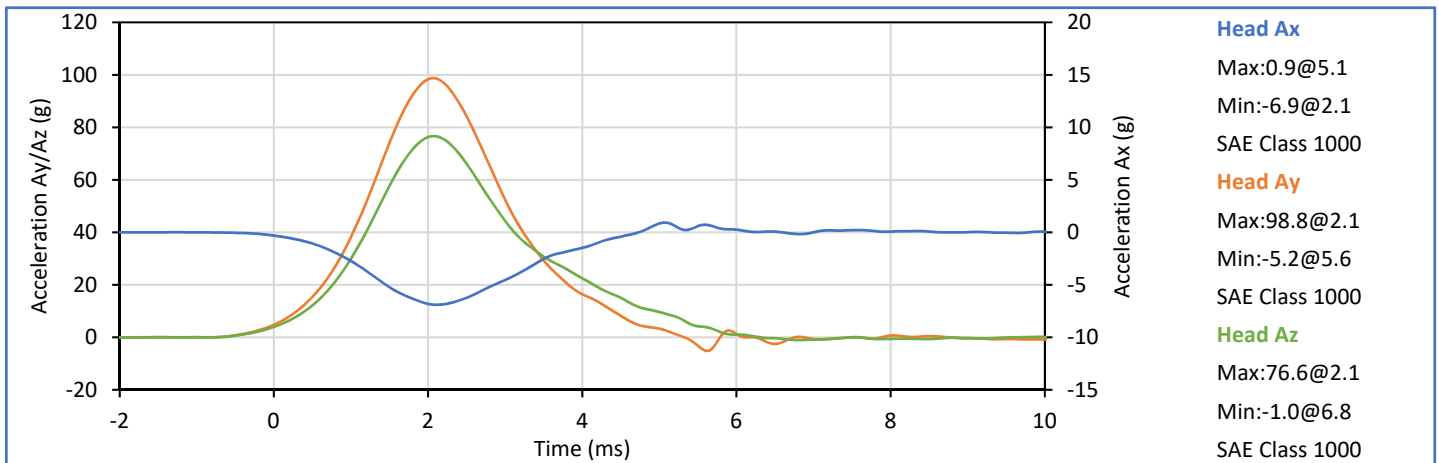
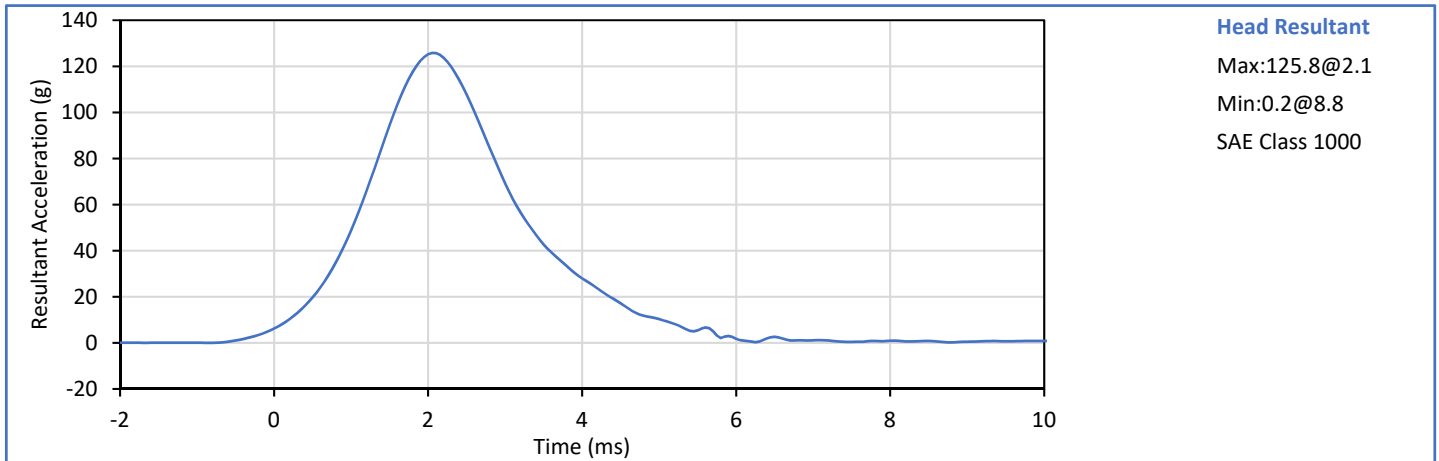
Approved By: 
 P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	115.0	137.0	125.8	Pass
Peak Head Ax	g	-15.0	15.0	-6.9	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.1	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

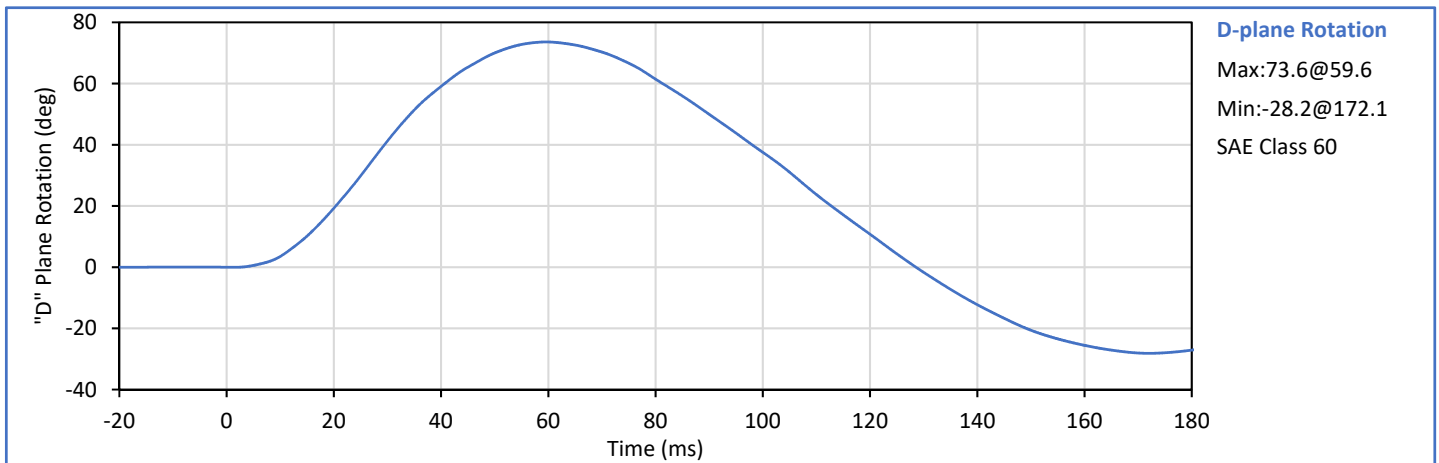
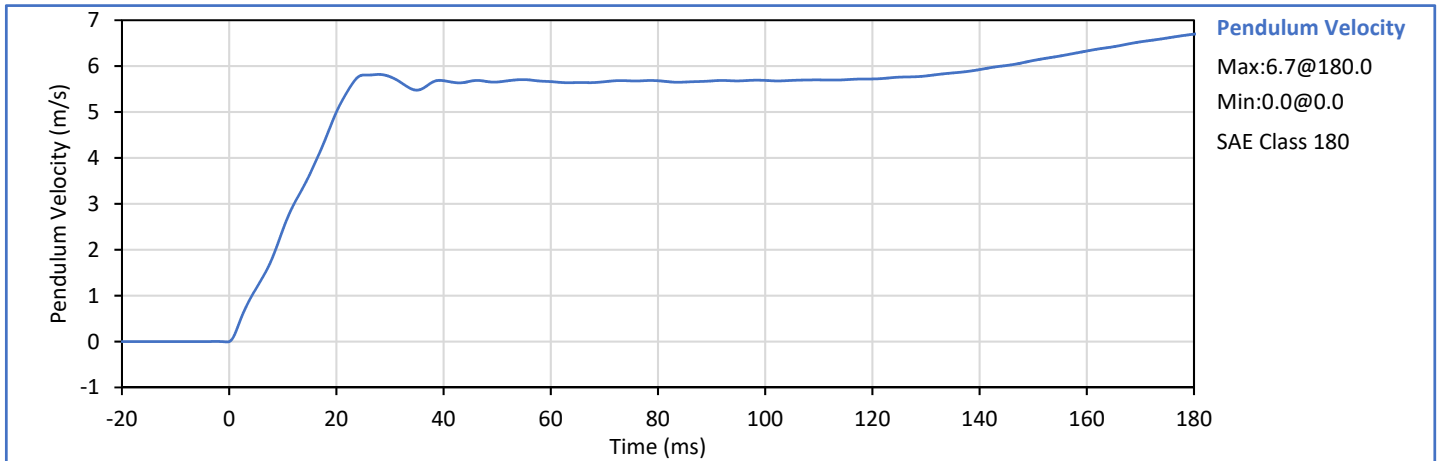
Approved By:
 P. Puzzuto

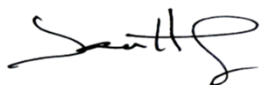



ATD Serial No.: 308

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.51	5.63	5.55	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.43	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.63	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	5.00	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.81	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	5.82	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	73.6	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	59.6	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-44.0	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	109.2	Pass
Overall Test Results					Pass



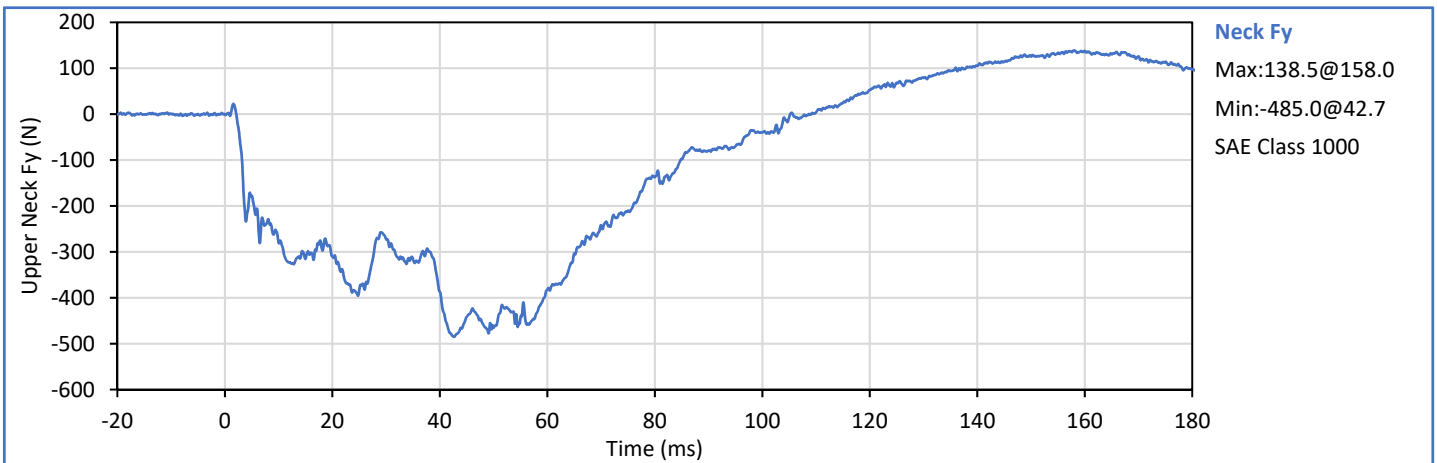
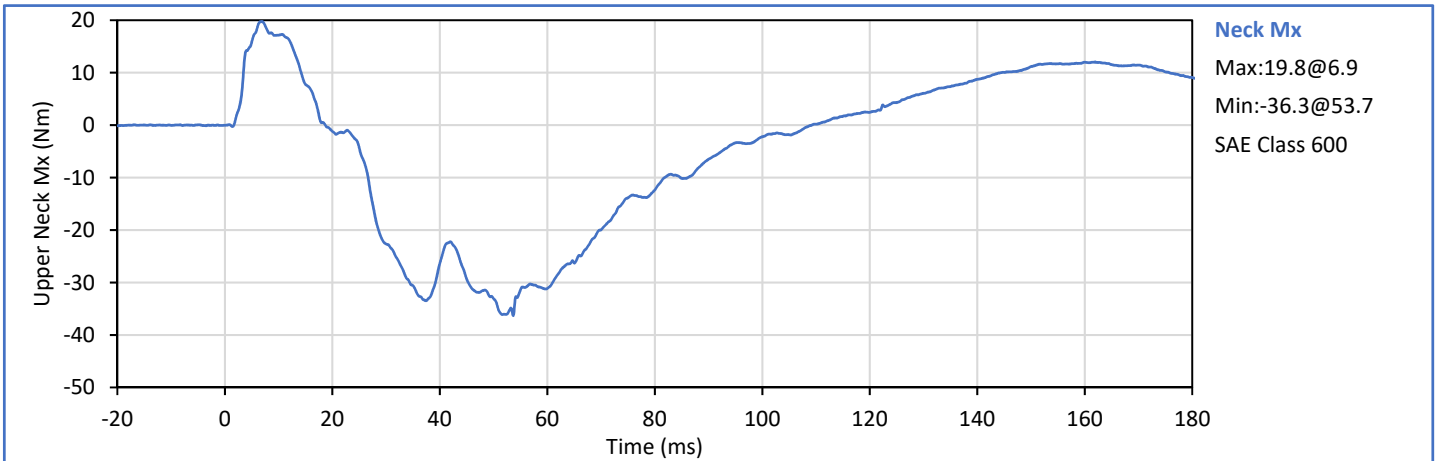
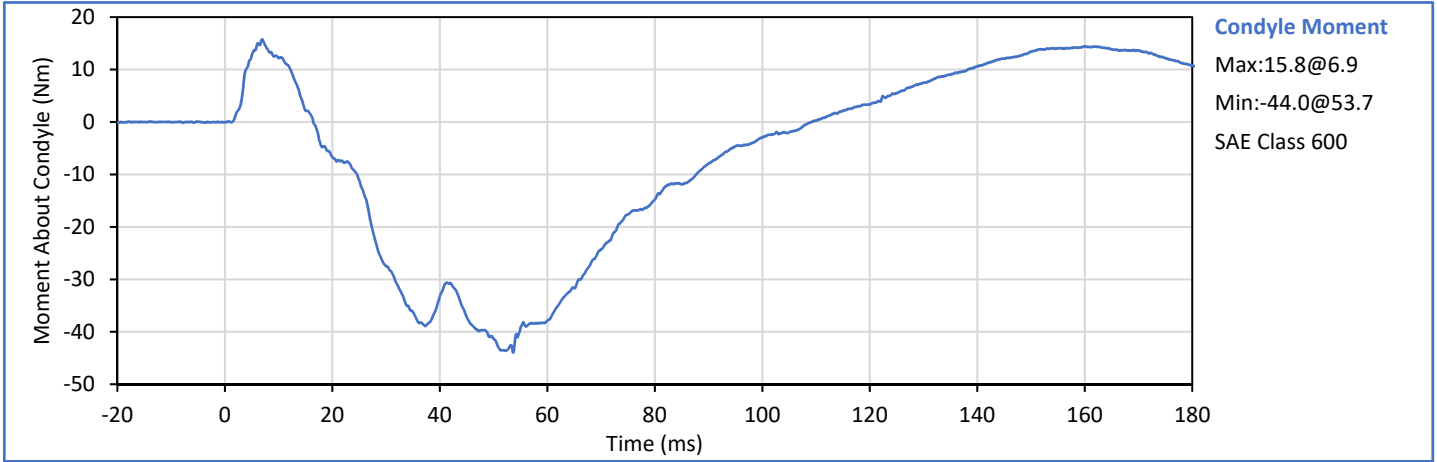
Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-14

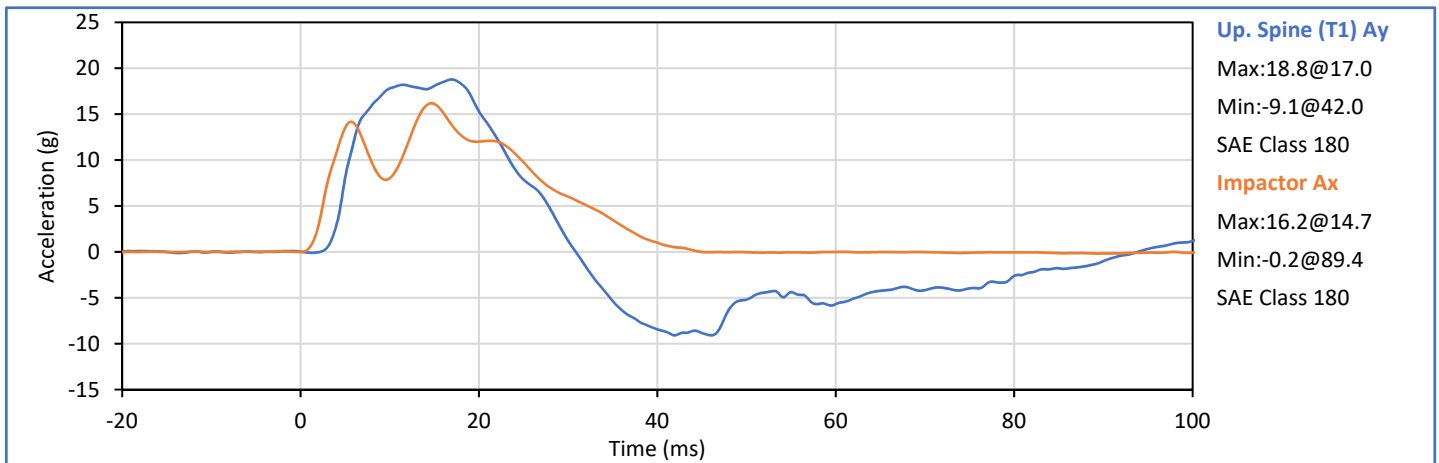
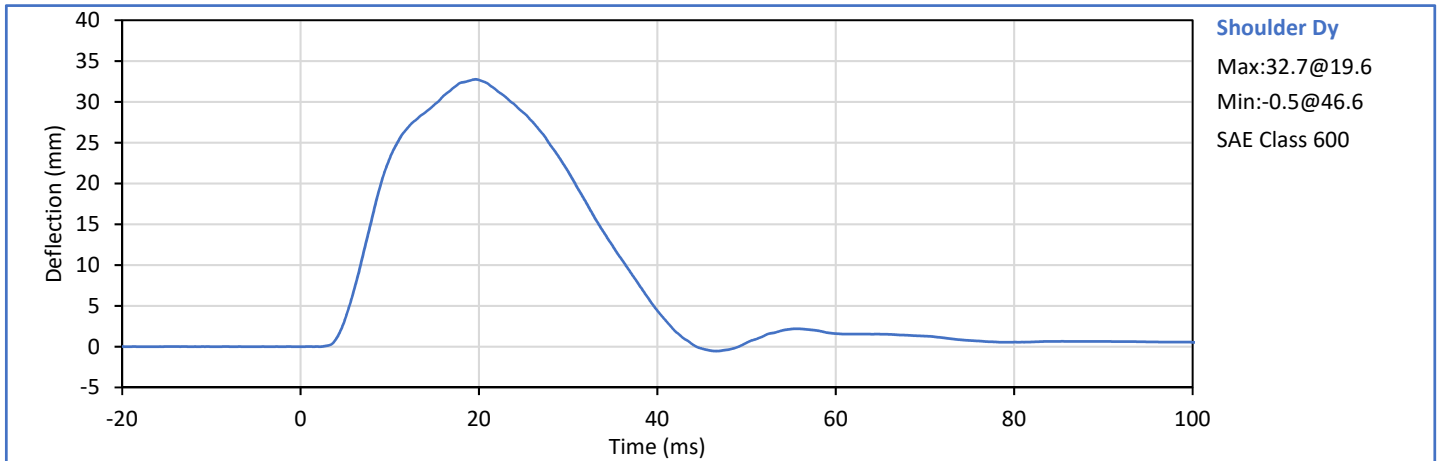




ATD Serial No.: 308

Test Date: 2018-12-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	39	Pass
Impactor Velocity	m/s	4.20	4.40	4.34	Pass
Peak Shoulder Dy	mm	28.0	37.0	32.7	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.8	Pass
Peak Impactor Ax	g	13.0	18.0	16.2	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

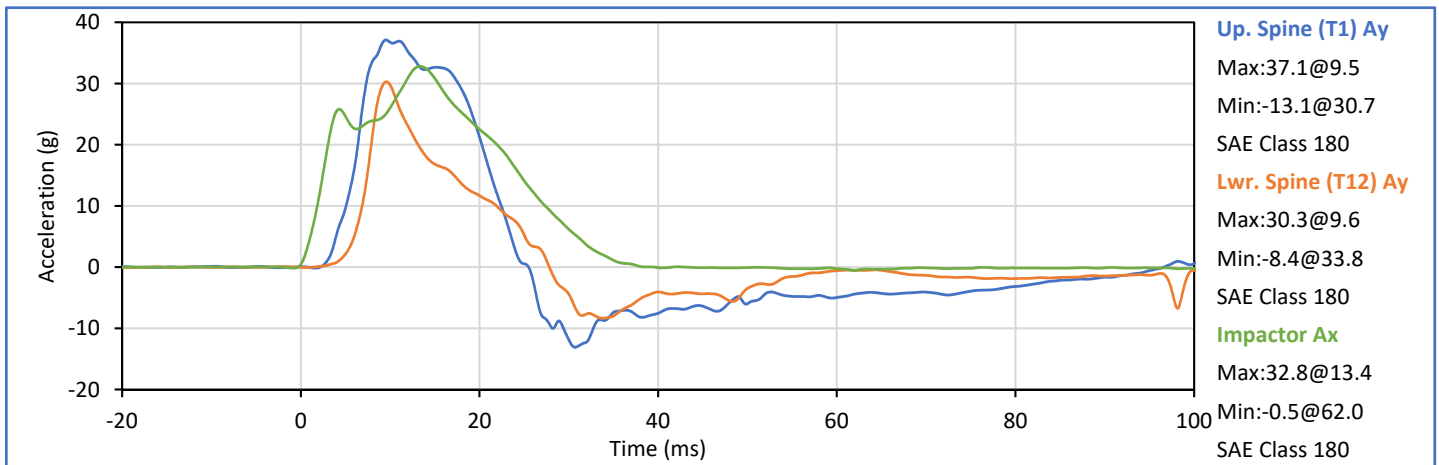
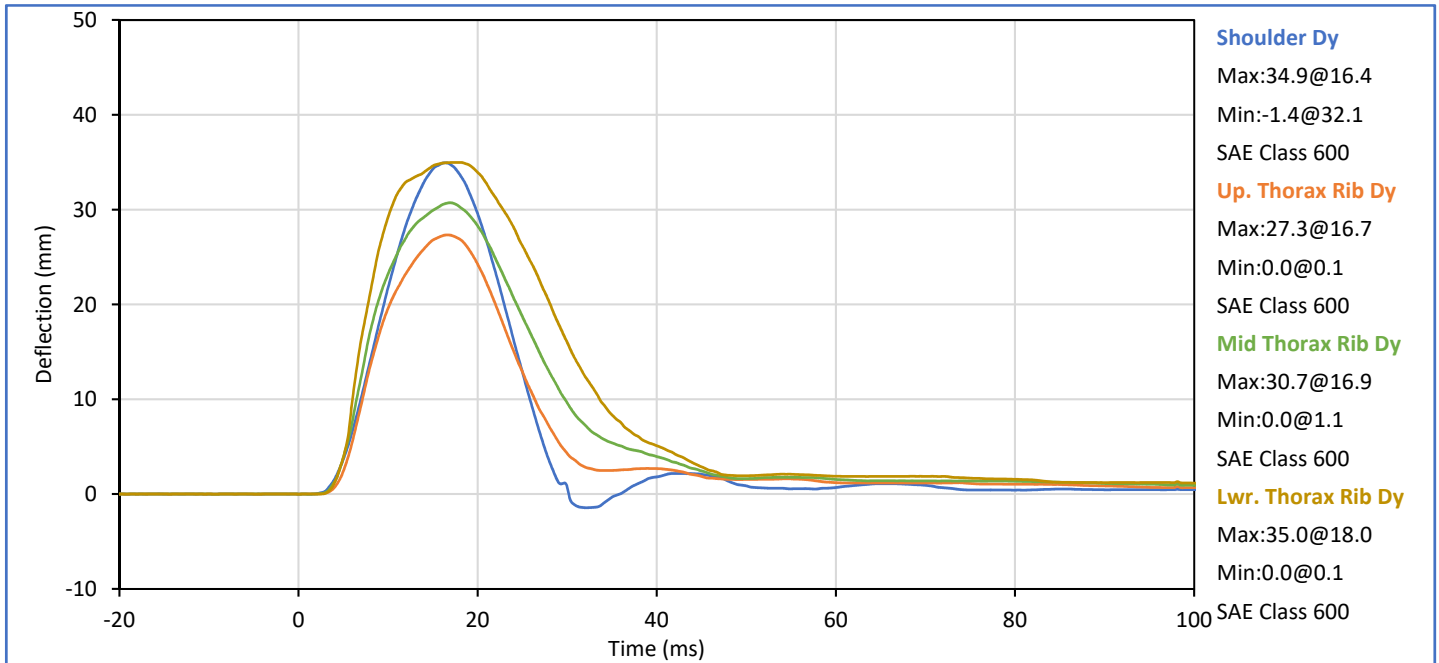
Approved By:
 P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	27	Pass
Impactor Velocity	m/s	6.60	6.80	6.63	Pass
Peak Shoulder Dy	mm	31.0	40.0	34.9	Pass
Peak Upper Rib Dy	mm	25.0	32.0	27.3	Pass
Peak Middle Rib Dy	mm	30.0	36.0	30.7	Pass
Peak Lower Rib Dy	mm	32.0	38.0	35.0	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	37.1	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	30.3	Pass
Peak Impactor Ax	g	30.0	36.0	32.8	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

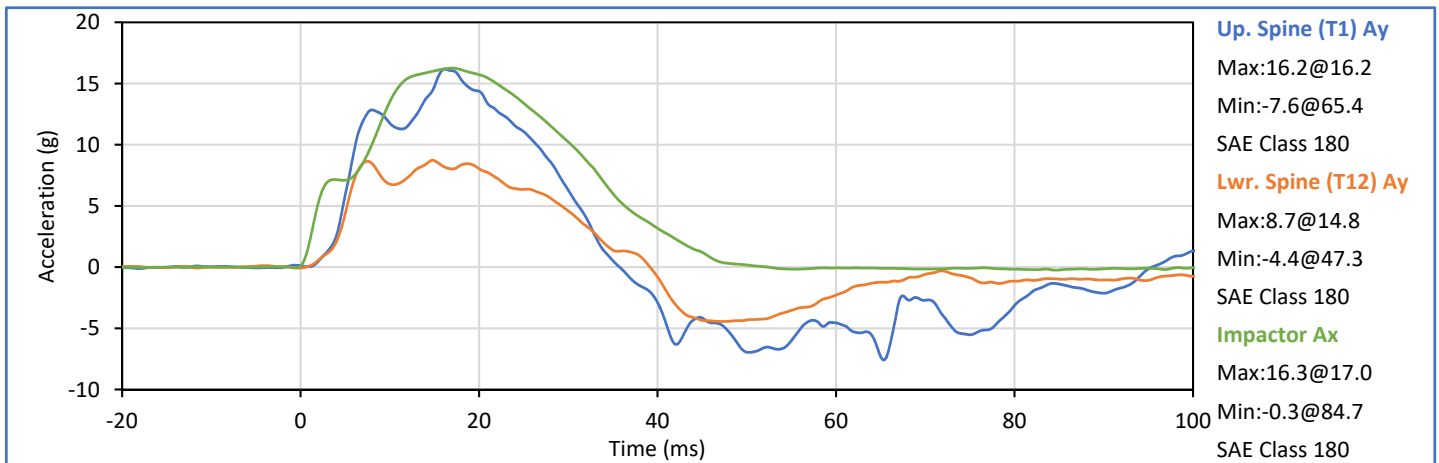
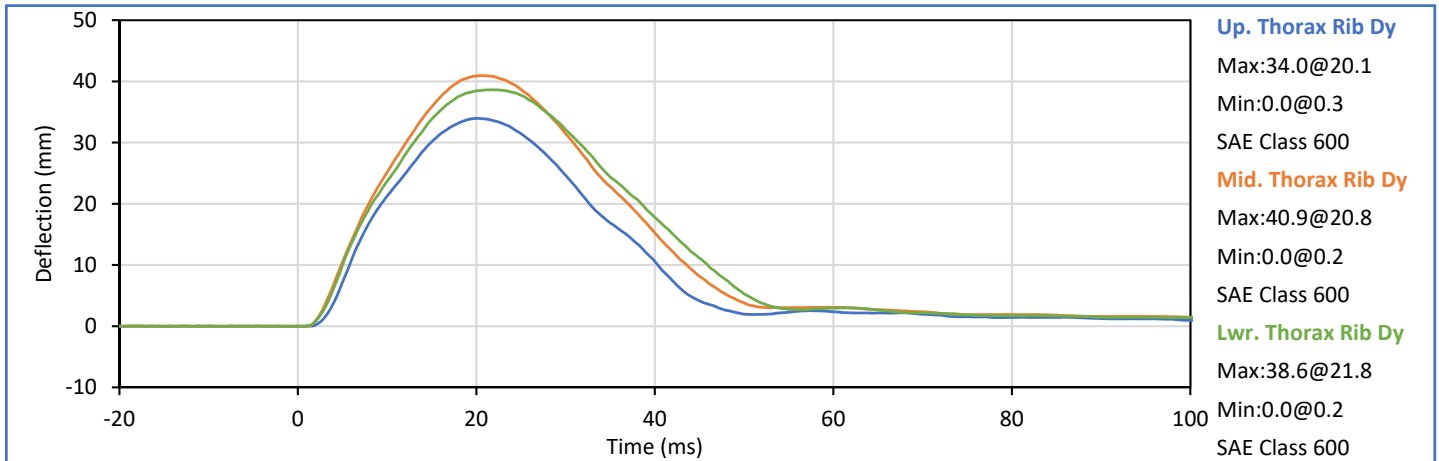
Approved By:
 P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	40	Pass
Impactor Velocity	m/s	4.20	4.40	4.23	Pass
Peak Upper Rib Dy	mm	32.0	40.0	34.0	Pass
Peak Middle Rib Dy	mm	39.0	45.0	40.9	Pass
Peak Lower Rib Dy	mm	35.0	43.0	38.6	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	16.2	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	8.7	Pass
Peak Impactor Ax	g	14.0	18.0	16.3	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
 J. Hernandez

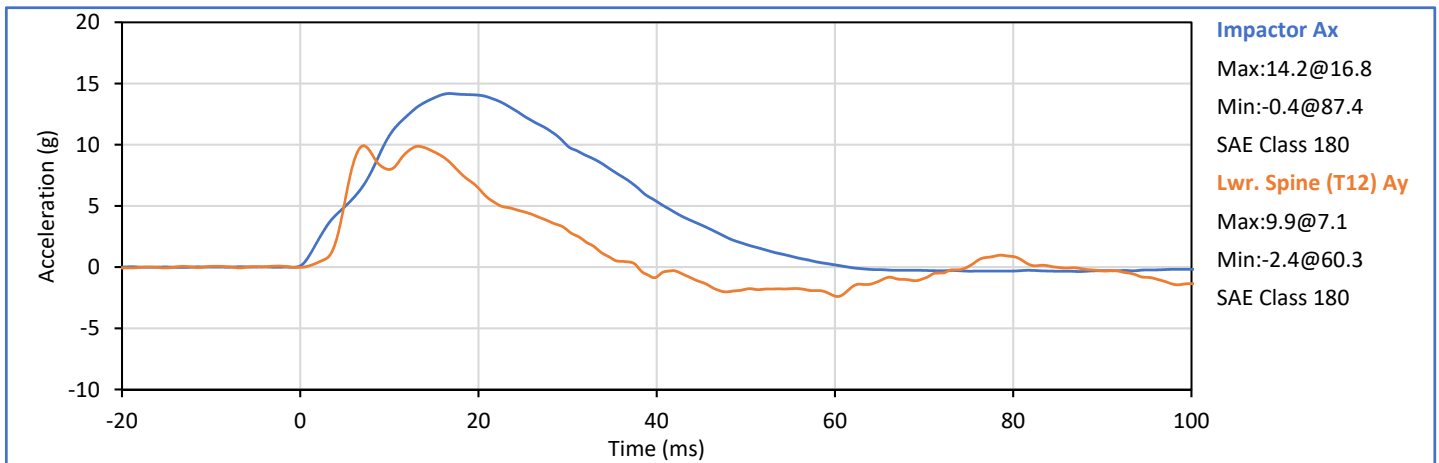
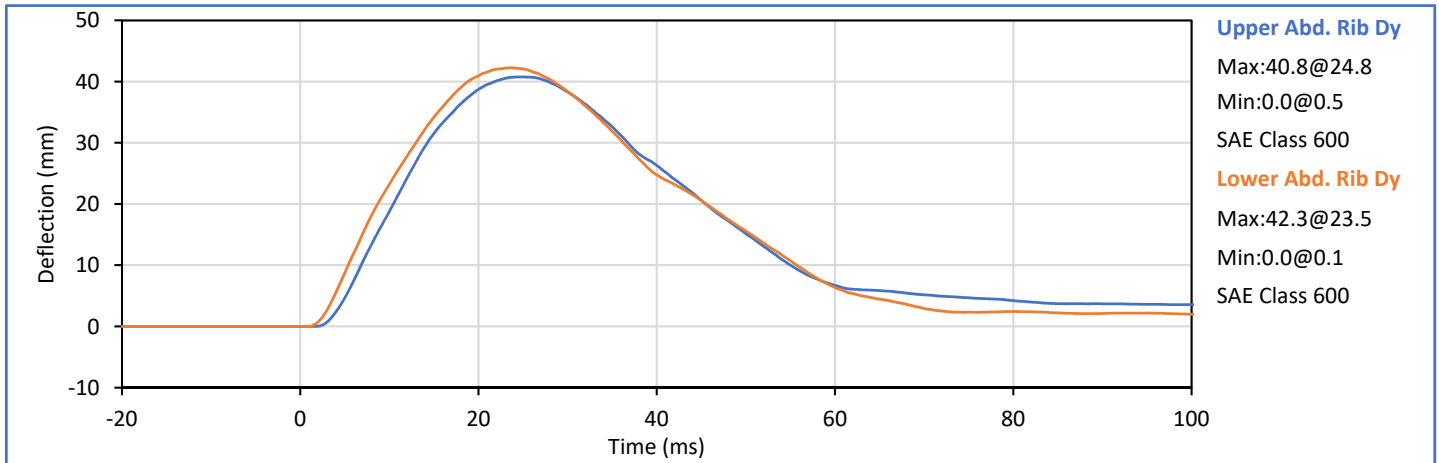
Approved By: *P. Puzzuto*
 P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	40	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	40.8	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	42.3	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	9.9	Pass
Peak Impactor Ax	g	12.0	16.0	14.2	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

Approved By:
 P. Puzzuto

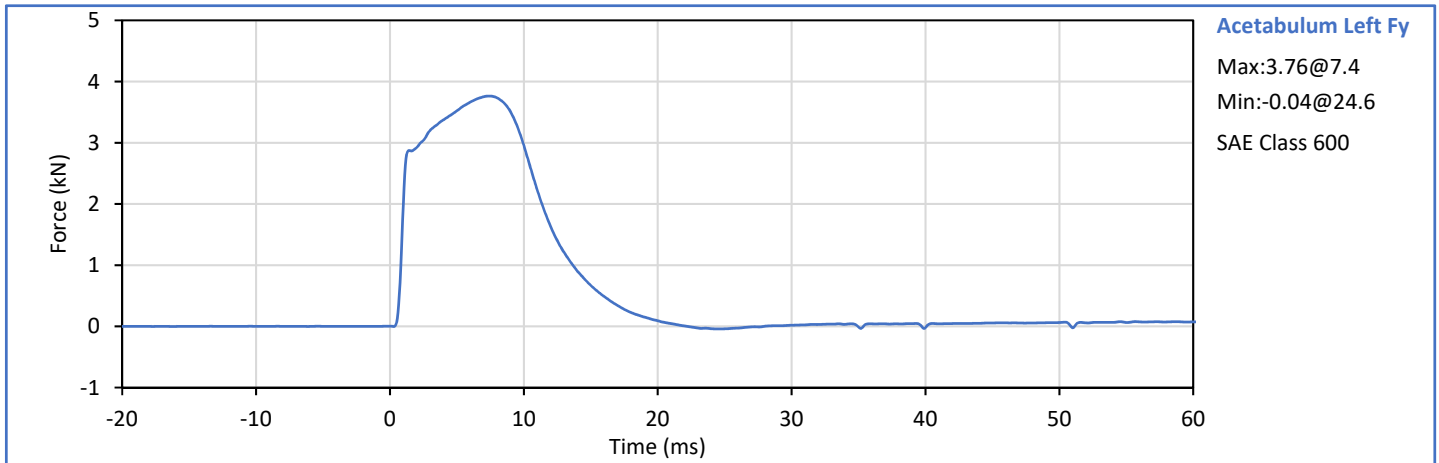
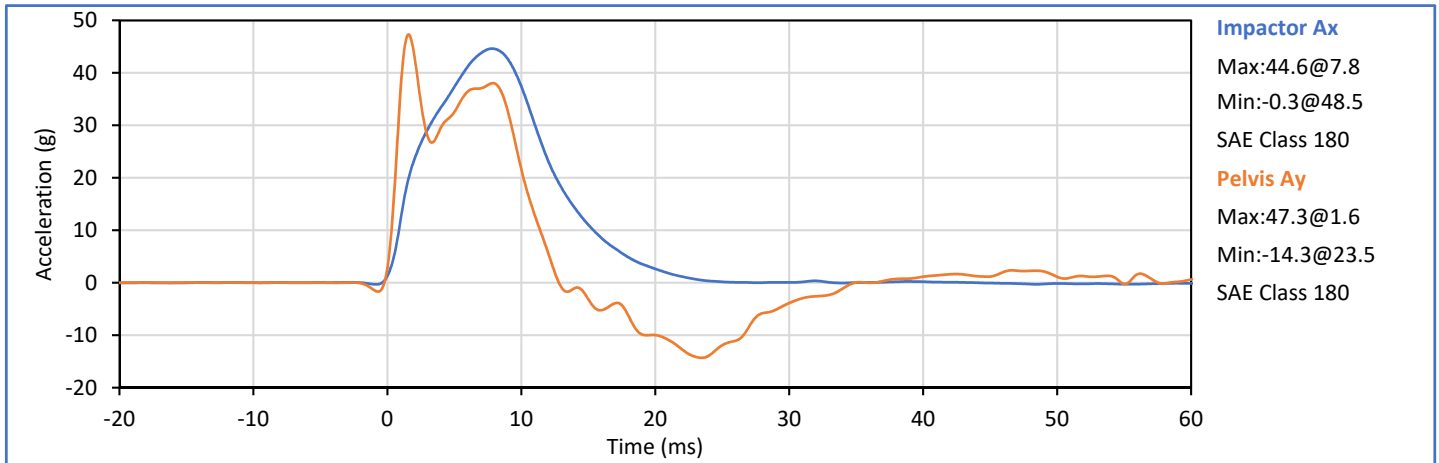


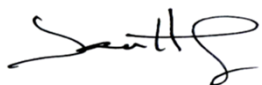
ATD Serial No.: 308


Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	42	Pass
Impactor Velocity	m/s	6.60	6.80	6.61	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.76	Pass
Pelvis Ay after 6ms	g	34.0	42.0	38.1	Pass
Peak Impactor Ax	g	38.0	47.0	44.6	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 11401 (SACO)



Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-14

Pelvis Plug S/N: 11401 (SACO)



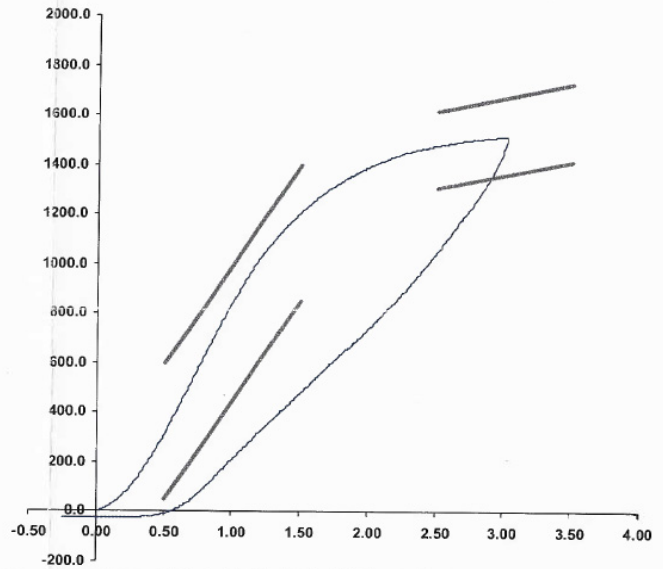
SID-IIs Pelvis Plug Certification Test

Plug S/N 11401
 Test Number 2870
 Report Number 2867
 Test Date 8/29/2016 9:31:00 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	313.63	50.00	600.00
Force @ 1.5 mm (N)	1,211.12	850.00	1,400.00
Force @ 2.5 mm (N)	1,479.41	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,516.24	1,361.00	1,673.00

Testing Machine STM-20 5965542
 Load Cell S/N (TI240813), 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 DC

Part Number 180-4450

Template No 107 29-Aug-16
 SACO Research

By: DC Date: 8/29/16



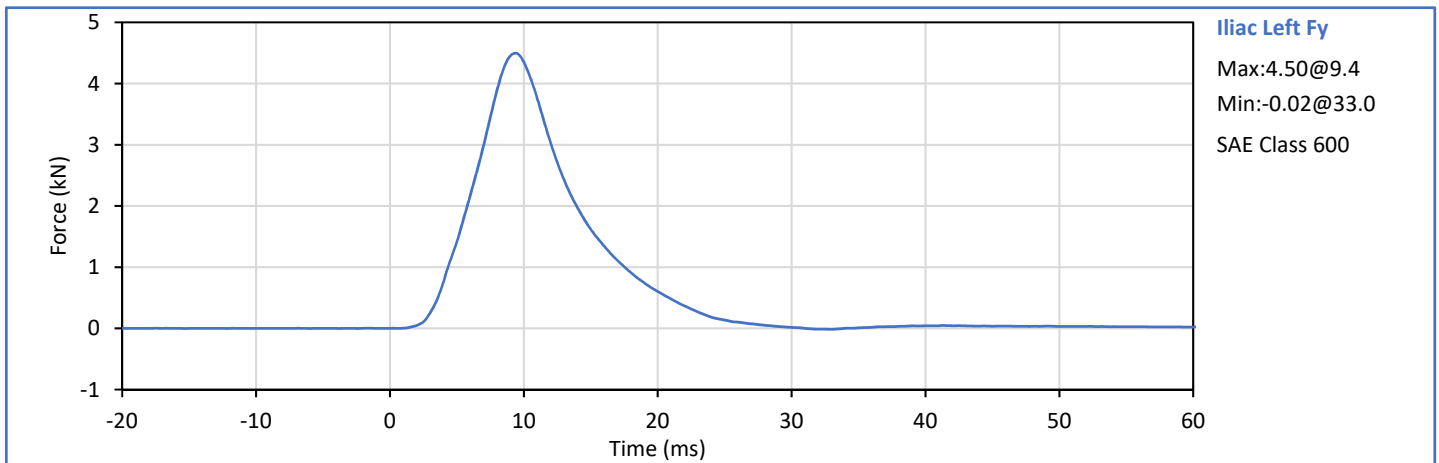
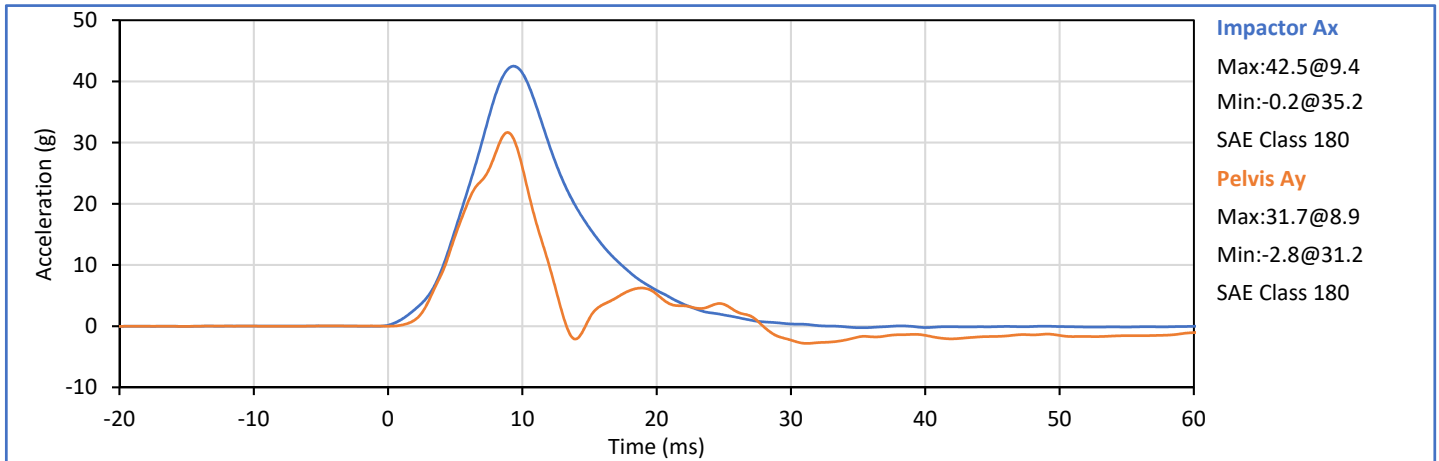
ATD Serial No.: 308

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.33	Pass
Peak Iliac Fy	kN	4.10	5.10	4.50	Pass
Pelvis Ay after 6ms	g	28.0	39.0	31.7	Pass
Peak Impactor Ax	g	36.0	45.0	42.5	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified



Technician: *J. Hernandez*
 J. Hernandez

Approved By: *P. Puzzuto*
 P. Puzzuto

APPENDIX C
POST-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA
LEFT SIDE CONFIGURATION




ATD Serial No.: F035

Test Date: 2018-12-27

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory Relative Humidity	%	10	70	26	Pass
1 - Sitting Height	mm	900	918	909	Pass
2 - Seat to Shoulder Joint	mm	558	572	569	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	353	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	102	Pass
5 - Sole to Seat, Sitting	mm	433	451	446	Pass
6 - Head Width	mm	152	158	154	Pass
7 - Shoulder/Arm Width	mm	461	479	466	Pass
8 - Thorax Width	mm	322	332	327	Pass
9 - Abdomen Width	mm	273	287	278	Pass
10 - Pelvis Lap Width	mm	359	373	372	Pass
11 - Head Depth	mm	196	206	201	Pass
12 - Thorax Depth	mm	262	272	268	Pass
13 - Abdomen Depth	mm	194	204	200	Pass
14 - Pelvis Depth	mm	235	245	243	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	157	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	604	Pass
				Overall Test Results	Pass

Technician: 
 J. Hernandez

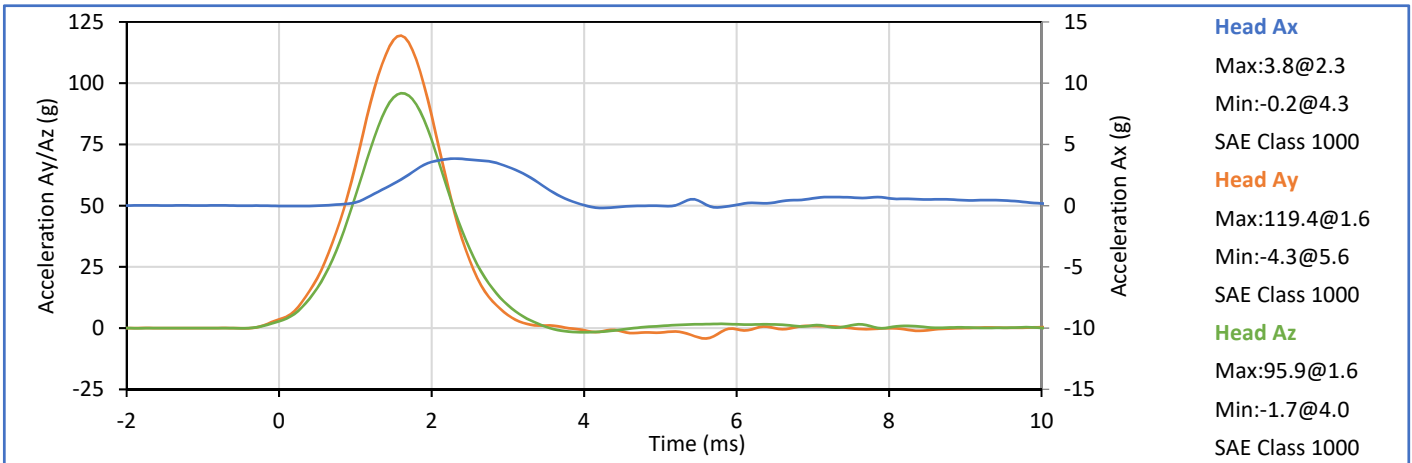
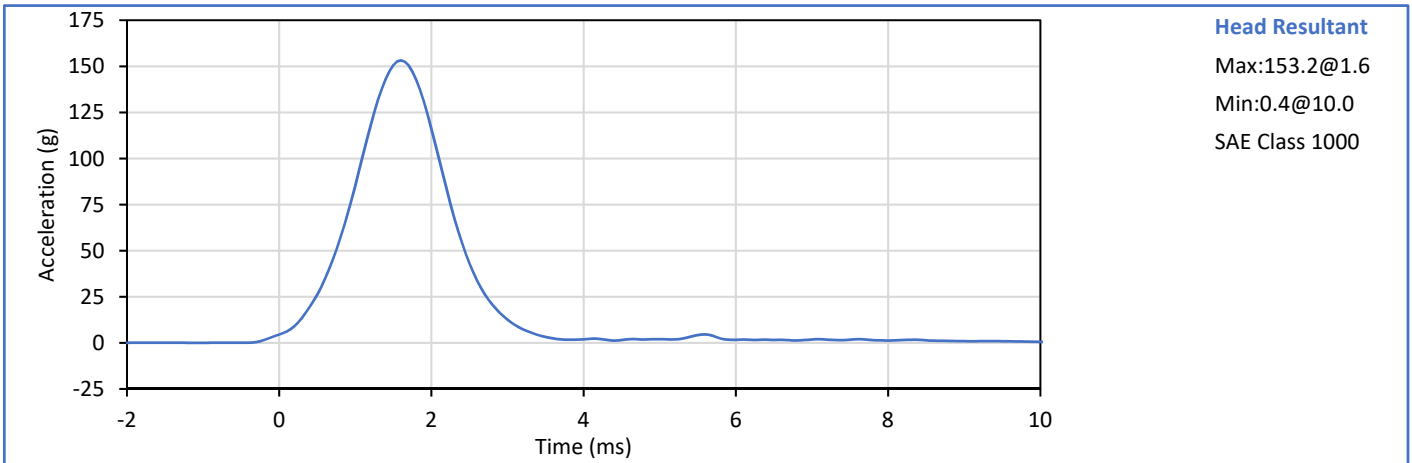
Approved By: 
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-27

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.6	Pass
Laboratory Humidity	%	10	70	26	Pass
Peak Resultant Acceleration	g	125.0	155.0	153.2	Pass
Peak Head Ax	g	-15.0	15.0	3.8	Pass
Oscillations After Main Pulse	%	0.0	15.0	3.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

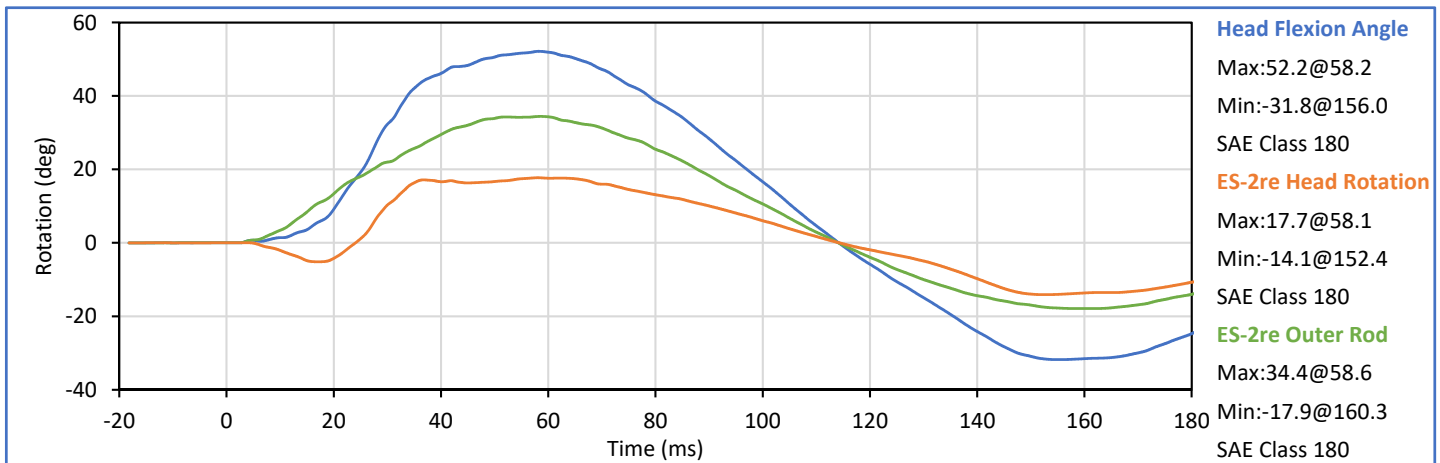
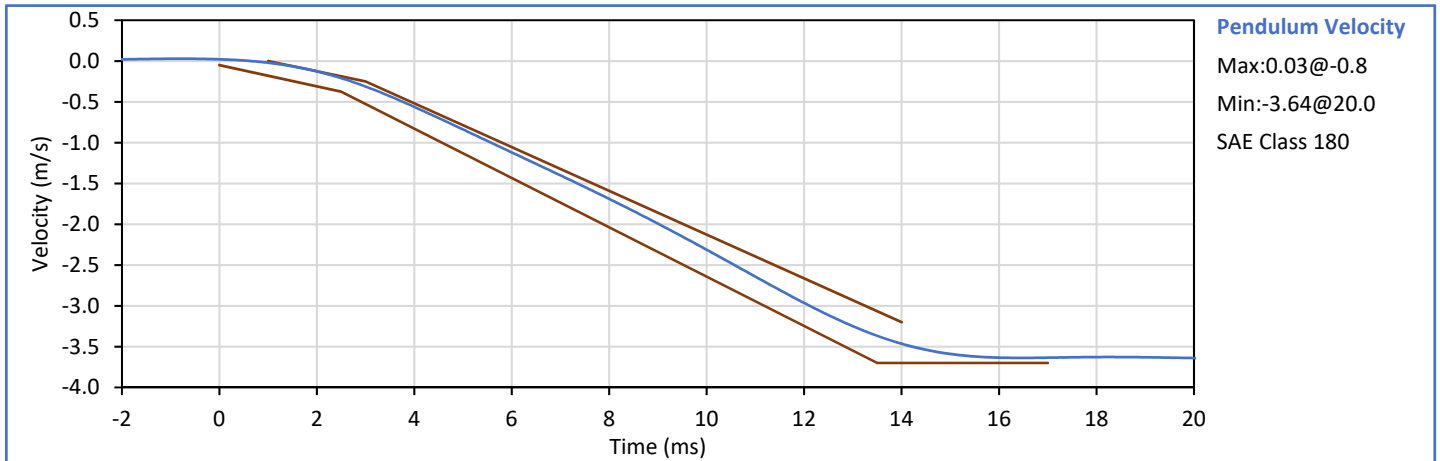
Approved By:
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2019-01-02

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	3.30	3.50	3.46	Pass
Peak Headform Flexion	deg	49.0	59.0	52.2	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	58.2	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	56.0	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

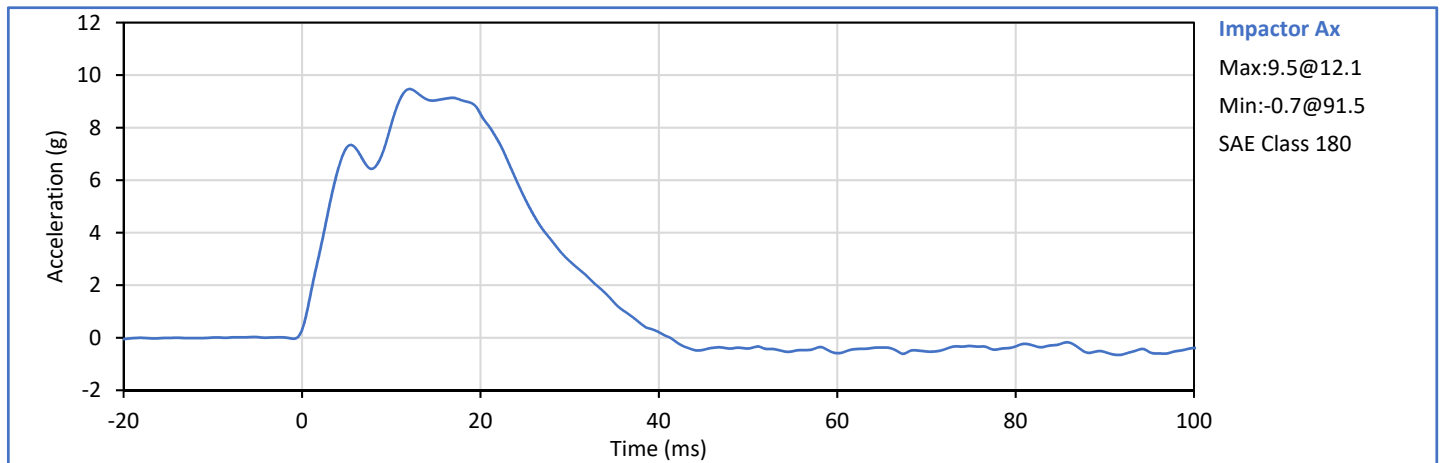
Approved By:
 P. Puzzuto




ATD Serial No.: F035

Test Date: 2018-12-29

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Humidity	%	10	70	17	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Impactor Ax	g	7.5	10.5	9.5	Pass
Overall Test Results					Pass



Technician: 
J. Hernandez

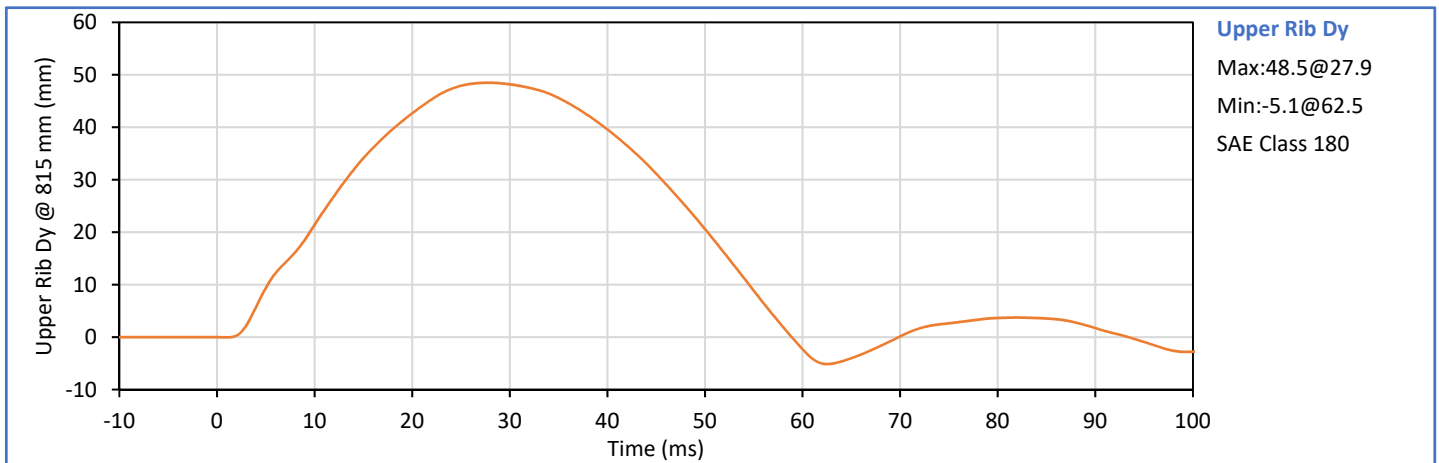
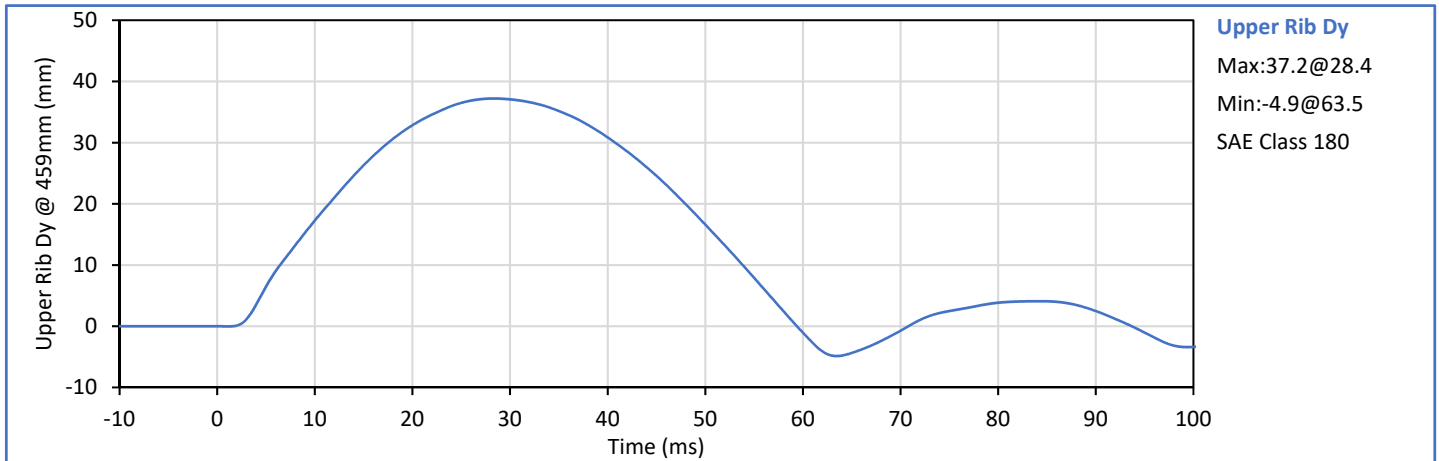
Approved By: 
P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-29

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	20	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	37.2	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	48.5	Pass
Overall Test Results					Pass



Technician:
J. Hernandez

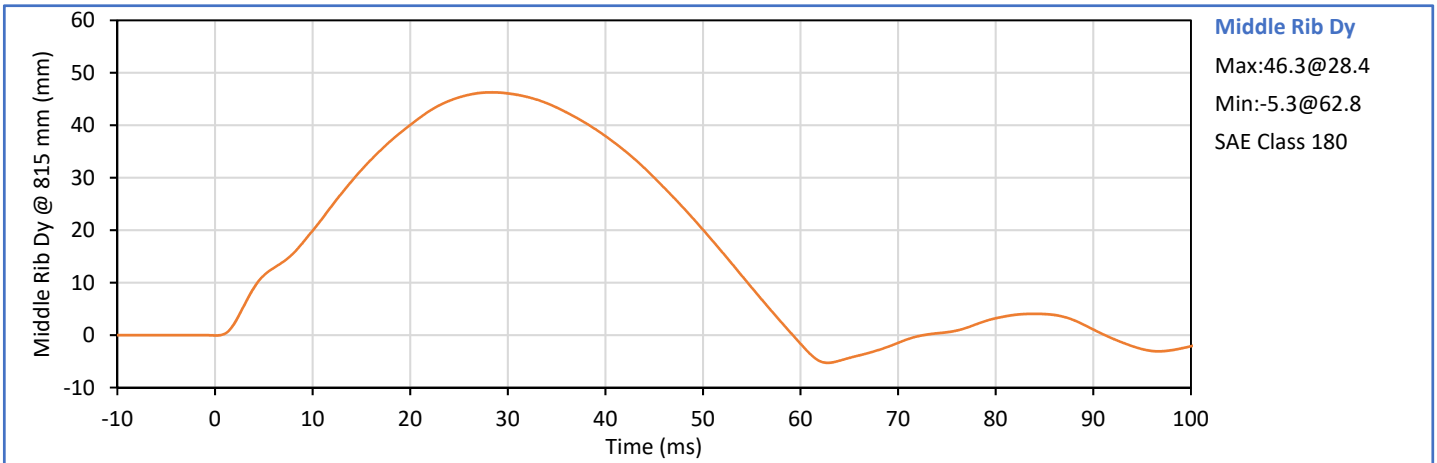
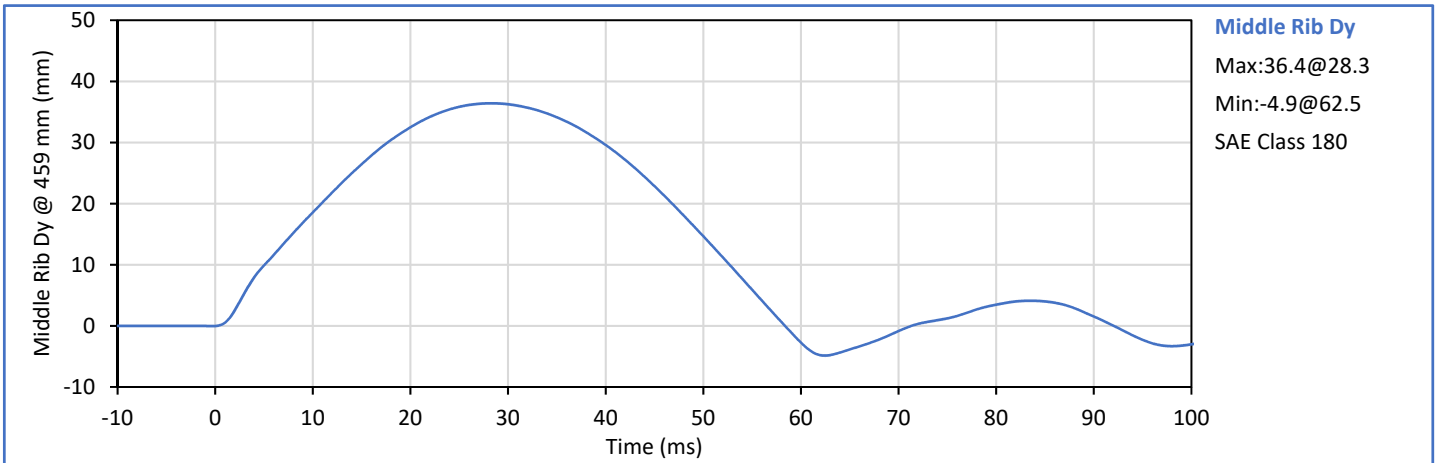
Approved By:
P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-29

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	20	Pass
Middle Rib Dy @ 459mm	mm	36.0	40.0	36.4	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	46.3	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
 J. Hernandez

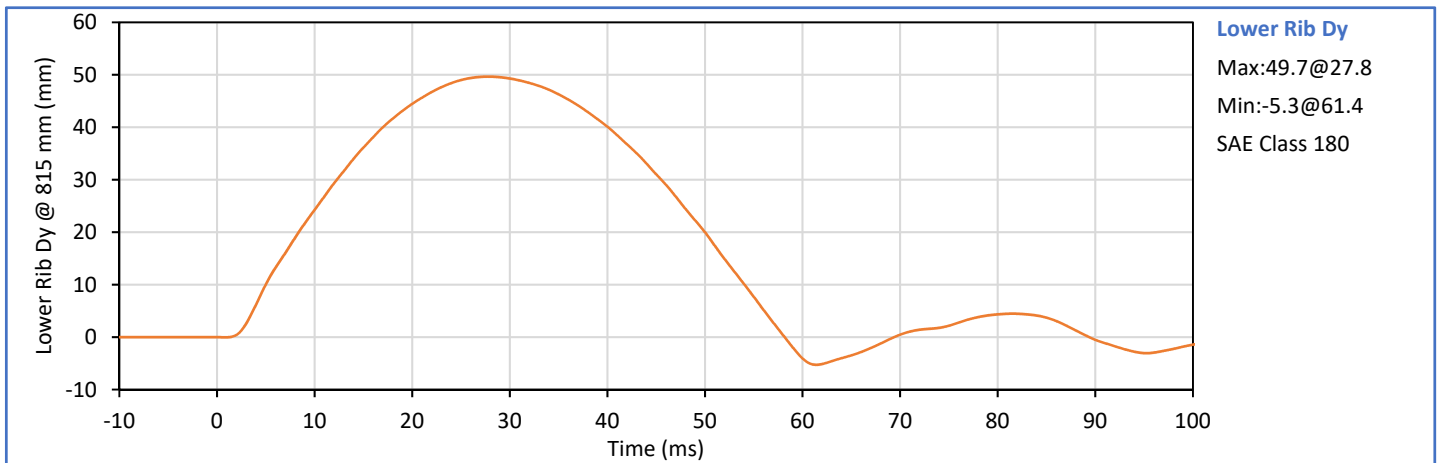
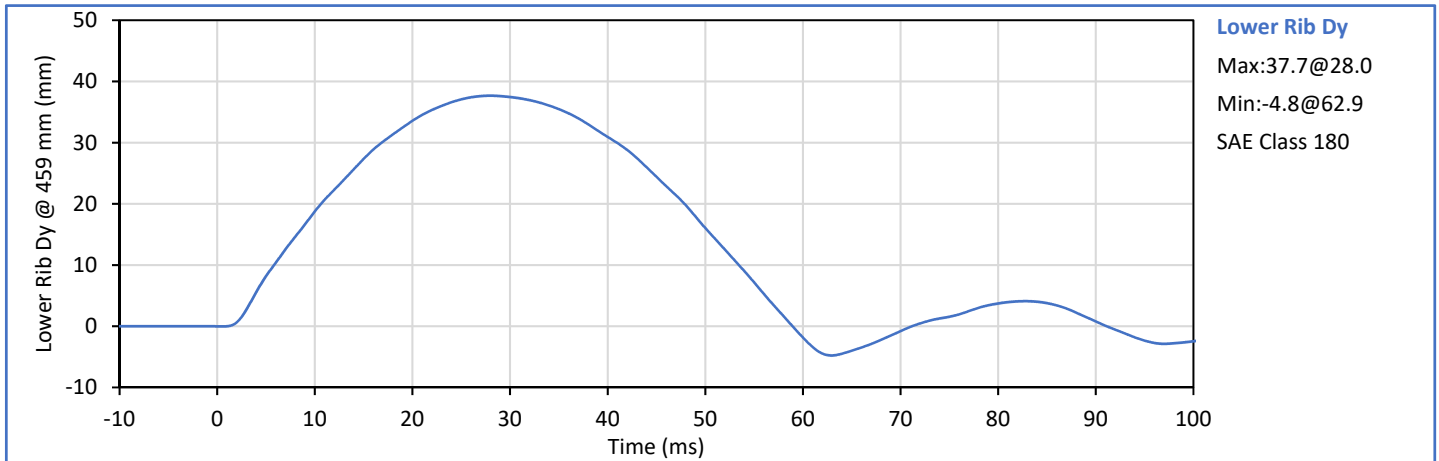
Approved By: *P. Puzzuto*
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-29

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	20	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	37.7	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	49.7	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
 J. Hernandez

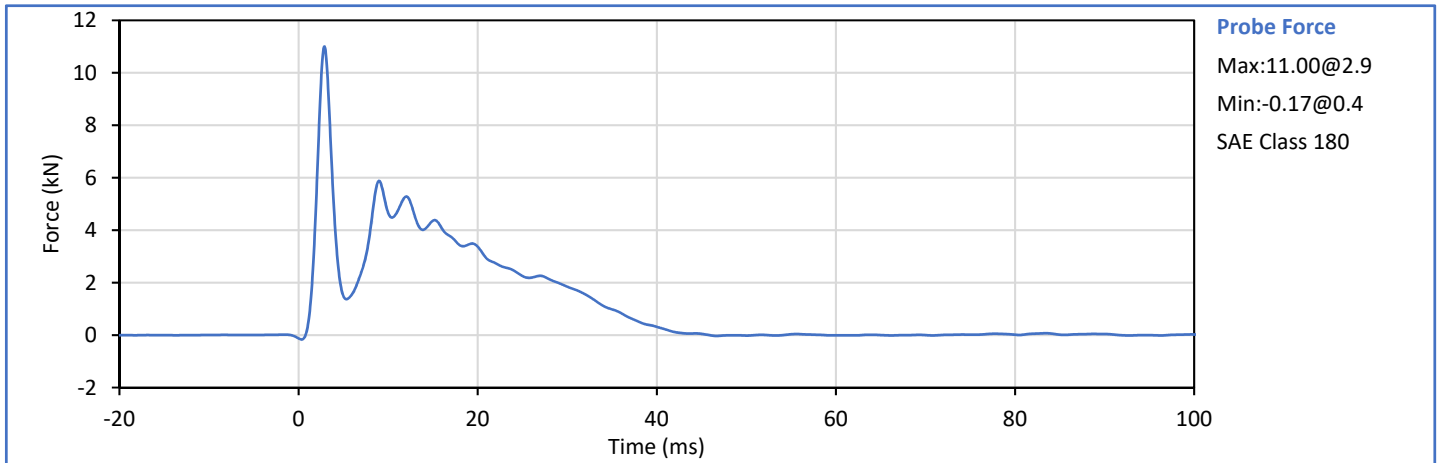
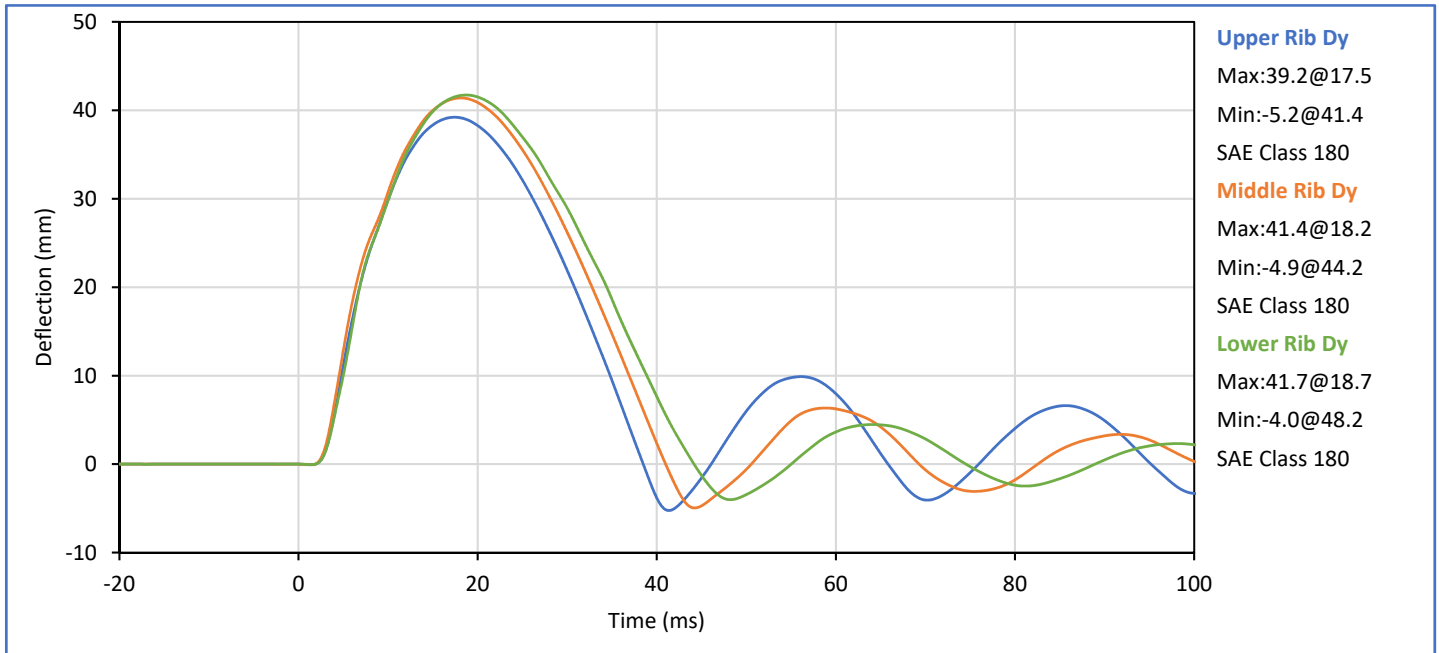
Approved By: *P. Puzzuto*
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-29

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Humidity	%	10	70	17	Pass
Impactor Velocity	m/s	5.40	5.60	5.46	Pass
Peak Upper Rib Dy	mm	34.0	41.0	39.2	Pass
Peak Middle Rib Dy	mm	37.0	45.0	41.4	Pass
Peak Lower Rib Dy	mm	37.0	44.0	41.7	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	5.88	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

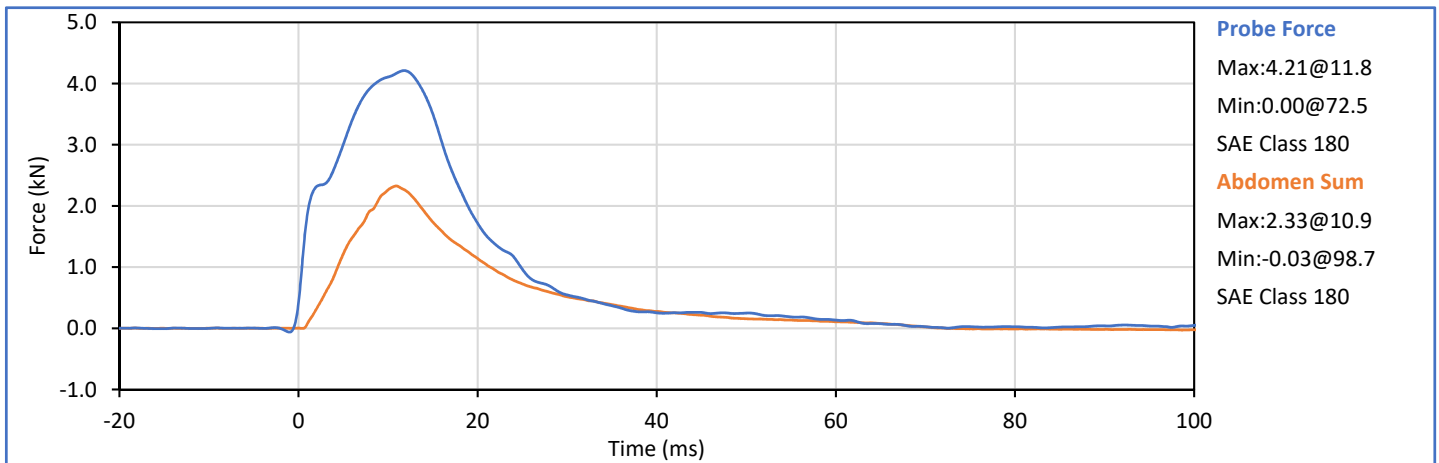
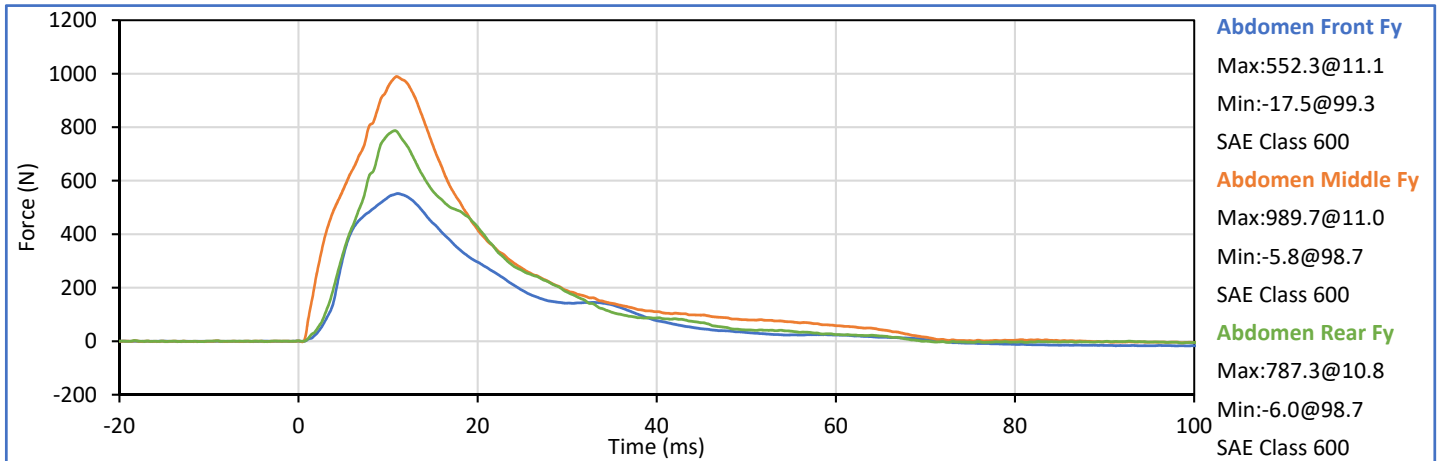
Approved By:
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-29

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	17	Pass
Impactor Velocity	m/s	3.90	4.10	3.98	Pass
Peak Impactor Force	kN	4.00	4.80	4.21	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.8	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.33	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	10.9	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

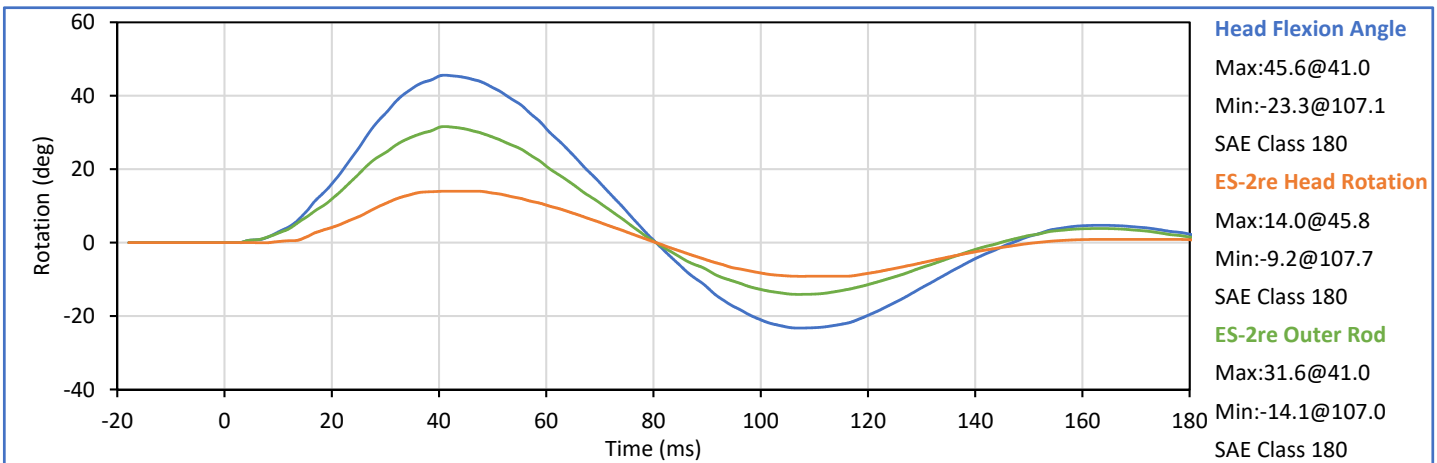
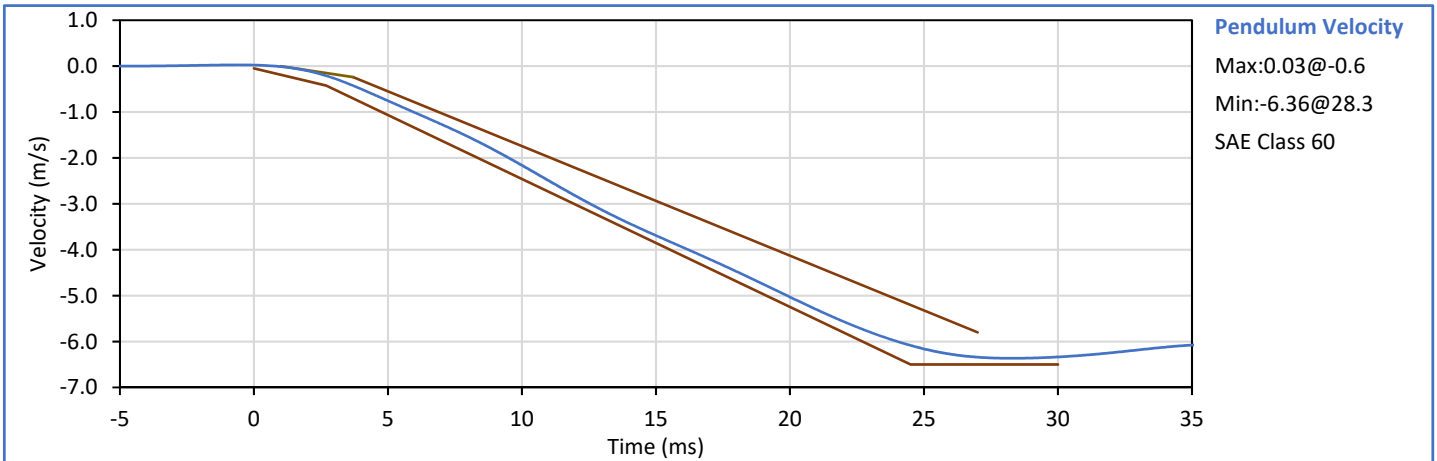
Approved By:
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2019-01-02

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	5.95	6.15	6.11	Pass
Peak Headform Flexion	deg	45.0	55.0	45.6	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	41.0	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	39.5	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
 J. Hernandez

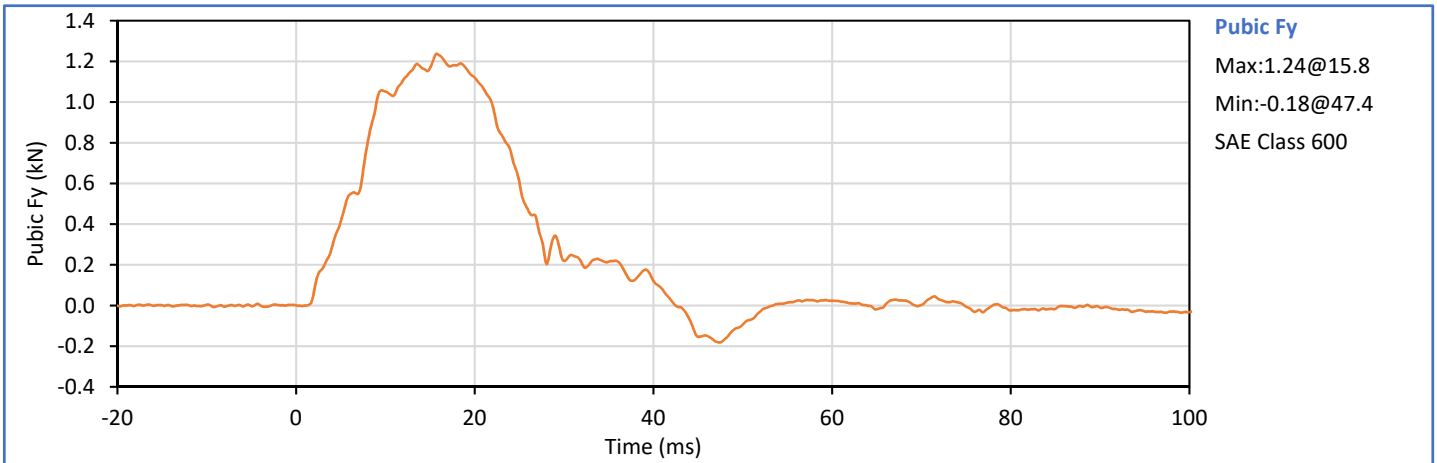
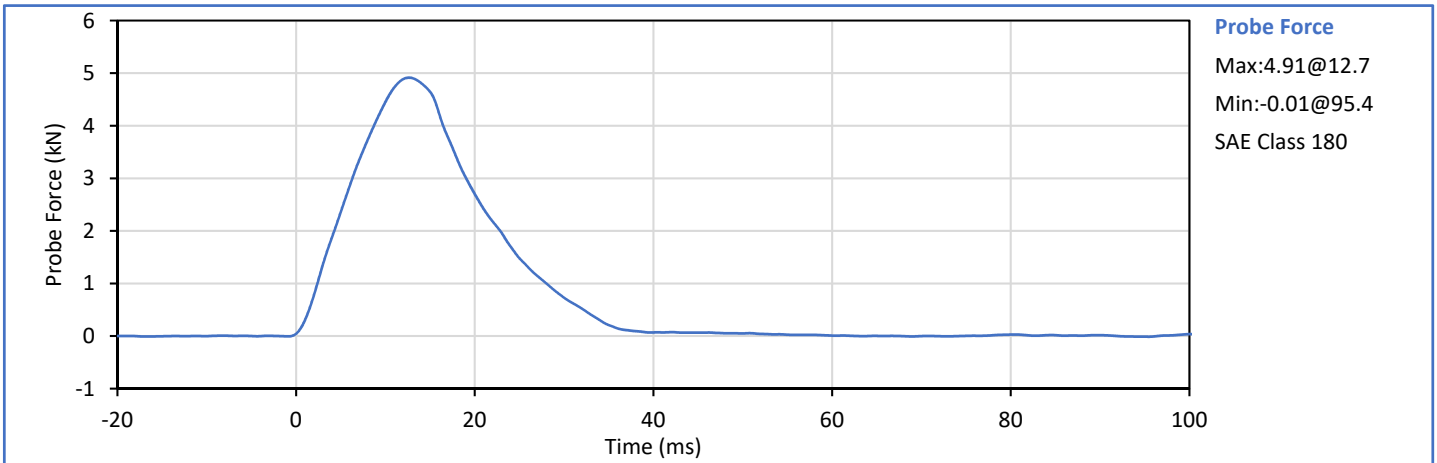
Approved By: *P. Puzzuto*
 P. Puzzuto



ATD Serial No.: F035

Test Date: 2018-12-29

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	28	Pass
Impactor Velocity	m/s	4.20	4.40	4.36	Pass
Peak Impactor Force	kN	4.70	5.40	4.91	Pass
Time of Peak Impactor Force	ms	11.8	16.1	12.7	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.24	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	15.8	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

Approved By:
 P. Puzzuto

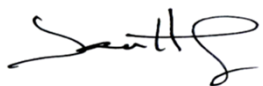



**SID-IIs Small Side Impact ATD
 External Measurements**

ATD Serial No.: 308

Test Date: 2018-12-27

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	25	Pass
A - Sitting Height	mm	772	788	779	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	85	Pass
D - H Point From Seatback	mm	141	151	145	Pass
E - Shoulder Pivot From Backline	mm	97	107	103	Pass
F - Thigh Clearance	mm	119	135	126	Pass
G - Head Breadth	mm	140	148	144	Pass
H - Head Back From Backline	mm	40	46	43	Pass
I - Head Depth	mm	178	188	183	Pass
J - Head Circumference	mm	541	551	546	Pass
K - Buttock To Knee Length	mm	514	540	521	Pass
L - Popliteal Height	mm	343	369	360	Pass
K - Knee Pivot To Floor Height	mm	392	409	397	Pass
N - Buttock Popliteal Length	mm	416	442	433	Pass
O - Chest Depth W/O Jacket	mm	195	211	202	Pass
P - Foot Length	mm	216	232	226	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	319	Pass
R - Arm Length	mm	249	259	255	Pass
S - Knee Joint To Seatback	mm	477	493	488	Pass
V - Shoulder Width	mm	341	357	344	Pass
W - Foot Width	mm	78	94	84	Pass
Y - Chest Circumference W/Jacket	mm	851	881	860	Pass
Z - Waist Circumference	mm	761	791	773	Pass
Overall Test Results					Pass

Technician: 
 J. Hernandez

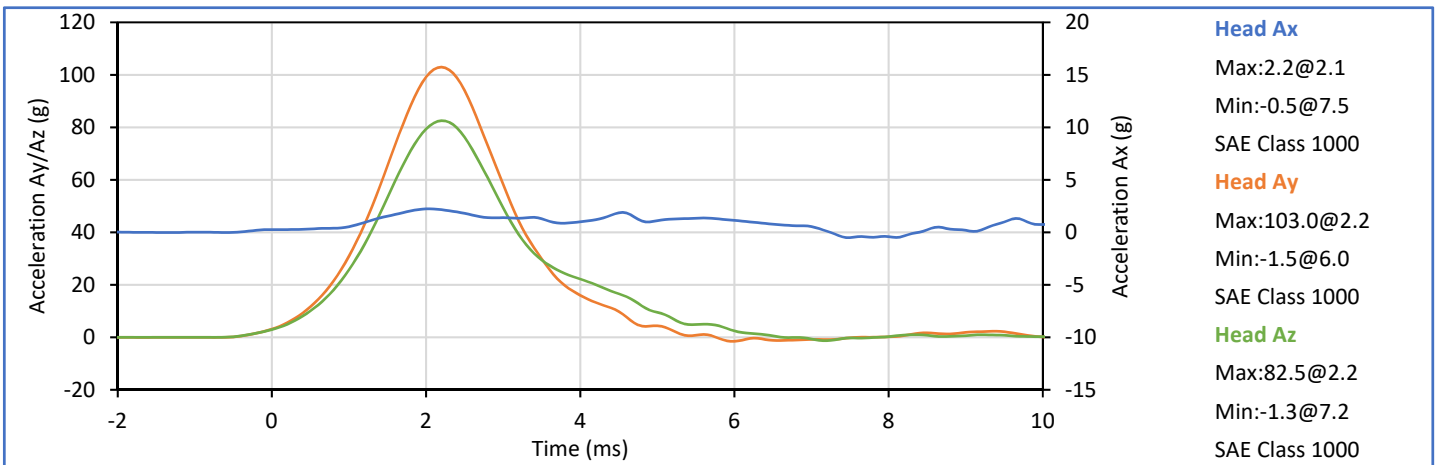
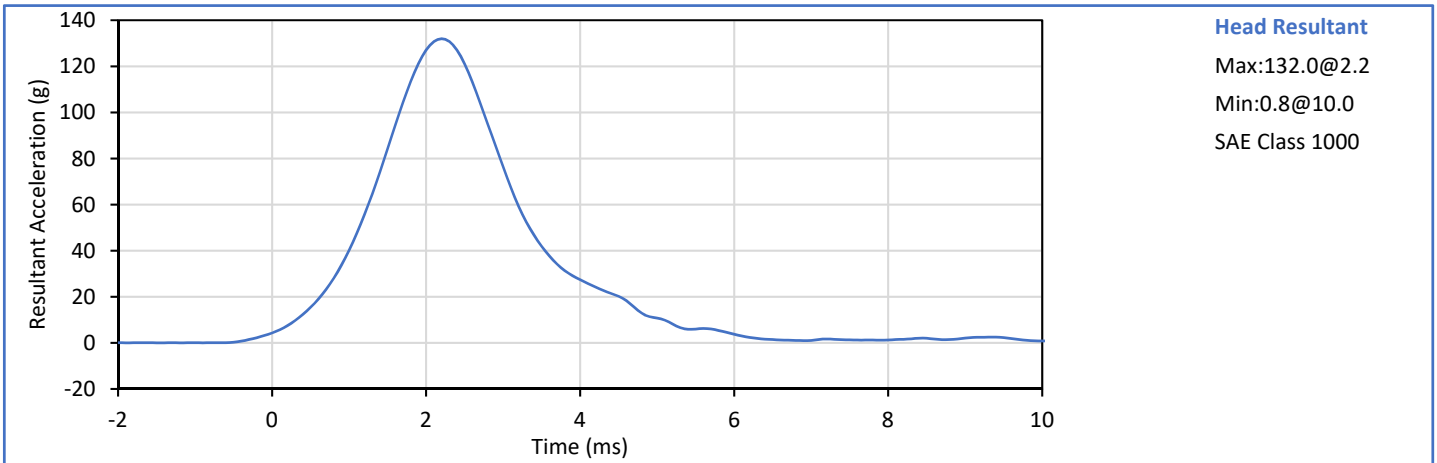
Approved By: 
 P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-27

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.4	Pass
Laboratory Humidity	%	10	70	25	Pass
Peak Resultant Acceleration	g	115.0	137.0	132.0	Pass
Peak Head Ax	g	-15.0	15.0	-0.5	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

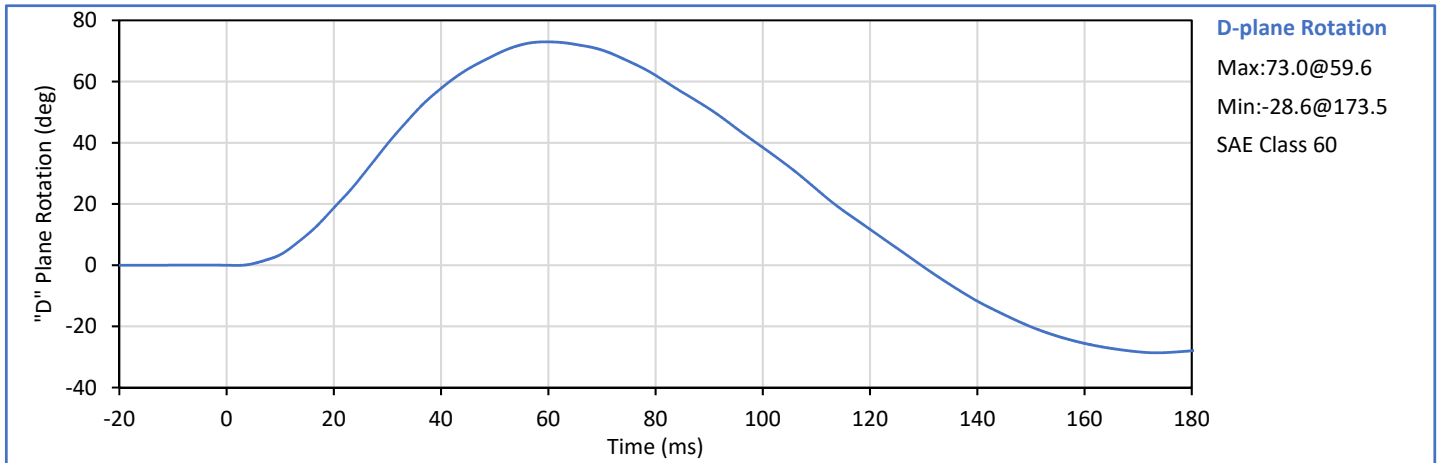
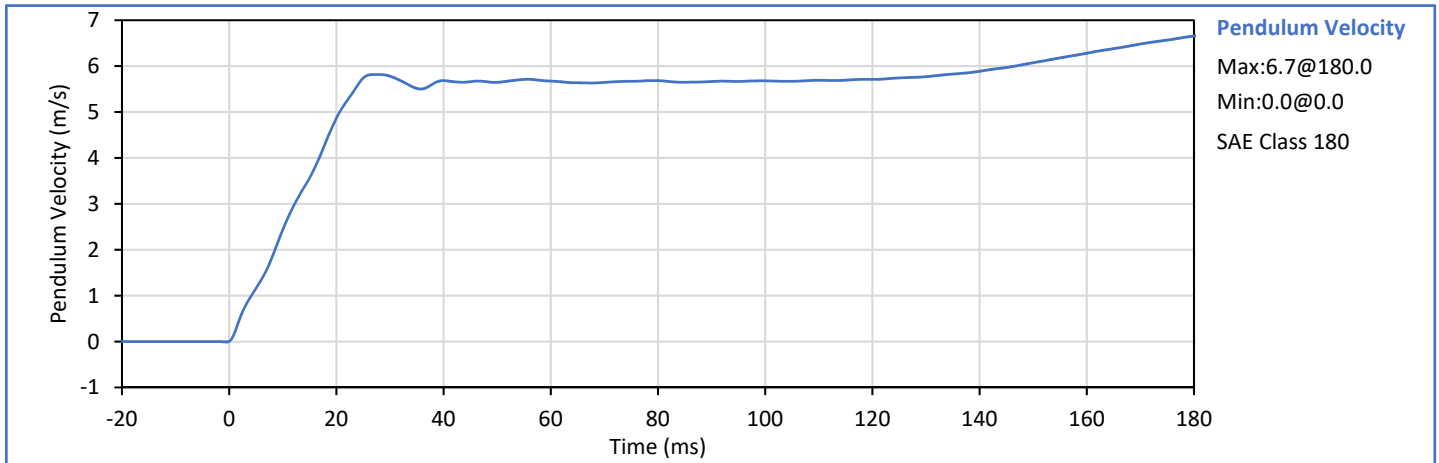
Approved By:
 P. Puzzuto




ATD Serial No.: 308

Test Date: 2018-12-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	21	Pass
Pendulum Velocity	m/s	5.51	5.63	5.55	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.44	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.56	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	4.86	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.74	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	5.82	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	73.0	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	59.6	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-42.4	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	110.3	Pass
Overall Test Results					Pass



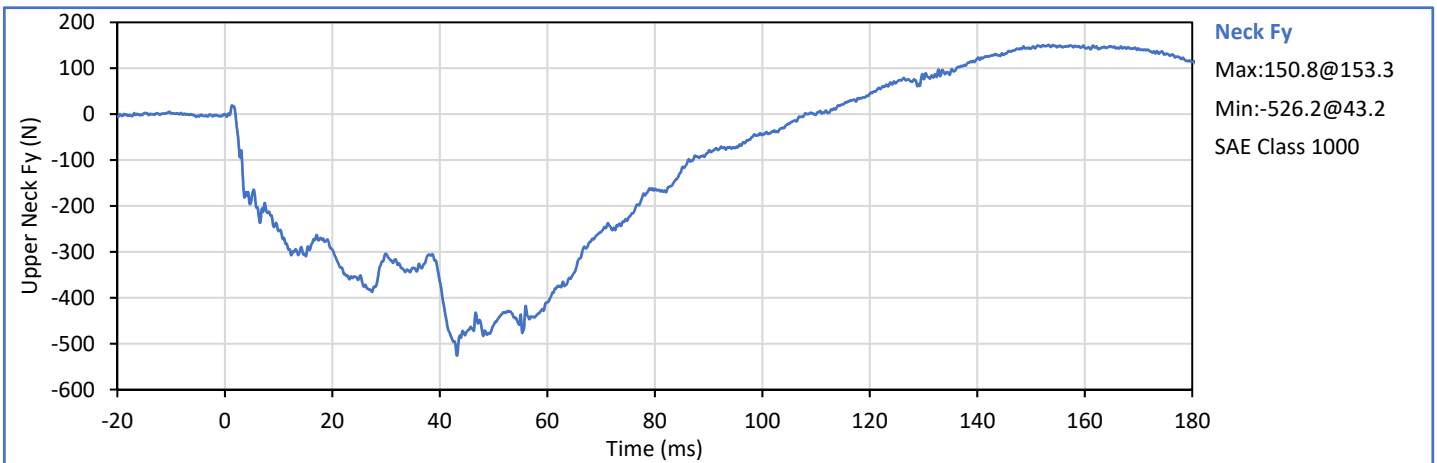
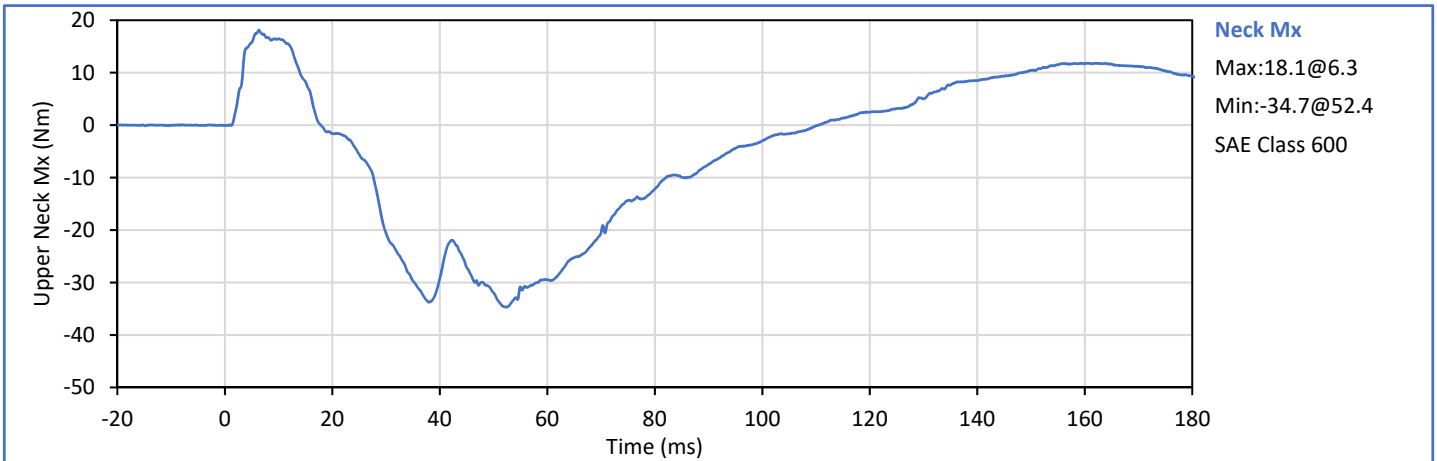
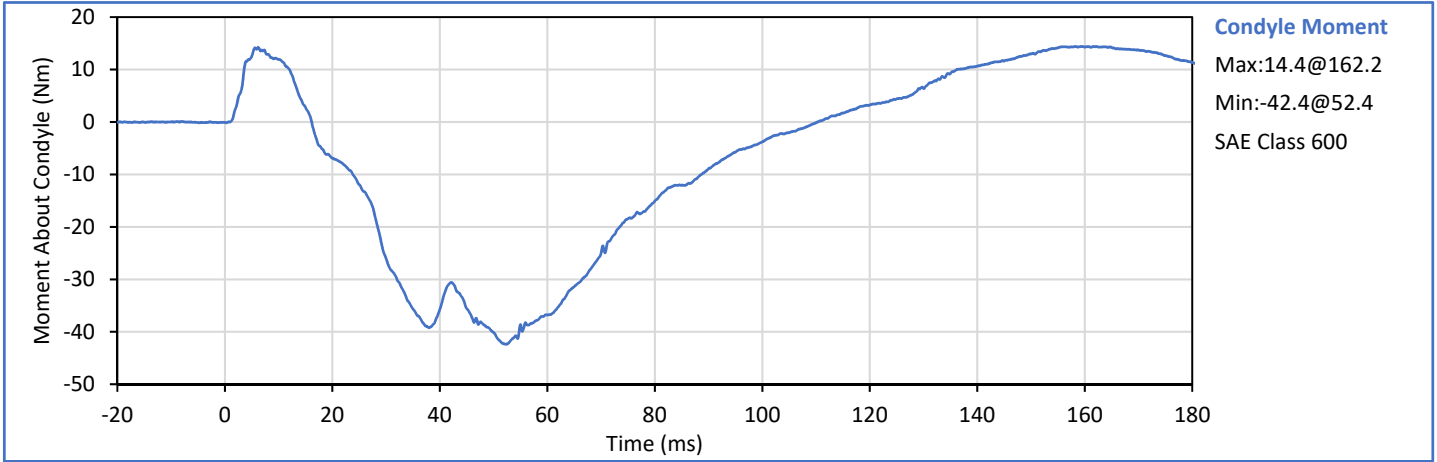
Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-28

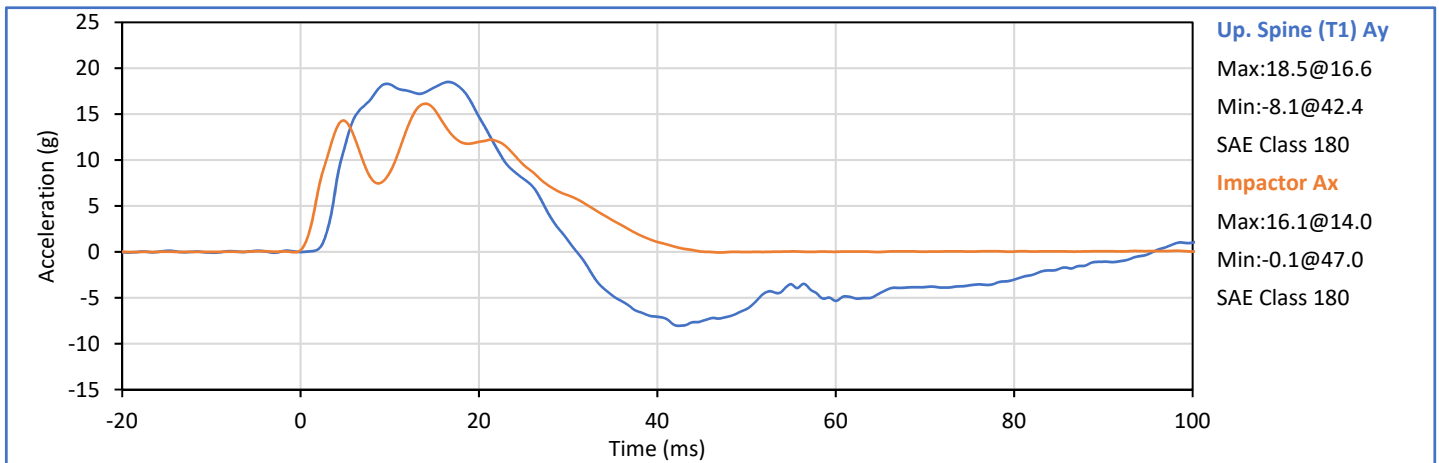
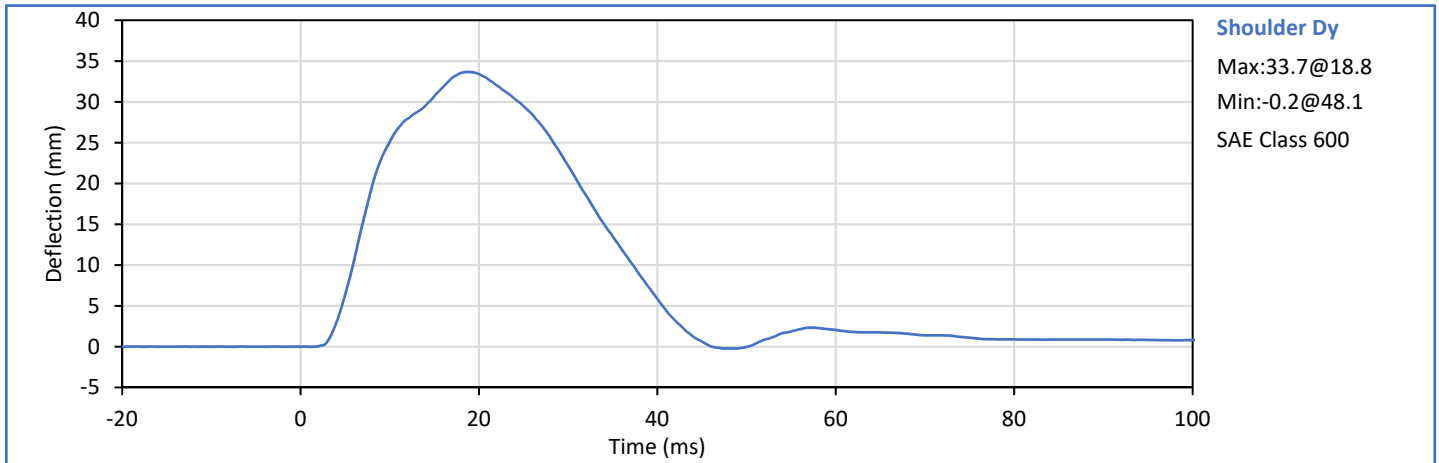




ATD Serial No.: 308

Test Date: 2018-12-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Humidity	%	10	70	21	Pass
Impactor Velocity	m/s	4.20	4.40	4.35	Pass
Peak Shoulder Dy	mm	28.0	37.0	33.7	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.5	Pass
Peak Impactor Ax	g	13.0	18.0	16.1	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

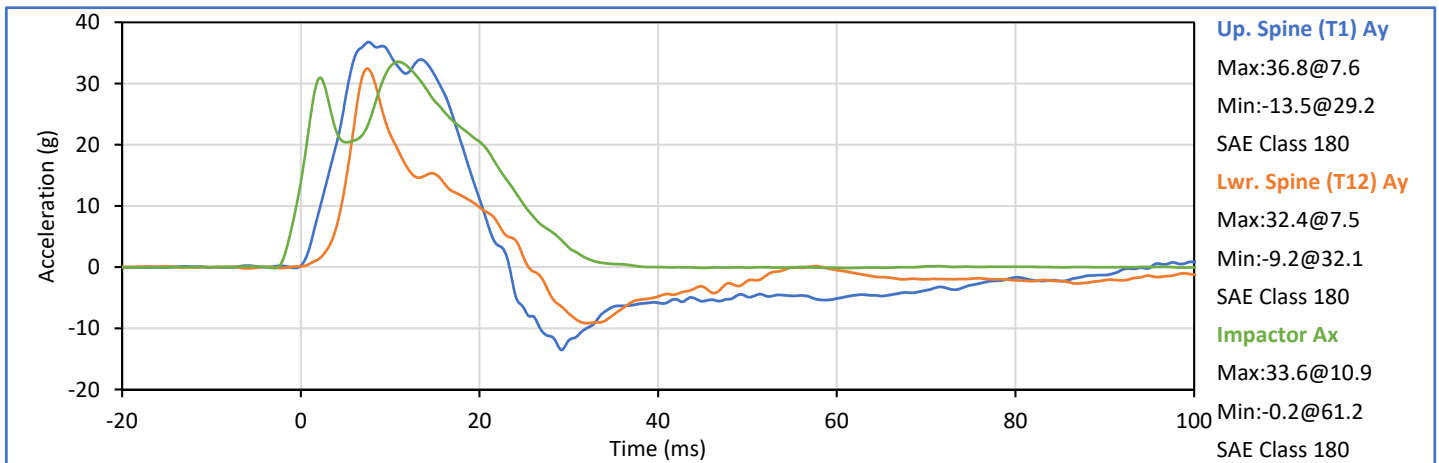
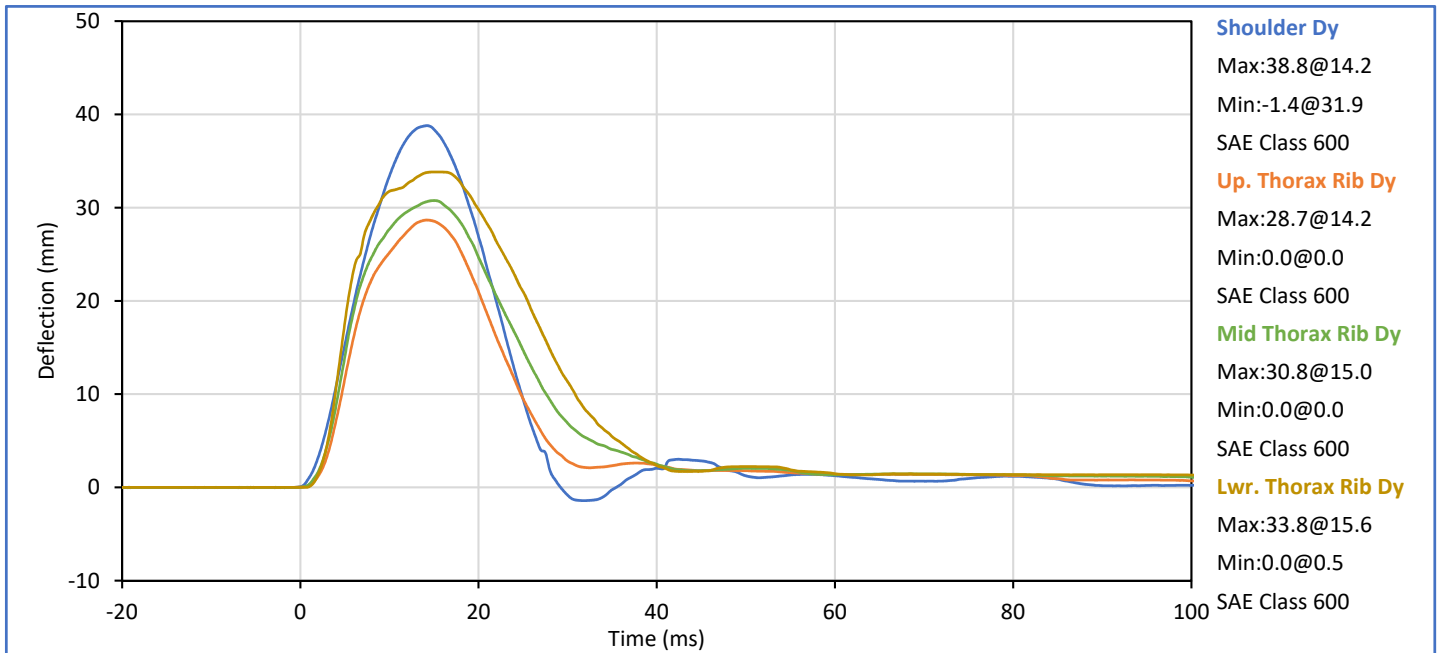
Approved By:
 P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	19	Pass
Impactor Velocity	m/s	6.60	6.80	6.73	Pass
Peak Shoulder Dy	mm	31.0	40.0	38.8	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.7	Pass
Peak Middle Rib Dy	mm	30.0	36.0	30.8	Pass
Peak Lower Rib Dy	mm	32.0	38.0	33.8	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	36.8	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	32.4	Pass
Peak Impactor Ax	g	30.0	36.0	33.6	Pass
Overall Test Results					Pass



Technician: J. Hernandez

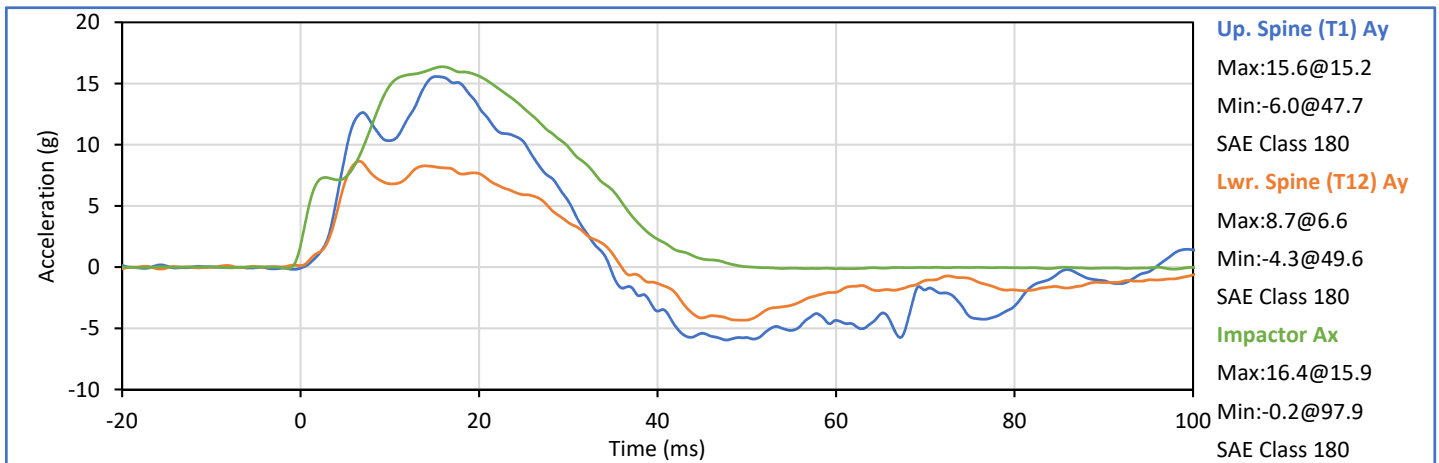
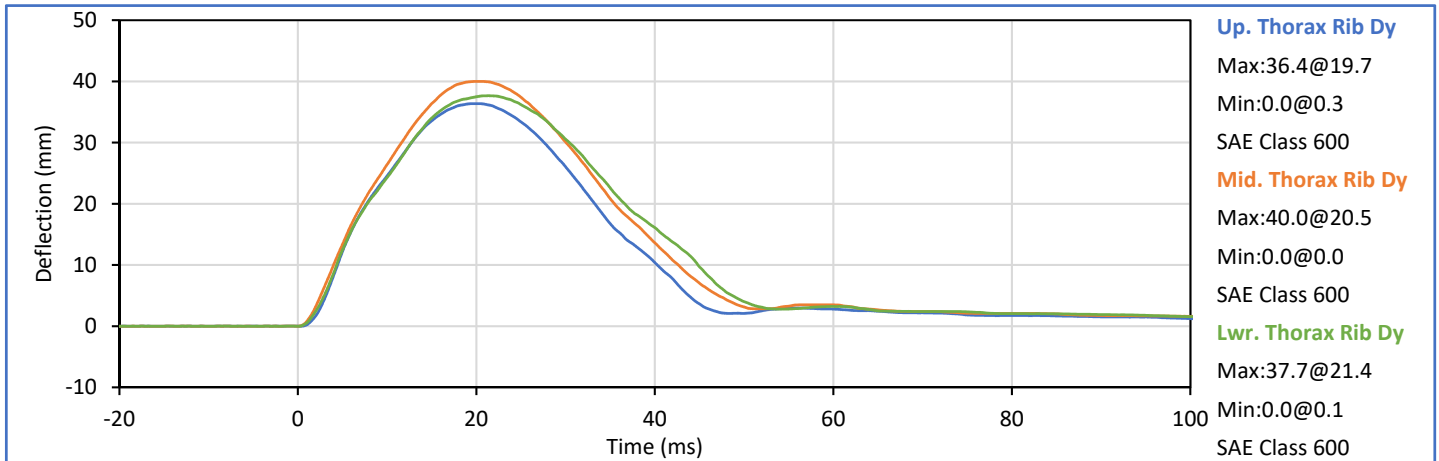
Approved By: P. Puzzuto



ATD Serial No.: 308

Test Date: 2018-12-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	19	Pass
Impactor Velocity	m/s	4.20	4.40	4.39	Pass
Peak Upper Rib Dy	mm	32.0	40.0	36.4	Pass
Peak Middle Rib Dy	mm	39.0	45.0	40.0	Pass
Peak Lower Rib Dy	mm	35.0	43.0	37.7	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	15.6	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	8.7	Pass
Peak Impactor Ax	g	14.0	18.0	16.4	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

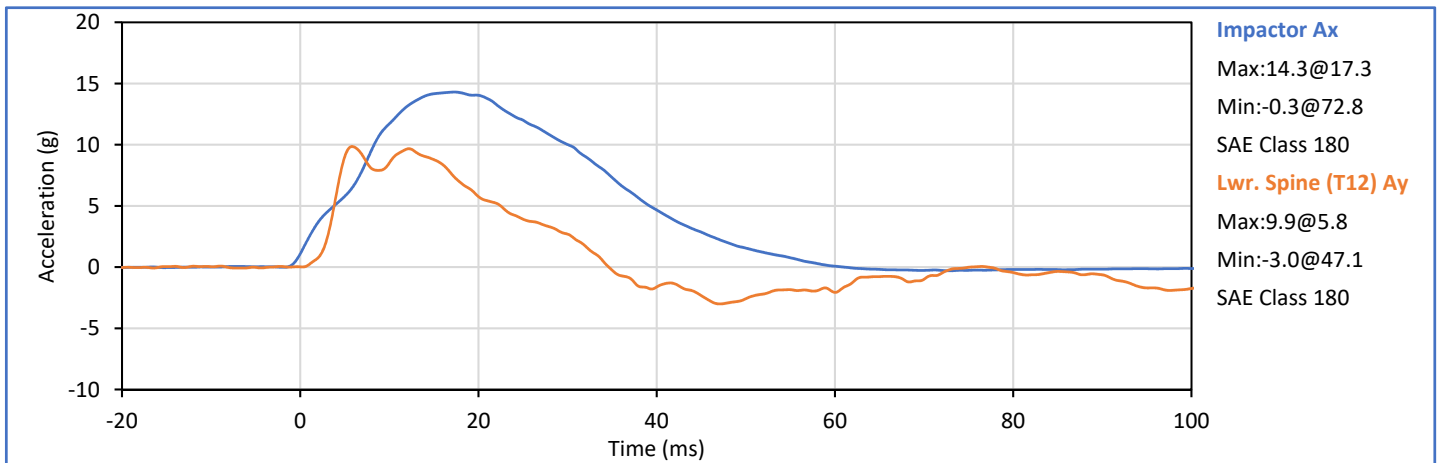
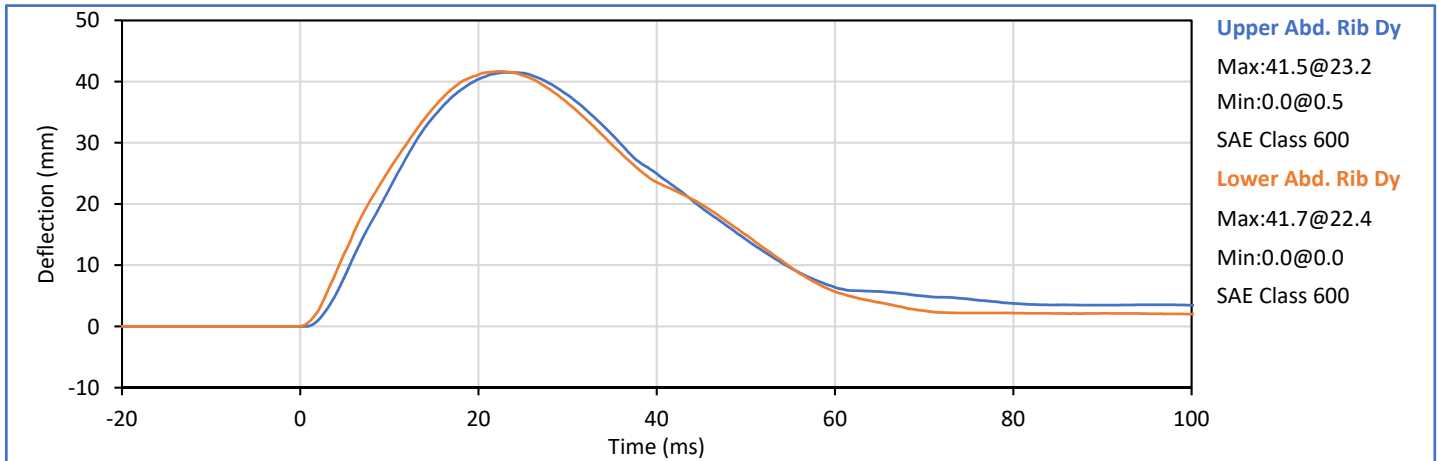
Approved By:
 P. Puzzuto

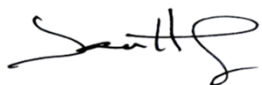



ATD Serial No.: 308

Test Date: 2018-12-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	22	Pass
Impactor Velocity	m/s	4.20	4.40	4.35	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	41.5	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	41.7	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	9.9	Pass
Peak Impactor Ax	g	12.0	16.0	14.3	Pass
Overall Test Results					Pass



Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto

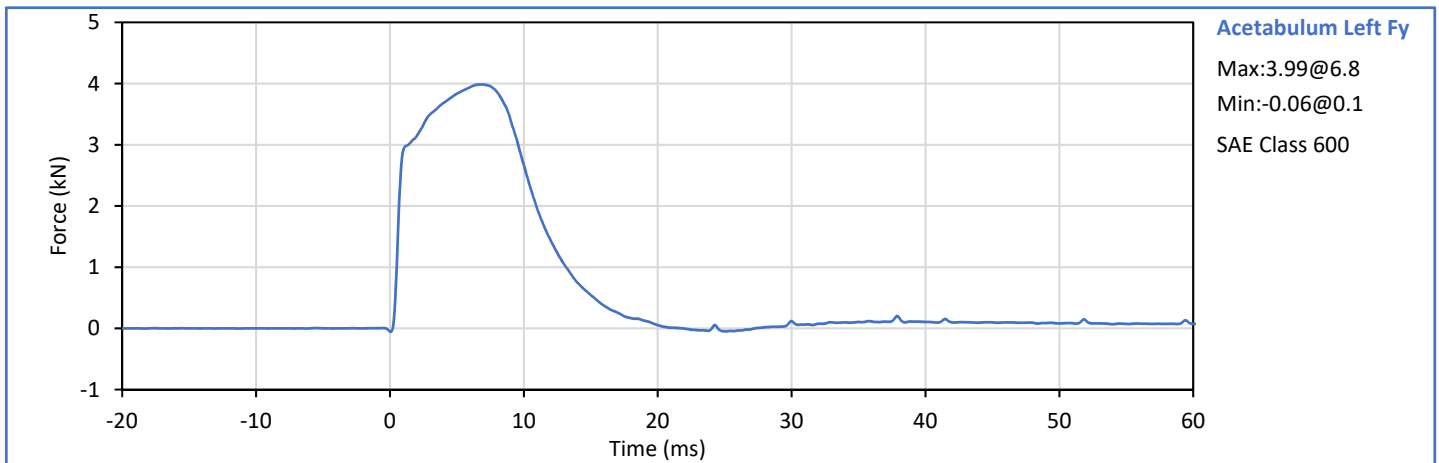
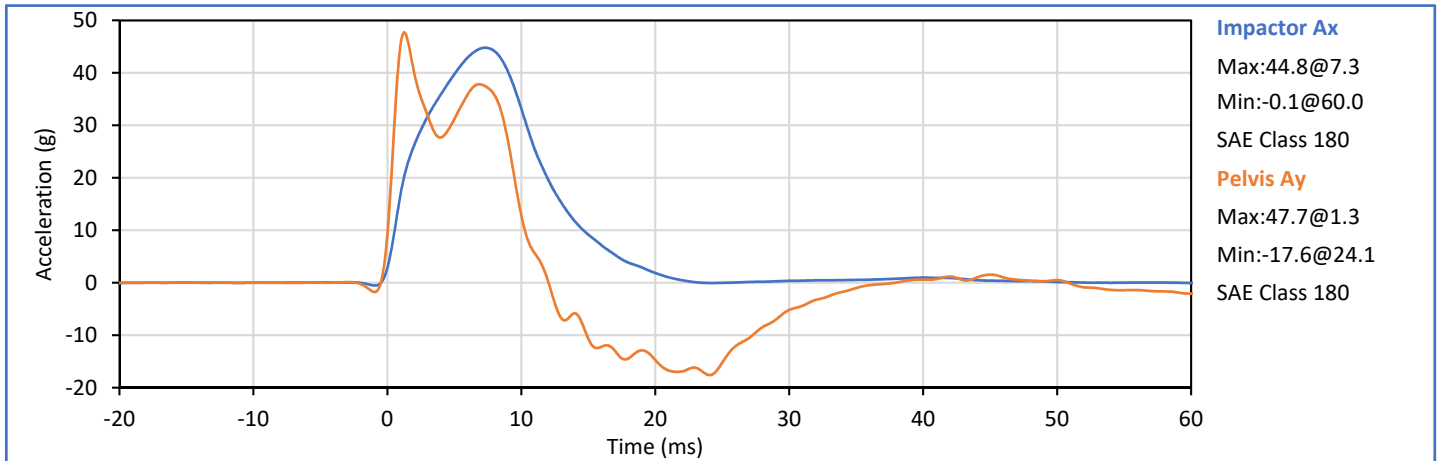


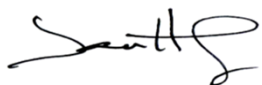
ATD Serial No.: 308


Test Date: 2018-12-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	22	Pass
Impactor Velocity	m/s	6.60	6.80	6.64	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.99	Pass
Pelvis Ay after 6ms	g	34.0	42.0	37.8	Pass
Peak Impactor Ax	g	38.0	47.0	44.8	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 11458 (SACO)



Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto



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 Info@karco.com www.karco.com

**SID-IIs Small Side Impact ATD
 Pelvis Acetabulum Impact**

ATD Serial No.: 308

Test Date: 2018-12-28

Pelvis Plug S/N: 11458 (SACO)



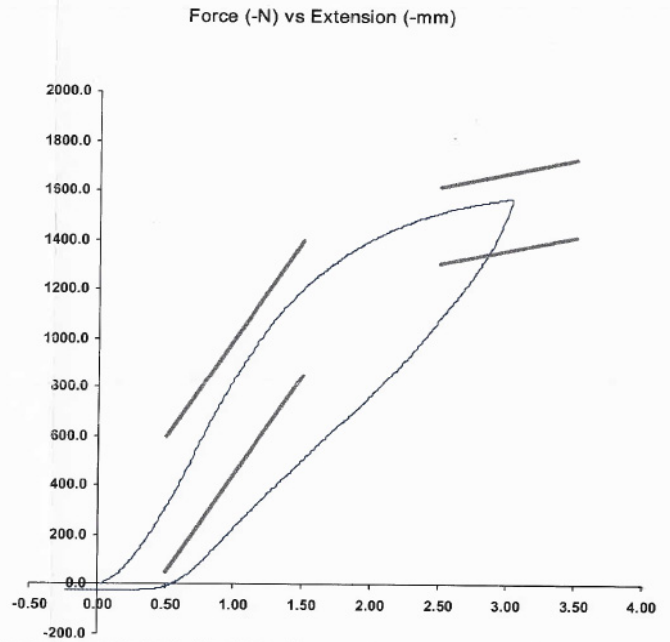
SID-IIs Pelvis Plug Certification Test

Plug S/N 11458
 Test Number 2947
 Report Number 2944
 Test Date 8/30/2016 11:17:32 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	316.20	50.00	600.00
Force @ 1.5 mm (N)	1,202.82	850.00	1,400.00
Force @ 2.5 mm (N)	1,511.97	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,567.40	1,361.00	1,673.00

Testing Machine STM-20 5965542
 Load Cell S/N (TI240813), Units (LBS) 1000
 Crosshead Speed (mm / min) or Rate 12.7
 Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator DC
 Part Number 180-4450

Template No 107 30-Aug-16
 SACO Research

By: DC Date: 8/30/16

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



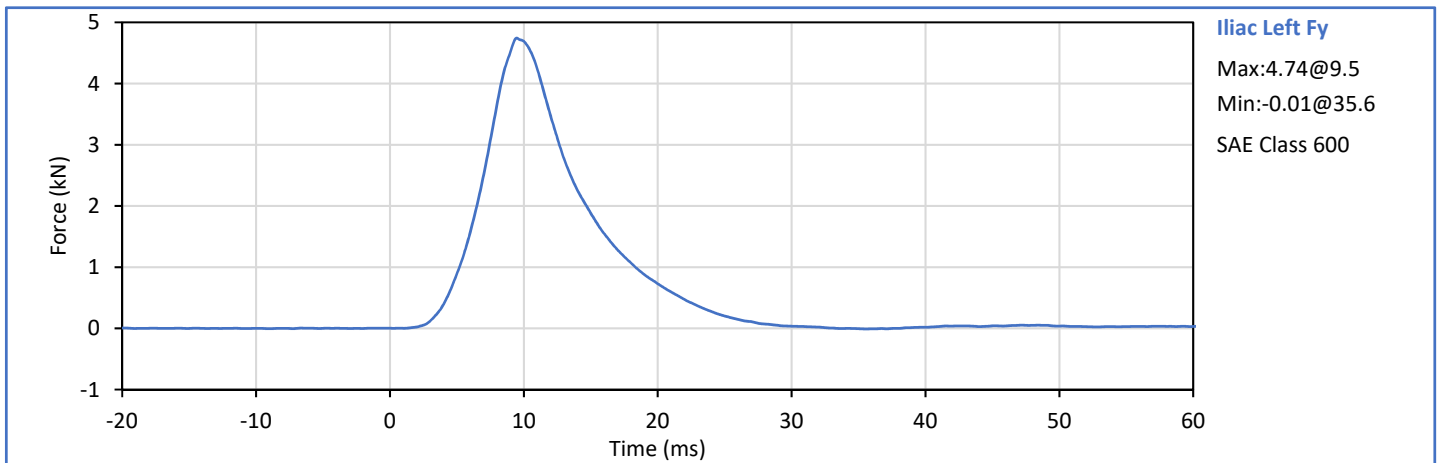
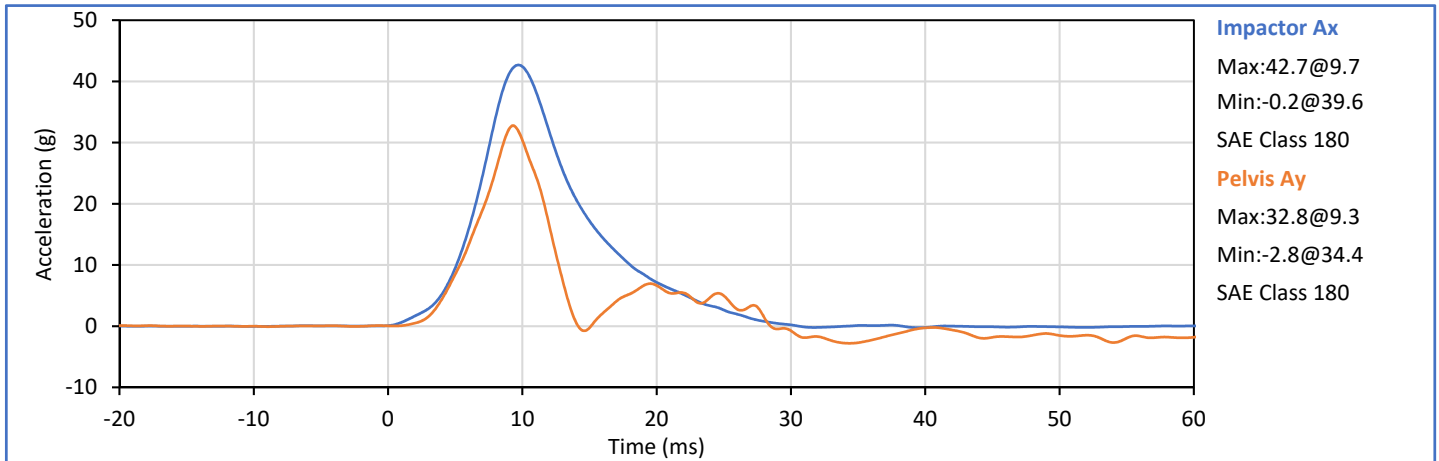
ATD Serial No.: 308

Test Date: 2018-12-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	20	Pass
Impactor Velocity	m/s	4.20	4.40	4.37	Pass
Peak Iliac Fy	kN	4.10	5.10	4.74	Pass
Pelvis Ay after 6ms	g	28.0	39.0	32.8	Pass
Peak Impactor Ax	g	36.0	45.0	42.7	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified



Technician:
 J. Hernandez

Approved By:
 P. Puzzuto

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Position: Driver
 ATD Type: ES-2re
 ATD S\N: F035

Table 1 - Driver ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Last Cal
Head Acceleration X Primary	P58760	Endevco	7264C-2k	2018-07-25
Head Acceleration Y Primary	P58763	Endevco	7264C-2k	2018-07-25
Head Acceleration Z Primary	P52093	Endevco	7264C-2k	2018-07-25
Head Acceleration X Redundant	P52072	Endevco	7264C-2k	2018-07-25
Head Acceleration Y Redundant	P58768	Endevco	7264C-2k	2018-07-25
Head Acceleration Z Redundant	P52074	Endevco	7264C-2k	2018-07-25
Upper Thorax Rib Deflection Y	180 (ES-2 Rib)	Honeywell	F38000203	2018-07-24
Middle Thorax Rib Deflection Y	177 (ES-2 Rib)	Honeywell	F38000203	2018-07-24
Lower Thorax Rib Deflection Y	186 (ES-2 Rib)	Honeywell	F38000203	2018-07-24
Anterior Abdominal Force Y	1504 Fy	R.A. Denton	2631J	2018-10-11
Middle Abdominal Force Y	1505 Fy	R.A. Denton	2631J	2018-10-11
Posterior Abdominal Force Y	1506 Fy	R.A. Denton	2631J	2018-10-11
Lower Spine T12 Acceleration X	P45011	Endevco	7264C-2k	2018-07-25
Lower Spine T12 Acceleration Y	P58992	Endevco	7264C-2k	2018-07-25
Lower Spine T12 Acceleration Z	P51700	Endevco	7264C-2k	2018-07-25
Pubic Symphysis Force Y	DG6784 Fy	FTSS	IF-556	2018-10-11

Position: Rear Pass.
 ATD Type: SID-IIs
 ATD S\N: 308

Table 2a - Passenger ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Last Cal
Head Acceleration X Primary	P63980	Endevco	7264C-2k	2018-09-14
Head Acceleration Y Primary	P58861	Endevco	7264C-2k	2018-09-14
Head Acceleration Z Primary	P51261	Endevco	7264C-2k	2018-09-14
Head Acceleration X Redundant	P58808	Endevco	7264C-2k	2018-09-14
Head Acceleration Y Redundant	P63310	Endevco	7264C-2k	2018-09-14
Head Acceleration Z Redundant	P49189	Endevco	7264C-2k	2018-09-14
Upper Thorax Rib Deflection Y	1172	Servo	08TCI-3725	2018-09-13
Middle Thorax Rib Deflection Y	1219	Servo	08TCI-3725	2018-09-13
Lower Thorax Rib Deflection Y	1221	Servo	08TCI-3725	2018-09-13
Upper Abdomen Rib Deflection Y	1252	Servo	08TCI-3725	2018-09-13
Lower Abdomen Rib Deflection Y	1283	Servo	08TCI-3725	2018-09-13
Lower Spine T12 Acceleration X	P52108	Endevco	7264C-2k	2018-09-14
Lower Spine T12 Acceleration Y	P63970	Endevco	7264C-2k	2018-09-14
Lower Spine T12 Acceleration Z	P51712	Endevco	7264C-2k	2018-09-14
Iliac Wing Impact Side Force Y	284 Fy (Iliac)	R.A. Denton	3228J	2018-06-21
Acetabulum Impact Side Force Y	272 Fy (Acetabulum)	R.A. Denton	3249J	2018-06-21

Table 1b - Passenger ATD Optional Instrumentation (Research Data Only)

Sensor Location	Sensor S\N	Mfr	Model	Last Cal
Head Rotation Rate X	ARS7498	DTS	ARS PRO-8k (2000Hz)	2017-08-10
Head Rotation Rate Y	ARS7367	DTS	ARS PRO-8k (2000Hz)	2017-08-10
Head Rotation Rate Z	ARS7377	DTS	ARS PRO-8k (2000Hz)	2017-08-10

Table 3 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Last Cal
Vehicle CG Ax	10396	Endevco	757F-2k	09-04-2018
Vehicle CG Ay	10432	Endevco	757F-2k	09-04-2018
Vehicle CG Az	10431	Endevco	757F-2k	09-04-2018
Right Side Sill at Front Seat Ax	10089	Endevco	757F-2k	2018-02-12
Right Side Sill at Front Seat Ay	10247	Endevco	757F-2k	2018-03-08
Right Side Sill at Front Seat Az	10103	Endevco	757F-2k	2018-02-21
Right Side Sill at Rear Seat Ax	A254881	MSI	52F-2000	2018-06-19
Right Side Sill at Rear Seat Ay	A254883	MSI	52F-2000	2018-06-18
Right Side Sill at Rear Seat Az	A254887	MSI	52F-2000	2018-06-18
Left Side Sill at Front Seat Ay	A227260	MSI	52F-2000	2018-09-17
Left Side Sill at Rear Seat Ay	A148256	MSI	52F-2000	2018-09-26
Left Lower A-Pillar Ay	10244	Endevco	757F-2k	2018-03-08
Left Middle A-Pillar Ay	10099	Endevco	757F-2k	2018-02-21
Left Lower B-Pillar Ay	10408	Endevco	757F-2k	09-04-2018
Left Middle B-Pillar Ay	10087	Endevco	757F-2k	2018-02-12
Driver Seat Track at H-Point Ay	10242	Endevco	757F-2k	2018-03-08
Rear Seat Structure Ay	A248840	MSI	52F-2000	2018-09-15
Right Rear Occupant Comp. Ay	10117	Endevco	757F-2k	2018-02-12
Engine Block Top Ax	A185596	MSI	52F-2000	2018-09-18
Engine Block Top Ay	A226930	MSI	52F-2000	2018-09-26
Rear Floopan Above Axle Ax	10406	Endevco	757F-2k	09-05-2018
Rear Floopan Above Axle Ay	10392	Endevco	757F-2k	09-05-2018
Rear Floopan Above Axle Az	10435	Endevco	757F-2k	09-04-2018

Table 4 - Moving Deformable Barrier (MDB) Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Last Cal
MDB CG Ax	A217449	MSI	52F-2000	2018-09-17
MDB CG Ay	A224545	MSI	52F-2000	2018-09-25
MDB CG Az	A224490	MSI	52F-2000	2018-09-17
MDB Left Side at Rear Axle Ax	A224516	MSI	52F-2000	2018-09-21
MDB Left Side at Rear Axle Ay	A160734	MSI	52F-2000	2018-11-28