

REPORT NUMBER: SINCAP-MGA-2015-043

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

**MAZDA MOTOR CORPORATION
2015 Mazda CX-9 Sport SUV
NHTSA No.: M20155401**

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



Test Date: December 12, 2014

Final Report Date: February 18, 2015

FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NVS-111
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590**

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Approval Date: February 18, 2015

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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15. Supplementary Notes																																																							
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the 2015 Mazda CX-9 Sport SUV in accordance with the specifications of the Office of Crashworthiness Standards NCAP Side Laboratory Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on December 12, 2014. The impact velocity of the Moving Deformable Barrier (MDB) was 62.1 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.6° C. The target vehicle post-test maximum crush was 274 mm at level 3. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="4">Driver ATD (ES-2re)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>131</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>15</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>952</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>2022</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="4">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>249</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>Gs</td> <td>82</td> <td>43</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>3628</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38*</td> <td>20</td> </tr> <tr> <td>Maximum Abdomen Rib Deflection</td> <td>mm</td> <td>45*</td> <td>24</td> </tr> </tbody> </table> *Proposed IARV The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.				Driver ATD (ES-2re)				Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	131	Maximum Thorax Rib Deflection	mm	44	15	Total Abdominal Force	N	2500	952	Pubic Symphysis Force	N	6000	2022	Passenger ATD (SID-IIs)				Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	249	Resultant Lower Spine Acceleration	Gs	82	43	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3628	Maximum Thoracic Rib Deflection	mm	38*	20	Maximum Abdomen Rib Deflection	mm	45*	24
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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2015 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-09-D-00124. The purpose of this test is to generate comparative side impact performance in a 2015 Mazda CX-9 Sport SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated September 2013.

SECTION 2 SUMMARY OF TEST RESULTS

A 2015 Mazda CX-9 Sport SUV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.1 km/h. The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by MGA Research Corporation in Burlington, Wisconsin on December 12, 2014. Pre-test and post-test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS NCAP Side Laboratory Test Procedure dated September 2013. The side impact event was documented by eleven (11) cameras. Camera locations are included in this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

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

PASSENGER ATD (SID-IIs)

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

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

Dummy Injury readings were recorded as follows:

DUMMY INJURY VALUES

	Driver ATD (ES-2re)		
Measurement Description	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	131
Maximum Thorax Rib Deflection	mm	44	15
Total Abdominal Force	N	2500	952
Pubic Symphysis Force	N	6000	2022

	Passenger ATD (SID-IIs)		
Measurement Description	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	249
Resultant Lower Spine Acceleration	Gs	82	43
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3628
Maximum Thoracic Rib Deflection	mm	38*	20
Maximum Abdomen Rib Deflection	mm	45*	24

*Proposed IARV

Supplemental restraint information is given below:

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

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

GENERAL COMMENTS

Left Front Sill Y has no valid data after 3 ms.

Left Rear Sill Y has no valid data after 5 ms.

Left Lower B-Post Y has no valid data after 18 ms.

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

SECTION 3
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20155401	Traction Control System (TCS)	Yes
Model Year	2015	Auto-Leveling System	No
Make	Mazda	Automatic Door Locks (ADL)	Yes
Model	CX-9	Power Window Auto-Reverse	Yes
Body Style	SUV	Other Optional Feature	N/A
VIN	JM3TB2BAXF0447704	Driver Front Airbag	Yes
Body Color	Blue Reflex Mica	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	212 / 132	Driver Head/Torso Airbag	No
Engine Displacement (L)	3.7	Driver Torso Airbag	No
Type/No. Cylinders	6	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Lateral	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	No
Transmission Speeds	6	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	Front	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	No
Sunroof/T-Top	No	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	No
Power Seats	Driver Only	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	No
		Other Restraint Feature	N/A

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

Manufactured By	Mazda Motor Corporation	GVWR (kg)	2645
Date of Manufacture	08/14	GAWR Front (kg)	1276
Vehicle Type	MPV	GAWR Rear (kg)	1400

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	2	7	
Capacity Weight (VCW) (kg)				539	(A)
DSC x 68.04 kg				476	(B)
Rated Cargo and Luggage Weight (RCLW)				63	(A-B)

VEHICLE SEAT TYPE

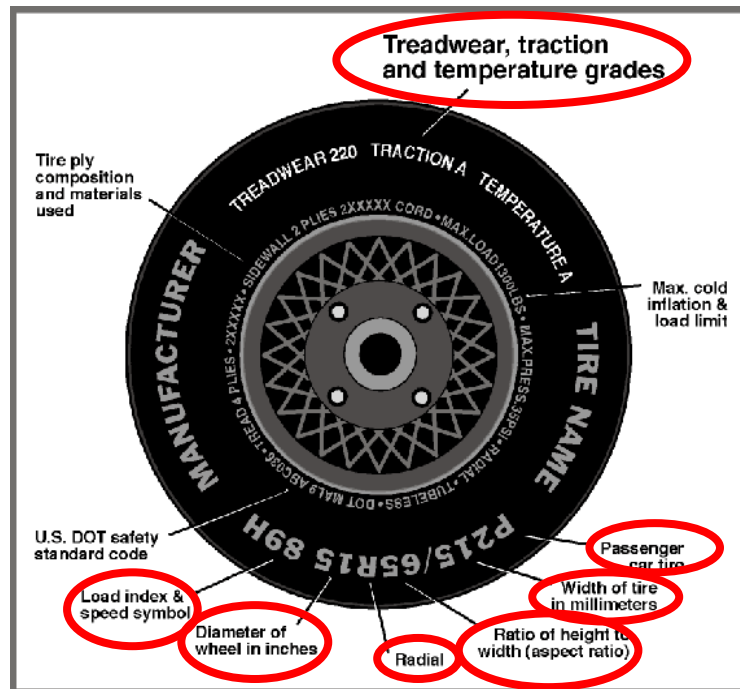
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X					w/lever	Driver only
Rear or Second Row			X			w/lever	
Third Row Seat			X		X		

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	250	250
Recommended Tire Size	P245/60R18	P245/60R18
Tire Size on Vehicle	P245/60R18	P245/60R18
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Dueler H/L 400	Dueler H/L 400
Treadwear	300	300
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	104H	104H
Tire Material	Rubber	Rubber
DOT Safety Code Left	H4L2 DEC 3114	H4L2 DEC 3114
DOT Safety Code Right	H4L2 DEC 3114	H4L2 DEC 3114

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014

TEST PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	272	272	276	276
Tire Placard	kPa	250	250	250	250
Owner's Manual	kPa				
As Tested	kPa	250	250	250	250

MDB TIRE SPECIFICATIONS

	Requirement	Units	LF	RF	LR	RR
Tire Size	P205/75R15	N/A	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	200 ± 21	kPa	200	200	200	200

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	556.5	413.5		605.0	491.0		597.0	500.0	
Right	kg	543.5	398.0		551.5	449.0		545.5	460.5	
Ratio	%	57.5	42.5		55.2	44.8		54.3	45.7	
Totals	kg	1100.0	811.5	1911.5	1156.5	940.0	2096.5	1142.5	960.5	2103.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1911.5	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	63	(C)
Calculated Test Vehicle Target Weight (TVTW)	kg	2103.8	(A+B+C)

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

TEST VEHICLE ATTITUDES AND CG

	Units	Fully Loaded	As Tested	Meets Requirement***
Left Front	mm	817	810	Yes
Right Front	mm	830	826	Yes
Right Rear	mm	828	826	Yes
Left Rear	mm	812	821	Yes
Vehicle CG (Aft of Front Axle)	mm	1313	1289	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	35	37	

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

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
Test Date: 12/12/2014

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Weight of Ballast, if any	18.1
None	0.0

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014

SEAT POSITIONING

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	26.2	11.4	18.8
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCR Height (mm)	SCR Height Position	SCR Height (mm)		
				Rear- most	Mid- Fore/Aft	Forward- Most
Driver Seat	18.8	0	Max	46	46	46
			Mid	23	23	23
			Min	0	0	0
Front Passenger Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

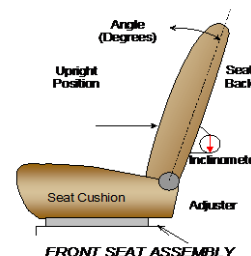
NHTSA No. M20155401
 Test Date: 12/12/2014

SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-most Position	
	mm	Detents	mm	Detent
Driver Seat	264		132	
Front Passenger Seat	260	27 (1 st as 1)	120	12 th (1 st as 0)
Front Center Seat				
Struck Side Rear Seat	120	3 (1 st as 1)	120	2 nd (1 st as 0)
Non-Struck Side	120	3 (1 st as 1)	120	2 nd (1 st as 0)
Rear Center Seat	120	3 (1 st as 1)	120	2 nd (1 st as 0)

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is adjusted following Appendix C, "Positioning Dummies in the Test Vehicle" in the NCAP Laboratory Test Procedure dated September 2013. The rear center and non-struck side rear outboard seat backs are positioned to match the struck side rear seat back.



Seat	Total Seat Back Angle Range		Test Position from Vertical	
	Degrees	Detents	Degrees	Detent
Driver Seat w/Seated Dummy	86.5		15.2	
Front Passenger Seat	67.8	35 (1 st as 1)	14.9	8 th (1 st as 0)
Front Center Seat				
Struck Side Rear Seat	9.4	6 (1 st as 1)	10.3	0 th (1 st as 0)
Non-Struck Side Rear Seat	9.4	6 (1 st as 1)	10.3	0 th (1 st as 0)
Rear Center Seat	9.4	6 (1 st as 1)	10.3	0 th (1 st as 0)

Seat back angles measured on headrest post.

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014

SEAT BELT ANCHORAGE ADJUSTMENT

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

	Total # of Positions	Placed in Position #
Driver Seat	4 detents (1 st as 1)	0 th (uppermost as 0)
Rear Seat	Fixed	Not Applicable

HEAD RESTRAINT ADJUSTMENT

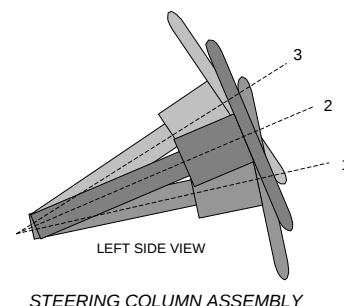
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	4	Highest
Rear Seat	4	Lowest

STEERING COLUMN ADJUSTMENT

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

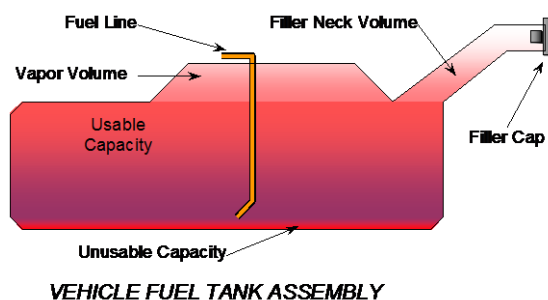
	Degrees	Fore/Aft Position (mm)
Lowermost, Position 1	65.4	320
Geometric Center, Position 2	62.7	295
Uppermost, Position 3	60.0	270
Telescoping Steering Wheel Travel		50
Test Position	62.7	295



FUEL PUMP

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

The vehicle is equipped with an electric fuel pump.
The fuel pump operates when starter or engine is activated.
The fuel pipe is on the left side.



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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014

FUEL TANK CAPACITY DATA

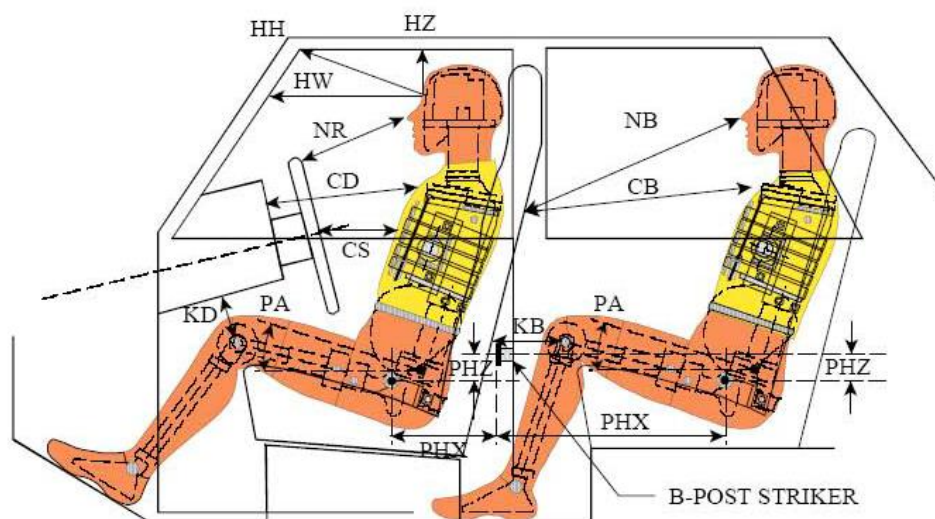
	Liters
Usable Capacity of "Standard" Tank (see Form No. 1)	76.1
Usable Capacity of "Optional" Tank (see Form No. 1)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	76.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	70.8
Actual Amount of Solvent Used	70.8
1/3 of Usable Capacity	25.4

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

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Mazda CX-9 Sport SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
Test Date: 12/12/2014



LEFT SIDE VIEW

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

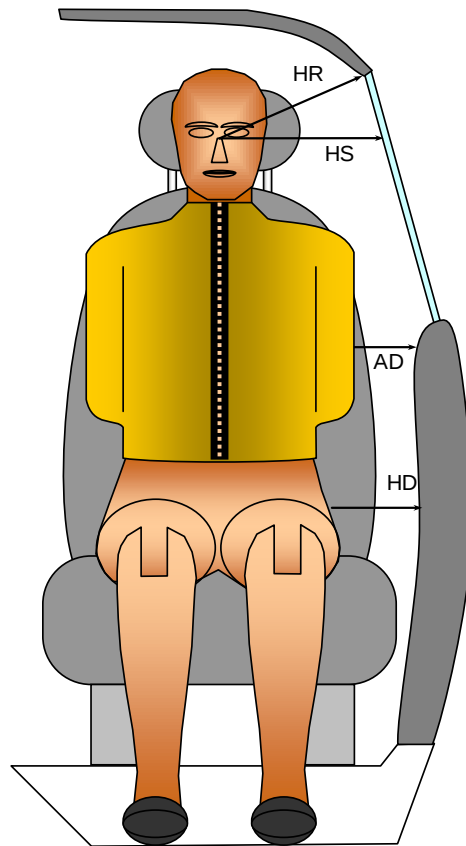
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	389	17.6		
HW		Head to Windshield	670			
HZ	HZ	Head to Roof Liner	175		303	
NR	NB	Nose to Rim/Seat Back	476	18.5	551	10.0
CD	CB	Chest to Dashboard/Seat Back	603	9.3	550	12.4
CS		Chest to Steering Wheel	365	3.9		
KDL	KBL	Left Knee to Dash/Seat Back	160	10.8	300	5.7
KDR	KBR	Right Knee to Dash/Seat Back	149	11.5	302	4.9
PAX	PAX	Pelvic Tilt Angle X		20.4		23.9
	PAY	Pelvic Tilt Angle Y		-0.6		-0.6
PHX	PHX	Hip Point to Striker (X-Axis)	257		417	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	122		196	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014



FRONT VIEW OF DUMMY

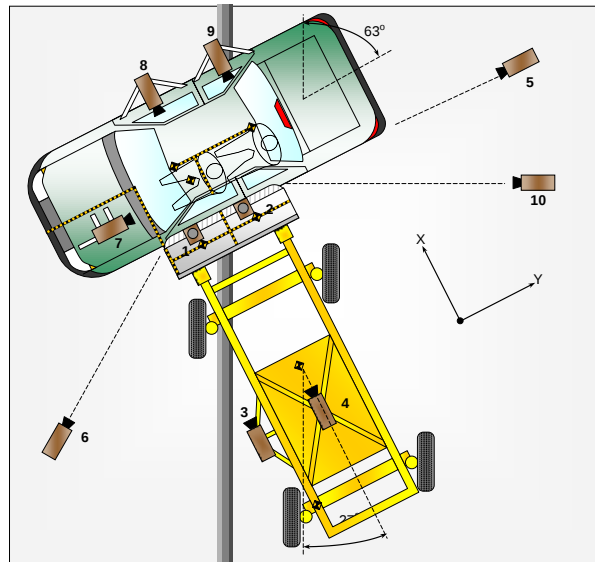
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	211	274
HS	Head to Side Window	mm	354	390
AD	Arm to Door	mm	130	179
HD	Hip Point to Door	mm	191	190

DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2015 Mazda CX-9 Sport SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
Test Date: 12/12/2014



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X*	Y*	Z*		
1	Overhead Overall	-120	190	-5050	14	1000
2	Overhead Close-Up	40	20	-5050	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	30	5090	-1080	24	1000
6	Left Front	4190	-4390	-1080	24	1000
7	Driver Front (OB)				16	1000
8	Driver Side (OB)				8	1000
9	Passenger Side (OB)				8	1000
10	Real Time Left Rear					30
11	Real Time Inrun					30

Reference: Impact Point projected to Ground; +X = To Front of MDB, +Y = To Right of MDB, +Z = Down

* All measurements accurate to ± 6 mm

Explain why camera(s) did not operate as intended: None

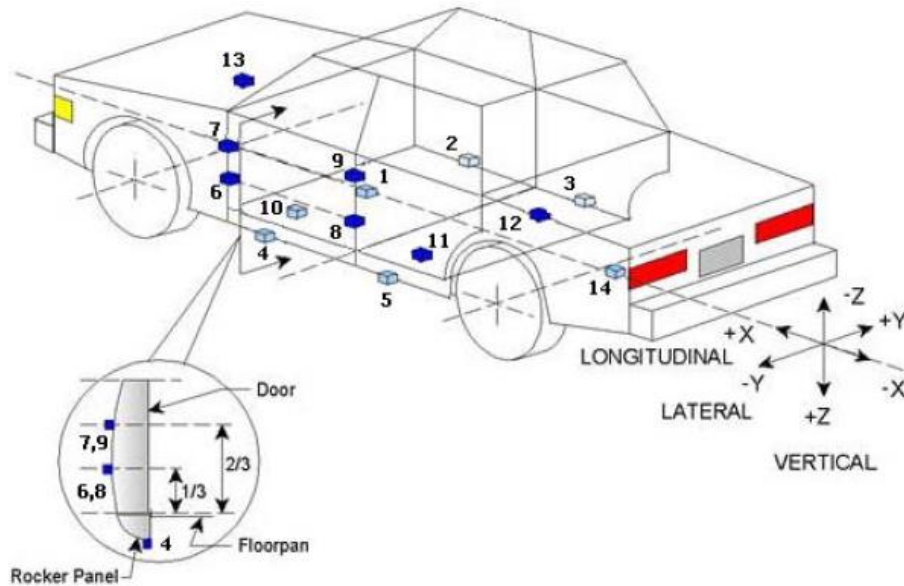
INSTRUMENTATION

	Number of Channels
Driver Dummy	16
Passenger Dummy	16
Vehicle Structure	23
MDB Accelerometers	5
MDB Contacts	2
Total	62

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014



TEST VEHICLE ACCELEROMETER LOCATIONS

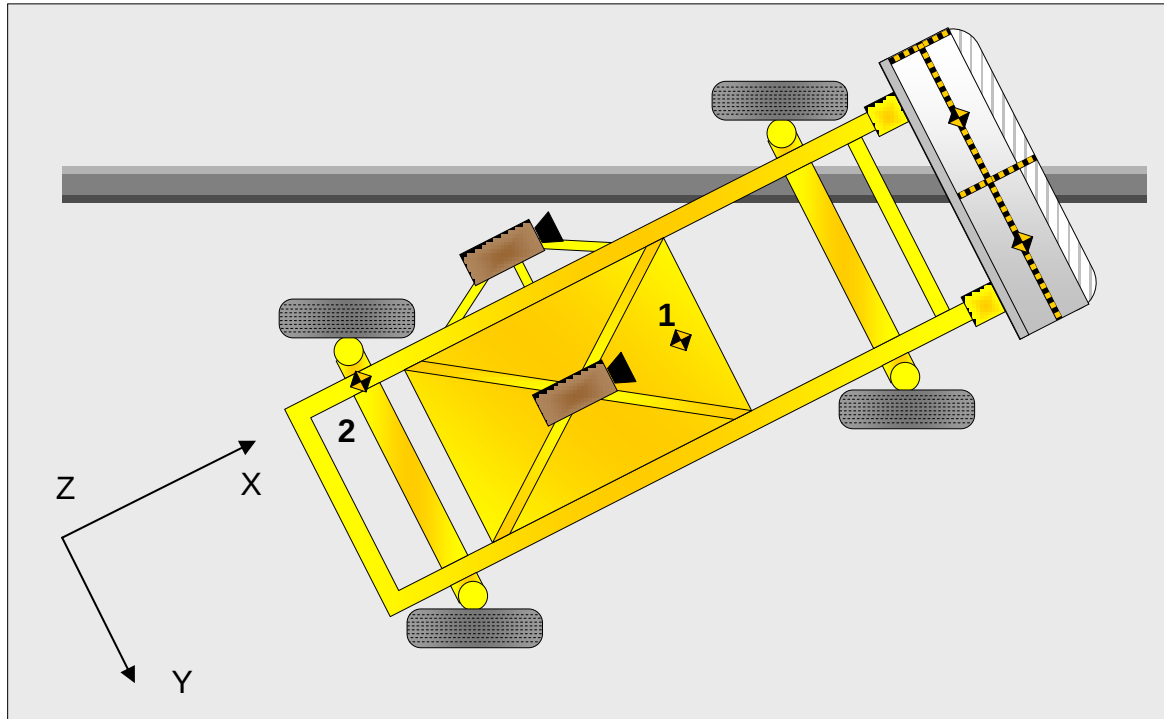
Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2807	0	-480
2	Right Sill at Front Seat	2554	727	-285
3	Right Sill at Rear Seat	1561	731	-285
4	Left Sill at Front Door	2895	-728	-273
5	Left Sill at Rear Door	1796	-730	-275
6	Left Lower A-Post	3421	-870	-656
7	Left Middle A-Post	3400	-865	-880
8	Left Lower B-Post	2321	-766	-755
9	Left Middle B-Post	2255	-724	-976
10	Front Seat Track	2565	-370	-428
11	Rear Seat Structure	2072	-277	-463
12	Rt. Rear Occ. Compartment	2058	314	-495
13	Engine Block	4296	0	-845
14	Rear Above Axle	728	0	-590

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: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	MDB CG	-1105	0	-330
2	MDB Rear	-2580	-650	-625

Reference: X - MDB Face (+ forward)
 Y - MDB Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2015 Mazda CX-9 Sport SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
Test Date: 12/12/2014

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	None	Curtain Airbag, Center Headrest
Top of Head	Curtain Airbag, Headliner	Curtain Airbag, Center Headrest
Left Side of Head	Curtain Airbag, Headliner	Curtain Airbag
Back of Head	Curtain Airbag	Curtain Airbag, Center Headrest
Left Shoulder	Curtain Airbag	Door Panel
Upper Torso	Side Airbag, Seatback	None
Lower Torso	Side Airbag, Seatback	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 Door
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge Systems Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Record Width of Opening at Striker (mm)	N/A	N/A	N/A	N/A	N/A

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

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

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
Test Date: 12/12/2014

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2875
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		498
Actual Impact Point (Aft of Front Axle)	mm		507
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	-9
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	+7

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2015 Mazda CX-9 Sport SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
Test Date: 12/12/2014

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1251
Overall Length Including Honeycomb Face	4115
Wheelbase of Framework Carriage	2595
CG Location aft of Front Axle	1134

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	390.0	300.1	
Right	kg	376.8	294.7	
Ratio	%	56.3	43.7	
Totals	kg	766.8	594.8	1361.6

SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.1
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.3
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 to 28	27.0

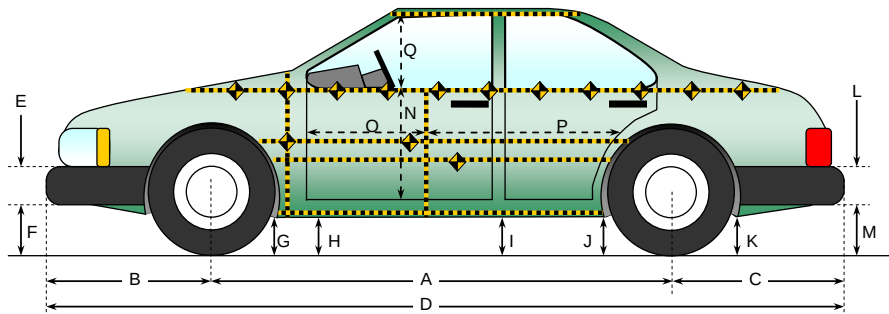
MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Right	254
B	Top of Bumper	533	800	Right	139
C	Mid-Level	686	800	Left	101
D	Top of Stack	813	800	Left	113

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014



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

LEFT SIDE VIEW

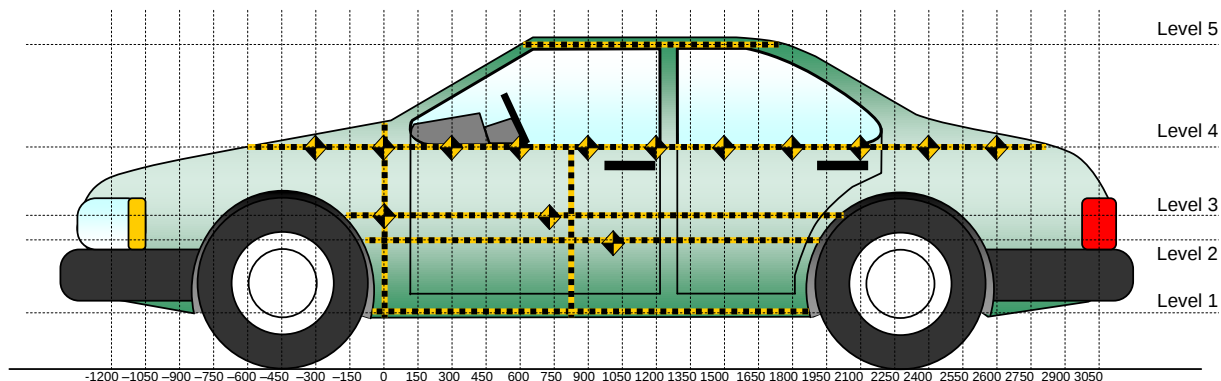
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2875	2863	12
B	Front Axle to FSOV	1091	1098	-7
C	Rear Axle to RSOV	1130	1133	-3
D	Total Length at Centerline	5096	5094	2
E	Front Bumper Thickness	112	112	0
F	Front Bumper Bottom to Ground	257	251	6
G	Sill Height at Front Wheel Well	234	239	-5
H	Sill Height at Front Door Leading Edge	235	239	-4
I	Sill Height at B Pillar	243	240	3
J1	Sill Height at Rear Wheel Well	250	255	-5
J2	Pinch Weld Height at Rear Wheel Well	246	250	-4
K	Sill Height Aft of Rear Wheel Well	286	292	-6
L	Rear Bumper Thickness	112	112	0
M	Rear Bumper Bottom to Ground	355	365	-10
N	Sill Height to Window Bottom Sill	962	790	172
O	Front Door Leading Edge to Impact CL	830	755	75
P	Rear Door Trailing Edge to Impact CL	1175	1106	69
Q	Front Window Opening	466	457	9
R	Right Side Length	3980	3980	0
S	Left Side Length	3980	3966	14
T	Vehicle Width at B Post	1922	1848	74

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014



All Measurements Shown in mm

LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	411	186	450
2	Mid Door	694	266	900
3	Occupant Hip Point	718	274	900
4	Window Sill	1114	107	1200
5	Window Top	1615	25	1350

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

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014

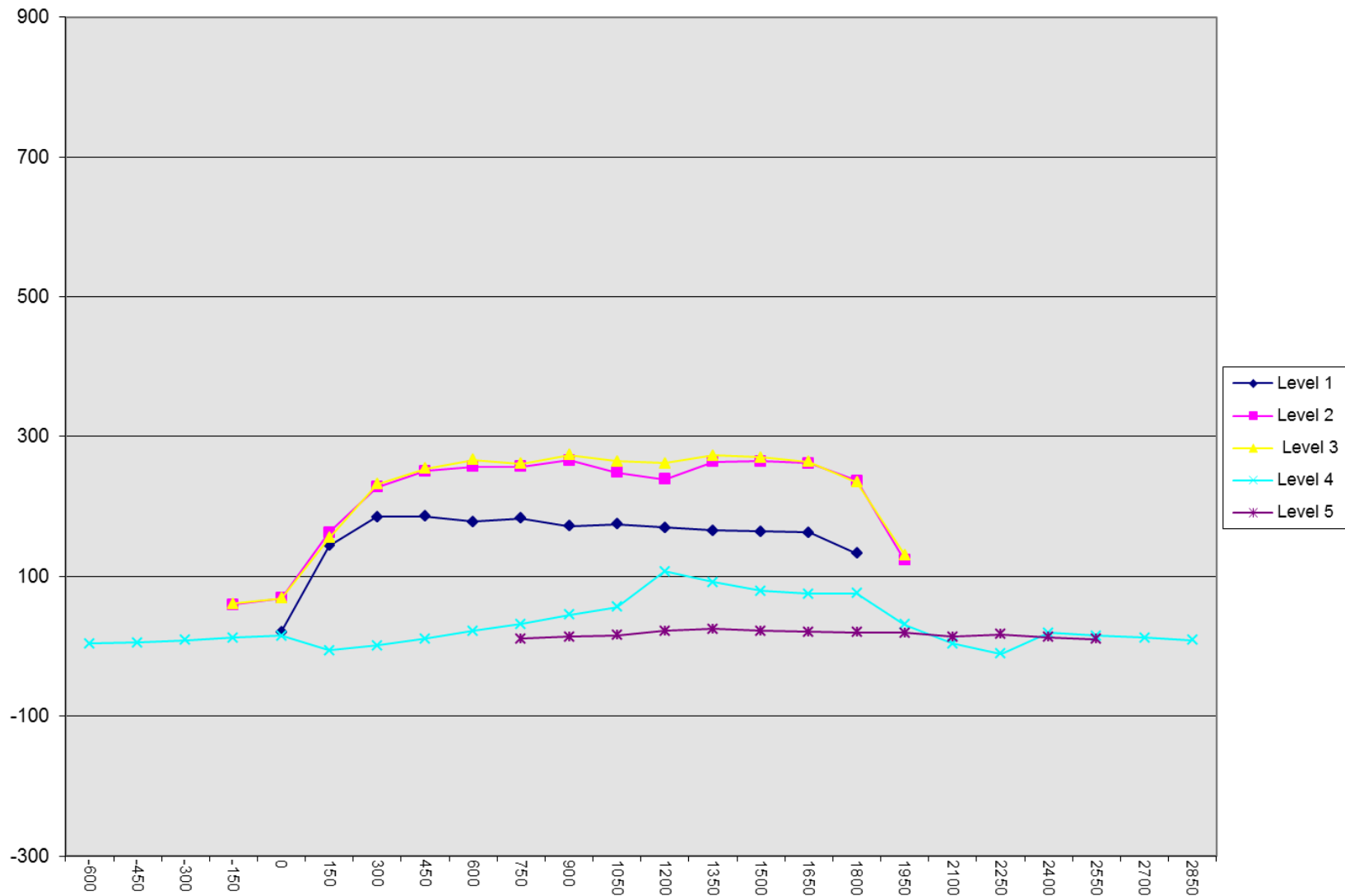
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-600				331					335					4	
-450				305					310					5	
-300				278					287					9	
-150		136	134	262			196	195	274			60	61	12	
0	161	141	140	248		182	210	209	263		21	69	69	15	
150	157	147	146	240		301	310	301	234		144	163	155	-6	
300	155	145	144	230		340	373	376	231		185	228	232	1	
450	154	144	142	221		340	395	396	232		186	251	254	11	
600	155	144	141	215		333	401	408	237		178	257	267	22	
750	154	143	141	210	464	337	400	402	242	475	183	257	261	32	11
900	155	143	142	205	458	327	409	416	250	472	172	266	274	45	14
1050	156	145	142	201	456	331	394	407	257	472	175	249	265	56	16
1200	158	146	143	197	453	328	385	405	304	475	170	239	262	107	22
1350	159	146	144	194	450	325	410	417	286	475	166	264	273	92	25
1500	160	147	145	191	452	324	412	415	270	474	164	265	270	79	22
1650	161	148	146	188	452	324	410	410	263	473	163	262	264	75	21
1800	162	148	147	184	452	295	385	382	260	472	133	237	235	76	20
1950		140	139	182	455		263	270	213	474		123	131	31	19
2100				183	461				187	475				4	14
2250				183	465				172	482				-11	17
2400				186	473				205	486				19	13
2550				190	484				205	494				15	10
2700				195					207					12	
2850				203					212					9	

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

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
Test Program: NCAP Side MDB Impact Test

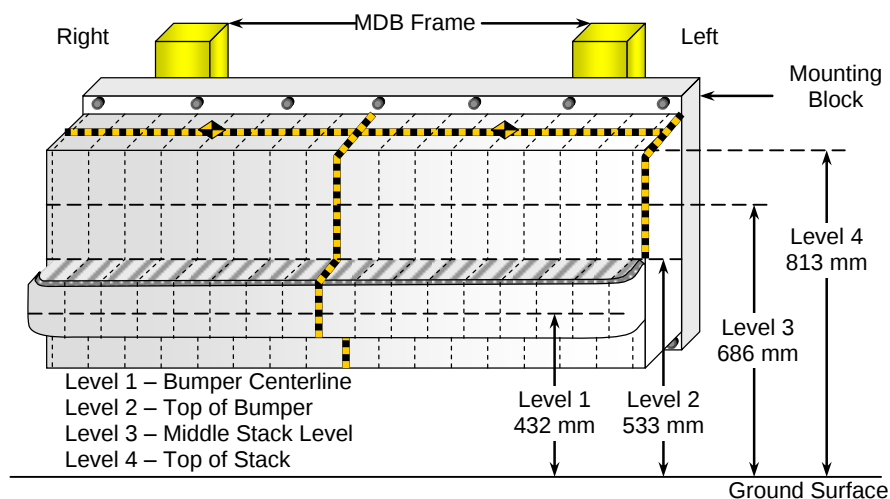
NHTSA No. M20155401
Test Date: 12/12/2014



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014



FRONT VIEW

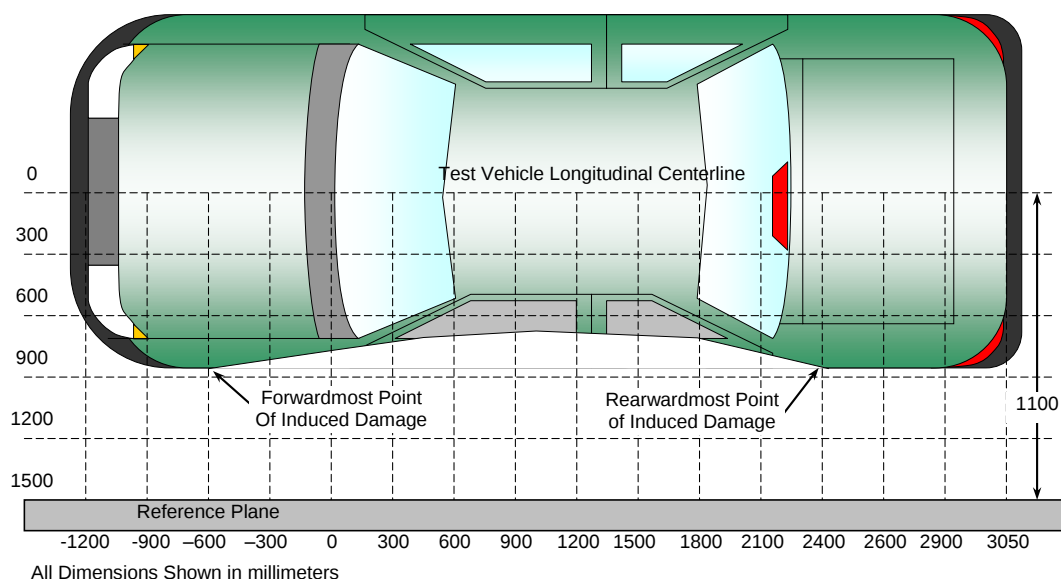
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C _L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
4	103	73	74	43	43	53	63	70	62	53	56	66	73	83	86	94	113
3	95	73	53	46	45	47	69	66	53	39	31	30	33	39	48	67	101
2	139	130	121	115	110	105	103	103	99	101	102	100	100	98	96	95	113
1	254	246	243	240	238	237	228	230	227	228	224	227	216	217	216	214	212

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014



TOP VIEW

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	2025	3	139	176	37
2	1620	3	145	412	267
3	1215	3	143	403	260
4	810	3	141	405	264
5	405	3	143	394	251
6	0	3	140	209	69

MDB DAMAGE PROFILE DISTANCES

DPD	Distance from Center of MDB	Level	Post-Test (mm)
1	800 mm right of center	1	254
2	480 mm right of center	1	240
3	160 mm right of center	1	229
4	160 mm left of center	1	226
5	480 mm left of center	1	217
6	800 mm left of center	1	212

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

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

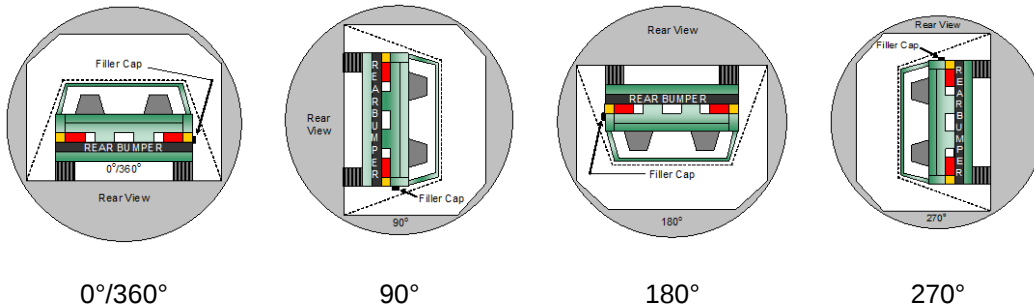
NHTSA No. M20155401
 Test Date: 12/12/2014

Test Time: 1:36 pm

Temperature: 21.6° C

- A. From impact until vehicle motion ceases: 0 oz.
 (Maximum Allowable = 1 ounce)
 B. For the 5 minute period after motion ceases: None
 (Maximum allowable = 5 ounces)
 C. For the following 25 minutes: None
 (Maximum allowable = 1 oz./minute)
 D. Spillage Details: None

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	109	300	409
90° to 180°	112	300	412
180° to 270°	107	300	407
270° to 360°	113	300	413

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

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

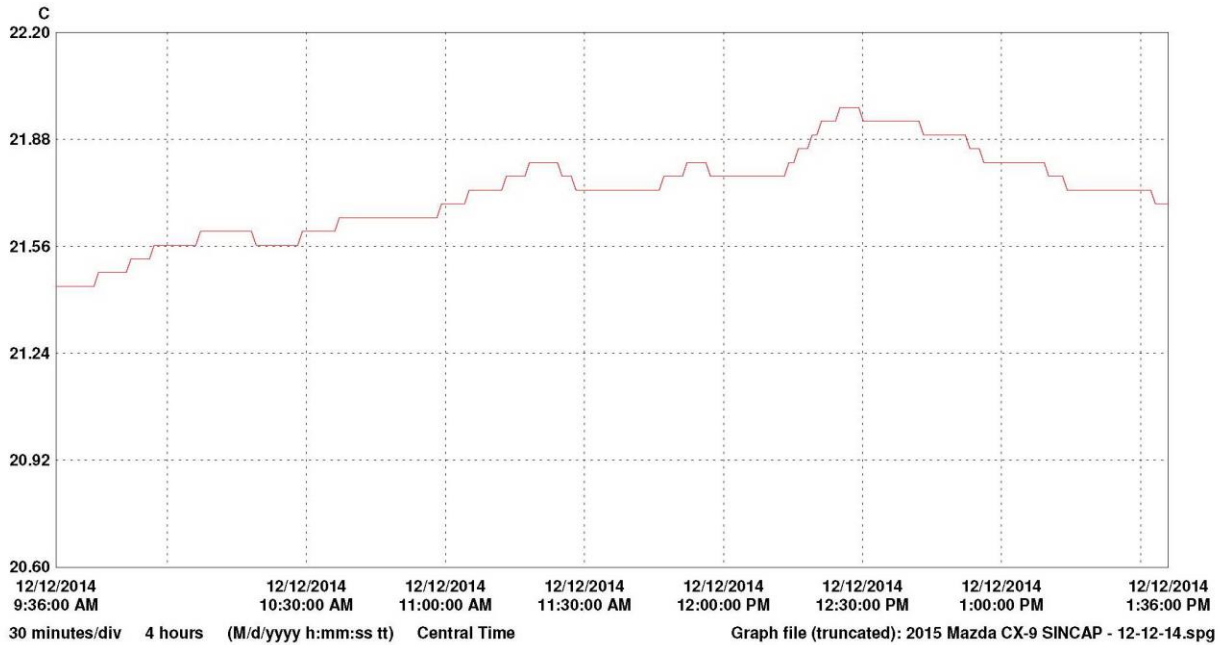
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 15 **DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA**

Test Vehicle: 2015 Mazda CX-9 Sport SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No. M20155401
 Test Date: 12/12/2014



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	04042132	MGA logger	1		21.98	21.72	21.44	C	Temperature	04042132_MGA_logger.spl
LN	Logger file			ID #	Security	Created by	Creation time			
1	C:\Program Files\Veriteq Instruments\vLog 4.4\04042132_MGA_logger.spl									