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# PERFORMANCE EVALUATION OF MISSOURI DOT DUAL-POST, U-CHANNEL SIGN SUPPORT ACCORDING TO MASH 2016

Submitted by

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<b>16. Abstract</b> The objective of this research w safety performance evaluation crite <i>Manual for Assessing Safety Hardw</i> U-channel sign support at 62.7 mp impacted the dual-post, U-channel sign (1,104-kg) small car impacted the d tests, the impact was head-on to the successful according to MASH 20 Minimal occupant compartment der manner and allowed the vehicle to U-channel sign support system met	vas to evaluate the dual-post, U-cha eria of the American Association <i>vare</i> (MASH). In test no. MOS-5 h (100.9 km/h) and an angle of 0 sign support at 63.3 mph (101.9 kr ual-post, U-channel sign support a e vehicle, with the vehicle and syst 16 criteria. None of the systems s formation occurred in all three tess continue travelling without any m all the TL-3 safety performance cr	nnel sign support sys of State Highway a a 5,026-lb (2,280-l degrees. In test no. n/h) and an angle of t 20.0 mph (32.2 km em centerlines align howed potential for ts. In each test, the ajor obstruction of t iteria of MASH 2010	stem according to the Test Level 3 (TL-3) nd Transportation Officials' (AASHTO) (xg) pickup truck impacted the dual-post, MOS-6, a 2,420-lb (1,098-kg) small car 0 degrees. In test no. MOS-7, a 2,435-lb /h) and an angle of 0 degrees. In all three ed. All three tests were determined to be penetrating the occupant compartment. system readily activated in a predictable the windshield. Therefore, the dual-post, 6.			
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#### UNCERTAINTY OF MEASUREMENT STATEMENT

The Midwest Roadside Safety Facility (MwRSF) has determined the uncertainty of measurements for several parameters involved in standard full-scale crash testing and non-standard testing of roadside safety features. Information regarding the uncertainty of measurements for critical parameters is available upon request by the sponsor and the Federal Highway Administration.

#### **INDEPENDENT APPROVING AUTHORITY**

The Independent Approving Authority (IAA) for the data contained herein was Dr. Joshua Steelman, Associate Professor in the Department of Civil and Environmental Engineering

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#### **1 INTRODUCTION**

#### **1.1 Background**

U-channel posts, as shown in Figure 1, are one of three post mounting options that the Missouri Department of Transportation (MoDOT) utilizes for temporary traffic control devices. The other two options are perforated square steel tubes and wood posts. According to MoDOT's standard plans, these posts are to be utilized with rigid sign panels, which are mounted between 5 ft and 7 ft (1.5 and 2.1 m) above the ground. For the U-channel post option, MoDOT's standard plans state that only one splice is allowed per post and that four 5/16-in. (8-mm) diameter galvanized ASTM A449 bolts, nuts, and washers are to be used in the splice connection. Two posts are required if the sign is greater than 4 ft (1.2 m) in width unless it is a diamond-shaped sign. Further, the posts should be free from any bracing and should not extend above the sign panel, except as needed for warning light attachments. MoDOT desired to test the existing system as used in the field.

Limited testing of temporary, ground-mounted sign supports has been conducted according to the National Cooperative Highway Research Program (NCHRP) Report No. 350 [1] and the *Manual for Assessing Safety Hardware* (MASH) [2, 3] safety performance criteria. In test no. 474660-1-2, a single U-channel post met the MASH performance evaluation criteria when impacted with a 2270P pickup truck; in the same test, the single perforated square steel tube post failed MASH test designation no. 3-62 due to exceeding the windshield deformation threshold of 3 in. (76 mm) [4].



Figure 1. Ground-Mounted, Dual-Post, U-channel Sign System

### **1.2 Objective**

The objective of this research included an evaluation of the safety performance of a temporary, ground-mounted, dual-post, U-channel sign support system. The system was evaluated according to the Test Level 3 (TL-3) criteria of MASH 2016 [3].

#### 1.3 Scope

The research objective was achieved through the completion of several tasks. Three fullscale crash tests were conducted on the ground-mounted, dual-post, U-channel sign support system according to MASH 2016 test designation nos. 3-60, 3-61, and 3-62. Next, the full-scale vehicle crash test results were analyzed, evaluated, and documented. Conclusions and recommendations were then made pertaining to the safety performance of the ground-mounted, dual-post, U-channel sign support system.

#### **2 DESIGN DETAILS**

The sign support test installation consisted of a dual-post, U-channel sign support system, as shown in Figures 2 through 11. Photographs of the test installation are shown in Figures 12 through 15. Material specifications, mill certifications, and certificates of conformity for the system materials are shown in Appendix A.

The same system configuration was used in all three tests. Each post utilized a two-part assembly with a 3.0 lb/ft (4.5 kg/m) U-channel sign support and 3.0 lb/ft (4.5 kg/m) U-channel embedment stub attached by means of a lap splice. The lap slice consisted of four  $\frac{5}{16}$ -in. diameter by 1<sup>3</sup>/<sub>4</sub>-in. long (8-mm x 44-mm) bolts and nuts with a  $\frac{5}{16}$ -in. (8-mm) diameter plain washer under the nut and bolt head, as shown in Figures 5 and 6. The total length of the post assembly was 170 in. (4,318 mm). The posts were spaced 30 in. (762 mm) apart on center, and the stubs were embedded 36 in. (914 mm) into the ground.

This sign support system was configured with two sign panels. The larger 48-in. x 48-in. (1,219-mm x 1,219-mm) diamond-shaped sign was centered between and supported by both posts. Its orientation was 45 degrees from horizontal with its bottom corner 84 in. (2,134 mm) above the ground, as shown in Figure 5. The smaller 24-in. x 24-in. (610-mm x 610-mm) sign was centered and supported by the left post. It was oriented horizontally with its bottom edge 60 in. (1,524 mm) above the ground, as shown in Figure 5. The signs were connected to the U-channels with  $\frac{5}{16}$ -in. diameter by  $\frac{21}{2}$ -in. long (8-mm x 64-mm) bolts and nuts with a  $\frac{5}{16}$ -in. (8-mm) diameter plain washer under the nut and bolt head, as shown in Figure 5 and 6.



Figure 2. Test Installation Layout, Test No. MOS-5



Figure 3. Test Installation Layout, Test No. MOS-6



Figure 4. Test Installation Layout, Test No. MOS-7



Figure 5. Sign Assembly Overview, Test Nos. MOS-5 through MOS-7



Figure 6. Sign Assembly Details, Test Nos. MOS-5 through MOS-7



Figure 7. Post Details, Test Nos. MOS-5 through MOS-7



Figure 8. Post Details, Test Nos. MOS-5 through MOS-7



Figure 9. Sign Details, Test Nos. MOS-5 through MOS-7



Figure 10. Hardware, Test Nos. MOS-5 through MOS-7

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
a1	2	3.0 lb/ft [4.5 kg/m] U—Channel Sign Post, 132" [3,353] Long	ASTM A499 Gr. 60 Min. Yield = 60 ksi [414 Mpa]	ASTM A123	-
۵2	2	3.0 lb/ft [4.5 kg/m] Rib-Bak U-Channel Base Post, 54" [1,372] Long	ASTM A499 Gr. 60 Min. Yield = 80 ksi [552 Mpa]	ASTM A123	<u></u>
Ь1	1	48"x48"x0.08" [1219x1219x2] Sign with Reflective Sheeting	Aluminum Alloy 5052 or Similar	-	_
b2	1	24"x24"x0.08" [610x610x2] Sign with Reflective Sheeting	Aluminum Alloy 5052 or Similar	_	-
c1	14	5/16"—18 UNC [M8x1.25], 2 1/2" [70] Long Fully Threaded Hex Bolt	SAE J429 Gr. 5 or equivalent	Fe/ZN 3AN per ASTM F1941	FBX08b
c2	28	5/16" [8] Dia. Plain USS Washer	ASTM F844	ASTM A123 or A153 or B695 Class 55	FWC08a
c3	14	5/16"—18 UNC [M8x1.25] Heavy Hex Nut	SAE J995 Gr. 5 or equivalent	Fe/Zn 3AN per ASTM F1941	FNX08b

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	AA W		MoDOT U-Channel Test No. MOS-5	Signs	SHEET: 8 of 8 DATE: 6/17/2019
-	Midwest	Roadside	Bill of Materials		DRAWN BY: DJW/MKB
	Safety	Facility	DWG. NAME. MOS-5_R7	SCALE: None UNITS: in.[mm]	REV. BY: JEK/JDS/ KAL

Figure 11. Bill of Materials, Test Nos. MOS-5 through MOS-7



Figure 12. Test Installation Photographs, Test Nos. MOS-5 through MOS-7



Figure 13. Test Installation Photographs, Test Nos. MOS-5 through MOS-7



Figure 14. Test Installation Photographs, Test Nos. MOS-5 through MOS-7



Figure 15. Test Installation Photographs, U-Channel Post and Stub Splice, Test Nos. MOS-5 through MOS-7

## **3 TEST REQUIREMENTS AND EVALUATION CRITERIA**

### **3.1 Test Requirements**

Support structures, such as U-channel sign supports, must satisfy impact safety standards to be declared eligible for federal reimbursement by the Federal Highway Administration for use on the National Highway System. For new hardware, these safety standards consist of the guidelines and procedures published in MASH 2016. According to TL-3 of MASH 2016, support structures must be subjected to three full-scale vehicle crash tests, as summarized in Table 1.

	Test		Vehicle	Impact C	onditions	
Test Article	Designation No.	Test Vehicle	Weight, lb (kg)	Speed, mph (km/h)	Impact Point	Evaluation Criteria <sup>1</sup>
	3-60	1100C	2,425 (1,100)	19 (30)	CIA	B,D,F,H,I,N
Support Structures	3-61	1100C	2,425 (1,100)	62 (100)	CIA	B,D,F,H,I,N
	3-62	2270P	5,000 (2,270)	62 (100)	CIA	B,D,F,H,I,N

Table 1. MASH 2016 TL-3 Crash Test Conditions for Support Structures

<sup>1</sup> Evaluation criteria explained in Table 2.

CIA = Critical Impact Angle

Test designation nos. 3-60, 3-61, and 3-62 were conducted for the dual-post, U-channel sign support system. In each test, the system was contacted by the test vehicle at a 0-degree angle, or head-on to the vehicle, with the vehicle centerline aligned with the centerline of the system. MASH notes that the CIA should be selected to represent the highest risk for the system to fail any of the recommended evaluation criteria. Since these sign supports will not typically be installed 90 degrees from the normal direction of travel, a critical impact angle between 0 and 25 degrees is recommended. Impacting the sign systems at a 0-degree angle was believed to be the most critical in terms of maximizing the potential contact area of the sign panels with the windshield and roof.

## 3.2 Evaluation Criteria

Evaluation criteria for full-scale vehicle crash testing are based on three appraisal areas: (1) structural adequacy; (2) occupant risk; and (3) vehicle trajectory after collision. Criteria for structural adequacy are intended to evaluate the ability of the sign supports to readily activate in a predictable manner by breaking away, fracturing, or yielding. Occupant risk evaluates the degree of hazard to occupants in the impacting vehicle. Post-impact vehicle trajectory is a measure of the potential of the vehicle to result in a secondary collision with other vehicles and/or fixed objects, thereby increasing the risk of injury to the occupants of the impacting vehicle and/or other vehicles. These evaluation criteria are summarized in Table 2 and defined in greater detail in MASH 2016. The full-scale vehicle crash tests were conducted and reported in accordance with the procedures provided in MASH 2016.

In addition to the standard occupant risk measures, the Post-Impact Head Deceleration (PHD), the Theoretical Head Impact Velocity (THIV), and the Acceleration Severity Index (ASI) were determined and reported. Additional discussion on PHD, THIV and ASI is provided in MASH 2016.

Structural Adequacy	B.	The test article should readil breaking away, fracturing, or	y activate in a pred yielding.	ictable manner by		
	D.	Detached elements, fragments or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformations of, or intrusions into, the occupant compartment should not exceed limits set forth in Section 5.2.2 and Appendix E of MASH 2016.				
	F.	The vehicle should remain upright during and after collision. The maximum roll and pitch angles are not to exceed 75 degrees.				
Occupant	H.	Occupant Impact Velocity (OIV) (see Appendix A, Section A5.2.2 of MASH 2016 for calculation procedure) should satisfy the following limits:				
Risk		Occupant Impact Velocity Limits				
		Component	Preferred	Maximum		
		Longitudinal	10 ft/s (3.0 m/s)	16 ft/s (4.9 m/s)		
	I.	The Occupant Ridedown Acceleration (ORA) (see Appendix A, Section A5.2.2 of MASH 2016 for calculation procedure) should satisfy the following limits:				
		Occupant Ridedown Acceleration Limits				
		Component	Preferred	Maximum		
		Longitudinal and Lateral	15.0 g's	20.49 g's		
Post-Impact Vehicular Response	N.	Vehicle trajectory behind the test article is acceptable.				

 Table 2. MASH 2016 Evaluation Criteria for Support Structures

### **3.3 Soil Strength Requirements**

In accordance with Chapter 3 and Appendix B of MASH 2016, foundation soil strength must be verified before any full-scale crash testing can occur. During the installation of a soil dependent system, W6x16 posts are installed near the impact region utilizing the same installation procedures as the system itself. Prior to full-scale testing, a dynamic impact test must be conducted to verify a minimum dynamic soil resistance of 7.5 kips (33.4 kN) at post deflections between 5 and 20 in. (127 and 508 mm) measured at a height of 25 in. (635 mm). If dynamic testing near the

system is not desired, MASH 2016 permits a static test to be conducted instead and compared against the results of a previously established baseline test. In this situation, the soil must provide a resistance of at least 90% of the static baseline test at deflections of 5, 10, and 15 in. (127, 254, and 381 mm). Further details can be found in Appendix B of MASH 2016.

#### **4 TEST CONDITIONS**

#### 4.1 Test Facility

The Outdoor Test Site is located at the Lincoln Air Park on the northwest side of the Lincoln Municipal Airport and is approximately 5 miles (8.0 km) northwest of the University of Nebraska-Lincoln.

#### 4.2 Vehicle Tow and Guidance System

A reverse-cable tow system with a 1:2 mechanical advantage was used to propel the test vehicle. The distance traveled and the speed of the tow vehicle were one-half that of the test vehicle. The test vehicle was released from the tow cable before impact with the sign support system. A digital speedometer on the tow vehicle increased the accuracy of the test vehicle impact speed.

A vehicle guidance system developed by Hinch [5] was used to steer the test vehicle. A guide flag, attached to the left-front wheel and the guide cable, was sheared off before impact with the sign support system. The  $\frac{3}{8}$ -in. (9.5-mm) diameter guide cable was tensioned to approximately 3,500 lb (15.6 kN) and supported both laterally and vertically every 100 ft (30.5 m) by hinged stanchions. The hinged stanchions stood upright while holding up the guide cable, but as the vehicle was towed down the line, the guide flag struck and knocked each stanchion to the ground.

#### 4.3 Test Vehicles

For test no. MOS-5, a 2011 Dodge Ram 1500 crew cab pickup truck was used as the test vehicle. The curb, test inertial, and gross static vehicle weights were 5,302 lb (2,405 kg), 5,026 lb (2,280 kg), and 5,191 lb (2,355 kg), respectively. The test vehicle is shown in Figures 16 and 17, and vehicle dimensions are shown in Figure 18. Note that pre-test photographs of the vehicle's undercarriage are not available.

For test no. MOS-6, a 2009 Kia Rio small car was used as the test vehicle. The curb, test inertial, and gross static vehicle weights were 2,510 lb (1,139 kg), 2,420 lb (1,098 kg), and 2,584 lb (1,172 kg), respectively. The test vehicle is shown in Figures 19 and 20 and vehicle dimensions are shown in Figure 21.

For test no. MOS-7, a 2009 Kia Rio small car was used as the test vehicle. The curb, test inertial, and gross static vehicle weights were 2,499 lb (1,134 kg), 2,435 lb (1,104 kg), and 2,593 lb (1,176 kg), respectively. The test vehicle is shown in Figures 22 and 23, and vehicle dimensions are shown in Figure 24.

MASH 2016 requires test vehicles used in crash testing to be no more than six model years old. Two 2009 models were used for test nos. MOS-6 and MOS-7 because the vehicle geometry of newer models did not comply with recommended vehicle dimension ranges specified in Table 4.1 of MASH 2016. The use of older test vehicles due to recent small car vehicle properties falling outside of MASH 2016 recommendations was allowed by FHWA and AASHTO in MASH implementation guidance dated May of 2018 [6].



Figure 16. Test Vehicle, Test No. MOS-5



Figure 17. Vehicle's Interior Floorboards, Test No. MOS-5

Date:	Date: 4/9/2019			Test Name: MOS-5			VIN No: 1D7RB1CT 2B \$657795				
Year:	r:2011		Make:		Do	dge	Model:	Model: Ra		im 1500	
Tire Size:	P275/60	R20	Tire Inflati	ion Pressure:	35	Psi	Odometer:		211919		
							Vehicle G Target Range	eometry - in rslisted below	(mm)		
	FI						A: 77 1/8 78±2(1	(1959) B: 950±50)	75 1/2	(1918)	
îĦ	M		2	, v		Ť	C: 229 1/4 237±13 (6	(5823) D: 020±325)	39±3 (1	(1016) 000±75)	
Ϋ́	- H	1	+	[ <u>+</u> -			E: 140 1/4 148±12 (3	(3562) F: (760±300)	49	(1245)	
<u> </u>		A	Test inerti	al CG		_	G: 29 5/16 min 2	(745) H: 8(710)	60 1/16 63±4 (15	(1526) 575±100)	
	+-Q-+					+	I: <u>13 1/4</u>	(337) J:	27 1/2	(699)	
P-+	-R-	6		\	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	B	K: 21 1/2	(546) L	30 1/2	(775)	
	72	Ğ		16		-	M: <u>68 1/8</u> 67±15 (	(1730) N: 1700±38)	68 67±1.5 (	(1727) 1700±38)	
	- COP		G	s		ĸ Ļ	O: 45 1/4 43±4 (1	(1149) P: 100±75)	5	(127)	
_		-н	-E	,	-F+		Q: 31 1/2	(800) R	21 1/2	(546)	
-	- 1				-		S: 14 1/2	<u>(368)</u> T:		(1956)	
Macc Distrib	ution Ib (ka)						U (ii	npact width):	38 9/16	(980)	
								WheelCenter			
Gross Static	LF_1457	(661)	RF 1518	(689)				Height (Front): Wheel Center	15 3/4	(400)	
	LR 1106	(502) F	RR 1110	(503)				Height (Rear):	15 3/4	(400)	
							Clea	Wheel Wel rance (Front):	43/4	(121)	
Weights								Wheel We I	1		
lb (kg)	Ci	urb	Test Ir	nertial	Gross	Static	Cle	arance (Rear):	7 1/8	(181)	
W-front	2944	(1335)	2873	(1303)	2975	(1349)		Bottom Frame Height (Front):	13 5/8	(346)	
W-rear	2358	(1070)	2153	(977)	2216	(1005)		Bottom Frame Height (Rear):	12 1/4	(311)	
W-total	5302	(2405)	5026	(2280)	5191	(2355)		Engine Type:	Gas	oline	
			30002110	(2270230)	51632116	(2343230)		Engine Size:	5.7	1 v8	
GWWR Ratings Ib Su				urrogate Occupant Data			Transn	Transmission Type:		Automatic	
Front	3700			Type:	Hybrid	1 11		Drive Type:	RV	ND	
Rear	3900			Mass:	165	b		Cab Style:	Crev	vCab	
Total	6800		Seat	Position:	Passer	ger		Bed Length:	6	7"	
Note an	y damage pri	or to test: _		Small hail	dents is s	urface of I	nood. Dent in	surface of ro	oof.		

Figure 18. Vehicle Dimensions, Test No. MOS-5







Figure 19. Test Vehicle, Test No. MOS-6


Figure 20. Test Vehicle's Interior Floorboards and Undercarriage, Test No. MOS-6

Date:	6/12/2	019	-:	Test Name:	MC	S-6	VIN No:	KNADE2	23296512	2940
Year:	200	9	-	Make:	к	ia	Model:		Rio	
Tire Size:	185/65	R14	Tire Inflat	ion Pressure:	32	Psi	Odometer:	1	38093	
+	F			PL	3	Ŧ	Vehicle G Target Range	eometry - in. ( slisted below	(mm)	
	M	1	]	N		T	A: 66 1/4 65±3(16	(1683) B: 350±75)	57 1/2	(1461)
ļ	+		X			1	C: 166 5/8 169±8 (43	(4232) D:	35 1/4 35±4 (9	(895) 00±100)
<u></u>	1 tot	- SF	$\sim$	BA	1	•	E: 98 1/2 98±5 (25	(2502) F: 00±125)	36 1/2	(927)
			Те	st Inertial CG			G: 22 3/4	(578) H:	36 1/8 39±4 (9	(918) 90±100)
	- 0		A			Ŧ	l: <u>16</u>	(406) J:	20	(508)
P	H	1	10		B	 B	K: 15 1/2	(394) t	21	(533)
011		6	9			<u>t</u>	M: 57 3/4 56±2 (14	(1467) N:	57 1/2 58±2 (1	(1461) 425±50)
+++		<u>+</u>	1			+ +	O: 27 3/4 24±4 (60	(705) P:	4 1/8	(105)
	- D -+-		е		F		Q: 23 1/4	(591) R:	15 3/8	(391)
			0		31		S: 9	(229) T:	65 3/4	(1670)
Mass Distrib	ution b(ka	1					U (ir	, npact width):_	61 7/8	(1572)
Gross Statio	1 5 925	(279)	DE 791	(254)			Top of	fradiator core	27	(696)
GIUSS STALIC	LF 035	(3/3)	<u>Kr /81</u>	[354]				Wheel Center	21	(000)
	LR 442	(200)	RR 526	(239)			ł	Height (Front):	10 3/4	(273)
								Height (Rear):	11 1/8	(283)
Weights			-					Wheel Well		
lb (kg)	C	urb	Test	nertial	Gross	Static	Clea	rance (Front):	25 1/4	(641)
W-front	1578	(716)	1532	(695)	1616	(733)	Clea	arance (Rear):	247/8	(632)
		252220	112222	24122171	102225	1992200		Bottom Frame	0.010	1122202
W-rear	932	(423)	888	(403)	968	(439)		Height (Front):	6 3/4	(171)
W-total	2510	(1139)	2420 2420±55	(1098) (1100±25)	2584 2585±55	(1172) (1175±50)	1	Height (Rear):	9 1/4	(235)
							1	Engine Type:	Gas	oline
GWWR Ratin	qs Ib		Surrogat	e Occupant Da	ata			Engine Size:	1.4L	4 cyl
Front	1918	_		Type:	Hybrid	11	Transm	nission Type:	Auto	matic
Rear	1874	_		Mass:	164 I	b		Drive Type:	FV	v D
Total .	3638	_	Seat	Position: R	light/Pas	senger				
Note any	/ damage pri	ior to test				No	ne			

Figure 21. Vehicle Dimensions, Test No. MOS-6







Figure 22. Test Vehicle, Test No. MOS-7



Figure 23. Vehicle's Interior Floorboards and Undercarriage, Test No. MOS-7

Date:	6/28/20	019	_		Test Name	:мс	)S-7	VIN No:	KNADE	22389658	0563
Year:	2009	9	_		Make	:K	ia	Model:		Rio	
Tire Size:	185/65	R14	_	Tire Infla	tion Pressure	: 32	psi	Odometer:	:	269054	
							•	Vehicle C Target Rang	Geometry - in. ( es listed below	(mm)	
	M				N		т   •	A: <u>66 3/8</u> 65±3 (1 C: <u>167</u> 169±8 (2 E: <u>98 1/2</u> 98±5 (2	(1686)         B:           650±75)         D:           (4242)         D:           300±200)         F:           500±125)         F:	58 1/4 34 1/2 <sup>35±4 (s</sup> 31 3/4	(1480) (876) 000±100) (806)
				Te	st Inertial CG			G: <u>22 13/16</u>	<u>(579)</u> H:	35 15/16 39±4 (9	<b>(913)</b> 990±100)
	Q-    R	-				<u> </u>	4	l: <u>15 1/2</u> K: 16	(394) J:	21	(533)
			s	0				$M: 57 3/8 = 56 \pm 2 (1)$	(406) L. (1457) N: (425±50)	57 3/8 56±2 (1	(372) (1457) (425±50)
f	-	н_+	- 1				Ť	0: <u>27 1/2</u> 24±4 (6	(699) P: 600±100)	1 1/4	(32)
	- D		E	C		F		Q: 22 3/4	(578) R:	15 3/8	(391)
	I			0		I		S: 12	(305) T:	65 1/8	(1654)
Mass Distribu	ution - lb (ka)							U (	impact width):	30 5/8	(778)
Gross Static	LF 820	(372)	RF	803	(364)			Тор	of radiator core	28	(711)
	LR 475	(215)	RR	495	(225)				Wheel Center Height (Front):	10 3/4	(273)
									Wheel Center Height (Rear):	11 1/8	(283)
lb (kg)	Cu	urb		Test I	nertial	Gross	Static	CI	Wheel Well earance (Front):	25 1/2	(648)
W-front	1606	(728)		1547	(702)	1623	(736)	с	Wheel Well learance (Rear):	25 5/8	(651)
W-rear	893	(405)		888	(403)	970	(440)		Bottom Frame Height (Front):	7 1/8	(181)
W-total	2499	(1134)	_	2435	(1104)	2593	(1176)		Bottom Frame Height (Rear):	11	(279)
				2420±55	(1100±25)	2585±55	(1175±50)		Engine Type:	Gas	oline
GVWR Rating	js Ib		:	Surrogate	e Occupant Da	ata			Engine Size:	1.6L	4 Cyl
Front	1918	_			Туре:	Hybrid	3 11	Trans	mission Type:	Auto	matic
Rear	1874	_			Mass:	158 I	b		Drive Type:	F\	ND
Total	3638	-		Seat	Position:	Right/Pas	senger				
Note ar	ny damage pri	or to test:					No	ne			

Figure 24. Vehicle Dimensions, Test No. MOS-7

The longitudinal component of the center of gravity (c.g.) for all vehicles was determined using the measured axle weights. The Suspension Method [7] was used to determine the vertical component of the c.g. for the 2270P pickup truck. This method is based on the principle that the c.g. of any freely suspended body is in the vertical plane through the point of suspension. The vehicle was suspended successively in three positions, and the respective planes containing the c.g. were established. The intersection of these planes pinpointed the final c.g. location for the test inertial condition. The vertical component of the c.g. for the 1100C vehicles was determined utilizing a procedure published by SAE [8]. The final c.g. locations are shown in Figures 25 through 27. Data used to calculate the location of the c.g. and ballast information are shown in Appendix B.

Square, black-and-white checkered targets were placed on the vehicles, as shown in Figures 25 through 27, to serve as reference points in the high-speed digital video and aid in video analysis. Round, checkered targets were placed at the c.g. on the left-side door, the right-side door, and the roof of the vehicle.

The front wheels of the test vehicles were aligned to vehicle standards except the toe-in value was adjusted to zero such that the vehicles would track properly along the guide cable. A 5B flash bulb was mounted under the vehicle's right-side windshield wiper for test nos. MOS-5 and MOS-6 and the left-side windshield wiper for test no. MOS-7, and was fired by a pressure tape switch mounted at the right quarter point of the front bumper. The flash bulb was fired upon initial impact with the test article to create a visual indicator of the precise time of impact on the high-speed digital videos. A radio-controlled brake system was installed in each test vehicle so the vehicle could be brought safely to a stop after the test.



Figure 25. Target Geometry, Test No. MOS-5



Figure 26. Target Geometry, Test No. MOS-6



Figure 27. Target Geometry, Test No. MOS-7

# 4.4 Simulated Occupant

For test nos. MOS-5, MOS-6, and MOS-7, a Hybrid II 50<sup>th</sup>-Percentile, Adult Male Dummy, equipped with clothing and footwear, was placed in the right-front seat of the test vehicle with the seat belt fastened. The dummy had final weights of 165 lb (75 kg), 164 lb (74 kg), and 158 lb (72 kg) for test nos. MOS-5, MOS-6, and MOS-7, respectively. As recommended by MASH 2016, the dummy was not included in calculating the c.g. locations.

# 4.5 Data Acquisition Systems

# 4.5.1 Accelerometers

Two environmental shock and vibration sensor/recorder systems were used to measure the accelerations in the longitudinal, lateral, and vertical directions. Both accelerometer systems were mounted near the c.g. of the test vehicles. The electronic accelerometer data obtained in dynamic testing was filtered using the SAE Class 60 and the SAE Class 180 Butterworth filter conforming to the SAE J211/1 specifications [9].

The two systems, the SLICE-1 and SLICE-2 units, were modular data acquisition systems manufactured by Diversified Technical Systems, Inc. (DTS) of Seal Beach, California. The SLICE-1 unit was designated as the primary system in test nos. MOS-6 and MOS-7. In test no. MOS-5, the SLICE-2 unit was designated as the primary system. The acceleration sensors were mounted inside the bodies of custom-built, SLICE 6DX event data recorders and recorded data at 10,000 Hz to the onboard microprocessor. Each SLICE 6DX was configured with 7 GB of non-volatile flash memory, a range of  $\pm$ 500 g's, a sample rate of 10,000 Hz, and a 1,650 Hz (CFC 1000) anti-aliasing filter. The "SLICEWare" computer software program and a customized Microsoft Excel worksheet were used to analyze and plot the accelerometer data.

## 4.5.2 Rate Transducers

Two identical angular rate sensor systems mounted inside the bodies of the SLICE-1 and SLICE-2 event data recorders were used to measure the rates of rotation of the test vehicle. Each SLICE MICRO Triax ARS had a range of 1,500 degrees/sec in each of the three directions (roll, pitch, and yaw) and recorded data at 10,000 Hz to the onboard microprocessors. The raw data measurements were then downloaded, converted to the proper Euler angles for analysis, and plotted. The "SLICEWare" computer software program and a customized Microsoft Excel worksheet were used to analyze and plot the angular rate sensor data.

## 4.5.3 Retroreflective Optic Speed Trap

The retroreflective optic speed trap was used to determine the speed of the test vehicles before impact. Five retroreflective targets, spaced at approximately 18-in. (457-mm) intervals, were applied to the side of each vehicle. When the emitted beam of light was reflected by the targets and returned to the Emitter/Receiver, a signal was sent to the data acquisition computer, recording at 10,000 Hz, as well as the external LED box activating the LED flashes. The speed was then calculated using the spacing between the retroreflective targets and the time between the signals. LED lights and high-speed digital video analysis are used as a backup if vehicle speeds cannot be determined from the electronic data.

# **4.5.4 Digital Photography**

Five AOS high-speed digital video cameras, eight GoPro digital video cameras, and four Panasonic digital video cameras were utilized to film test no. MOS-5. Four AOS high-speed digital video cameras, six GoPro digital video cameras, and four Panasonic digital video cameras were utilized to film test nos. MOS-6 and MOS-7. Camera details, camera operating speeds, lens information, and a schematic of the camera locations relative to the systems are shown in Figures 28 through 30 for test nos. MOS-5, MOS-6, and MOS-7, respectively.

The high-speed videos were analyzed using TEMA Motion and Redlake MotionScope software programs. Actual camera speed and camera divergence factors were considered in the analysis of the high-speed videos. A digital still camera was also used to document pre- and posttest conditions for all tests.



No.	Туре	Operating Speed (frames/sec)	Lens	Lens Setting
AOS-1	AOS Vitcam CTM	500	KOWA 16 mm Fixed	-
AOS-5	AOS X-PRI Gigabit	500	100 mm Fixed	-
AOS-6	AOS X-PRI Gigabit	500	Fujinon 35 mm Fixed	-
AOS-7	AOS X-PRI Gigabit	500	KOWA 25 mm Fixed	-
AOS-9	AOS TRI-VIT	500	KOWA 12 mm Fixed	-
GP-8	GoPro Hero 4	120		
GP-9	GoPro Hero 4	120		
GP-10	GoPro Hero 4	120		
GP-11	GoPro Hero 4	240		
GP-18	GoPro Hero 6	240		
GP-19	GoPro Hero 6	240		
GP-20	GoPro Hero 6	240		
GP-21	GoPro Hero 6	240		
PAN-1	Panasonic HC-V770	120		
PAN-2	Panasonic HC-V770	120		
PAN-3	Panasonic HC-V770	120		
PAN-4	Panasonic HC-V770	120		

Figure 28. Camera Locations, Speeds, and Lens Settings, Test No. MOS-5



No.	Туре	Operating Speed (frames/sec)	Lens	Lens Setting
AOS-1	AOS Vitcam CTM	500	KOWA 25 mm	-
AOS-5	AOS X-PRI	500	100 mm	-
AOS-6	AOS X-PRI	500	Fujinon 35 mm	-
AOS-7	AOS X-PRI	500	Fujinon 50 mm	-
GP-8	GoPro Hero 4	120		
GP-9	GoPro Hero 4	120		
GP-18	GoPro Hero 6	240		
GP-19	GoPro Hero 6	240		
GP-20	GoPro Hero 6	240		
GP-21	GoPro Hero 6	240		
PAN-1	Panasonic HC-V770	120		
PAN-2	Panasonic HC-V770	120		
PAN-3	Panasonic HC-V770	120		
PAN-4	Panasonic HC-V770	120		

Figure 29. Camera Locations, Speeds, and Lens Settings, Test No. MOS-6



No.	Туре	Operating Speed (frames/sec)	Lens	Lens Setting
AOS-1	AOS Vitcam CTM	500	KOWA 16 mm	-
AOS-5	AOS X-PRI	500	Sigma 28-70 DG #2	-
AOS-6	AOS X-PRI	500	Sigma 28-70 DG #1	-
AOS-9	AOS TRI-VIT 2236	500	100 mm	-
GP-8	GoPro Hero 4	120		
GP-9	GoPro Hero 4	120		
GP-18	GoPro Hero 6	240		
GP-19	GoPro Hero 6	240		
GP-20	GoPro Hero 6	240		
GP-21	GoPro Hero 6	240		
PAN-1	Panasonic HC-V770	120		
PAN-2	Panasonic HC-V770	120		
PAN-3	Panasonic HC-V770	120		
PAN-4	Panasonic HC-V770	120		

Figure 30. Camera Locations, Speeds, and Lens Settings, Test No. MOS-7

# 5 FULL-SCALE CRASH TEST NO. MOS-5

# 5.1 Static Soil Test

Before full-scale crash test no. MOS-5 was conducted, the strength of the foundation soil was evaluated with a static test, as described in MASH 2016. The static test results, as shown in Appendix C, demonstrated a soil resistance above the baseline test limits. Thus, the soil provided adequate strength, and full-scale crash testing could be conducted on the sign support system.

# **5.2 Weather Conditions**

Test no. MOS-5 was conducted on May 15, 2019 at approximately 11:45 a.m. The weather conditions as per the National Oceanic and Atmospheric Administration (station 14939/LNK) were reported and are shown in Table 3.

Temperature	82°F
Humidity	40%
Wind Speed	11 mph
Wind Direction	110° from True North
Sky Conditions	Sunny
Visibility	10 Statute Miles
Pavement Surface	Dry
Previous 3-Day Precipitation	0.14 in.
Previous 7-Day Precipitation	1.09 in.

Table 3. Weather Conditions, Test No. MOS-5

# **5.3 Test Description**

Initial vehicle impact was to occur with the vehicle centerline aligned with the centerline of the system, as shown in Figure 31. The 5,026-lb (2,280-kg) pickup truck impacted the U-channel sign system oriented at 0 degrees, or head-on to the vehicle, at a speed of 62.7 mph (100.9 km/h). The vehicle came to rest 250 ft – 3 in. (76.3 m) longitudinally downstream and 8 ft – 6 in. (2.6 m) laterally to the right of the centerline after brakes were applied. A detailed description of the sequential impact events is contained in Table 4. Sequential photographs are shown in Figures 32 and 33. Documentary photographs of the crash test are shown in Figures 34 through 36. The vehicle trajectory and final position are shown in Figure 37.

TIME	EVENT				
(sec)					
0.000	Vehicle's front bumper contacted left and right posts.				
0.002	Vehicle's hood contacted left and right posts. Both posts deflected downstream.				
0.004	Right post fractured just above the embedded stub.				
0.006	Left post fractured just above the embedded stub.				
0.008	Lower sign deformed due to post flexure.				
0.012	Vehicle's front bumper deformed.				
0.016	Upper sign deformed due to post movements.				
0.030	Detached portion of system became airborne when it lost contact with vehicle.				
0.094	Upper sign contacted vehicle's roof.				
0.102	Vehicle's roof deformed.				
0.156	System lost contact with vehicle.				
0.752	Vehicle yawed left/counterclockwise.				
2.446	Detached portion of system contacted ground.				

 Table 4. Sequential Description of Impact Events, Test No. MOS-5







Figure 31. Impact Location, Test No. MOS-5





0.050 sec



0.100 sec



0.200 sec



0.300 sec



0.400 sec

Figure 32. Sequential Photographs, Test No. MOS-5



0.000 sec



0.050 sec



0.100 sec



0.200 sec



0.300 sec



0.400 sec



Figure 33. Additional Sequential Photographs, Test No. MOS-5

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Figure 34. Documentary Photographs, Test No. MOS-5









Figure 35. Documentary Photographs, Test No. MOS-5



Figure 36. Documentary Photographs, Test No. MOS-5



Figure 37. Vehicle Final Position and Trajectory Marks, Test No. MOS-5

## 5.4 System Damage

Damage to the system was severe, as shown in Figures 38 through 42. System damage consisted of contact marks, fracture and deformation of the posts, and bending of the upper sign panel.

The left and right edges of the upper sign panel bent in the downstream direction such that the left edge was 13 in. (330 mm) out of plane and the right edge was  $7\frac{1}{2}$  in. (191 mm) out of plane. The right post sheared  $26\frac{1}{2}$  in. (673 mm) above the ground line, and the left post sheared  $27\frac{3}{4}$  in. (705 mm) above the ground line. The upper portion of both posts remained attached to the sign panels and the posts were minimally damaged.

Both embedded stubs bent at the ground line in the downstream direction, and the bending deformed the U-channel stub cross sections to a width of 4<sup>3</sup>/<sub>4</sub> in. (121 mm). Cracking along the centerline of both U-channel stubs was visible beginning at the ground line and extending up 3<sup>3</sup>/<sub>4</sub> in. (95 mm), stopping below the bolted connection to the post. The height of the remaining stub in its deformed state was greater than 4 in. (102 mm) above the ground line. Removing the stubs from the ground revealed that the left post had fractured below the ground line. Both stubs had additional centerline cracking along the embedded portion of the stub, extending approximately 6 in. below the ground line. The bolted connections between the embedded stubs and the U-channel posts remained intact. On the right post, 11-in. (279 mm) long contact marks started at the sheared top and extended down. Contact marks on the left edge of the left post started 21<sup>3</sup>/<sub>4</sub> in. (552 mm) from the sheared top and extended down. Additional contact marks on the right edge of the left post started 22<sup>3</sup>/<sub>4</sub> in. (578 mm) from the sheared top and extended down.



Figure 38. System Damage, Test No. MOS-5







Figure 39. System Damage, Sign Panels, Test No. MOS-5



Figure 40. System Damage, U-Channel Posts, Test No. MOS-5



Figure 41. System Damage, U-Channel Posts, Test No. MOS-5



Figure 42. System Damage, Embedded Stubs, Test No. MOS-5



## 5.5 Vehicle Damage

The damage to the vehicle was minimal, as shown in Figures 43 and 44. The maximum occupant compartment intrusions are listed in Table 5 along with the intrusion limits established in MASH 2016 for various areas of the occupant compartment. Complete occupant compartment and vehicle deformations and the corresponding locations are provided in Appendix D. MASH 2016 defines intrusion or deformation as the occupant compartment being deformed and reduced in size with no observed penetration. There were no penetrations into the occupant compartment and none of the established MASH 2016 deformation limits were violated. Outward deformations, which are denoted as negative numbers in Appendix D are not considered crush toward the occupant and are not evaluated by MASH 2016 criteria.

The majority of damage was concentrated on the front of the vehicle where the impact occurred. The grille was cracked on both sides of the vehicle and was fractured on the left side. The front bumper was dented and bent downward. The hood of the vehicle was slightly ajar. Scrapes were observed along the undercarriage. The lower control arms and muffler were slightly dented. The roof was slightly dented. No damage was observed to the sides of the vehicle, and the windshield and windows remained intact.







Figure 43. Vehicle Damage, Test No. MOS-5





Figure 44. Vehicle Undercarriage Damage, Test No. MOS-5





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LOCATION	MAXIMUM INTRUSION in. (mm)	MASH 2016 ALLOWABLE INTRUSION in. (mm)
Wheel Well & Toe Pan	0.2 (5)	≤ 9 (229)
Floor Pan & Transmission Tunnel	0.2 (5)	≤ 12 (305)
A-Pillar	0.2 (5)	≤ 5 (127)
A-Pillar (Lateral)	0.0 (0)	≤ 3 (76)
B-Pillar	0.2 (5)	≤ 5 (127)
B-Pillar (Lateral)	0.0 (0)	≤ 3 (76)
Side Front Panel (in Front of A-Pillar)	0.0 (0)	≤ 12 (305)
Side Door (Above Seat)	0.0 (0)	≤ 9 (229)
Side Door (Below Seat)	0.0 (0)	≤ 12 (305)
Roof	0.1 (3)	$\leq 4 (102)$
Windshield	0.0 (0)	≤ 3 (76)
Side Window	Intact	No shattering resulting from contact with structural member of test article
Dash	0.2 (5)	N/A

Table 5. Maximum Occupant Compartment Intrusion by Location, Test No. MOS-5

N/A - No MASH 2016 criteria exist for this location

# 5.6 Occupant Risk

The calculated occupant impact velocities (OIVs) and maximum 0.010-sec average occupant ridedown accelerations (ORAs) in both the longitudinal and lateral directions, as determined from the accelerometer data, are shown in Table 6. The impulse on the vehicle was relatively small and of short duration. As a result, *x* and *y* in the flail-space model were less than 2 ft and 1 ft, respectively, during the period when the vehicle was in contact with the system. As specified in Section A5.2.2 of MASH 2016 in such cases, it is recommended that OIV be set equal to the vehicle's change in velocity during contact with the test article, or parts thereof. If parts of the test article remain in contact with the vehicle after impact, the vehicle's change in velocity should be computed at the time the vehicle clears the footing or foundation of the test article. For test no. MOS-5, OIV was reported as the vehicle's change in velocity at 0.5 sec after impact, at which point the vehicle had cleared the test article foundation and was no longer in contact with any portion of the test article. The OIVs were within suggested limits, as provided in MASH 2016, and ORA values were not applicable. The calculated ASI values are also shown in Table 6. THIV and PHD values were not applicable. The recorded data from the accelerometers and the rate transducers are shown graphically in Appendix E.

Evaluation Criteria		Trans	MASH 2016	
		SLICE-1	SLICE-2 (primary)	Limits
ΟΙΥ	Longitudinal	-2.17 (-0.66)	-2.15 (-0.65)	±16 (4.9)
ft/s (m/s)	Lateral	-1.03 (-0.31)	-1.11 (-0.34)	not required
ORA	Longitudinal	N/A	N/A	±20.49
g's	Lateral	N/A	N/A	±20.49
MAX. ANGULAR DISPL. deg.	Roll	1.5	-1.4	±75
	Pitch	0.8	0.8	±75
	Yaw	-1.0	-1.1	not required
THIV ft/s (m/s)		N/A	N/A	not required
PHD g's		N/A	N/A	not required
ASI		0.12	0.11	not required

Table 6. Summary of OIV, ORA, THIV, PHD, and ASI Values, Test No. MOS-5

Note: The vehicle cleared the test article foundation at 0.400 sec after impact for test no. MOS-5, which was used to determine vehicle change in velocity, denoted as OIV.

N/A = Not Applicable

# 5.7 Discussion

The analysis of the test results for test no. MOS-5 showed that the system readily activated in a predictable manner via post fracture and allowed the 2270P vehicle to continue travelling without any major obstruction of the windshield. A summary of the test results and sequential photographs are shown in Figure 45. Detached elements, fragments, or other debris from the test article did not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or work-zone personnel. Deformations of, or intrusions into, the occupant compartment that could have caused serious injury did not occur. Vehicle roll, pitch, and yaw angular displacements, as shown in Appendix E, were deemed acceptable because they did not adversely influence occupant risk nor cause rollover. After impact, the vehicle traversed the foundation and continued forward until it stopped downstream from the system. Therefore, test no. MOS-5 was determined to be acceptable according to the MASH 2016 safety performance criteria for test designation no. 3-62.



N/A – Not applicable

Figure 45. Summary of Test Results and Sequential Photographs, Test No. MOS-5

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## 6 FULL-SCALE CRASH TEST NO. MOS-6

### 6.1 Static Soil Test

Before full-scale crash test no. MOS-6 was conducted, the strength of the foundation soil was evaluated with a static test, as described in MASH 2016. The static test results, as shown in Appendix C, demonstrated a soil resistance above the baseline test limits. Thus, the soil provided adequate strength, and full-scale crash testing could be conducted on the sign support system.

#### **6.2 Weather Conditions**

Test no. MOS-6 was conducted on June 12, 2019 at approximately 1:30 p.m. The weather conditions as per the National Oceanic and Atmospheric Administration (station 14939/LNK) were reported and are shown in Table 7.

Temperature	73°F
Humidity	32%
Wind Speed	21 mph
Wind Direction	360° from True North
Sky Conditions	Sunny
Visibility	10.0 Statute Miles
Pavement Surface	Dry
Previous 3-Day Precipitation	0.35 in.
Previous 7-Day Precipitation	0.35 in.

Table 7. Weather Conditions, Test No. MOS-6

## **6.3 Test Description**

Initial vehicle impact was to occur with the vehicle centerline aligned with the centerline of the system, as shown in Figure 46. The 2,420-lb (1,098-kg) small car impacted the U-channel sign system oriented at 0 degrees, or head-on to the vehicle, at a speed of 63.3 mph (101.9 km/h). The vehicle came to rest 274 ft - 7 in. (83.7 m) longitudinally downstream and 18 ft (5.5 m) laterally to the right of the centerline after brakes were applied. A detailed description of the sequential impact events is contained in Table 8. Sequential photographs are shown in Figures 47 and 48. Documentary photographs of the crash test are shown in Figures 49 through 51. The vehicle trajectory and final position are shown in Figure 52.
TIME	EVENT
(sec) 0.000	Vehicle's front bumper contacted left and right posts.
0.002	Vehicle's front bumper deformed. Lower half of system deflected downstream.
0.004	Vehicle's hood contacted left and right posts.
0.006	Vehicle's hood deformed. Upper half of system deflected downstream. Left post fractured. Soil heave formed on the downstream side of both posts.
0.008	Vehicle's hood flexed. Right post fractured. Both embedded stubs bent downstream.
0.024	Vehicle pitched upward.
0.032	Vehicle yawed counterclockwise.
0.042	Detached portion of system became airborne.
0.064	Both sign post stubs contacted vehicle's undercarriage.
0.146	Upper sign contacted vehicle's left C-pillar.
0.148	Upper sign contacted vehicle's trunk lid.
0.150	Vehicle's trunk lid deformed.
0.158	Vehicle rolled clockwise.
0.188	System lost contact with vehicle.
0.198	Vehicle pitched downward.
0.292	Vehicle rolled counterclockwise.
0.574	Vehicle pitched upward.
0.914	Vehicle pitched downward.
1.016	Detached portion of system contacted ground.

Table 8. Sequential Description of Impact Events, Test No. MOS-6







Figure 46. Impact Location, Test No. MOS-6



Figure 47. Sequential Photographs, Test No. MOS-6



Figure 48. Additional Sequential Photographs, Test No. MOS-6



Figure 49. Documentary Photographs, Test No. MOS-6















Figure 50. Documentary Photographs, Test No. MOS-6













Figure 51. Documentary Photographs, Test No. MOS-6









Figure 52. Vehicle Final Position and Trajectory Marks, Test No. MOS-6

#### 6.4 System Damage

Damage to the system was severe, as shown Figures 53 through 57. System damage consisted of contact marks, deformation, and fracture of the sign posts as well as deformation and cracking of the upper sign panel.

The left post sheared 23 in. (584 mm) above the ground line while the right post sheared  $25\frac{1}{2}$  in. (648 mm) above the ground line. The portion of the system above the shear plane became airborne, contacted the roof of the test vehicle, and landed upstream from the original system position. The sign panels remained attached to the posts. All four corners of the upper sign were bent slightly out of plane and a crack extended inward approximately 4 in. (102 mm) from the upper-right edge of the panel.

Both embedded stubs bent at the ground line in the downstream direction and the bending deformed the U-channel stub cross sections, increasing the section width to 5% in. (149 mm) at the left stub and 5 in. (127 mm) at the right stub. Cracking along the centerline of both U-channel stubs was visible beginning at the ground line, extending  $3\frac{1}{2}$  in. (89 mm) up the left stub and  $5\frac{1}{2}$  in. (140 mm) up the right stub. In both stubs, the cracking stopped below the bolted connection to the post. The height of the remaining stub in its deformed state was greater than 4 in. (102 mm) above the ground line. Removing the stubs from the ground revealed that both stubs had additional centerline cracking along the embedded portion of the stub. The bolted connections between the embedded stubs and the U-channel posts remained intact, however, the left post had a centerline crack beginning at the bottom of the post and extending up approximately 4 in. (102 mm). The left post had contact marks on the front face starting 9 in. (229 mm) from the ground and measuring 13 in. (330 mm) long. The right post was had contact marks starting 12 in. (305 mm) above the ground that measured 12 in. (305 mm) in length.



Figure 53. System Damage, Test No. MOS-6



Figure 54. System Damage, Sign Panels, Test No. MOS-6



Figure 55. System Damage, U-Channel Posts, Test No. MOS-6



Figure 56. System Damage, U-Channel Posts, Test No. MOS-6



Figure 57. System Damage, Embedded Stubs, Test No. MOS-6



### 6.5 Vehicle Damage

The damage to the vehicle was minimal, as shown in Figure 58. The maximum occupant compartment intrusions are listed in Table 9 along with the intrusion limits established in MASH 2016 for various areas of the occupant compartment. Complete occupant compartment and vehicle deformations and the corresponding locations are provided in Appendix D. MASH 2016 defines intrusion or deformation as the occupant compartment being deformed and reduced in size with no observed penetration. There were no penetrations into the occupant compartment and none of the established MASH 2016 deformation limits were violated. Outward deformations, which are denoted as negative numbers in Appendix D are not considered crush toward the occupant and are not evaluated by MASH 2016 criteria.

The majority of the damage was concentrated on the front of the vehicle where the impact occurred. The grille and hood were crushed inward. The left-side running light disengaged from the vehicle. The bumper insert disengaged from the top mounts. The right fender deformed outward at the middle. The left side of the trunk was crushed downward into the trunk compartment. The right frame horn was dented inward toward the engine compartment. The floor pan and gas tank experienced minor scraping. The windshield and side windows remained intact.







Figure 58. Vehicle Damage, Test No. MOS-6



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Figure 59. Vehicle Damage, Test No. MOS-6

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Figure 60. Vehicle Undercarriage Damage, Test No. MOS-6





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LOCATION	MAXIMUM INTRUSION in. (mm)	MASH 2016 ALLOWABLE INTRUSION in. (mm)
Wheel Well & Toe Pan	0.7 (18)	≤ 9 (229)
Floor Pan & Transmission Tunnel	0.5 (13)	≤ 12 (305)
A-Pillar	0.9 (23)	≤ 5 (127)
A-Pillar (Lateral)	0.0 (0)	≤ 3 (76)
B-Pillar	0.3 (8)	≤ 5 (127)
B-Pillar (Lateral)	0.1 (3)	≤ 3 (76)
Side Front Panel (in Front of A-Pillar)	0.1 (3)	≤ 12 (305)
Side Door (Above Seat)	0.0 (0)	≤ 9 (229)
Side Door (Below Seat)	0.0 (0)	≤ 12 (305)
Roof	0.4 (10)	$\leq 4 (102)$
Windshield	0.0 (0)	≤ 3 (76)
Side Window	Intact	No shattering resulting from contact with structural member of test article
Dash	0.9 (23)	N/A

Table 9. Maximum Occupant Compartment Intrusion by Location, Test No. MOS-6

N/A - No MASH 2016 criteria exist for this location

### 6.6 Occupant Risk

The calculated occupant impact velocities (OIVs) and maximum 0.010-sec average occupant ridedown accelerations (ORAs) in both the longitudinal and lateral directions, as determined from the accelerometer data, are shown in Table 10. The impulse on the vehicle was relatively small and of short duration. As a result, *x* and *y* in the flail-space model were less than 2 ft and 1 ft, respectively, during the period when the vehicle was in contact with the system. As specified in Section A5.2.2 of MASH 2016 in such cases, it is recommended that OIV be set equal to the vehicle's change in velocity during contact with the test article, or parts thereof. If parts of the test article remain in contact with the vehicle after impact, the vehicle's change in velocity should be computed at the time the vehicle clears the footing or foundation of the test article. For test no. MOS-6, OIV was reported as the vehicle's change in velocity at 0.3 sec after impact, at which point the vehicle had cleared the test article foundation and was no longer in contact with any portion of the test article. The OIVs were within suggested limits, as provided in MASH 2016, and ORA values were not applicable. The calculated ASI values are also shown in Table 10. THIV and PHD values were not applicable. The recorded data from the accelerometers and the rate transducers are shown graphically in Appendix F.

Evaluation Criteria		Trans	MASH 2016	
		SLICE-1 (primary)	SLICE-2	Limit
ΟΙν	Longitudinal	-3.93 (-1.97)	-3.95 (-1.20)	±16 (4.9)
ft/s (m/s)	Lateral	-0.19 (-0.06)	-0.41 (-0.12)	not required
ORA g's	Longitudinal	N/A	N/A	±20.49
	Lateral	N/A	N/A	±20.49
MAX. ANGULAR DISPL. deg.	Roll	1.1	1.1	±75
	Pitch	1.8	1.9	±75
	Yaw	-0.5	-0.7	not required
THIV ft/s (m/s)		N/A	N/A	not required
PHD g's		N/A	N/A	not required
ASI		0.16	0.15	not required

Table 10. Summary of OIV, ORA, THIV, PHD, and ASI Values, Test No. MOS-6

Note: The vehicle cleared the test article foundation at 0.300 sec after impact for test no. MOS-6, which was used to determine vehicle change in velocity, denoted as OIV

N/A = Not Applicable

#### 6.7 Discussion

The analysis of the test results for test no. MOS-6 showed that the system readily activated in a predictable manner via post fracture and allowed the 1100C vehicle to continue travelling without any major obstruction of the windshield. A summary of the test results and sequential photographs is shown in Figure 61. Detached elements, fragments, or other debris from the test article did not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or work-zone personnel. Deformations of, or intrusions into, the occupant compartment that could have caused serious injury did not occur. Vehicle roll, pitch, and yaw angular displacements, as shown in Appendix E, were deemed acceptable because they did not adversely influence occupant risk nor cause rollover. After impact, the vehicle traversed the foundation and continued forward until it stopped downstream from the system. Therefore, test no. MOS-6 was determined to be acceptable according to the MASH 2016 safety performance criteria for test designation no. 3-61.



0.000 sec

82



0.050 sec



0.100 sec

III





0.300 sec



Test Agency	MwRSF
Test Number	
Date	
MASH 2016 Test Designation No	
Test Article	
Key Component – Upper Sign	
Size	
Thickness	
Height to Bottom of Sign	
Key Component – Lower Sign	
Size	
Thickness	
Height to Bottom of Sign	
Key Component – U-Channel Posts	
Weight	
Length	
Key Component – U-Channel Stub	
Weight	
Length	
Soil Type	Well-Graded Gravel
Vehicle Make /Model	
Curb	2,510 lb (1,139 kg)
Test Inertial	2,420 lb (1,098 kg)
Gross Static	2,584 lb (1,172 kg)
Impact Conditions	
Speed	63.3 mph (101.9 km/h)
Angle	0 degrees
Impact Location	Centerline of front bumper
Kinetic Energy324.2 kip-ft (439.6 kJ)	≥ 288 kip-ft (390 kJ) limit from MASH 2016
Exit Box Criterion	N/A
Vehicle Stability	Satisfactory
Vehicle Stopping Distance	
	18 ft (5.5 m) laterally to the right

0.150 sec r<sup>1</sup> [25] 3 [76] (TYP) 84 1/2" [2147] 60" [1524] Ground 36" 914] [762]

Vehicle Damage	 	 Moderate
VDS [10]	 	 
CDC [11]	 	 12-FCEN-1
Maximum Interior Deformation	 	 0.9 in. (23 mm)
		'n

Test Article Damage ......Severe Transducer Data

Evaluation Criteria		Transducer		MASIL2016
		SLICE-1 (primary)	SLICE-2	Limit
OIV ft/s	Longitudinal	-3.93 (-1.97)	-3.95 (-1.20)	±16 (4.9)
(m/s)	Lateral	-0.19 (-0.06)	-0.41 (-0.12)	not required
ORA	Longitudinal	N/A	N/A	±20.49
g's	Lateral	N/A	N/A	±20.49
MAX	Roll	1.1	1.1	±75
ANGULAR DISP.	Pitch	1.8	1.9	±75
deg.	Yaw	-0.5	-0.7	not required
THIV –	THIV – ft/s (m/s)		N/A	not required
PHD - g's		N/A	N/A	not required
ASI		0.16	0.15	not required

N/A - Not applicable

Figure 61. Summary of Test Results and Sequential Photographs, Test No. MOS-6

## 7 FULL-SCALE CRASH TEST NO. MOS-7

## 7.1 Static Soil Test

Before full-scale crash test no. MOS-7 was conducted, the strength of the foundation soil was evaluated with a static test, as described in MASH 2016. The static test results, as shown in Appendix C, demonstrated a soil resistance above the baseline test limits. Thus, the soil provided adequate strength, and full-scale crash testing could be conducted on the sign support system.

## 7.2 Weather Conditions

Test no. MOS-7 was conducted on June 28, 2019 at approximately 2:00 p.m. The weather conditions as per the National Oceanic and Atmospheric Administration (station 14939/LNK) were reported and are shown in Table 11.

Temperature	93°F
Humidity	54%
Wind Speed	8 mph
Wind Direction	230° from True North
Sky Conditions	Sunny
Visibility	10.0 Statute Miles
Pavement Surface	Dry
Previous 3-Day Precipitation	0.40 in.
Previous 7-Day Precipitation	1.88 in.

Table 11. Weather Conditions, Test No. MOS-7

# 7.3 Test Description

Initial vehicle impact was to occur with the vehicle centerline aligned with the centerline of the system, as shown in Figure 62. The 2,435-lb (1,104-kg) small car impacted the U-channel sign system oriented at 0 degrees, or head-on to the vehicle, at a speed of 20.0 mph (32.2 km/h). The vehicle came to rest 44 ft – 7 in. (13.6 m) longitudinally downstream and 5 ft – 7 in. (1.7 m) laterally to the right of the centerline after brakes were applied. A detailed description of the sequential impact events is contained in Table 12. Sequential photographs are shown in Figures 63 and 64. Documentary photographs of the crash test are shown in Figures 65 through 67. The vehicle trajectory and final position are shown in Figure 68.

TIME	EVENT
(sec)	
0.000	Vehicle's front bumper contacted left and right posts.
0.006	Vehicle's front bumper deformed.
0.008	Left and right posts bent downstream.
0.012	Lower sign deformed due to post flexure.
0.014	Upper sign deformed due to post movements.
0.016	Both posts deflected downstream.
0.062	Vehicle's hood deformed.
0.176	Vehicle's right-front tire became airborne.
0.182	Vehicle's left-front tire became airborne.
0.328	Vehicle pitched upward.
0.356	Vehicle pitched downward.
0.358	Top of sign contacted ground as vehicle began to traverse over system.
0.462	Vehicle's right-front tire regained contact with ground.
0.470	Vehicle's undercarriage contacted the system. Vehicle's left-front tire regained contact with ground.
0.540	Bottom corner of the upper sign bent.
2.474	System lost contact with vehicle.

Table 12. Sequential Description of Impact Events, Test No. MOS-7







Figure 62. Impact Location, Test No. MOS-7



2.450 sec

Figure 63. Sequential Photographs, Test No. MOS-7



0.000 sec



0.100 sec



0.250 sec



0.600 sec



1.600 sec



2.450 sec







1.500 sec



0.000 sec



0.150 sec



0.300 sec



0.500 sec



1.000 sec



1.500 sec

Figure 64. Additional Sequential Photographs, Test No. MOS-7











Figure 65. Documentary Photographs, Test No. MOS-7



Figure 66. Documentary Photographs, Test No. MOS-7

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Figure 67. Documentary Photographs, Test No. MOS-7



Figure 68. Vehicle Final Position and Trajectory Marks, Test No. MOS-7

### 7.4 System Damage

Damage to the system was severe, as shown in Figures 69 through 72. System damage consisted of contact marks on the posts, bending of the posts, and bending of the upper sign panel.

The left and right posts bent downstream at the ground line and the bolted connections to the embedded stubs remained intact. The sign panels remained attached to the posts, and the bottom edge of the upper sign panel was bent. The system in its deformed state was greater than 4 in. (102 mm) above the ground line. Removing the embedded stubs from the ground revealed cracking along the centerline of the U-channel that extended several inches below the ground line. In addition, both embedded stubs were bent.

On the left post, a  $21\frac{1}{2}$ -in. (546-mm) long contact mark on the left flange and a  $39\frac{1}{2}$  in. (1,003-mm) long contact mark on the right flange started 10 in. (254 mm) and  $7\frac{1}{2}$  in. (191 mm) from the ground line, respectively. Four contact marks were found on the right post. The left flange had  $37\frac{1}{2}$ -in. (953-mm) and 24-in. (610-mmm) long contact marks that started  $10\frac{1}{2}$  in. (267 mm) and 53 in. (1,346 mm) from the ground line, respectively. The right flange had a 24-in. (610-mm) long contact mark that started 9 in. (229 mm) from the ground line and a  $26\frac{1}{2}$ -in. (673-mm) long contact mark that started 66 in. (1,676 mm) from the ground line. Over the lower portion of the system, both posts exhibited lateral deformation toward the centerline of the system and deformation of the left U-channel flange.



Figure 69. System Damage, Test No. MOS-7



Figure 70. System Damage, Sign Panels, Test No. MOS-7







Figure 71. System Damage, U-Channel Posts, Test No. MOS-7



Figure 72. System Damage, Embedded Stubs, Test No. MOS-7





## 7.5 Vehicle Damage

The damage to the vehicle was minimal, as shown in Figure 73. The maximum occupant compartment intrusions are listed in Table 13 along with the intrusion limits established in MASH 2016 for various areas of the occupant compartment. Complete occupant compartment and vehicle deformations and the corresponding locations are provided in Appendix D. MASH 2016 defines intrusion or deformation as the occupant compartment being deformed and reduced in size with no observed penetration. There were no penetrations into the occupant compartment and none of the established MASH 2016 deformation limits were violated. Outward deformations, which are denoted as negative numbers in Appendix D are not considered crush toward the occupant and are not evaluated by MASH 2016 criteria.

The majority of the damage was concentrated on the front of the vehicle where the impact occurred, and on the undercarriage of the vehicle where the system contacted the vehicle. The bumper was scraped and cracked at the two points where the bumper impacted the posts of the system. Scraping occurred along a majority of the undercarriage of the vehicle. The windshield, windows, and remainder of the vehicle remained undamaged.
















Figure 74. Vehicle Damage, Test No. MOS-7



Figure 75. Vehicle Undercarriage Damage, Test No. MOS-7





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LOCATION	MAXIMUM INTRUSION in. (mm)	MASH 2016 ALLOWABLE INTRUSION in. (mm)
Wheel Well & Toe Pan	0.1 (3)	≤ 9 (229)
Floor Pan & Transmission Tunnel	0.1 (3)	≤ 12 (305)
A-Pillar	0.9 (23)	≤ 5 (127)
A-Pillar (Lateral)	0.3 (8)	≤ 3 (76)
B-Pillar	0.2 (5)	≤ 5 (127)
B-Pillar (Lateral)	0.2 (5)	≤ 3 (76)
Side Front Panel (in Front of A-Pillar)	0.3 (8)	≤ 12 (305)
Side Door (Above Seat)	0.2 (5)	≤ 9 (229)
Side Door (Below Seat)	0.2 (5)	≤ 12 (305)
Roof	0.2 (5)	$\leq$ 4 (102)
Windshield	0.0 (0)	≤ 3 (76)
Side Window	Intact	No shattering resulting from contact with structural member of test article
Dash	0.4 (10)	N/A

Table 13. Maximum Occupant Compartment Intrusion by Location, Test No. MOS-7

N/A - No MASH 2016 criteria exist for this location

## 7.6 Occupant Risk

The calculated occupant impact velocities (OIVs) and maximum 0.010-sec average occupant ridedown accelerations (ORAs) in both the longitudinal and lateral directions, as determined from the accelerometer data, are shown in Table 14. The OIVs and ORAs were within suggested limits, as provided in MASH 2016. The calculated THIV, PHD, and ASI values are also shown in Table 14. The recorded data from the accelerometers and the rate transducers are shown graphically in Appendix G.

		Trans	ducer	MASH 2016
Evaluati	on Criteria	SLICE-1 (primary)	SLICE-2	Limit
OIV	Longitudinal	-15.03 (-4.58)	-14.90 (-4.54)	±16 (4.9)
ft/s (m/s)	Lateral	-0.07 (-0.02)	0.08 (0.02)	not required
ORA	Longitudinal	-1.91	-1.79	±20.49
g's	Lateral	1.71	1.79	±20.49
MAX.	Roll	-0.9	-0.8	±75
ANGULAR DISPL.	Pitch	5.4	5.6	±75
deg.	Yaw	0.4	-0.2	not required
T ft/s	HIV (m/s)	15.03 (4.58)	14.90 (4.54)	not required
Р	PHD g's		1.79	not required
l	ASI	0.33	0.31	not required

Table 14. Summary of OIV, ORA, THIV, PHD, and ASI Values, Test No. MOS-7

## 7.7 Discussion

The analysis of the test results for test no. MOS-7 showed that the system readily activated in a predictable manner by deforming to the ground and allowed the 1100C vehicle to continue travelling without any major obstruction of the windshield. A summary of the test results and sequential photographs is shown in Figure 76. Detached elements, fragments, or other debris from the test article did not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or work-zone personnel. Deformations of, or intrusions into, the occupant compartment that could have caused serious injury did not occur. Vehicle roll, pitch, and yaw angular displacements, as shown in Appendix G, were deemed acceptable because they did not adversely influence occupant risk nor cause rollover. After impact, the vehicle traversed the foundation and continued forward until it stopped downstream of the system. Therefore, test no. MOS-7 was determined to be acceptable according to the MASH 2016 safety performance criteria for test designation no. 3-60.



Figure 76. Summary of Test Results and Sequential Photographs, Test No. MOS-7

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### **8 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS**

The objective of this project was to evaluate the dual-post, U-channel sign support system in accordance with MASH 2016 TL-3 criteria. The test article utilized for full-scale crash testing consisted of two signs attached to two U-channel posts. The posts were embedded in the ground using a spliced U-channel configuration. Each crash test was to occur with the centerline of the vehicle aligned with the centerline of the system. A summary of the test evaluation is shown in Table 15.

In test no. MOS-5, the 5,026-lb (2,280-kg) pickup truck impacted the U-channel sign support system oriented at 0 degrees, or head-on to the vehicle, at a speed of 62.7 mph (100.9 km/h), resulting in a kinetic energy of 661.4 kip-ft (896.7 kJ). After impact, the system readily activated in a predictable manner via post fracture and allowed the vehicle to continue travelling without any major obstruction of the windshield. All vehicle decelerations, ORAs, and OIVs fell within the recommended safety limits established in MASH 2016. Therefore, test no. MOS-5 was successful according to the safety performance criteria of MASH 2016 test designation no. 3-62.

In test no. MOS-6, the 2,420-lb (1,098-kg) small car impacted the U-channel sign support system oriented at 0 degrees, or head-on to the vehicle, at a speed of 63.3 mph (101.9 km/h), resulting in a kinetic energy of 324.2 kip-ft (439.6 kJ). After impact, the system readily activated in a predictable manner via post fracture and allowed the vehicle to continue travelling without any major obstruction of the windshield. All vehicle decelerations, ORAs, and OIVs fell within the recommended safety limits established in MASH 2016. Therefore, test no. MOS-6 was successful according to the safety performance criteria of MASH 2016 test designation no. 3-61.

In test no. MOS-7, the 2,435-lb (1,104-kg) small car impacted the U-channel sign support system oriented at 0 degrees, or head-on to the vehicle, at a speed of 20.0 mph (32.2 km/h), resulting in an impact severity of 32.6 kip-ft. (44.1 kJ) After impact, the system readily activated in a predictable manner by deforming to the ground and allowed the vehicle to continue travelling without any major obstruction of the windshield or penetration of the occupant compartment. All vehicle decelerations, ORAs, and OIVs fell within the recommended safety limits established in MASH 2016. Therefore, test no. MOS-7 was successful according to the safety performance criteria of MASH 2016 test designation no. 3-60.

Evaluation Factors		Eva	luation Criteria		Test No. MOS-5	Test No. MOS-6	Test No. MOS-7		
Structural Adequacy	B.	The test article should readily ac fracturing, or yielding.	tivate in a predictable ma	nner by breaking away,	S	S	S		
	D.	1. Detached elements, fragments penetrate or show potential for per undue hazard to other traffic, ped	s or other debris from the enetrating the occupant con lestrians, or personnel in a	e test article should not npartment, or present an work zone.	S	S	S		
		2. Deformations of, or intrusions limits set forth in Section 5.2.2 at	into, the occupant compare nd Appendix E of MASH 2	ement should not exceed 2016.	S	S	S		
	F.	The vehicle should remain upright pitch angles are not to exceed 75	The vehicle should remain upright during and after collision. The maximum roll itch angles are not to exceed 75 degrees.						
Occupant	H.	Occupant Impact Velocity (OIV) for calculation procedure) should	(see Appendix A, Section satisfy the following limit	A5.2.2 of MASH 2016 s:					
Risk		Occupa	nt Impact Velocity Limits		S	S	S		
		Component	Preferred	Maximum					
		Longitudinal	10 ft/s (3.0 m/s)	16 ft/s (4.9 m/s)					
	I.	The Occupant Ridedown Acceler MASH 2016 for calculation proc	ration (ORA) (see Append edure) should satisfy the fo	ix A, Section A5.2.2 of ollowing limits:					
		Occupant F	Ridedown Acceleration Lin	nits	S	S	S		
		Component	Preferred	Maximum					
		Longitudinal and Lateral	15.0 g's	20.49 g's					
Post-Impact Vehicular Response	N.	Vehicle trajectory behind the ter	st article is acceptable.		S	S	S		
		MASH 2016 Test l	Designation No.		3-62	3-61	3-60		
		Final Evaluation	(Pass or Fail)		Pass	Pass	Pass		
S – Sa	tisfac	tory U – Unsatisfactory	NA - Not Applicable						

# Table 15. Summary of Safety Performance Evaluation

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## 9 MASH EVALUATION

The evaluation of Missouri DOT's dual-post, U-channel sign support system was conducted with four connection bolts. Two sign panels were attached to the U-channel masts. The bottom panel height was placed at 5 ft (1.5 m) from the ground line. The MoDOT dual-post, U-channel sign support system was subjected to three full-scale crash tests in accordance with MASH 2016 TL-3 evaluation criteria.

In test no. MOS-5, the 2270P pickup truck impacted the U-channel sign support system oriented at 0 degrees, or head-on to the vehicle, at a speed of 62.7 mph (100.9 km/h), resulting in a kinetic energy of 661.4 kip-ft (896.7 kJ). After impact, the system fractured as intended and the vehicle continued onward without major windshield damage. All occupant risk criteria were satisfied, and the test successfully met the safety performance criteria of MASH 2016 test designation no. 3-62.

In test no. MOS-6, the 1100C small car impacted the U-channel sign support system oriented at 0 degrees, or head-on to the vehicle, at a speed of 63.3 mph (101.9 km/h), resulting in a kinetic energy of 324.2 kip-ft (439.6 kJ). After impact, the system fractured as intended and the vehicle continued onward without major windshield damage. All occupant risk criteria were satisfied, and the test successfully met the safety performance criteria of MASH 2016 test designation no. 3-61.

In test no. MOS-7, the 1100C small car impacted the U-channel sign support system oriented at 0 degrees, or head-on to the vehicle, at a speed of 20.0 mph (32.2 km/h), resulting in an kinetic energy of 32.6 kip-ft. (44.1 kJ). After impact, the system deformed and the vehicle to continued onward without major windshield damage occupant compartment penetration. All occupant risk criteria were satisfied, and the test successfully met the safety performance criteria of MASH 2016 test designation no. 3-60.

With the successful completion of all three crash tests within the TL-3 testing matrix, the MoDOT dual-post, U-channel sign support system with four connection bolts at the base was determined to be crashworthy to MASH 2016 TL-3 criteria. Any deviations to the system configuration can potentially lead to very different results. Therefore, the safety performance of variations can only be verified through the use of full-scale crash testing.

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- Bullard, Jr., D.L., Bligh, R.P., Menges, W.L., and Haug, R.R., NCHRP Web-Only Document 157: Volume I: Evaluation of Existing Roadside Safety Hardware Using Updated Criteria – Technical Report, National Cooperative Highway Research Program (NCHRP) Project 22-12(03), Transportation Research Board, Washington, D.C., 2010.
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## **11 APPENDICES**

# Appendix A. Material Specifications

Item No.	Description	Material Specification	Reference No.
a1	3.0 lb/ft [4.5 kg/m] U-Channel Sign Post, 132" [3,353] Long	ASTM A499 Gr. 60 Min. Yield = 60 ksi [414 Mpa]	H#109058
a2	3.0 lb/ft [4.5 kg/m] U-Channel Sign Post, 54" [1,372] Long	ASTM A499 Gr. 60 Min. Yield = 60 ksi [414 Mpa]	H#109058
b1	48"x48"x0.08" [1219x1219x2] Sign with Reflective Sheeting	Aluminum Alloy 5052 or Similar	Lot#747503 Order#M69056 PO#1236657
b2	24"x24"x0.08" [610x610x2] Sign with Reflective Sheeting	Aluminum Alloy 5052 or Similar	Lot#747503 Order#M69056 PO#1236657
c1	5/16"-18 UNC [M8x1.25], 2 1/2" [70] Long Fully Threaded Hex Bolt	SAE J429 Gr. 5 or equivalent	P#13810 O#110249806 H#8201230BA
c2	5/16" [8] Dia. Plain USS Washer	ASTM F844	L#s54218015502 P#33181 PO#210166277
c3	5/16"-18 UNC [M8x1.25] Heavy Hex Nut	SAE J995 Gr. 5 or equivalent	P#36304 PO#210167611 H#370563

Table A-1. Bill of Materials, Test Nos. MOS-5 through MOS-7

Chicago Heights		F	CHICA	RT OF CH	S STEEL C	AND PH'	Y <b>SICAL</b> EIGHTS, IL	TESTS 60411		Page 1 o	f1	11/7/2018
Steel				FO	R 3# CH	ANNEL						
HeatNumber	Tensile	Yield	С	Mn	Р	s	Si	Cu	Ni	Мо	Cr	
109058	178,900	112,700	.91	1.00	.009	.008	.34	.20	.07	.02	.23	

Above material meets ASTM A1, A499 and A1075 requirements. Galvanized material meets ATM A123 specs. All material conforms to FHWA buy America Act 23-ERC23-635.410 requirements. Melted and manufactured in the U.S.A. WE HEREBY CERTIFY THAT THE STATED FIGURES ARE CORRECT AS CONTAINED IN THE RECORDS OF THE COMPANY

Centra Smile SUPERVISOR

Figure A-1. U-Channel Sign Post, Test Nos. MOS-5 through MOS-7

OL GRIMCO 1585 FEI FENTON,	NAI Relied Pro any Mail Problem Manheim Pike aster, Pa. 1760 INC INC INC INC INC INC INC INC INC INC	ducts its, lac.		Certif	Q GRIMCO, 1 GRIMCO, 1 GRIMCO AN 861 E TAI AKRON, C	Tes INC. (RON WAR LIMADGE J H 443	EHOUSE AVE 10-3511	ilts		CERT DATE SKID N SKID V PAGE	NO ( NO ( NO ( NO (	000218 6/09/ 876449	4288 2018 ,175
ORDER NO	M69056	PO NO	1236657			1		MILL F	INISH				
ITEM NO	1	PART NO	MCOIL8480	5		1		NON AN	ODIZE QU	ALITY			
ALLOY	5052	TEMPER	238	FORM	COIL			OUT: 3	TANDARD N	MILL FINISH			
GAUGE	.08000	WIDTH	48.0000	LENGTH	0.0000	1		IN: S7	ANDARD M	ILL FINISH			
2011 7475	INGOT 8226523 HEAD UI TAIL UI HEAD YI TAIL YI TAIL YI TAIL XI	SI SI SI SI SI SI SI SI SI SI SI SI SI S	FE 0.27 TRENGTH LON TRENGTH LON NGTH OFFSET KGTH OFFSET K., AT FRAC	CU 0.06 G 43.1 K3 G 43.4 K3 =.2% LONG #.2% LONG TURE 8 % TURE 8 %	MN 0.08 SI SI 9 37.6 KSI 5 37.2 KSI	NG 2.5	CR 0.18	NI 0.005	2N 0.01	TI 0.03			
MECHANICA	CHEMIC CHEMIST MECHANI	AL COMPOSI TRY EXPRESI ICAL PROPI	ITION ACCOR SED AS % W ERTIES ACCO	DING TO / /W FOR E/ RDING TO	ASTM E-1251-1 ACH REPORTED ASTM B-557-1	1 ELEMENT 5							
ASME	SB209-11	A 5052 H38	8, ASTM 820	9-14 5052	2 1138								
We here to cartify the and tested in accord	t, unless otherwise is nor with, and has be	edicated, the mater	ial covered by this pep he applicable received	ort his been mins sents described he	dactured, inspected, rein, including any	These coamo	dities, technology Diversion controls	and softwate caps	ted from the Unit	ed States in accordance cation complies with 25	with the Ed	pert Main	stration
We hereful certify the and tested in accord specifications formin note that mercury is manufacture of our devicements	t, unless otherwise is nor with, and has be g a part of the descr set a nermal centan rodget. Certificatio	edicated, the mater en found to meet, i prion and that san faunt in aluminous n of test results sho (2014) faults.	ial covered by this rep he applicable require plat operations of allow and arithm it all not be reproduced	ort has been man pents described in the material met nor any of its com scept in ball. The	dictured, inspected, rein, including are the composition. Also, pounds late used in the insterial was methed in the Composition	Desc conno Regulations. Authorized D	dtirt, technology Diversion contrac ( E.)	ad offican ope y to U.S. Les print	telfenn de Uni hied. This certifi . High=L	ed States in accordance cation complies with 12 ab Superv.	isor		itert Admini

Figure A-2. Sign Post with Reflective Sheeting, Test Nos. MOS-5 through MOS-7

# QUALITY CERTIFICATE

# NINGBO JINDING FASTENING PIECE CO., LTD

	ALJINGIANG J	TULUNGHU	VINGBO 1	JHINA IEI	2:+80-9	(4-803	30122	FAX: +8	6-574-8	0030808		
Customer:	FASTENAL CO	MPANY PU	JRCHASING		Dat	е:			2018-0	5-01		
Product:	HEX TAP BOI	Л			Con	tract	No:		17JDF7	78T		
Class:	5				Inv	oice	No:		18-004	52710		
Size:	5/16-18X2-1	/2			Lot	No:			350088	0001		
Marking:	JDF three 1	adius			Ord	er No.			110249	806		
Quantity:	26.825 mpcs	3			Par	t No.			13810			
					Pro	ductio	n Dat	e	2018-0	3-21		
Dimensions	Of SPEC:				Cer	tifica	te No	). :	201804	1500094		
In	spection Items		Sta	ndard		R	esult		Sa	mple	Pε	iss
Visual App	earance				OK				20		20	
Body Diame	ter	0.	307-0.31	3	0.3	07-0.3	13		20		20	
Thread	Go	3/	l		OK				20		20	
	No Go	2/	1		OK				20		20	
Width Acro	ss Flats	0.	500-0.48	4	0.4	92-0, 4	93		20		20	
Width Acro	oss Corners	0.	577-0.55	2	0.5	62-0.5	63		20		20	
Major Diam	eter	0.	303-0.31	1	0, 3	03-0.3	808		20		20	
llead lleigh	t	0.	235-0.19	5	0.2	04-0.2	08		20		20	
Total Leng	th	2.	454-2.50	0	2.4	74-2.4	75		20		20	
Thread Len	gth	m	in 2.362		2.4	02-2.4	02		20		20	
Mechanical	Properties											
CharacTeri	stics	St	andard		Res	ult						
Core Hardn	less [HRC]	25	5-34		28.	5-30			10		10	
Wedge Stre	ength [psi]	m	in 120000	E.	124	814-13	3377		8		8	
Yield Stro	ngth [psi]	m	in 92000		106	818-10	7543		8		8	
Elongation	ı [%]	m	in 14		16.	9-17.0			8		8	
Reduction	Of arca [%]	m	in 35		46.	6-47.3			8		8	
Proof Load	L [[b]	48	500		450	0			1		1	
CHEMICAL CO	MPOSITION (%)	- 65	10.5-25					1004	2007-00		1000	
fleat No	10-10-4 MIR.	C	Si	Mn	Р	S		Cr	Ni	Cu	Мо	В
Spec. :	min	0.2500										
1992.000	max	0.5500		1	0.025	0 0.0	0250	Taxia Sectors	98. 1.4850			0.0030
35#	8201230BA	0.34	0.16	0.66	0.015	0.0	10 - 2	0.03	0.01	0.03	0.0	
Thickness Surfage Con			min 5	ing togt	mothod	5. 03	3-5.6	ording t	20 o ASTM I	DECOM OF	20 07. atom	dord
Surrace coa	tting.	test me	thod for	measuremo	ent of (	coating	g thi	ekness b	y X-Ray	spectro	ometry)	uaru
Thread Speci	fication: ASME B1.1	2008, U	NIFIED INC	CH SCREW TH	IREADS (UI	N AND U	NR TH	READ FORM	)			
Sampling Dim fasteners	ension Specificatio	on: ASME I	318.18-201	7 inspecti	on and (	quality	assu	rance for	high-vo	lume mac	hine asse	emb1y
Dimension Sp	ecification: ASME F	318.2.1 20	012, HEX CA	P SCREWS								
Sampling mec Mechanical P	hanical properties roperties and Perfo	specifica ormance II	tion: ASI spection	M F1470 20	012 Stan	dard Gu	ide f	or Fasten	er Sampl	ing for :	Specified	
Mechanical P	roperties: SAE J429	2014, MEG	CHANICAL /	ND MATERIA	L REQUI	REMENTS	FOR	EXTERNALL	Y THREAD	ED FASTE	NERS	
Surface Defe	ct:ASTM_F788/F788M-	-2013, SURI	FACE DISCO	NTINUITIES	OF BOL	TS, SCRE	WS, AN	D STUDS				
Plating Spec	ification: ASTM 194	1 Se Plete	ectrodepo	sited Coat	ings On	Thread	led Fa	steners				
this ropo	rt is compli	宗教金典繁新	¥N ₩ 1	0204 3	1 cort	ifico	ation	1				
Quality Cont	rol Supervisor	有限公司盾相	A 5	10204 0.	r cert	TITCA	101.01	L	Quality	Control	Manager	Q
quarrey colle	ior supervisor	NIN CONTRACT	CAN -						lauricy		aunuger	0
		C	9						沈介	主狄		

Figure A-3. <sup>5</sup>/<sub>16</sub>-in. (8-mm) Dia. Fully Threaded Hex Bolt, Test Nos. MOS-5 through MOS-7

FNL PART# 33181 FNL PO# 210166277



#### **Certificate of Compliance**

BRIGHTON-BEST INTERNATIONAL, INC. 940 ENTERPRISE ST AURORA IL 60504-4906 630-898-9600

R31101 FASTENAL CO-WINONA PRODUCT SUPPORT CENTER 1801 THEURER BLVD. WINONA MN 55987

Date : 11/14/2018

This is to certify that the USS FLAT WASHER, HDG (INCH) stated below conforms to the requirements and specifications per

ASME B18.21.1, Type-A, ASTM F2329 H.D.G.

or the revision in effect at the time of manufacture.

Item code 345002 Size 5/16" Description USS FLAT WASHER, HDG (INCH) Lot# s54218015502 Country Of Origin CHINA

Stephen Metal

Stephen McFalls Quality Control Manager

Figure A-4. <sup>5</sup>/<sub>16</sub>-in. (8-mm) Dia. Plain USS Washer, Test Nos. MOS-5 through MOS-7

## SUPER CHENG INDUSTRIAL CO., LTD.

NO. 18 BEN-GONG 2nd ROAD., BEN CHOU INDUSTRIAL PARK, KAOHSIUNG COUNTY 820, TAIWAN R.O.C. TEL : 886-7-6225326-30(5 LINES) FAX : 886-7-6215377/6212335/6235829

## **CERTIFICATE OF INSPECTION**

CERT. # : P5818	0504	<b>ISSUED DATE</b> :	2018/8/10		PAGE 1 OF 1
CLIENT : SUPER	R CHENG INDUS	TRIAL CO., LTD.			8
ADDRESS : NO. 1	8 BEN-GONG 2nd R	OAD., BEN CHOU INDU	STRIAL PARK, KAC	HSIUNG COUNTY 820,	TAIWAN R.O.C.
PURCHASER :	FASTENAL CO	MPANY PURCHAS	ING PO # : 21	0167611	17
	PART # 36304		QTY SHIP	PED: 162,000 PC	8
COMMODITY :	GRADE 5 FIN HE	X NUT	FINISH :	TRIVALENT ZINC	1
SIZE : 5/16-18	LOT#	: P58180504 S	AMPLING PLAN	: ASME B18.18-17 / A	ASTM F1470-12
QTY: 711157	PCS MATE	RIAL: 1010AM	HEAT NO	.: 370563	
MANUFACTURE	R: SUPER CHEN	G IND. CO., LTD.	MANU.	DATE: 2018/6/29	
DIMENSIONAL IN	SPECTION	SPEC. : ASME B18.	2.2-15	SAMPLED BY : YI FA	ANG HSIEH
<u>ITEM</u>	SAMPLE SIZE	SPECIFIED	ACTUAL	L RESULT JI	JDGMENT
APPEARANCE	29	ASTM F812-12	GOO GOO	D	OK
THREAD	15	ASME B1.1-03	PA:	SS	OK
W.A.F.	7	0.500 ~ 0.489 in	n 0.493 ~	0.491 in.	OK
W.A.C.	7	$0.577 \sim 0.557$ in	n 0.563 ~	0.561 in.	OK
THICKNESS	7	$0.273 \sim 0.258$ in	n 0.264 ~	0.262 in.	OK
L.					
MECHANICAL PR	OPERTIES	SPEC. : SAE J995-1	7	SAMPLED BY : YI FA	ANG HSIEH
ITEM	SAMPLE SIZE	TEST METHOD	SPECIFIED	ACTUAL RESULT	JUDGMENT
HARDNESS	7	ASTM F606/F606M-16	MAX HRC32	94 ~ 89 HRBW	PASS
PROOF LOAD	5	ASTM F606/F606M-16	MIN 6300 LB	6411 ~ 6407 LB	PASS
SURFACE FINISH		SPEC. : ASTM F194	1/F1941M-16	SAMPLED BY : CHE	NG HSIEN SU
<u>ITEM</u>	SAMPLE SIZE	TEST METHOD	SPECIFIED	ACTUAL RESULT	JUDGMENT
PLATING THICKNESS	5 15	ASTM B568-98	<b>MIN 0.0001</b> in	$0.00019 \sim 0.00014$ in	PASS

REMARK :

**1 • THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LAB.** 

2 \ THIS INSPECTION CERTIFICATE IS FOR RESPONSIBILITY UNDER SAMPLE ONLY.

3 · ABOVE SAMPLES TESTED CONFORM TO THE FASTENER SPECIFICATION OR STANDARDS.

4 · THIS INSPECTION CERTIFICATE IS ISSUED ACCORDING TO DIN EN10204 TYPE 3.1



LAB. DIRECTOR(SIGNATORY) :

表單編號:LQC 10E Rev.0

Figure A-5. <sup>5</sup>/<sub>16</sub>-in. (18-mm) Dia. Heavy Hex Nut, Test Nos. MOS-5 through MOS-7

# Appendix B. Vehicle Center of Gravity Determination

Year	TICIECIC	Test Name:	MOS-5	VIN:	1D7F	RB1CT2BS6	57795
i can.	2011	Make:	Dodge	Model:		Ram 1500	
Vehicle CG E VEHICLE + + + +	Determination Equipment Unballastec Hub Brake active Pneumatic	on I Truck (Curb) ation cylinder & tank (Nitrogen)	frame	Weight (lb.) 5302 19 8 31	Vertical CG (in.) 29.244059 15.75 30 7/8 25 1/2	Vertical M (lbin.) 155052 299.25 247 790.5	
+	Strobe/Brak	ke Battery		5	27 3/8	136.875	
+	Brake Rece	eiver/Wires		6	54	324	
+	CG Plate in	cluding DAS		50	32 3/8	1618.75	
-	Battery			-47	41 3/4	-1962.25	
-	Oil			-6	17 1/4	-103.5	
-	Interior			-114	40	-4560	
÷	Fuel			-169	18 7/8	-3189.875	
-	Coolant			-9	38 1/2	-346.5	
-	Washer flui	d	10 0 0	0	0	0	
+	Water Balla	st (In Fuel Tank	()	0	0	0	
+	Onboard Su	upplemental Bat	tery	13	26 1/4	341.25	
-	Spare Tire			-84	24 1/2	-2058	
+				7		0	
		Estimated Tota Vertical CG I	l Weight (lb.) Location (in.	) 5005 ) 29.2886		140309.3	1
Vehicle Dime	nsions for	Estimated Tota Vertical CG I <u>C.G. Calculatio</u> in	I Weight (Ib.) Location (in.	) 5005 ) 29.2886	68 125	in	
Vehicle Dime Wheel Base:	nsions for 140.25	Estimated Tota Vertical CG I <b>C.G. Calculatio</b> in.	l Weight (lb. Location (in. o <b>ns</b> Front Tr Rear Tr	) 5005 29.2886 ack Width: rack Width:	<u>68.125</u> 68	in. .in.	-
Vehicle Dime Wheel Base:	nsions for 140.25 wity	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS	I Weight (lb. Location (in. ms Front Tr Rear Tr H Targets	) 5005 ) 29.2886 rack Width: rack Width:	68.125 68 Test Inertia	in. in.	Differenc
Vehicle Dime Wheel Base: Center of Gra Test Inertial W	nsions for 140.25 wity /eight (lb.)	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ±	I Weight (lb. Location (in. Pront Tr Rear Tr H Targets : 110	) 5005 ) 29.2886 rack Width: rack Width:	68.125 68 <b>Test Inertia</b> 5026	in. in.	Differenc 26.
Vehicle Dime Wheel Base: Center of Gra Test Inertial W Longitudinal C	nsions for 140.25 wity /eight (lb.) G (in.)	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ±	I Weight (lb. Location (in. Pins Front Tr Rear Tr H Targets : 110 : 4	) 5005 ) 29.2886 rack Width:	68.125 68 <b>Test Inertia</b> 5026 60.079238	in. in.	Differenc 26. -2.9207
Vehicle Dime Wheel Base: Center of Gra Test Inertial W Longitudinal C Lateral CQ (ir	nsions for 140.25 nvity /eight (lb.) :G (in.) n.)	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ± NA	I Weight (lb. Location (in. Pns Front Tr Rear Tr H Targets 110 4	) 5005 29.2886 rack Width: rack Width:	68.125 68 <b>Test Inertia</b> 5026 60.079238 -0.216673	in. in.	Differenc 26. -2.9207 N
Vehicle Dime Wheel Base: Center of Gra Test Inertial W Longitudinal C Lateral CG (ir Vertical CG (i	nsions for ( 140.25 wity /eight (lb.) G (in.) n.) n.)	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ± NA 28 c	I Weight (lb.) Location (in. ms Front Tr Rear Tr H Targets 110 4	) 5005 29.2886 ack Width: ack Width:	68.125 68 <b>Test Inertia</b> 5026 60.079238 -0.216673 29.29	in. in.	Differenc 26. -2.9207 N 1.2886
Vehicle Dime Wheel Base: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (i Vote: Long. CG is Note: Lateral CG	nsions for 140.25 wity /eight (lb.) :G (in.) n.) s measured from measured from	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ± NA 28 c m front axle of test n centerline - positiv	I Weight (Ib. Location (in. ms Front Tr Rear Tr H Targets 110 4 or greater vehicle re to vehicle rig	) 5005 29.2886 rack Width: rack Width: ht (passenger)	68.125 68 <b>Test Inertia</b> 5026 60.079238 -0.216673 29.29 ) side	in. in.	Differenc 26. -2.9207 N/ 1.2886
Vehicle Dime Wheel Base: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (i Note: Long. CG is Note: Lateral CG	nsions for ( 140.25 wity /eight (lb.) G (in.) n.) s measured from measured from the figure for the figure for t	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ± NA 28 c m front axle of test n centerline - positiv	I Weight (lb.) Location (in. Front Tr Rear Tr H Targets 110 4 or greater vehicle re to vehicle rig	bin venicie 5005 29.2886 rack Width: rack Width: ht (passenger)	68.125 68 <b>Test Inertia</b> 5026 60.079238 -0.216673 29.29 ) side <b>TEST INER</b>	in. in. I	Differenc 26. -2.9207 N. 1.2886
Vehicle Dime Wheel Base: Center of Gra Test Inertial W Longitudinal C Lateral CG (ir Vertical CG (i Vertical CG (i Note: Lateral CG Note: Lateral CG	nsions for 140.25 wity /eight (lb.) G (in.) n.) s measured fro measured fron <b>1T (lb.)</b> Left	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ± NA 28 c m front axle of test n centerline - positiv Right	I Weight (lb., Location (in. ms Front Tr Rear Tr H Targets 110 4 or greater vehicle re to vehicle rig	) 5005 29.2886 rack Width: rack Width: ht (passenger)	68.125 68 <b>Test Inertia</b> 5026 60.079238 -0.216673 29.29 ) side <b>TEST INER</b>	in. in. I TIAL WEIGI	Differenc 26. -2.9207 N. 1.2886 HT (Ib.) Right
Vehicle Dime Wheel Base: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (i Vertical CG (i Note: Long. CG is Note: Lateral CG	nsions for 140.25 wity /eight (lb.) G (in.) n.) s measured from measured from <b>1T (lb.)</b> Left 1497	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ± NA 28 c m front axle of test 1 n centerline - positiv Right 1447	I Weight (lb., Location (in. ms Front Tr Rear Tr H Targets 110 4 or greater vehicle re to vehicle rig	) 5005 29.2886 rack Width: rack Width: ht (passenger)	68.125 68 <b>Test Inertia</b> 5026 60.079238 -0.216673 29.29 ) side <b>TEST INER</b> Front	in. in. in. <b>I</b> <b>TIAL WEIG</b> Left 1445	Differenc 26. -2.9207 N. 1.2886 HT (Ib.) Right 1428
Vehicle Dime Wheel Base: Center of Gra Test Inertial W Longitudinal C Lateral CG (ir Vertical CG (i Vertical CG (i Note: Lateral CG CURB WEIGH Front Rear	nsions for 140.25 wity /eight (lb.) G (in.) n.) s measured from measured from <b>1T (lb.)</b> Left 1497 1191	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ± NA 28 c m front axle of test n centerline - positiv Right 1447 1167	I Weight (lb.) Location (in. ms Front Tr Rear Tr H Targets 110 4 or greater vehicle re to vehicle rig	) 5005 29.2886 rack Width: rack Width: ht (passenger)	68.125 68 <b>Test Inertia</b> 5026 60.079238 -0.216673 29.29 ) side <b>TEST INER</b> Front Rear	in. in. in. I I Left 1445 1084	Differenc 26. -2.9207 N/ 1.2886 HT (Ib.) Right 1428 1069
Vehicle Dime Wheel Base: Center of Gra Test Inertial M Longitudinal C Lateral CG (in Vertical CG (i Vertical CG (i Note: Long. CG is Note: Lateral CG CURB WEIGH Front Rear	nsions for 140.25 wity /eight (lb.) :G (in.) n.) s measured from measured from <b>1T (lb.)</b> Left 1497 1191 2944	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ± NA 28 c m front axle of test n centerline - positiv Right 1447 1167	I Weight (lb. Location (in. ms Front Tr Rear Tr H Targets 110 4 or greater vehicle re to vehicle rig	) 5005 29.2886 rack Width: rack Width: ht (passenger)	68.125 68 <b>Test Inertia</b> 5026 60.079238 -0.216673 29.29 ) side <b>TEST INER</b> Front Rear FRONT	in. in. I TIAL WEIGI Left 1445 1084 2873	Differenc 26. -2.9207 N/ 1.2886 HT (Ib.) Right 1428 1069
Vehicle Dime Wheel Base: Center of Gra Test Inertial M Longitudinal C Lateral CG (in Vertical CG (i Vertical CG (i Note: Long. CG is Note: Lateral CG CURB WEIGH Front Rear FRONT REAR	nsions for 140.25 wity /eight (lb.) :G (in.) n.) s measured from measured from <b>1T (lb.)</b> Left 1497 1191 2944 2358	Estimated Tota Vertical CG I C.G. Calculatio in. 2270P MAS 5000 ± 63 ± NA 28 c m front axle of test n centerline - positiv Right 1447 1167 lb.	I Weight (lb. Location (in. ms Front Tr Rear Tr H Targets 110 4 or greater vehicle re to vehicle rig	) 5005 29.2886 rack Width: rack Width: ht (passenger)	68.125 68 <b>Test Inertia</b> 5026 60.079238 -0.216673 29.29 ) side <b>TEST INER</b> Front Rear FRONT REAR	in. in. in. <b>TIAL WEIG</b> Left 1445 1084 2873 2153	Differenc 26. -2.9207 N/ 1.2886 HT (Ib.) Right 1428 1069 Ib. Ib.

Figure B-1. Vehicle Mass Distribution, Test No. MOS-5

Date:	6/12/2019	Test Name:	MOS-6	VIN:	KNA	DE772260	512940
Year:	2009	Make:	Kia	Model:		Rio	
Vehicle CG	Determinati	on					
					Weight		
	Vehicle Equ	uipment		200	(lb.)		
	+	Unballasted Ca	ar (Curb)		2510		
	+	Hub		L.	19		
	+	Brake activatio	n cylinder &	frame	8		
	+	Pneumatic tan	< (Nitrogen)		22		
	+	Strobe/Brake E	Battery		5		
	+	Brake Receive	r/Wires		6		
	+	CG Plate inclue	ding DAS		22		
		Battery			-31		
	-	Oil			-5		
		Interior			-63		
	-	Fuel			-40		
					-/		
	-	Vasner fluid	In Fuel Tenk	A	-8		
	+	Ophoord Supp	In Fuel Tank	.) ton/	0		
		Onboard Supp	iementai bat	lery	0		
	*						
	Note: (+) is ad	ded equipment to ve Estim	hicle, (-) is remo nated Total V	oved equipmen Veight (Ib.)	nt from vehicle 2438	5 5	
Vehicle Dime	Note: (+) is ad	ded equipment to ve Estim C.G. Calculatio	hicle, (-) is remo nated Total V ns	oved equipmen Veight (Ib.)	nt from vehicle		
<b>Vehicle Dime</b> Wheel Base:	Note: (+) is ad	ded equipment to ve Estim <u>C.G. Calculatio</u> in.	hicle, (-) is remo nated Total V ns Front Tra	oved equipmen Veight (Ib.)	nt from vehicle	in.	_
<u>Vehicle Dime</u> Wheel Base: Roof Height:	Note: (+) is ad nsions for 98.5 57.5	ded equipment to ve Estim C.G. Calculatio	hicle, (-) is remo nated Total V <b>ns</b> Front Tra Rear Tra	ved equipmer Veight (Ib.)	2438	in. in.	_
<b>Vehicle Dime</b> Wheel Base: Roof Height:	Note: (+) is ad <b>insions for</b> ( 98.5 57.5	ded equipment to ve Estim <u>C.G. Calculatio</u> in. _in.	hicle, (-) is remo nated Total V <b>ns</b> Front Tra Rear Tra	ved equipmer Veight (Ib.) ack Width: ack Width:	2438 2438 57.75 57.5	in. in.	_
<b>Vehicle Dime</b> Wheel Base: Roof Height:	Note: (+) is ad <b>insions for</b> ( 98.5 57.5	ded equipment to ve Estim C.G. Calculatio _in. _in.	hicle, (-) is remo nated Total V <b>ns</b> Front Tra Rear Tra	veight (Ib.)	nt from vehicle 2438 57.75 57.5	in. in.	_
<u>Vehicle Dime</u> Wheel Base: Roof Height: Center of Gra	Note: (+) is ad <b>insions for</b> ( 98.5 57.5 <b>avity</b>	ded equipment to ve Estim <u>C.G. Calculatio</u> in. in. <u>1100C MAS</u>	hicle, (-) is remo nated Total V ns Front Tra Rear Tra H Targets	ved equipmer Veight (Ib.)	2438 27.75 57.75 57.5 Test Inertial	in. in.	Difference
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W	Note: (+) is ad ensions for ( 98.5 57.5 wity Veight (lb.)	ded equipment to ve Estim C.G. Calculatio in. in. 1100C MAS 2420 ±	hicle, (-) is remo nated Total V ns Front Tra Rear Tra H Targets 55	ved equipmer Veight (Ib.)	2438           2438           57.75           57.5           Test Inertial           2420           26 444	in. in.	Difference 0
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C	Note: (+) is ad ensions for ( 98.5 57.5 avity /eight (lb.) >G (in.)	ded equipment to ve Estim <u>C.G. Calculatio</u> in. in. <u>1100C MAS</u> 2420 ± 39 ±	hicle, (-) is reme nated Total V ns Front Tra Rear Tra H Targets : 55 : 4	ved equipmer Veight (Ib.)	2438 2438 57.75 57.5 <b>Test Inertial</b> 2420 36.144	in. in.	Differend 0 -2.85
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (ir	Note: (+) is ad ensions for ( 98.5 57.5 avity Veight (lb.) 2G (in.) n.) n.)	ded equipment to ve Estim <u>C.G. Calculatio</u> in. in. <u>1100C MAS</u> 2420 ± 39 ± NA	hicle, (-) is remo nated Total V <b>ns</b> Front Tra Rear Tra <b>H Targets</b> : 55	veight (Ib.)	57.75 57.75 57.5 <b>Test Inertial</b> 2420 36.144 -0.595 22.73	in. in.	Difference 0 -2.85
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (in	Note: (+) is ad ensions for ( 98.5 57.5 avity Veight (lb.) CG (in.) n.) n.)	ded equipment to ve Estim <u>C.G. Calculatio</u> in. in. <u>1100C MAS</u> 2420 ± 39 ± NA NA	hicle, (-) is remo nated Total V ns Front Tra Rear Tra H Targets : 55 : 4	veight (Ib.)	57.75           57.5           57.5           57.5           2420           36.144           -0.595           22.73	in. in.	Difference 0 -2.85 N N
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (i Note: Long. CG i	Note: (+) is ad ensions for ( 98.5 57.5 avity Veight (lb.) CG (in.) n.) n.) s measured from measured from	ded equipment to ve Estim C.G. Calculatio in. in. 1100C MAS 2420 ± 39 ± NA NA m front axle of test v	hicle, (-) is remo nated Total V ns Front Tra Rear Tra H Targets : 55 : 4	ved equipmer	57.75           57.5           57.5           Test Inertial           2420           36.144           -0.595           22.73	in. in.	Differend 0 -2.85 N
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (i Note: Long. CG i Note: Lateral CG	Note: (+) is ad ensions for ( 98.5 57.5 avity Veight (lb.) CG (in.) n.) in.) s measured from	ded equipment to ve Estim C.G. Calculatio in. in. 1100C MAS 2420 ± 39 ± NA NA M m front axle of test v 1 centerline - positive	hicle, (-) is reme nated Total V ns Front Tra Rear Tra H Targets : 55 : 4	veight (Ib.)	2438         2438         57.75         57.5         77.5         57.5         7.5         36.144         -0.595         22.73         side	in. in.	Difference 0 -2.85 N N
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (i Note: Long. CG i Note: Lateral CG	Note: (+) is ad ensions for ( 98.5 57.5 avity Veight (lb.) CG (in.) n.) in.) s measured from the form the	ded equipment to ve Estim C.G. Calculatio in. in. 1100C MAS 2420 ± 39 ± NA NA NA m front axle of test v n centerline - positive	hicle, (-) is remain nated Total V ns Front Tra Rear Tra H Targets : 55 : 4	ved equipmer Veight (Ib.)	2438           2438           57.75           57.5           77.5           57.5           7.5           2420           36.144           -0.595           22.73           side           TEST INER*	in. in.	— Differend 0 -2.85 N N
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (i Note: Long. CG i Note: Lateral CG	Note: (+) is ad sensions for ( 98.5 57.5 avity Veight (lb.) CG (in.) n.) s measured from measured from 1T (lb.)	ded equipment to ve Estim <u>C.G. Calculatio</u> in. in. <u>1100C MAS</u> 2420 ± 39 ± NA NA M front axle of test v n centerline - positive	hicle, (-) is remo nated Total V <b>ns</b> Front Tra Rear Tra H Targets : 55 : 4	ved equipmer Veight (Ib.)	2438         2438         57.75         57.5         Test Inertial         2420         36.144         -0.595         22.73         side         TEST INER*	in. in. TIAL WEIG	— Differend 0 -2.85 N N SHT (Ib.)
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (ir Vertical CG (i Note: Long. CG i Note: Lateral CG	Note: (+) is ad sensions for ( 98.5 57.5 avity Veight (Ib.) 2G (in.) n.) in.) s measured from imeasured from IT (Ib.) Left	ded equipment to ve Estim <u>C.G. Calculatio</u> in. in. <u>1100C MAS</u> 2420 ± 39 ± NA NA m front axle of test v n centerline - positive Right	hicle, (-) is remo nated Total V <b>ns</b> Front Tra Rear Tra H Targets : 55 : 4	veight (Ib.)	2438         2438         57.75         57.5         Test Inertial         2420         36.144         -0.595         22.73         side         TEST INER*	in. in. TIAL WEIG	Differend 0 -2.85 N SHT (Ib.) Right
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (ir Vertical CG (i Note: Long. CG i Note: Lateral CG CURB WEIGH	Note: (+) is ad ensions for ( 98.5 57.5 avity Veight (Ib.) CG (in.) n.) in.) s measured fro measured fron IT (Ib.) Left 818	ded equipment to ve Estim C.G. Calculatio in. in. in. 1100C MAS 2420 ± 39 ± NA NA m front axle of test v n centerline - positive Right 760	hicle, (-) is remo nated Total V ns Front Tra Rear Tra H Targets : 55 : 4	ved equipmer Veight (Ib.)	2438 2438 57.75 57.5 <b>Test Inertial</b> 2420 36.144 -0.595 22.73 side <b>TEST INER</b> Front	in. in. TIAL WEIG	Difference 0 -2.85 N SHT (Ib.) Right 711
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial M Longitudinal C Lateral CG (in Vertical CG (i Note: Long. CG i Note: Lateral CG CURB WEIGH Front Rear	Note: (+) is ad ensions for ( 98.5 57.5 avity Veight (lb.) 2G (in.) n.) in.) s measured from tr (lb.) Left 818 453	ded equipment to ve Estim C.G. Calculatio in. in. in. 1100C MAS 2420 ± 39 ± NA NA Ma front axle of test v n centerline - positive Right 760 479	hicle, (-) is remo nated Total V ns Front Tra Rear Tra H Targets : 55 : 4	ved equipmen Veight (Ib.)	2438 2438 57.75 57.5 <b>Test Inertial</b> 2420 36.144 -0.595 22.73 side <b>TEST INER</b> Front Rear	in. in. TIAL WEIG Left 821 414	Differend 0 -2.85 N SHT (Ib.) Right 711 474
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (ir Vertical CG (i Vertical CG (i Note: Long. CG i Note: Lateral CG CURB WEIGH Front Rear FRONT	Note: (+) is ad ensions for ( 98.5 57.5 avity Veight (lb.) CG (in.) n.) in.) s measured fro measured fron <b>IT (lb.)</b> Left 818 453 1578	ded equipment to ve Estim C.G. Calculatio in. in. 1100C MAS 2420 ± 39 ± NA NA m front axle of test v n centerline - positive Right 760 479	hicle, (-) is remo nated Total V ns Front Tra Rear Tra H Targets : 55 : 4	ved equipmer Veight (Ib.)	2438 2438 57.75 57.5 <b>Test Inertial</b> 2420 36.144 -0.595 22.73 side <b>TEST INER</b> Front Rear FRONT	in. in. TIAL WEIG Left 821 414 1532	Difference 0 -2.85 N SHT (Ib.) Right 711 474
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (ir Vertical CG (i Vertical CG (i Note: Long. CG i Note: Lateral CG CURB WEIGH Front Rear FRONT REAR	Note: (+) is ad ensions for ( 98.5 57.5 avity Veight (lb.) CG (in.) n.) in.) s measured from HT (lb.) Left 818 453 1578 932	ded equipment to ve Estim C.G. Calculatio in. in. 1100C MAS 2420 ± 39 ± NA NA m front axle of test v n centerline - positive Right 760 479 Ib. Ib.	hicle, (-) is remo nated Total V ns Front Tra Rear Tra H Targets : 55 : 4	ved equipmer Veight (Ib.)	2438         2438         57.75         57.5         Test Inertial         2420         36.144         -0.595         22.73         side         TEST INER         Front         Rear         FRONT         REAR	in. in. TIAL WEIG Left 821 414 1532 888	Difference 0 -2.85 N SHT (Ib.) Right 711 474 Ib.

Figure B-2. Vehicle Mass Distribution, Test No. MOS-6

Date.	6/28/2019	Test Name:	MOS-7	VIN:	KNA	DE2238963	080263
Year:	2009	Make:	Kia	Model:		Rio	
Vehicle CG	Determinat	tion			\\/ = : = h t		
	Vohielo Equ	vipmont			vveight (lb)		
		Unballasted C:	ar (Curb)		2499	ľ	
	+	Hub			19		
	+	Brake activatio	on cylinder 8	frame	7		
	+	Pneumatic tan	k (Nitroaen)		31		
	+	Strobe/Brake	Battery		5		
	+	Brake Receive	r/Wires		6		
	+	CG Plate inclu	iding DAQ	************************************	22		
	-	Battery			-35		
	-	Oil			-11		
	-	Interior			-78		
	-	Fuel			-15		
	-	Coolant			-6		
	-	Washer fluid			-9		
	+	Water Ballast	(In Fuel Tan	k)			
	+	Onboard Supp	lemental Ba	ttery	0		
	Note: (+) is ac	dded equipment to Estin	vehicle, (-) is r nated Total \	removed equi Neight (Ib)	pment from vel 2435	hicle	
Vehicle Dim	Note: (+) is ac	dded equipment to Estin <u>C.G. Calculat</u>	vehicle, (-) is r nated Total \ ions	removed equi	ipment from vel	hicle	_
Vehicle Dime Wheel Base:	Note: (+) is ac ensions for 98.5	dded equipment to Estin <u>C.G. Calculat</u> _in.	vehicle, (-) is r nated Total \ <b>ions</b> Front Tra	emoved equi Weight (Ib) ack Width:	2435 57.375	hicle	_
Vehicle Dim Wheel Base: Roof Height:	Note: (+) is ac ensions for 98.5 58.25	dded equipment to Estin <u>C.G. Calculat</u> _in. _in.	vehicle, (-) is r nated Total \ <b>ions</b> Front Tra Rear Tra	emoved equi Weight (Ib) ack Width: ack Width:	2435 2435 57.375 57.375	in.	_
Vehicle Dime Wheel Base: Roof Height:	Note: (+) is ac ensions for 98.5 58.25	dded equipment to Estin <u>C.G. Calculat</u> _in. _in.	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra	emoved equi Weight (Ib) ack Width: ack Width:	2435 27.375 57.375	in. in.	_
Vehicle Dim Wheel Base: Roof Height: Center of Gra	Note: (+) is ac ensions for 98.5 58.25 avity	dded equipment to Estin <u>C.G. Calculat</u> _in. _in. _in. 1100C MAS	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra H Targets	emoved equi Weight (Ib) ack Width: ack Width:	2435 27.375 57.375 57.375	in. in.	 Difference
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial V	Note: (+) is ac ensions for 98.5 58.25 avity Veight (Ib)	dded equipment to Estin <u>C.G. Calculat</u> in. in. <u>1100C MAS</u> 2420 <del>1</del>	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra H Targets ⊧ 55	emoved equi Weight (Ib) ack Width: ack Width:	2435 27.375 57.375 57.375 <b>Test Inertial</b> 2435	hicle in. in.	Differenc 15
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C	Note: (+) is ac ensions for 98.5 58.25 avity Veight (lb) CG (in.)	dded equipment to Estin <u>C.G. Calculat</u> in. in. <u>1100C MAS</u> 2420 <del>1</del> 39 <del>1</del>	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra H Targets ± 55 ± 4	emoved equi Weight (Ib) ack Width: ack Width:	2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921	in. in.	<b>Differenc</b> 15 -3.07
Vehicle Dim Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (ii	Note: (+) is ac ensions for 98.5 58.25 avity Veight (lb) CG (in.) n.)	dded equipment to Estin <u>C.G. Calculat</u> in. in. <u>1100C MAS</u> 2420 <u>4</u> 39 <u>4</u> NA	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra H Targets ⊧ 55 ⊧ 4	emoved equi Weight (Ib) ack Width: ack Width:	2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813	in. in.	Differenc 15 -3.07 N
Vehicle Dim Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (	Note: (+) is ac ensions for 98.5 58.25 avity Veight (lb) CG (in.) n.) in.)	dded equipment to Estin <u>C.G. Calculat</u> in. in. <u>1100C MAS</u> 2420 ± 39 ± NA NA	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra H Targets ⊧ 55 ⊧ 4	emoved equi Weight (Ib) ack Width: ack Width:	2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783	in. in.	Differenc 15. -3.07 N N
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG ( Note: Long. CG	Note: (+) is ac ensions for 98.5 58.25 avity Veight (lb) CG (in.) n.) is measured fr	dded equipment to Estin <u>C.G. Calculat</u> in. in. <u>1100C MAS</u> 2420 <del>1</del> 39 <del>1</del> NA NA rom front axle of te	vehicle, (-) is r nated Total V ions Front Tra Rear Tra H Targets ± 55 ± 4	emoved equi	2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783	in. in.	— Differenc 15 -3.07 N N
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (in Vertical CG (in Note: Long. CG Note: Lateral CC	Note: (+) is ac ensions for 98.5 58.25 avity Veight (Ib) CG (in.) n.) in.) is measured from	dded equipment to Estin <u>C.G. Calculat</u> in. in. <u>1100C MAS</u> 2420 ± 39 ± NA NA rom front axle of te om centerline - pos	vehicle, (-) is r nated Total V ions Front Tra Rear Tra H Targets ± 55 ± 4	eright (passe	2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783 nger) side	hicle in. in.	Differenc 15. -3.07 N N
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (in Vertical CG (in Note: Long. CG Note: Lateral CC Note: Lateral CC	Note: (+) is ac ensions for 98.5 58.25 avity Veight (lb) CG (in.) n.) is measured fro emeasured fro HT (lb)	dded equipment to Estin C.G. Calculat in. in. 1100C MAS 2420 ± 39 ± NA NA rom front axle of te om centerline - pos	vehicle, (-) is r nated Total V ions Front Tra Rear Tra H Targets ± 55 ± 4	eright (passe	2435 2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783 nger) side <b>TEST INER</b>	in. in. I	— Differenc 15. -3.07 N N
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG ( Note: Long. CG Note: Lateral CC Note: Lateral CC	Note: (+) is ac ensions for 98.5 58.25 avity Veight (Ib) CG (in.) n.) in.) is measured fro the fight (Ib)	dded equipment to Estin <u>C.G. Calculat</u> in. in. in. <u>1100C MAS</u> 2420 <u>=</u> 39 <u>=</u> NA NA rom front axle of te om centerline - pos	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra H Targets ± 55 ± 4	eright (passe	2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783 nger) side <b>TEST INER</b>	in. in. I TIAL WEIC	Differenc 15 -3.07 N N SHT (Ib)
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (in Vertical CG (in Vertical CG (in Note: Long. CG Note: Lateral CC Note: Lateral CC	Note: (+) is ac ensions for 98.5 58.25 avity Veight (Ib) CG (in.) n.) in.) is measured fro HT (Ib) Left	dded equipment to Estin <u>C.G. Calculat</u> in. in. <u>1100C MAS</u> 2420 ± 39 ± NA NA NA rom front axle of to om centerline - pos	vehicle, (-) is r nated Total V ions Front Tra Rear Tra H Targets ± 55 ± 4	emoved equi	2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783 nger) side <b>TEST INER</b>	in. in. I TIAL WEIC	Difference 15 -3.07 N SHT (Ib) Right
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG ( Note: Long. CG Note: Lateral CC CURB WEIGH Front	Note: (+) is ac ensions for 98.5 58.25 avity Veight (lb) CG (in.) n.) is measured from HT (lb) Left 825	C.G. Calculat Estin C.G. Calculat in. in. 1100C MAS 2420 = 39 = NA NA NA rom front axle of to om centerline - pos Right 781	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra H Targets ± 55 ± 4	eright (passe	2435 2435 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783 nger) side <b>TEST INER</b> Front	in. in. I TIAL WEIC Left 807	Differenc 15 -3.07 N SHT (Ib) Right 740
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG ( Note: Long. CG Note: Lateral CC CURB WEIGH Front Rear	Note: (+) is ac ensions for 98.5 58.25 avity Veight (lb) CG (in.) n.) in.) is measured fro HT (lb) Left 825 440	dded equipment to         Estin         C.G. Calculat         _in.         _in.         _in.         1100C MAS         2420 ±         39 ±         NA         NA         rom front axle of te         pm centerline - post         Right         781         453	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra H Targets ± 55 ± 4	emoved equi	2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783 nger) side <b>TEST INER</b> Front Rear	in. in. I TIAL WEIC Left 807 445	Differenc 15. -3.07 N SHT (Ib) Right 740 443
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (in Vertical CG (in Vertical CG (in Note: Long. CG Note: Lateral CC CURB WEIGH Front Rear FRONT	Note: (+) is ac ensions for 98.5 58.25 avity Veight (lb) CG (in.) n.) is measured from the measured from the measured from the measured from the	C.G. Calculat Estin C.G. Calculat in. in. 1100C MAS 2420 ± 39 ± NA NA rom front axle of to om centerline - pos Right 781 453	vehicle, (-) is r nated Total \ ions Front Tra Rear Tra H Targets ⊧ 55 ⊧ 4	eright (passe	2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783 nger) side <b>TEST INER</b> Front Rear FRONT	in. in. TIAL WEIC Left 807 445 1547	Differenc 15. -3.07 N N SHT (Ib) Right 740 443 Ib
Vehicle Dime Wheel Base: Roof Height: Center of Gra Test Inertial W Longitudinal C Lateral CG (in Vertical CG (in Vertical CG (in Vertical CG (in Note: Long. CG Note: Lateral CC CURB WEIGH Front Rear FRONT REAR	Note: (+) is ac ensions for 98.5 58.25 avity Veight (lb) CG (in.) n.) is measured from tr (lb) Left 825 440 1606 893	C.G. Calculat in. in. in. 1100C MAS 2420 ± 39 ± NA NA rom front axle of to om centerline - pos Right 781 453 Ib	vehicle, (-) is r nated Total V ions Front Tra Rear Tra H Targets ± 55 ± 4	emoved equi	2435 2435 57.375 57.375 57.375 <b>Test Inertial</b> 2435 35.921 -0.813 22.783 nger) side <b>TEST INER</b> Front Rear FRONT REAR	in. in. in. TIAL WEIC Left 807 445 1547 888	

Figure B-3. Vehicle Mass Distribution, Test No. MOS-7

# Appendix C. Static Soil Tests



Figure C-1. Soil Strength, Initial Calibration Tests



Figure C-2. Static Soil Test, Test No. MOS-5



Figure C-3. Static Soil Test, Test No. MOS-6



Figure C-4. Static Soil Test, Test No. MOS-7

# Appendix D. Vehicle Deformation Records

Date: Year:	4/9/2 20	2019 111			Test Name: Make:	MC Do	0S-5 dge			VIN: Model:	1D7R	B1CT2BS6 Ram 1500	57795
					VE DRIVEI	HICLE DE	FORMATIO	ON - SET 1					
		Pretest X	Pretest Y	Pretest Z	Posttest X	Posttest Y	Posttest Z	∆X <sup>A</sup>	ΔY <sup>A</sup>	$\Delta Z^{A}$	Total ∆	Crush <sup>B</sup>	Directions for
	POINT	(in.)	(in.)	(in.)	(01.)	(11.)	(11.)	(11.)	(III.)	(III.)	(III.)	(11.)	Crush <sup>C</sup>
	1	58.8247	-8.0811	2.5687	58.8522	-8.0764	2.4094	-0.0275	0.0047	0.1593	0.1617	0.1593	Z
	2	58.9654	-11.3/39	2.4/61	58.9762	-11.3652	2.3209	-0.0108	0.0087	0.1552	0.1558	0.1552	<u>∠</u>
- <u>.</u>	3	50.0080	-14.3094	2.0130	50.9200	-14.40/9	2.3331	-0.0464	-0.0165	0.1674	0.1699	0.1674	7
NAN U	5	59.0009	-10.0101	2.4150	59 1903	-10.0000	2.2402	0.0113	0.0133	0.1581	0.1000	0.1074	X 7
	6	55 5582	-7.4327	4.3032	55,5776	-7.4725	4.1592	-0.0194	-0.0398	0.1440	0.1507	0.1440	Z
<b>2</b> 里)	7	55.3908	-11.2818	4.3749	55.3728	-11.2893	4.2478	0.0180	-0.0075	0.1271	0.1286	0.1284	X,Z
· >	8	55.3296	-14.6091	4.3949	55.3173	-14.6186	4.2555	0.0123	-0.0095	0.1394	0.1403	0.1399	X, Z
	9	55.3922	-18.6557	4.3558	55.3879	-18.6640	4.2058	0.0043	-0.0083	0.1500	0.1503	0.1501	X, Z
	10	55.5165	-21.9944	4.2749	55.4741	-22.0291	4.1395	0.0424	-0.0347	0.1354	0.1461	0.1419	X, Z
	11	51.0127	-7.4067	5.3252	51.0069	-7.4427	5.1966	0.0058	-0.0360	0.1286	0.1337	0.1286	Z
	12	50.8475	-12.1410	5.3324	50.8294	-12.1708	5.1962	0.0181	-0.0298	0.1362	0.1406	0.1362	Z
	13	50.7587	-15.9494	5.3138	50.7861	-15.9644	5.1727	-0.0274	-0.0150	0.1411	0.1445	0.1411	Z
	14	50,6741	-19.2808	5.3058	50,6393	-19.3109	5.1017	-0.0309	-0.0301	0.1441	0.1504	0.1441	2
	15	17 1445	7 1174	5.2911	47 1686	7 1244	5 1023	-0.0120	0.0021	0.1218	0.1400	0.1218	7
	17	46 8650	-10 9167	5 3336	46.8635	-10.8970	5 2102	0.0015	0.0197	0.1210	0.1244	0.1210	7
	18	46 7273	-14 8412	5 3194	46 7078	-14 7792	5 1880	0.0195	0.0620	0.1204	0.1200	0.1204	7
AN	19	46.4634	-19.0558	5.2990	46.4914	-19.0592	5.1649	-0.0280	-0.0034	0.1341	0.1370	0.1341	Z
d C	20	46.4586	-22.3894	5.3018	46.4714	-22.3718	5.1652	-0.0128	0.0176	0.1366	0.1383	0.1366	Z
j ⊠ j	21	42.4086	-7.4804	5.2903	42.3973	-7.4984	5.1812	0.0113	-0.0180	0.1091	0.1112	0.1091	Z
	22	42.1295	-10.3296	5.3318	42.1487	-10.3488	5.2208	-0.0192	-0.0192	0.1110	0.1143	0.1110	Z
-	23	41.7948	-13.9481	5.3029	41.8091	-13.9538	5.1849	-0.0143	-0.0057	0.1180	0.1190	0.1180	Z
	24	41.5918	-17.6280	5.2843	41.6034	-17.6358	5.1637	-0.0116	-0.0078	0.1206	0.1214	0.1206	Z
	25	41.3593	-21.8614	5.2945	41.3365	-21.85/7	5.1/15	0.0228	0.0037	0.1230	0.1252	0.1230	<u>∠</u> 7
	20	37.00/3	-7.3319	4.3000	37.6291	-7.4019	4.2401	-0.0418	-0.0700	0.0005	0.1015	0.0605	7
	28	37.4069	-16 5447	4.5460	37,4057	-16 5483	4.4554	-0.0103	-0.0271	0.0940	0.0303	0.0940	7
	29	37.2607	-19.8657	4.2820	37.2804	-19.8486	4.1748	-0.0197	0.0171	0.1072	0.1103	0.1072	Z
	30	37.3915	-23.5507	4.5129	37.3618	-23.5304	4.4007	0.0297	0.0203	0.1122	0.1178	0.1122	Z
<sup>A</sup> Positive va compartmer <sup>B</sup> Crush calc deforming ir <sup>c</sup> Direction f	alues denot nt. culations tha nward towar	e deformation at use multip rd the occup	on as inward le directiona ant comparti	toward the I componer ment.	occupant co nts will disre	ompartment, gard compo	negative va nents that ar	lues denote e negative : "NA" then r	deformation	ns outward a lude positive	away from the values whe	ne occupant ere the com	ponent is
Direction							ounation of the			o rocordou,			
		Pre	test Floor	Pan					Post	ttest Floor	Pan		
		1			P				1 m				A.

Figure D-1. Floor Pan Deformation Data – Set 1, Left, Test No. MOS-5

Date: Year:	4/9/2 20	<u>2019</u> )11			Test Name: Make:	MC Do	)S-5 dge			VIN: Model:	1D7R	B1CT2BS6 Ram 1500	57795
				F	VE	HICLE DE ER SIDE	FORMATI	ON AN - SET	1				
	POINT	Pretest X (in.)	Pretest Y (in.)	Pretest Z (in.)	Posttest X (in.)	Posttest Y (in.)	Posttest Z (in.)	ΔX <sup>A</sup> (in.)	ΔY <sup>A</sup> (in.)	ΔZ <sup>A</sup> (in.)	Total Δ (in.)	Crush <sup>B</sup> (in.)	Directions for Crush <sup>C</sup>
	1	59.7658	19.9074	-2.2364	59.8216	19.8630	-2.4359	-0.0558	0.0444	0.1995	0.2119	0.1995	Z
	2	61.6115	22.1442	0.1495	61.6647	22.0895	-0.0620	-0.0532	0.0547	0.2115	0.2248	0.2115	Z
	3	62.0911	25.2892	0.5270	62.1274	25.2783	0.3292	-0.0363	0.0109	0.1978	0.2014	0.1978	Z
νΨ,	4	62.2548	27.3387	0.4331	62.2675	27.2713	0.2453	-0.0127	0.0674	0.1878	0.1999	0.1878	Z
A N N	5	62.3008	30.1726	-0.8080	62.2800	30.1792	-0.9888	0.0208	-0.0066	0.1808	0.1821	0.1820	X, Z
ШЩХ	6	55.2954	18.8247	-0.3768	55.2865	18.7835	-0.5186	0.0089	0.0412	0.1418	0.1479	0.1421	X, Z
μĦ	7	56.4376	22.0342	2.8382	56.5247	22.0663	2.7009	-0.0871	-0.0321	0.1373	0.1657	0.1373	Z
>	8	56.6345	26.5916	3.3113	56.7029	26.5638	3.1164	-0.0684	0.0278	0.1949	0.2084	0.1949	Z
	9	56.6352	29.9495	3.3095	56.6796	29.9434	3.1273	-0.0444	0.0061	0.1822	0.1876	0.1822	Z
	10	56.6762	33.4173	3.2974	56.6924	33.3989	3.1334	-0.0162	0.0184	0.1640	0.1658	0.1640	Z
	11	50.2539	15.5428	1.5690	50.2653	15.5358	1.4693	-0.0114	0.0070	0.0997	0.1006	0.0997	Z
	12	51.0614	18.4835	4.3806	51.0893	18.4767	4.2656	-0.0279	0.0068	0.1150	0.1185	0.1150	Z
	13	51.4916	25.2227	5.3318	51.5541	25.2119	5.1710	-0.0625	0.0108	0.1608	0.1729	0.1608	Z
	14	51.4554	29.1022	5.3322	51.4841	29.1012	5.1711	-0.0287	0.0010	0.1611	0.1636	0.1611	Z
	15	51.3197	32.2301	5.3212	51.3893	32.2170	5.1584	-0.0696	0.0131	0.1628	0.1775	0.1628	Z
	16	47.0047	14.4301	3.2823	47.0572	14.3906	3.1163	-0.0525	0.0395	0.1660	0.1785	0.1660	Z
	17	47.9558	21.1767	5.3483	48.0464	21.1511	5.2008	-0.0906	0.0256	0.1475	0.1750	0.1475	Z
7	18	47.8431	25.3673	5.3304	47.9268	25.2415	5.1868	-0.0837	0.1258	0.1436	0.2085	0.1436	Z
AP	19	47.8945	28.1906	5.3224	47.9207	28.1401	5.1767	-0.0262	0.0505	0.1457	0.1564	0.1457	Z
н Ц	20	47.9212	32.0678	5.3184	48.0149	32.1108	5.1723	-0.0937	-0.0430	0.1461	0.1788	0.1461	Z
ō ()	21	43.4358	14.6778	4.2357	43.5110	14.6594	4.1161	-0.0752	0.0184	0.1196	0.1425	0.1196	Z
	22	43.8104	20.6004	5.1087	43.8874	20.5605	4.9637	-0.0770	0.0399	0.1450	0.1690	0.1450	Z
-	23	43.7806	24.5388	5.0921	43.8298	24.5167	4.9502	-0.0492	0.0221	0.1419	0.1518	0.1419	Z
	24	43.8510	27.9935	5.0901	43.8976	27.9635	4.9515	-0.0466	0.0300	0.1386	0.1493	0.1386	Z
	25	43.7699	32.4349	5.0916	43.8194	32.4182	4.9541	-0.0495	0.0167	0.1375	0.1471	0.1375	Z
	26	40.2150	17.6676	5.3467	40.2471	17.6359	5.2235	-0.0321	0.0317	0.1232	0.1312	0.1232	Z
	27	40.5257	24.5769	5.3137	40.5951	24.6269	5.1893	-0.0694	-0.0500	0.1244	0.1510	0.1244	Z
	28	40.6734	32.0721	5.3361	40.7553	32.0430	5.2043	-0.0819	0.0291	0.1318	0.1579	0.1318	Z
	29	33.6997	18.2398	1.3827	33.7246	18.1910	1.2727	-0.0249	0.0488	0.1100	0.1229	0.1100	Z
	30	33.6835	28.4127	1.3643	33.7478	28.4621	1.2471	-0.0643	-0.0494	0.1172	0.1425	0.1172	Z
A Positive v	alues denot	te deformati	on as inwar	d toward the	e occupant o	compartme	nt, negative	values deno	te deformat	ions outwar	d away from	n the occup	ant

compartment. <sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment. <sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-2. Floor Pan Deformation Data - Set 1, Right, Test No. MOS-5

Date: Year:	4/9/2 20	2019 )11			Test Name: Make:	MC Do	)S-5 dge			VIN: Model:	1D7F	B1CT2BS6 Ram 1500	57795
					VE DRIVE	HICLE DE R SIDE FL	FORMATI	ON - SET 2					
	POINT	Pretest X (in.)	Pretest Y (in.)	Pretest Z (in.)	Posttest X (in.)	Posttest Y (in.)	Posttest Z (in.)	ΔX <sup>A</sup> (in.)	ΔY <sup>A</sup> (in.)	ΔZ <sup>A</sup> (in.)	Total ∆ (in.)	Crush <sup>B</sup> (in.)	Directio for Crush
	1	60.0988	-22.9724	-1.6210	60.1613	-22.9760	-1.6094	-0.0625	-0.0036	-0.0116	0.0637	0.0000	NA
	2	60.3877	-26.3024	-1.7356	60.3902	-26.2593	-1.6943	-0.0025	0.0431	-0.0413	0.0597	0.0000	NA
	3	60.4229	-29.3289	-1.7149	60.4364	-29.3020	-1.6794	-0.0135	0.0269	-0.0355	0.0465	0.0000	NA
ż Ę	4	60.6704	-33.4276	-1.8027	60.6655	-33.3896	-1.7600	0.0049	0.0380	-0.0427	0.0574	0.0049	Х
A > U	5	60.9299	-37.2873	-1.8932	60.9554	-37.2550	-1.8663	-0.0255	0.0323	-0.0269	0.0492	0.0000	NA
Ш.Х.	6	56.8443	-22.4429	0.0914	56.8629	-22.4752	0.1283	-0.0186	-0.0323	-0.0369	0.0524	0.0000	NA
2 불	7	56.7221	-26.2977	0.2073	56.7794	-26.2966	0.2198	-0.0573	0.0011	-0.0125	0.0587	0.0000	NA
5	8	56.8383	-29.6321	0.1854	56.8299	-29.6259	0.2304	0.0084	0.0062	-0.0450	0.0462	0.0084	Х
	9	57.0101	-33.7342	0.1574	57.0294	-33.6671	0.1849	-0.0193	0.0671	-0.0275	0.0750	0.0000	NA
	10	57.2239	-37.0234	0.0833	57.2230	-37.0278	0.1221	0.0009	-0.0044	-0.0388	0.0391	0.0009	Х
	11	52.3437	-22.6155	1.1146	52.2900	-22.5901	1.1495	0.0537	0.0254	-0.0349	0.0689	-0.0349	Z
	12	52.2701	-27.3552	1.1201	52.2630	-27.3215	1.1530	0.0071	0.0337	-0.0329	0.0476	-0.0329	Z
	13	52.3122	-31.1015	1.1020	52.3406	-31.1145	1.1329	-0.0284	-0.0130	-0.0309	0.0439	-0.0309	Z
	14	52.4904	-34.4490	1.0956	52.5004	-34.4576	1.1253	-0.0100	-0.0086	-0.0297	0.0325	-0.0297	Z
	15	52.4381	-37.4740	1.0808	52.4430	-37.4475	1.1097	-0.0049	0.0265	-0.0289	0.0395	-0.0289	Z
	16	48.4305	-22.4038	1.0033	48.4438	-22.3942	1.0413	-0.0133	0.0096	-0.0380	0.0414	-0.0380	Z
	17	48.2343	-26.1700	1.1188	48.2586	-26.1746	1.1517	-0.0243	-0.0046	-0.0329	0.0412	-0.0329	Z
-	18	48.2473	-30.1377	1.1067	48.2266	-30.0597	1.1327	0.0207	0.0780	-0.0260	0.0848	-0.0260	Z
A	19	48.1071	-34.3862	1.0869	48.1466	-34.3445	1.1129	-0.0395	0.0417	-0.0260	0.0630	-0.0260	Z
2 2	20	48.2278	-37.6721	1.0907	48.2322	-37.6560	1.1163	-0.0044	0.0161	-0.0256	0.0306	-0.0256	Z
0 U	21	43.6783	-22.9048	1.0652	43.6866	-22.9199	1.1038	-0.0083	-0.0151	-0.0386	0.0423	-0.0386	Z
2	22	43.5343	-25.7662	1.1131	43.5287	-25.7768	1.1452	0.0056	-0.0106	-0.0321	0.0343	-0.0321	Z
<u> </u>	23	43.2335	-29.4065	1.0856	43.3042	-29.3908	1.1115	-0.0707	0.0157	-0.0259	0.0769	-0.0259	Z
	24	43.2109	-33.0747	1.0663	43.2159	-33.0774	1.0931	-0.0050	-0.0027	-0.0268	0.0274	-0.0268	Z
	25	43.1103	-37.3261	1.0784	43.0835	-37.3057	1.1040	0.0268	0.0204	-0.0256	0.0423	-0.0256	Z
	26	38.8973	-22.9257	0.0985	38.9210	-22.9761	0.1517	-0.0237	-0.0504	-0.0532	0.0770	-0.0532	Z
	27	38.9475	-27.7663	0.3378	38.9076	-27.7719	0.3630	0.0399	-0.0056	-0.0252	0.0475	-0.0252	Z
	28	38.9843	-32.1139	0.3049	39.0083	-32.1242	0.3281	-0.0240	-0.0103	-0.0232	0.0349	-0.0232	Z
	29	38.9352	-35.4705	0.0703	38.9691	-35.4276	0.0911	-0.0339	0.0429	-0.0208	0.0585	-0.0208	Z
	30	39.1847	-39.0862	0.3030	39.1668	-39.1048	0.3208	0.0179	-0.0186	-0.0178	0.0314	-0.0178	Z

<sup>6</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment. <sup>6</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-3. Floor Pan Deformation Data – Set 2, Left, Test No. MOS-5

Date: Year:	4/9/2 20	2019 111			Test Name: Make:	MC Do	)S-5 dge			VIN: Model:	1D7F	B1CT2BS6 Ram 1500	57795
					VE PASSENC	HICLE DE GER SIDE	FORMATIO	ON N - SET 2					
	POINT	Pretest X (in.)	Pretest Y (in.)	Pretest Z (in.)	Posttest X (in.)	Posttest Y (in.)	Posttest Z (in.)	ΔX <sup>A</sup> (in.)	ΔY <sup>A</sup> (in.)	ΔZ <sup>A</sup> (in.)	Total ∆ (in.)	Crush <sup>B</sup> (in.)	Directions for Crush <sup>C</sup>
	1	60.1977	4.9902	-6.4587	60.2227	5.0053	-6.4671	-0.0250	-0.0151	0.0084	0.0304	0.0084	Z
	2	61.9715	7.2840	-4.0725	61.9842	7.2913	-4.0877	-0.0127	-0.0073	0.0152	0.0211	0.0152	Z
	3	62.3521	10.4425	-3.6953	62.3419	10.4935	-3.6964	0.0102	-0.0510	0.0011	0.0520	0.0103	X, Z
	4	62.4516	12.4962	-3.7895	62.4175	12.4900	-3.7807	0.0341	0.0062	-0.0088	0.0358	0.0341	X
N A	5	62.4092	15.3300	-5.0310	62.3402	15.3963	-5.0161	0.0690	-0.0663	-0.0149	0.0968	0.0690	X
ШЩХ I	6	55.7628	3.7682	-4.6006	55.7182	3.7800	-4.5653	0.0446	-0.0118	-0.0353	0.0581	0.0446	X
2 뿐 -	7	56.8026	7.0123	-1.3856	56.8378	7.1024	-1.3430	-0.0352	-0.0901	-0.0426	0.1057	0.0000	NA
3	8	56.8564	11.5737	-0.9132	56.8686	11.6034	-0.9290	-0.0122	-0.0297	0.0158	0.0358	0.0158	Z
	9	56.7518	14.9299	-0.9155	56,7357	14.9805	-0.9198	0.0161	-0.0506	0.0043	0.0533	0.0167	X.Z
	10	56.6842	18.3974	-0.9281	56.6365	18.4346	-0.9152	0.0477	-0.0372	-0.0129	0.0619	0.0477	X
1	11	50.8259	0.3300	-2.6560	50.7979	0.3719	-2.5937	0.0280	-0.0419	-0.0623	0.0801	-0.0623	Z
	12	51.5398	3.2950	0.1553	51.5162	3.3389	0.2041	0.0236	-0.0439	-0.0488	0.0698	-0.0488	Z
1 1	13	51.7582	10.0445	1.1057	51.7591	10.0860	1.1080	-0.0009	-0.0415	-0.0023	0.0416	-0.0023	Z
	14	51.6004	13.9210	1.1055	51.5631	13.9710	1.1060	0.0373	-0.0500	-0.0005	0.0624	-0.0005	Z
1 1	15	51.3668	17.0431	1.0940	51.3673	17.0821	1.0915	-0.0005	-0.0390	0.0025	0.0391	0.0025	Z
	16	47.6126	-0.8837	-0.9438	47.6228	-0.8762	-0.9575	-0.0102	0.0075	0.0137	0.0187	0.0137	Z
1 1	17	48.3509	5.8897	1.1216	48.3849	5.9136	1.1272	-0.0340	-0.0239	-0.0056	0.0419	-0.0056	Z
	18	48.1070	10.0748	1.1029	48.1327	9.9980	1.1110	-0.0257	0.0768	-0.0081	0.0814	-0.0081	Z
AP	19	48.0699	12.8983	1.0945	48.0327	12.8949	1.0994	0.0372	0.0034	-0.0049	0.0377	-0.0049	Z
<b></b>	20	47.9750	16.7744	1.0900	47.9981	16.8665	1.0935	-0.0231	-0.0921	-0.0035	0.0950	-0.0035	Z
jo ⊵	21	44.0373	-0.7478	0.0083	44.0663	-0.7222	0.0297	-0.0290	0.0256	-0.0214	0.0442	-0.0214	Z
2	22	44.2257	5.1837	0.8805	44.2481	5.1884	0.8757	-0.0224	-0.0047	0.0048	0.0234	0.0048	Z
	23	44.0725	9.1192	0.8633	44.0623	9.1406	0.8602	0.0102	-0.0214	0.0031	0.0239	0.0031	Z
	24	44.0346	12.5745	0.8608	44.0182	12.5878	0.8601	0.0164	-0.0133	0.0007	0.0211	0.0007	Z
	25	43.8143	17.0111	0.8616	43.7957	17.0376	0.8603	0.0186	-0.0265	0.0013	0.0324	0.0013	Z
	26	40.7239	2.1397	1.1177	40.7037	2.1473	1.1241	0.0202	-0.0076	-0.0064	0.0225	-0.0064	Z
	27	40.8179	9.0553	1.0837	40.8249	9.1459	1.0878	-0.0070	-0.0906	-0.0041	0.0910	-0.0041	Z
	28	40.7306	16.5515	1.1051	40.7445	16.5633	1.0999	-0.0139	-0.0118	0.0052	0.0190	0.0052	Z
	29	34.1954	2.5069	-2.8487	34.1807	2.4892	-2.8500	0.0147	0.0177	0.0013	0.0230	0.0013	Z
	30	33.8603	12.6743	-2.8687	33.8708	12.7556	-2.8805	-0.0105	-0.0813	0.0118	0.0828	0.0118	Z

<sup>A</sup> Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

6 Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>c</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-4. Floor Pan Deformation Data – Set 2, Right Test No. MOS-5

rear:	20				VE DRIVER S		FORMATI	ON SH - SET 1	r	Model:		Ram 1500	
ľ		Pretest	Pretest	Pretest					a . (A	a —A	Tatal A	0 IB	Direction
		Х	Y	Z	(in )	(in )	Posttest Z	∆X^ (in.)	ΔY <sup>A</sup>	(in)	in )	Crush <sup>o</sup>	for
	POINT	(in.)	(in.)	(in.)	(11.7	(11.7	(11.7	(iii.)	(III.)	(III.)	(11.)	(01.)	Crush
	1	49.1898	1.6305	-27.9275	49.2243	1.5360	-28.0022	-0.0345	0.0945	-0.0/4/	0.1253	0.1253	X, Y, Z
л Ц	3	47.7760	-11.1546	-29.4729	47.7620	-11.3336	-29.5262	-0.0040	-0.1766	-0.0555	0.1606	0.2480	X Y 7
AS .	4	42.1840	0.5394	-17.1129	42.1560	0.4403	-17.2066	0.0280	0.0991	-0.0937	0.1392	0.1392	X, Y, Z
- ×	5	43.6308	-14.4268	-14.3714	43.5978	-14.5082	-14.4273	0.0330	-0.0814	-0.0559	0.1041	0.1041	X, Y, Z
	6	45.1436	-25.1882	-15.7569	45.0896	-25.2777	-15.8033	0.0540	-0.0895	-0.0464	0.1144	0.1144	X, Y, Z
	7	54.1078	-28.0166	-4.1540	54.0581	-28.0709	-4.2326	0.0497	-0.0543	-0.0786	0.1077	-0.0543	Y
US AN	8	54.1988	-28.0169	-0.9124	54.1488	-28.0645	-1.0451	0.0500	-0.04/6	-0.1327	0.1496	-0.04/6	Y V
	10	13,4960	-20.9334	-20.2156	13 /1029	-27.9037	-20.2160	0.0309	-0.0303	-0.0004	0.1391	-0.0303	
8	11	33.9377	-29.8795	-19.8454	33,8433	-29.9467	-19.8047	0.0944	-0.0672	0.0407	0.1228	-0.0672	Y
S R C	12	22.3800	-30.0084	-19.6874	22.3304	-30.0904	-19.6717	0.0496	-0.0820	0.0157	0.0971	-0.0820	Y
288	13	43.7987	-29.1333	-6.5120	43.7633	-29.1422	-6.5751	0.0354	-0.0089	-0.0631	0.0729	-0.0089	Y
MP	14	33.7632	-31.3105	-4.3014	33.6753	-31.3426	-4.3007	0.0879	-0.0321	0.0007	0.0936	-0.0321	Y
_	15	23.5852	-30.4/65	-3.21/3	23.5962	-30.5090	-3.2238	-0.0110	-0.0325	-0.0065	0.0349	-0.0325	Y
	16	37.8580	2.1670	-43.1/40	37.8029	2.0/14	-43.23/2	0.0551	0.0956	-0.0632	0.1272	-0.0632	
	1/	37 1001	-1.6230	-43.1230	37.0036	-6.0042	-43.2199	0.0965	-0.1209	-0.0943	0.2365	-0.0943	
	19	36.2461	-10.5735	-43.0277	36.0623	-10.6640	-43.1213	0.1838	-0.0905	-0.0936	0.2252	-0.0936	Z
	20	36.2641	-15.5990	-42.8696	36.1619	-15.7132	-42.9185	0.1022	-0.1142	-0.0489	0.1609	-0.0489	Z
RT	21	31.4721	2.0225	-46.0039	31.3645	1.9781	-46.0463	0.1076	0.0444	-0.0424	0.1239	-0.0424	Z
	22	31.3402	-2.5291	-45.9526	31.3195	-2.6338	-45.9790	0.0207	-0.1047	-0.0264	0.1099	-0.0264	Z
6	23	30.8261	-6.9696	-45.8773	30.7147	-7.1266	-45.9115	0.1114	-0.1570	-0.0342	0.1955	-0.0342	<u>Z</u>
8	24	30.0009	-11.4835	-45.7535	29.8/61	-11.6861	-45.7833	0.1248	-0.2026	-0.0298	0.2398	-0.0298	
	25	25.9769	2 2425	-45.5677	25.4103	2 2248	-45.5906	0.0805	-0.2009	-0.0229	0.2267	-0.0229	
	27	25.2184	-2.7212	-46.5217	25.1221	-2.8006	-46.4747	0.0963	-0.0794	0.0470	0.1334	0.0470	Z
	28	24.8268	-8.3177	-46.3624	24.6452	-8.4435	-46.3448	0.1816	-0.1258	0.0176	0.2216	0.0176	Z
	29	24.3740	-12.3752	-46.2543	24.2180	-12.4898	-46.2569	0.1560	-0.1146	-0.0026	0.1936	-0.0026	Z
	30	23.6910	-16.3354	-46.0396	23.5792	-16.5181	-46.0536	0.1118	-0.1827	-0.0140	0.2146	-0.0140	Z
	31	54.0115	-26.7159	-28.7050	53.9547	-26.8076	-28.7550	0.0568	-0.0917	-0.0500	0.1189	0.0568	X
AR mu	32	51.2254	-26.06/1	-30.6343	51.2662	-26.1931	-30.6623	-0.0408	-0.1260	-0.0280	0.1354	0.0000	
ĭĽ, ×iĽ	34	45.6732	-25.4771	-32.4390	40.9047	-25.5967	-32.4372	-0.0428	-0.1216	-0.0023	0.1269	0.0023	
A-A Ma	35	42.8437	-23.8357	-36.4727	42,8606	-23.9662	-36,4944	-0.0169	-0.1305	-0.0217	0.1334	0.0000	NA
	36	38.2557	-23.3233	-39.4924	38.2064	-23.4205	-39.4821	0.0493	-0.0972	0.0103	0.1095	0.0504	X, Z
	31	54.0115	-26.7159	-28.7050	53.9547	-26.8076	-28.7550	0.0568	-0.0917	-0.0500	0.1189	-0.0917	Y
3AR	32	51.2254	-26.0671	-30.6343	51.2662	-26.1931	-30.6623	-0.0408	-0.1260	-0.0280	0.1354	-0.1260	Y
ILL	33	48.9219	-25.4771	-32.4395	48.9647	-25.5987	-32.4372	-0.0428	-0.1216	0.0023	0.1289	-0.1216	Y
A-P -ate	34	40.0/32	-24.1013	-34.5211	43.0417	-24.0002	-34.5810	-0.0169	-0.1029	-0.0099	0.1232	-0.1029	Y Y
~ _	36	38,2557	-23.3233	-39,4924	38,2064	-23,4205	-39,4821	0.0493	-0.0972	0.0103	0.1095	-0.0972	Y
це~	37	11.2564	-23.8483	-39.4081	11.1842	-23.9496	-39.4179	0.0722	-0.1013	-0.0098	0.1248	0.0722	X
	38	9.2070	-25.8764	-32.1045	9.1621	-25.9584	-32.1716	0.0449	-0.0820	-0.0671	0.1151	0.0449	Х
A, Y	39	13.4769	-26.9348	-29.4082	13.3890	-27.0125	-29.4287	0.0879	-0.0777	-0.0205	0.1191	0.0879	Х
m≥c	40	10.2129	-27.5650	-24.8905	10.1772	-27.6262	-24.9372	0.0357	-0.0612	-0.0467	0.0849	0.0357	Х
ΒA	37	11.2564	-23.8483	-39.4081	11.1842	-23.9496	-39.4179	0.0722	-0.1013	-0.0098	0.1248	-0.1013	Y
aral	38	9.2070	-25.8/64	-32.1045	9.1621	-25.9584	-32.1/16	0.0449	-0.0820	-0.06/1	0.1101	-0.0820	Y
B-P _ate	40	10.2129	-20.9340	-29.4002	10.1772	-27.6262	-29.4207	0.0357	-0.0612	-0.0203	0.0849	-0.0612	Y
Positive vi ompartme	alues denot nt.	e deformatio	on as inward	I toward the	occupant c	ompartment	t, negative v	alues denot	e deformatio	ons outward	away from	the occupation	nt
Crush calc eforming in	culations that	at use multip rd the occup	ele directionation	al componer tment.	nts will disre	gard compo	onents that a	re negative	and only inc	lude positiv	e values wh	ere the corr	nponent is



Date:	4/9/	2019	_		Test Name:	MC	)S-5			VIN:	1D7R	B1CT2BS6	57795
Year:	20	)11	-		Make:	Do	dge			Model:		Ram 1500	
_				PAS	VEI SENGER	HICLE DE SIDE INT	FORMATI	ON RUSH - S	ET 1				
		Pretest X	Pretest Y	Pretest Z	Posttest X	Posttest Y	Posttest Z	$\Delta X^{\!A}$	$\Delta Y^A$	$\Delta Z^A$	Total ∆	Crush <sup>B</sup>	Direction: for
	POINT	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	Crush <sup>C</sup>
	1	49.1432	9.1385	-27.8346	49.0880	9.1381	-27.9685	0.0552	0.0004	-0.1339	0.1448	0.1448	X, Y, Z
ΤÑ	2	49.7393	21.2090	-27.3929	49.6858	21.1960	-27.5253	0.0535	0.0130	-0.1324	0.1434	0.1434	X, Y, Z
₹SF	3	50.2698	32.6903	-26.7748	50.2079	32.6972	-26.9171	0.0619	-0.0069	-0.1423	0.1553	0.1553	X, Y, Z
۵×	4	42.1593	6.9636	-17.0284	42.1140	6.8943	-17.1170	0.0453	0.0693	-0.0886	0.1213	0.1213	X, Y, Z
-	5	44.3064	22.7196	-16.1282	44.2601	22.6697	-16.2291	0.0463	0.0499	-0.1009	0.1217	0.1217	X, Y, Z
	6	45.2295	34.6701	-15.7868	45.1848	34.7032	-15.9105	0.0447	-0.0331	-0.1237	0.1356	0.1356	X, Y, Z
Ш	7	54.0896	36.2943	2.0182	54.1704	36.2795	1.9179	-0.0808	0.0148	-0.1003	0.1296	0.0148	Y
ΒÄΕ	8	57.1589	36.3277	-1.2564	57.0929	36.3082	-1.4265	0.0660	0.0195	-0.1701	0.1835	0.0195	Y
0 2	9	54.3281	36.4196	-3.2005	54.4953	36.4007	-3.2110	-0.1672	0.0189	-0.0105	0.1686	0.0189	Y
ш	10	44.4607	38.4321	-19.6730	44.4158	38.4231	-19.8183	0.0449	0.0090	-0.1453	0.1523	0.0090	Y
<b>⊖</b>	11	33.0549	38.3729	-19.4215	32.9492	38.3661	-19.5144	0.1057	0.0068	-0.0929	0.1409	0.0068	Y
S R C	12	20.6774	38.7337	-19.1717	20.5616	38.7478	-19.2225	0.1158	-0.0141	-0.0508	0.1272	-0.0141	Y
SQC	13	41.5607	39.2803	0.7447	41.5642	39.2752	0.6965	-0.0035	0.0051	-0.0482	0.0486	0.0051	Y
Ę I	14	35.1127	39.2546	1.0023	35.0999	39.2493	0.8715	0.0128	0.0053	-0.1308	0.1315	0.0053	Y
≤	15	24,2925	38,6999	0.2481	24,2856	38,6955	0.1721	0.0069	0.0044	-0.0760	0.0764	0.0044	Y
	16	37 9746	8 6853	-43 0494	37 7779	8 6165	-43 1848	0 1967	0.0688	-0.1354	0.2485	-0 1354	7
	17	37 4692	15.0361	-42 9039	37 2385	15 0162	-43.0442	0.1307	0.0000	-0.1403	0.2403	-0.1403	7
	18	36 3715	20.8721	-42 7285	36,2308	20 7758	-42 8484	0.1317	0.0100	-0 1100	0.2025	-0 1100	7
	10	34 5334	25.8204	-42.7203	34 2966	25 7961	-42.8512	0.2368	0.0303	-0.1105	0.2020	-0.1208	7
	20	33 03/5	28 5154	-42.7304	32 8164	28 5126	-42.0312	0.2300	0.0243	-0.1200	0.2009	-0.1200	7
-	20	32 1200	6 8840	-45 8523	31 85/0	6 7080	-45.0431	0.2101	0.0020	-0.0008	0.2400	-0.0008	7
Ñ	21	22.1230	11 1270	45.0023	22 2072	11 1460	45 7022	0.2741	0.0001	-0.0900	0.3010	-0.0300	2 7
Ľ.	22	32.4430	15.0110	-45.7010	32.2072	1/ 0360	-45.7952	0.2304	-0.0091	-0.0910	0.2007	-0.0910	7
8	23	31 0101	10 1692	-45.3314	31 7/80	10 1224	-45.0470	0.2072	0.0741	-0.0904	0.2402	-0.0304	7
Х Х	24	30.8806	24 4583	-45 1003	30 6827	24 4537	-45.4004	0.1711	0.0440	-0.0308	0.1300	-0.0300	7
	25	26 1863	6 6764	-46 5403	25.0278	6 6135	-46 5313	0.1575	0.0040	0.0130	0.2110	0.0180	7
	20	26.2200	11 8518	-46 4362	25.0270	11 7/10	-46.4312	0.2303	0.0023	0.0100	0.2007	0.0100	7
	28	26.2200	15 3442	-46 2402	26.0984	15 3038	-46.2505	0.2430	0.1033	-0.0000	0.2091	-0.0103	7
	20	20.2773	19.9442	-40.2402	20.0304	18 7087	-46.1080	0.1709	0.0404	-0.0103	0.1037	-0.0103	7
,	29	25 8010	23 6315	-40.0749	25.0424	23 6460	-40.1000	0.2077	-0.0479	-0.0331	0.2740	-0.0331	7
	30	23.0919	23.0313	-43.7059	23.0370	23.0409	-45.0150	0.2.041	-0.0134	-0.0479	0.2334	-0.0473	
~	31	51.1920	34.7651	-29.2456	51.0423	34.7528	-29.4223	0.1497	0.0123	-0.1767	0.2319	0.1502	
A nu Z	<u>ు</u> ∠	40.2008	22 7700	22 0000	40.2000	33.3090	-31.0005	0.0070	0.0023	0.1140	0.1203	0.0578	
, ≺ ši L	<u> </u>	40.4049	32.1102	-33.0099	45.2001	32.13/8	-34.0003	0.1300	0.0204	-0.1304	0.1913	0.1403	
A-F Aac	34	41.9507	32.0128	-30.3032	41.8209	31.9981	-30.4320	0.1298	0.0147	-0.1288	0.1034	0.1306	
· -	<u></u>	30.9035	31.2890	-30.15/1	30.004/	31.3295	-30.3330	0.0788	-0.0405	-0.1/59	0.1970	0.0788	
	30	35.6071	30.6123	-40.8898	35.4994	30.6628	-41.0296	0.1077	-0.0505	-0.1398	0.1836	0.1077	<u> </u>
	31	51.1920	34.7651	-29.2456	51.0423	34.7528	-29.4223	0.1497	0.0123	-0.1767	0.2319	0.0123	Y
ΒAR	32	48.2658	33.3913	-31.6860	48.2080	33.3890	-31.8005	0.0578	0.0023	-0.1145	0.1283	0.0023	Y
리민	33	45.4049	32.7782	-33.8699	45.2661	32.7578	-34.0003	0.1388	0.0204	-0.1304	0.1915	0.0204	Y
A-P ate	34	41.9507	32.0128	-36.3032	41.8209	31.9981	-36.4320	0.1298	0.0147	-0.1288	0.1834	0.0147	Y
4 1	35	38.9635	31.2890	-38.1571	38.8847	31.3295	-38.3330	0.0788	-0.0405	-0.1759	0.1970	-0.0405	<u> </u>
	36	35.6071	30.6123	-40.8898	35.4994	30.6628	-41.0296	0.1077	-0.0505	-0.1398	0.1836	-0.0505	Y
AR E	37	13.9501	35.9315	-24.4916	13.8886	35.9488	-24.5026	0.0615	-0.0173	-0.0110	0.0648	0.0615	X
∃ ĕ ≻.	38	9.4568	34.3470	-30.9472	9.3316	34.3492	-30.9946	0.1252	-0.0022	-0.0474	0.1339	0.1252	X
<u>e x</u> ×	39	13.0230	33.5863	-34.9154	12.9319	33.5930	-34.9710	0.0911	-0.0067	-0.0556	0.1069	0.0911	X
m ≥ ⊂	40	11.2013	32.3156	-39.0182	10.9811	32.3208	-39.0758	0.2202	-0.0052	-0.0576	0.2277	0.2202	X
Ϋ́	37	13.9501	35.9315	-24.4916	13.8886	35.9488	-24.5026	0.0615	-0.0173	-0.0110	0.0648	-0.0173	Y
al (	38	9.4568	34.3470	-30.9472	9.3316	34.3492	-30.9946	0.1252	-0.0022	-0.0474	0.1339	-0.0022	Y
= =	30	13.0230	33.5863	-34.9154	12.9319	33.5930	-34.9710	0.0911	-0.0067	-0.0556	0.1069	-0.0067	Y
ф £	- 39												

<sup>A</sup> Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.

Figure D-6. Occupant Compartment Deformation Data - Set 1, Right, Test No. MOS-5

Year:	20	11			Make:	Do	dge			Model:		Ram 1500	
						-							
					VE	HICLE DE	FORMATIO	ON					
					DRIVER S	SIDE INTER	RIOR CRUS	SH - SET 2					
		Protoct	Protoct	Protoct				273	28	8		23	Direction
		X	Y	7	Posttest X	Posttest Y	Posttest Z	ΔX <sup>A</sup>	ΔY <sup>A</sup>	ΔZ <sup>A</sup>	Total ∆	Crush <sup>B</sup>	for
	POINT	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	Crush <sup>C</sup>
	1	50.2519	-13.6551	-32,1002	50.3413	-13.6587	-32.0586	-0.0894	-0.0036	0.0416	0.0987	0.0987	X.Y.Z
	2	49.2516	-26,4831	-33.6129	49.3261	-26.5697	-33.5773	-0.0745	-0.0866	0.0356	0.1197	0.1197	X. Y. Z
S N	3	50.3673	-35.5662	-32.7730	50.3023	-35.6828	-32.6991	0.0650	-0.1166	0.0739	0.1526	0.1526	X, Y, Z
Š,	4	43.2631	-14.9399	-21.2958	43.2737	-14.9776	-21.2875	-0.0106	-0.0377	0.0083	0.0400	0.0400	X, Y, Z
-0	5	45.1811	-29.8448	-18.5103	45.1935	-29.8690	-18.4910	-0.0124	-0.0242	0.0193	0.0333	0.0333	X, Y, Z
	6	47.0391	-40.5562	-19.8631	47.0417	-40.5848	-19.8528	-0.0026	-0.0286	0.0103	0.0305	0.0305	X, Y, Z
ШШ	7	56.0662	-43.0659	-8.2356	56.0550	-43.0752	-8.2477	0.0112	-0.0093	-0.0121	0.0189	-0.0093	Y
SAN	8	56.1507	-43.0545	-4.9939	56.1338	-43.0636	-5.0600	0.0169	-0.0091	-0.0661	0.0688	-0.0091	Y
0° C	9	59.7720	-42.8611	-6.3620	59.7484	-42.8676	-6.4045	0.0236	-0.0065	-0.0425	0.0490	-0.0065	Y
Е	10	45.5528	-45.3725	-24.3118	45.5439	-45.3839	-24.2676	0.0089	-0.0114	0.0442	0.0465	-0.0114	Y
ы В К	11	35.9966	-45.6137	-23.9598	35.9686	-45.6220	-23.8907	0.0280	-0.0083	0.0691	0.0750	-0.0083	Y
385	12	24.4487	-46.1108	-23.8232	24.4662	-46.1420	-23.7989	-0.0175	-0.0312	0.0243	0.0432	-0.0312	Y
Ă O _	13	45.8026	-44.51/2	-10.6099	45.8092	-44.4843	-10.6263	-0.0066	0.0329	-0.0164	0.03/3	0.0329	Y
N N	14	25.6357	-47.0075	-8.4122	35.7904	-47.0118	-0.3003	0.0468	-0.0043	0.0259	0.0537	-0.0043	Y V
	15	20.0307	-40.4337	47.2604	29.0626	12 5077	47 2240	-0.0435	-0.0110	0.0034	0.0314	-0.0110	7
	17	38,8955	-17 3147	-47.3094	38 7993	-17 3304	-47.3349	0.0249	-0.0157	-0.0048	0.0440	-0.0048	7
	18	38 4380	-21 5940	-47 2868	38 4286	-21 6051	-47 2728	0.0002	-0.0111	0.0140	0.0202	0.0140	7
	19	37,7338	-26,3066	-47,1909	37,6399	-26,2932	-47 2148	0.0939	0.0134	-0.0239	0.0978	-0.0239	Z
	20	37.9117	-31.3285	-47.0189	37.9039	-31.3363	-47.0076	0.0078	-0.0078	0.0113	0.0158	0.0113	Z
0	21	32.5662	-13.8774	-50.2109	32.5418	-13.8135	-50.1669	0.0244	0.0639	0.0440	0.0813	0.0440	Z
2	22	32.5795	-18.4307	-50.1473	32.6474	-18.4244	-50.0961	-0.0679	0.0063	0.0512	0.0853	0.0512	Z
L.	23	32.2072	-22.8851	-50.0606	32.1896	-22.9346	-50.0271	0.0176	-0.0495	0.0335	0.0623	0.0335	Z
8	24	31.5261	-27.4227	-49.9259	31.5001	-27.5189	-49.8981	0.0260	-0.0962	0.0278	0.1035	0.0278	Z
œ	25	30.6418	-31.8260	-49.7300	30.6369	-31.9210	-49.7055	0.0049	-0.0950	0.0245	0.0982	0.0245	Z
	26	26.5821	-13.8498	-50.7892	26.5844	-13.7620	-50.6575	-0.0023	0.0878	0.1317	0.1583	0.1317	Z
	27	26.4681	-18.8196	-50.7274	26.4606	-18.7941	-50.6138	0.0075	0.0255	0.1136	0.1167	0.1136	Z
	28	26.2549	-24.4252	-50.5534	26.1680	-24.4495	-50.4811	0.0869	-0.0243	0.0723	0.1156	0.0723	2
	29	25.9315	-28.4948	-50.4348	25.8731	-28.50/6	-50.3914	0.0584	-0.0128	0.0434	0.0739	0.0434	2
	30	23.3740	-32.4742	-30.2103	25.3030	-32.3343	-30.1871	0.0092	-0.0003	0.0234	0.0041	0.0234	
~ ~ ~	32	53 1751	-41.0352	-32.7903	53,2085	-41.000	-32.7714	-0.0219	0.0022	0.0109	0.0290	0.0190	7,2
A n N	33	50.8575	-41.2005	-36 5377	50 9852	-41.3001	-36 4725	-0.1234	-0.0212	0.0652	0.1319	0.0652	7
N N I	34	47.5917	-40,1594	-38,6275	47.6476	-40,1626	-38.6287	-0.0559	-0.0032	-0.0012	0.0560	0.0000	NA
A-F Ma	35	44.7381	-39.3338	-40.5869	44.8457	-39.3613	-40.5528	-0.1076	-0.0275	0.0341	0.1162	0.0341	Z
**************************************	36	40.1421	-38.9762	-43.6166	40.1869	-38.9703	-43.5576	-0.0448	0.0059	0.0590	0.0743	0.0593	Y, Z
	31	55.9768	-41.8352	-32.7903	55.9987	-41.8330	-32.7714	-0.0219	0.0022	0.0189	0.0290	0.0022	Y
R S	32	53.1751	-41.2809	-34.7266	53.2985	-41.3081	-34.6889	-0.1234	-0.0272	0.0377	0.1319	-0.0272	Y
al (	33	50.8575	-40.7695	-36.5377	50.9852	-40.7905	-36.4725	-0.1277	-0.0210	0.0652	0.1449	-0.0210	Y
-PII	34	47.5917	-40.1594	-38.6275	47.6476	-40.1626	-38.6287	-0.0559	-0.0032	-0.0012	0.0560	-0.0032	Y
La A	35	44.7381	-39.3338	-40.5869	44.8457	-39.3613	-40.5528	-0.1076	-0.0275	0.0341	0.1162	-0.0275	Y
	36	40.1421	-38.9762	-43.6166	40.1869	-38.9703	-43.5576	-0.0448	0.0059	0.0590	0.0743	0.0059	Y
AR Z	37	13.1731	-40.3620	-43.5817	13.1964	-40.3827	-43.5898	-0.0233	-0.0207	-0.0081	0.0322	0.0000	NA
Υä.Ε	38	11.1750	-42.4347	-36.2764	11.2149	-42.4516	-36.3492	-0.0399	-0.0169	-0.0728	0.0847	0.0000	NA
Aax (X,	39	15.4712	-43.3491	-33.5691	15.4641	-43.3649	-33.5903	0.0071	-0.0158	-0.0212	0.0274	0.0071	X
ш <b>Z</b> ~	40	12.2201	-44.0/08	-29.0559	12.25/9	-44.0803	-29.1099	-0.03/8	-0.0095	-0.0540	0.0666	0.0000	NA
AR	37	13.1731	-40.3620	-43.5817	13.1964	-40.3827	-43.5898	-0.0233	-0.0207	-0.0081	0.0322	-0.0207	Y
ILL	38	15.4712	-42.4347	-30.2/64	11.2149	-42.4516	-30.3492	-0.0399	-0.0169	-0.0728	0.0847	-0.0169	Y
В-Р ate	40	12 2201	-43.3491	-33,3691	12 2570	-43.3649	-33.5903	-0.0378	-0.0158	-0.0212	0.0274	-0.0158	
	40	12.2201	-44.0708	-29.0009	12.2019	-44.0003	-23.1039	-0.0378	-0.0035	-0.0040	0.0000	-0.0035	1 1

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Hell LAR Anximum An	Pretest           X           (in.)           49.9442           50.1598           50.3281           43.0227           44.6722           45.2184           54.0074           57.0770           54.2464           44.334           52.9365           20.5535           41.3917           24.1509           38.8086           38.1035           36.8224           33.2463           33.2055           33.2055           33.2055           33.2055           32.4283           31.2235	Pretest Y (in.) -6.1007 5.9826 17.4750 -8.4934 7.3224 21.3294 21.3294 21.321 23.0317 22.6136 22.5847 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	Pretest Z (in.) -32.0359 -31.5949 -30.9776 -21.2355 -20.3351 -19.9942 -2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -23.4009 -3.4664 -3.2144 -3.9779 -47.2603 -47.2603 -47.1160 -46.9421 -46.9421 -46.9421 -46.9461 -46.6148 -50.0681 -49.9176 -49.7679 -49.5950 -49.5950	VE ASSENGEI Posttest X (in.) 49.9365 50.1520 50.3090 43.0036 44.6480 45.1914 54.0684 54.0684 54.0684 54.0684 54.06987 54.4049 44.3174 32.8574 32.8574 34.8756 33.41572 34.8756 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8408 33.3435 32.8408 33.328408 33.338408 34.338408 34.338408 34.338408 34.338408 34.338408 34.338408 34.348408	Posttest Y (in.) -6.0962 5.9746 17.4866 -8.5587 7.2766 19.3332 21.1928 21.3137 21.3242 23.0269 22.6080 22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	Posttest Z (in.) -32.0485 -31.6049 -30.9966 -21.2181 -20.3255 -20.0056 -2.1500 -5.4855 -7.2780 -2.3.9162 -23.9162 -23.9162 -23.9472 -3.2550 -3.9873 -47.2991 -47.2991 -47.2991 -47.2991 -47.2991 -47.2991 -47.2991 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	DN           USH - SE                ΔX <sup>A</sup> (in.)                 0.0077                 0.0191                 0.0191                 0.0191                 0.0191                0.0242                 0.0783                0.0783                 0.075                 0.0753                0.0753                0.0753                 0.0704                 0.0703                0.0763                 0.0775                0.0753                 0.0753                0.0753                 0.0753                 0.0753                 0.0233                 0.1501                0.1501                 0.1404                 0.1501                0.1404                 0.1842                 0.11504	ΔΥ <sup>A</sup> (in.)           0.0045           0.0045           0.0045           0.0045           0.0056           0.0157           0.0056           0.0056           0.0052           0.0056           0.0056           0.0026           0.0026           0.0026           0.0027           0.0028           0.0042           0.0288           0.0038           0.0077           0.0076	ΔZ <sup>A</sup> (in.) -0.0126 -0.0190 -0.0190 -0.0174 -0.0318 -0.0318 -0.0318 -0.0318 -0.0318 -0.0347 -0.0073 -0.0077 -0.0662 -0.0406 -0.0466 -0.0460 -0.0268 -0.0328 -0.0229 -0.0223 -0.0072	Total Δ (in.)           0.0154           0.0153           0.0702           0.0527           0.0691           0.0691           0.0500           0.0796           0.0796           0.0510           0.0522           0.1580           0.0510           0.0522           0.1581           0.1988           0.1628           0.1435           0.2041           0.1508	Crush <sup>B</sup> (in.) 0.0154 0.0293 0.0702 0.0527 0.0073 0.0069 0.0157 0.0079 0.00473 0.00056 -0.0139 0.00056 -0.0139 0.0002 0.0019 -0.0388 -0.0450 -0.0259 -0.0223 -0.0073 -0.0072	Directio for Crush X, Y, ; X, Y, ; X, Y, ; X, Y, ; Y Y Y Y Y Y Y Y Y Y Y Y Y Z Z Z Z Z Z
HCT SIDE SIDE DASH aximum aximum aximum aximum constraints and	Pretest           X           49.9442           50.1598           50.3281           43.0227           44.6722           45.2184           54.2464           54.2464           32.9365           20.5535           41.3919           34.9477           24.1509           38.8086           38.1035           36.8224           33.2463           33.0250           33.0055           32.4283           31.2235	Pretest Y (in.) -6.1007 5.9826 17.4750 -8.4934 7.3224 21.1997 21.3294 21.3294 21.321 23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	Pretest Z (in.) -32.0359 -31.5949 -31.5949 -30.9776 -21.2355 -20.3351 -19.9942 -2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -23.4009 -3.4664 -3.2147 -4.5957 -4.5967 -4.59779 -4.597779 -4.597779 -	ASSENGE           Posttest X (in.)           49.9365           50.1520           50.3090           43.0036           44.6480           45.9114           54.0684           56.9987           54.4049           44.3174           32.8574           20.4631           41.3776           38.6950           37.9534           36.7728           33.059           32.8408           33.0551           32.8938           32.4335	R SIDE INT -6.0962 5.9746 17.4866 -8.5587 7.2766 19.3332 21.1928 21.3137 21.3242 23.0269 22.6080 22.5086 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	Posttest Z (in.) -32.0485 -31.6049 -30.9966 -21.2181 -20.3255 -20.0056 -2.1500 -5.4855 -7.2780 -23.9162 -23.6472 -23.9162 -23.9472 -23.9472 -3.4102 -3.2550 -3.9873 -47.2991 -47.7610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	USH - SE	ΔΥ <sup>Å</sup> (in.)           0.0045           0.0080           0.0116           -0.0653           0.0458           -0.0371           0.0069           0.0157           0.0079           0.0046           0.0056           -0.0139           0.0022           0.0019           -0.0228           0.0942           0.0258           0.0038           -0.0877           0.0076	ΔZ <sup>Å</sup> (in.) -0.0100 -0.0100 -0.0190 -0.0174 -0.0318 -0.0318 -0.0318 -0.0318 -0.03318 -0.0347 -0.0077 -0.0662 -0.0094 -0.0450 -0.0269 -0.0229 -0.0293 -0.0072	Total Δ (in.) 0.0154 0.0293 0.0702 0.0527 0.0691 0.0691 0.0691 0.0691 0.0392 0.0796 0.0392 0.0796 0.0510 0.0510 0.0522 0.1581 0.1098 0.1628 0.1628 0.1435 0.2041 0.2041 0.2041 0.1508	Crush <sup>B</sup> (in.) 0.0150 0.0293 0.0702 0.0527 0.0057 0.0079 0.0157 0.0079 0.0056 -0.0139 0.0056 -0.0139 0.00056 -0.0139 0.0002 0.0019 -0.0388 -0.0229 -0.0293 -0.0229 -0.0229 -0.0293 -0.0072	Directio for Crush X, Y, : X, Y, : X, Y, : X, Y, : Y Y Y Y Y Y Y Y Y Y Y Y Y Z Z Z Z Z Z
HDPACT SIDE Asximum aximum aximum AC, Y, Z) A A A A A A A A A A A A A	Pretest X (in.) 49.9442 50.1588 50.3281 43.0227 44.6722 45.2184 54.0074 57.0770 54.2464 44.3349 32.9365 20.5535 20.5535 20.5535 34.13919 34.9477 24.1509 38.8086 38.1035 36.8224 34.8296 33.2453 33.0255 33.0055 33.0055 33.0055 33.12235 27.0924	Pretest Y (in.) -6.1007 5.9826 17.4750 -8.4934 7.3224 21.1997 21.3294 21.3294 21.3294 21.3294 23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.22240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	Pretest Z (in.) -32.0359 -31.5949 -30.9776 -21.2355 -20.3351 -19.9942 -2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -23.4009 -3.4664 -3.2144 -3.9779 -47.2603 -4	Posttest X (in.) 49.9365 50.1520 50.3090 43.0036 44.548 45.1914 54.0684 56.9987 54.4049 44.3174 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 33.6571 33.1059 32.8408 33.0551 32.8408	Posttest Y (in.) -6.0962 5.9746 17.4866 -8.5587 7.2766 21.1928 21.1928 21.1928 21.3322 21.1928 21.3242 23.0269 22.6080 22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	Posttest Z (in.) -32.0485 -31.6049 -30.9966 -21.2181 -20.0256 -2.00056 -2.1500 -5.4855 -7.2780 -23.9162 -23.9472 -23.9392 -3.4102 -3.2550 -3.9873 -47.2991 -47.2991 -47.2991 -47.2991 -47.2991 -47.610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	ΔX <sup>A</sup> (in.) 0.0077 0.0191 0.0191 0.0242 0.0270 0.0242 0.0270 0.0761 0.0783 -0.1585 0.0175 0.0791 0.0904 0.0143 0.01430 0.01308 0.01308 0.01308 0.01551 0.1404 0.1504 0.1504 0.11504	ΔΥ <sup>A</sup> (in.) 0.0045 0.0080 -0.0116 -0.0653 0.0458 -0.0371 0.0069 0.0157 0.0079 0.0056 -0.0139 0.0056 -0.0139 0.00056 -0.0139 0.0022 0.0019 -0.0686 -0.0229 0.0042 0.0258 0.0038 -0.0258	ΔZ <sup>A</sup> (in.) -0.0126 -0.0100 -0.0190 0.0174 0.0096 -0.0114 0.0318 0.1223 -0.0318 0.1223 -0.0347 -0.0077 0.0562 -0.0456 -0.0456 -0.0456 -0.0269 -0.0322 -0.0293 -0.0072	Total Δ (in.) 0.0154 0.0150 0.0293 0.0702 0.0527 0.0691 0.0860 0.2004 0.0392 0.0796 0.0392 0.0796 0.0510 0.0550 0.0510 0.0552 0.1581 0.1098 0.1628 0.1628 0.1435 0.2041 0.1508	Crush <sup>B</sup> (in.) 0.0150 0.0293 0.0702 0.0527 0.00527 0.0079 0.0157 0.0079 0.0079 0.0056 -0.0139 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0388 -0.0269 -0.0269 -0.0223 -0.0223 -0.0073 -0.0072	Directio for Crush X, Y, 2 X, Y, 2 X, Y, 2 X, Y, 2 X, Y, 2 Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Z Z Z Z
HPACT SIDE aximum aximum aximum aximum AC 1 1 2 3 4 DOON 4 DOON 4 C 2 C C C C C C C C C C C C C	X (in.) 49.9442 50.1588 50.3281 43.0227 44.6722 45.2184 54.0074 44.3349 32.9365 20.5535 20.5535 20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 34.8296 33.2453 33.0255 33.0055 30.005	Y (in.) -6.1007 5.9826 17.4750 -8.4934 7.3224 7.3224 21.3997 21.3294 21.3294 21.3294 21.3294 21.3294 23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	Z (in.) -32.0359 -31.5949 -30.9776 -21.2355 -20.3351 -19.9942 -2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -23.4009 -3.4664 -3.2144 -3.9779 -47.2603 -	Postest X (in.) 49.9365 50.1520 50.3090 43.0036 44.5480 45.1914 54.0684 56.9987 54.4049 44.3174 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 38.6950 33.0551 33.0551 32.8408 33.0551 32.8408	Posttest Y (in.) -6.0962 5.9746 17.4866 17.4866 19.3332 21.1928 21.3372 21.3242 23.0269 22.6080 22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	Posttest 2 (in.) -32.0485 -31.6049 -30.9966 -21.2181 -20.0256 -2.1500 -5.4855 -7.2780 -23.9162 -23.6472 -23.6472 -3.2550 -3.2857 -3.9873 -47.2991 -47.2991 -47.2991 -47.2991 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	ΔX <sup>°</sup> (in.) 0.0077 0.0078 0.0191 0.0191 0.0242 0.0220 0.0242 0.0220 0.0242 0.0220 0.0242 0.0220 0.0242 0.0220 0.0242 0.0783 0.0175 0.0791 0.0904 0.01432 0.1501 0.1501 0.1604 0.1504 0.1192	ΔΥ <sup>*</sup> (in.) 0.0045 0.0080 -0.0116 -0.0653 0.0458 0.0458 0.0059 0.0157 0.009 0.0075 0.0076 -0.0139 0.00056 -0.0139 0.0002 0.00019 -0.0686 -0.0209 -0.0228 0.0942 0.0258 0.0038 -0.0877 0.0076	Δ2' (in.) -0.0100 -0.0100 -0.0190 0.0774 0.0096 -0.0114 -0.0318 -0.0318 0.1223 -0.0347 -0.0073 -0.0456 -0.0456 -0.0456 -0.0456 -0.0269 -0.0322 -0.0293 -0.0072	1018 Δ (in.) 0.0154 0.0293 0.0702 0.0527 0.0691 0.0691 0.0691 0.0691 0.0392 0.0796 0.0392 0.0796 0.0510 0.0580 0.0510 0.0252 0.1581 0.1098 0.1628 0.1628 0.1435 0.2041 0.1508	Crush <sup>o</sup> (in.) 0.0150 0.0293 0.0702 0.0527 0.0473 0.0069 0.0157 0.0073 0.0078 0.0056 0.0157 0.0079 0.0078 0.0007 0.0029 0.0019	for Crush X, Y, 2 X, Y, 2 X, Y, 2 X, Y, 2 X, Y, 2 Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Z Z Z Z
Altrictar Altrictar	IT         (in.)           49.9442         50.1588           50.3281         43.0227           44.6722         45.2184           54.0074         44.6722           45.2184         54.0074           57.0770         54.2484           44.3349         32.9365           20.5535         20.5535           41.3919         34.9477           24.1509         38.8086           33.2453         33.0250           33.2055         33.0056           32.4283         33.0250           32.12235         32.0252	(in.) -6.1007 5.9826 17.4750 -8.4934 7.3224 19.2961 21.1997 21.3294 21.3294 21.321 23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.22240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	(in.) -32.0359 -31.5949 -30.9776 -21.2355 -20.3351 -19.9942 -2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -23.4009 -3.4664 -3.2144 -3.9779 -47.2603 -47	49.9365 50.1520 50.3090 43.0036 44.548 45.1914 54.0684 56.9987 54.4049 44.3174 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 38.6950 33.0551 32.8408 33.0551 32.8408	-6.0962 -6.0962 5.9746 17.4866 17.4866 19.3332 21.1928 21.3372 21.3242 23.0269 22.6986 22.6986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-32.0485 -31.6049 -30.9966 -21.2181 -20.0256 -2.1500 -5.4855 -7.2780 -23.9162 -23.9472 -23.6472 -23.99162 -3.2550 -3.2857 -3.9873 -47.2991 -47.2991 -47.2991 -47.2991 -47.2991 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0077 0.0077 0.0191 0.0191 0.0242 0.0270 0.0242 0.0270 0.0242 0.0270 0.0242 0.0270 0.0242 0.0270 0.0242 0.0783 0.0175 0.0791 0.0904 0.0143 0.0308 0.01308 0.01308 0.01308 0.01501 0.0496 0.1501 0.1404 0.1842 0.1504 0.11504 0.11504	0.0045 0.0080 -0.0116 -0.0653 0.0458 0.0458 0.0057 0.0079 0.0079 0.0079 0.0079 0.0079 0.0079 0.0042 0.00079 0.0009 0.0009 0.0009 0.0009 0.0009 0.0009 0.0009 0.0009 0.0009 0.0009 0.0009 0.0009 0.0009 0.0009 0.00000 0.000000	-0.0126 -0.0100 -0.0100 -0.0190 -0.0190 -0.0190 -0.0094 -0.0318 -0.0318 -0.0318 -0.0318 -0.0318 -0.0318 -0.0456 -0.0456 -0.0456 -0.0456 -0.0269 -0.0229 -0.0293 -0.0072	0.0154 0.0150 0.0293 0.0702 0.0527 0.0691 0.0691 0.0691 0.0691 0.0392 0.0796 0.0392 0.0796 0.0580 0.0510 0.0252 0.1581 0.1098 0.1628 0.1628 0.1435 0.2041 0.1508	0.0154 0.0150 0.0293 0.0702 0.0527 0.00527 0.00757 0.0075 0.0075 0.0078 0.0019 0.0009 0.0019 0.0022 0.0019 0.0022 0.0019 0.0022 0.0023 0.0029 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0229 0.0029 0.0022 0.0022 0.0029 0.0022 0.0029 0.0022 0.0022 0.0022 0.0029 0.0029 0.0022 0.0029 0.0029 0.0029 0.0029 0.0029 0.0029 0.0029 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0000 0.0022 0.00200000000	Crush X, Y, 2 X, Y, 2 X, Y, 2 X, Y, 2 X, Y, 2 Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Z Z Z Z Z Z Z Z
Halt International Action of the second system of t	49.9442 50.1598 50.3281 43.0227 44.6722 45.2184 54.0074 54.2464 54.2464 32.9365 20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 33.2463 33.2055 33.0055 33.0055 33.2055 33.0055 33.2055 33.	-6.1007 5.9826 17.4750 -8.4934 7.3224 19.2961 21.1997 21.3294 21.3294 21.321 23.0317 23.0317 23.0317 23.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.22240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	-32.0359 -31.5949 -30.9776 -21.2355 -20.3351 -19.9942 -2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -23.4009 -3.4664 -3.2144 -3.9779 -47.2603	49.9365 50.1520 50.3090 43.0036 44.6480 45.1914 54.0684 56.9987 54.4049 44.3174 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 37.9534 36.7728 36.9551 33.1059 32.8408 33.0551 32.8408 33.0551 32.8408	-6.0962 5.9746 17.4866 -8.5587 7.2765 19.3332 21.1928 21.3137 21.3242 23.0269 22.6080 22.5086 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-32.0485 -31.6049 -30.9966 -21.2181 -20.0256 -2.00056 -2.1500 -5.4855 -7.2780 -23.9162 -23.6472 -23.6472 -23.6472 -23.9873 -47.2991 -47.2991 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0077 0.0078 0.0191 0.0191 0.0242 0.0270 0.0270 0.0610 0.0783 -0.1585 0.0175 0.0791 0.0904 0.0791 0.0904 0.0143 0.0308 0.0233 0.1136 0.1501 0.1404 0.1842 0.1504 0.1504 0.1504	0.0045 0.0080 0.0080 0.0085 0.0458 0.0458 0.0057 0.0079 0.0157 0.0079 0.0056 0.0157 0.0079 0.0042 0.0056 0.0022 0.0019 0.0022 0.0019 0.0022 0.0019 0.00258 0.0038 0.0038 0.0038	-0.0128 -0.0190 -0.0190 0.0174 0.0096 -0.0114 0.0318 -0.0318 0.1223 -0.0347 -0.0077 0.0562 -0.0405 -0.0450 -0.0450 -0.0268 -0.0322 -0.0293 -0.0072	0.0154 0.0150 0.0293 0.0702 0.0527 0.0691 0.0691 0.0691 0.0691 0.0392 0.0796 0.0918 0.0510 0.0510 0.0525 0.1581 0.1098 0.1628 0.1628 0.1435 0.2041 0.1508	0.0154 0.0150 0.0293 0.0702 0.0527 0.069 0.0157 0.0079 0.0056 0.0075 0.0079 0.0056 0.0056 0.0056 0.00079 0.0022 0.0019 0.0022 0.0019 0.0229 0.0029 0.0022 0.0023 0.0022 0.0022 0.0029 0.0022 0.0022 0.0029 0.0022 0.0029 0.0022 0.0029 0.0029 0.0022 0.00290000000000	X, Y, 2 X, Y, 2 X, Y, 2 X, Y, 2 X, Y, 2 Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Z Z Z Z Z Z Z Z Z
Altrict side Altrict side Al	50.1396 50.3281 43.0227 44.6722 45.2184 54.0074 57.0770 54.2454 44.3349 32.9365 20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 34.8296 33.2463 33.2055 33.0055 33.0055 33.0055 33.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.205	5.3626 17.4750 -8.4934 7.3224 19.2961 21.1997 21.3294 21.321 23.0317 22.6136 22.5847 23.7639 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	-31.3849 -30.9776 -21.2355 -20.3351 -19.9942 -2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -23.4009 -3.4664 -3.2144 -3.2144 -3.9779 -47.2603 -	30.1320 50.3090 43.0036 44.6480 44.6480 44.6480 45.1914 54.0684 56.9987 54.4049 44.3174 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 37.9534 36.7728 36.9551 37.9534 36.0751 32.8408 33.0551 32.8408 33.0551 32.8408 33.24305 32.8435 32.8557 32.8574 33.0551 32.8574 32.8574 33.9551 32.8574 33.9551 33.9551 33.9551 33.9551 33.9551 33.9551 33.9551 33.9551 33.9551 33.9551 33.9551 33.9551 33.9551 33.98551 33.9551 32.8435 33.9551 35.9551 35.9551 35.9551 35.9551 35.9551 3	3.3746 3.3746 -8.5587 7.2766 -9.332 21.1928 21.3137 21.3242 23.0269 22.6080 22.5986 23.7892 22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-31.9049 -30.9966 -21.2181 -20.3255 -20.0056 -2.1500 -5.4855 -7.2780 -23.9162 -23.9162 -23.6472 -23.991 -3.2550 -3.9873 -47.2991 -47.2991 -47.2991 -47.2991 -47.2991 -47.2991 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0078 0.0191 0.0191 0.0242 0.0270 -0.0610 0.0783 -0.1585 0.0175 0.0791 0.0904 0.0143 0.0308 0.0233 0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1504 0.1504	0.0880 0.0116 -0.0116 -0.0458 -0.0371 0.0069 0.0157 0.0079 0.0069 0.0157 0.0079 0.0068 -0.0139 0.0007 0.00258 0.00258 0.0038 -0.0258 0.0038 -0.0258 0.0038 -0.0258 0.0038 -0.0258 0.0038 -0.0258 0.0038 -0.0258 0.0038 -0.0258 0.0038 -0.0258 0.0038 -0.0258 0.0038 -0.0258 0.0058 -0.0258 0.0058 -0.0258 0.0058 -0.0258 0.0058 -0.0258	-0.0190 -0.0190 -0.0190 -0.0174 -0.0174 -0.0318 -0.0318 -0.0318 -0.0348 -0.0348 -0.0077 -0.0562 -0.0406 -0.0094 -0.0388 -0.0450 -0.0268 -0.0322 -0.0233 -0.0072	0.0730 0.0293 0.0702 0.0527 0.0473 0.0691 0.0860 0.004 0.0392 0.0796 0.0796 0.0796 0.0796 0.0796 0.0796 0.0796 0.0510 0.0510 0.0510 0.0510 0.0511 0.0552 0.1583 0.1581 0.1028 0.1628 0.1628 0.1628	0.0133 0.0293 0.0702 0.0527 0.0473 0.0069 0.0157 0.0079 0.0047 0.0069 0.00457 0.0079 0.00450 0.0022 0.0019 0.0022 0.0019 0.0269 0.0269 0.0223 0.0072 0.0072	X, Y, Z X, Y, Z X, Y, Z X, Y, Z X, Y, Z Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Z Z Z Z
APILLAR aximum aximum aximum aximum aximum APANEL A A A A A A A A A A A A A	43.0227 44.6722 45.2184 54.0074 57.0770 54.2464 44.3349 32.9365 20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 33.2463 33.2055 33.0055 33.0055 33.2055 33.0055 33.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.2055 35.205		-21.2355 -20.3351 -19.9942 -2.1818 -5.4537 -7.4003 -23.6399 -23.4009 -3.4664 -3.2144 -3.2144 -3.2144 -3.2144 -3.2144 -46.9421 -46.9421 -46.9421 -46.9421 -46.9421 -46.9421 -46.9421 -46.9176 -49.7679 -49.5950	43.0036 44.0036 44.6480 45.1914 54.0684 56.9987 54.4049 44.3174 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8408 32.8403 32.8403	16.5587 7.2766 19.3322 21.1928 21.3137 21.3242 23.0269 22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-21.2181 -20.3255 -20.0056 -2.1500 -5.4855 -7.2780 -23.9162 -23.9162 -23.9162 -23.6472 -23.9332 -3.4102 -3.2550 -3.9873 -47.2991 -47.1610 -46.9980 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0191 0.0242 0.0270 -0.0610 0.0783 -0.1585 0.0175 0.0791 0.0904 0.0143 0.0308 0.0233 0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.11504	0.0653 0.0458 0.0458 0.0371 0.0069 0.0157 0.0079 0.0048 0.0056 0.019 0.0007 0.0007 0.0007 0.0007 0.0007 0.0007 0.0002 0.0019 0.0088 0.0028 0.00942 0.0258 0.00377 0.0076	0.0174 0.0096 -0.0114 0.0318 0.1223 -0.0318 0.1223 -0.0347 -0.0073 0.0077 -0.0073 -0.0094 -0.0094 -0.0388 -0.0450 -0.0269 -0.0269 -0.0223 -0.0072	0.0702 0.0527 0.0473 0.0691 0.0860 0.2004 0.0392 0.0796 0.0580 0.0510 0.0580 0.0510 0.0522 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	0.0702 0.0727 0.0473 0.0069 0.0157 0.0079 0.0048 0.0056 -0.0139 0.0007 0.0007 0.0022 0.0019 -0.0388 -0.0450 -0.0450 -0.0450 -0.0269 -0.0229 -0.0293 -0.0293 -0.0073 -0.0073	X, Y, Z X, Y, Z X, Y, Z Y Y Y Y Y Y Y Y Y Y Y Y Z Z Z Z Z Z Z
Aminimu Ami	44.6722 45.2184 54.0074 44.3349 32.9365 20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 33.2463 33.2055 33.0055 33.0055 33.0055 33.0055 33.24283 33.21223 27.0924	7.3224 19.2961 21.1997 21.3294 21.3294 21.321 23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	-20.3351 -19.9942 -2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -23.4009 -3.4664 -3.2144 -3.2144 -3.2144 -3.2144 -3.9779 -47.2603 -47.1160 -46.9421 -46.9421 -46.9461 -46.9461 -49.9617 -49.7679 -49.5950	44.6480 45.1914 54.0684 56.9987 54.4049 44.3174 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8408 32.8403 32.8435	7.2766 19.332 21.1928 21.3137 21.3242 23.0269 22.6080 22.5986 6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8353 3.3363	-20.3255 -20.0056 -2.1500 -5.4855 -7.2780 -23.6472 -23.6472 -3.34102 -3.2550 -3.9873 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0242 0.0270 -0.0610 0.0783 -0.1585 0.0175 0.0791 0.0904 0.0143 0.0308 0.0233 0.1136 0.1501 0.4046 0.1551 0.1404 0.1842 0.1504 0.11504	0.0458 -0.0371 0.0069 0.0157 0.0079 0.0048 0.0056 -0.0139 0.0007 0.0002 0.0019 -0.0688 -0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	0.0096 -0.0114 0.0318 -0.0318 0.1223 -0.0347 -0.0073 0.0073 -0.0450 -0.0450 -0.0450 -0.0450 -0.0269 -0.0223 -0.0293 -0.0072	0.0527 0.0473 0.0691 0.0860 0.2004 0.0392 0.0796 0.0918 0.0580 0.0510 0.0550 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	0.0527 0.0473 0.0069 0.0157 0.0079 0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0388 -0.0450 -0.0450 -0.0450 -0.0269 -0.0223 -0.0293 -0.0072	X, Y, Z X, Y, Z Y Y Y Y Y Y Y Y Y Y Y Z Z Z Z Z Z Z Z
Aminimu Ami	45.2184 54.0074 57.0770 54.2464 44.3349 32.9365 20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 34.8296 33.2463 33.0255 33.0055 33.0055 33.0055 33.2453 33.245	19.2961 21.1997 21.3294 21.321 23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	-19.9942 -2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -23.4009 -3.4664 -3.2144 -3.2144 -3.2144 -3.2144 -3.9479 -47.2603 -47.2607 -47.2	45.1914 54.0684 56.9987 54.4049 44.3174 32.6574 20.4631 41.3776 34.9169 24.1276 38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8408 32.8403 32.8435	19.3332 21.1928 21.3137 21.3242 23.0269 22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-20.0056 -2.1500 -5.4855 -7.2780 -23.9162 -23.6472 -23.3932 -3.4102 -3.2550 -3.9873 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0270 -0.0610 0.0783 0.0175 0.0175 0.0175 0.0791 0.0904 0.0143 0.0308 0.0233 0.1136 0.1501 0.4046 0.1575 0.1404 0.1842 0.1504 0.1504 0.1504	-0.0371 0.0069 0.0157 0.0079 0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0686 -0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	-0.0114 0.0318 -0.0318 -0.0347 -0.0073 0.0077 0.0562 -0.0460 -0.0450 -0.0450 -0.0450 -0.0450 -0.0450 -0.0450 -0.0450 -0.0450 -0.0269 -0.0322 -0.0273 -0.0072	0.0473 0.0691 0.0860 0.2004 0.0392 0.0796 0.0918 0.0580 0.0580 0.0550 0.0550 0.0552 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.2041	0.0473 0.0069 0.0157 0.0079 0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0388 -0.0450 -0.0450 -0.0269 -0.0229 -0.0223 -0.0273 -0.0072	X, Y, 2 Y Y Y Y Y Y Y Y Y Z Z Z Z Z Z Z Z
APILLAR aximum aximum aximum aximum APACT SIDE APANEL COOR - (Z) COOR	54.0074 57.0770 54.2464 44.3349 32.9365 20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 34.8296 33.2463 33.0250 33.0055 33.0055 33.0055 33.0055 32.4283 33.12235	21.1997 21.3294 21.3321 23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	-2.1818 -5.4537 -7.4003 -23.8815 -23.6399 -3.4664 -3.2144 -3.2144 -3.9779 -47.2603 -47.2603 -47.1160 -46.9421 -46.9421 -46.9421 -46.9421 -46.9461 -49.9176 -49.97679 -49.5950	54.0684 56.9987 54.4049 44.3174 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 38.6950 33.6551 33.1059 32.8408 33.0551 32.8408	21.1928 21.3137 21.3242 23.0269 22.6986 23.7692 23.7591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-2.1500 -5.4855 -7.2780 -23.9162 -23.6472 -23.3932 -3.4102 -3.2550 -3.9873 -47.2991 -47.1610 -45.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	-0.0610 0.0783 -0.1585 0.01755 0.0791 0.0904 0.0143 0.0308 0.0233 0.1136 0.0233 0.1136 0.1575 0.1404 0.1575 0.1404 0.1542 0.1594	0.0069 0.0157 0.0079 0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0686 0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	0.0318 -0.0318 -0.0318 -0.0347 -0.0073 0.0562 -0.0406 -0.0094 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0293 -0.0073 -0.0072	0.0691 0.0860 0.2004 0.0392 0.0796 0.0918 0.0580 0.0510 0.0252 0.1383 0.1581 0.1098 0.1628 0.1628 0.1435 0.2041 0.1508	0.0069 0.0157 0.0079 0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0388 -0.0450 -0.0269 -0.0228 -0.0223 -0.0223 -0.0073	Y Y Y Y Y Y Y Y Z Z Z Z Z Z Z Z
Altrice A 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	57.0770 54.2464 44.3349 32.9365 20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 33.8263 33.2463 33.2463 33.2055 33.0055 33.0055 33.0055 32.4283 31.2235 27.0924	21.3294 21.3321 23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	-5.4537 -7.4003 -23.8815 -23.6399 -23.4069 -3.2144 -3.2144 -3.9779 -47.2603 -47.2603 -47.2603 -47.2603 -47.2603 -47.2603 -46.9421 -46.9421 -46.9421 -46.9421 -46.9421 -46.9421 -49.9176 -49.7679 -49.5950	56.9987 54.4049 44.3174 32.8574 20.4631 41.3776 38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8408 33.0551 32.8408 33.0551	21.3137 21.3242 23.0269 22.6080 22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-5.4855 -7.2780 -23.9162 -23.9162 -23.3932 -3.2550 -3.2550 -3.9873 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0783 -0.1585 0.0791 0.0904 0.0143 0.0308 0.0233 0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1504	0.0157 0.0079 0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0686 -0.0209 0.0942 0.0942 0.0258 0.0038 -0.0877 0.0076	-0.0318 0.1223 -0.0347 -0.0073 0.0077 0.0562 -0.0406 -0.0094 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	0.0860 0.2004 0.0392 0.0796 0.0918 0.0580 0.0510 0.0252 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	0.0157 0.0079 0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0388 -0.0450 -0.0269 -0.02293 -0.02293 -0.0073 -0.0073	Y Y Y Y Y Y Y Z Z Z Z Z Z Z Z
μ         9           Image: State of the state of	34,2464 44,3349 32,9365 20,5535 41,3919 34,9477 24,1509 38,8086 38,1035 36,8224 34,8296 33,2463 33,2463 33,2055 33,0055 33,0055 33,0055 32,4283 31,2235 27,0924	21.3321 23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	-7,4003 -23,8815 -23,6399 -23,4009 -3,4664 -3,2144 -3,9779 -47,2603 -47,1160 -46,9421 -46,9421 -46,9461 -46,9461 -46,9461 -49,9461 -49,9461 -49,9476 -49,7679 -49,7679	34.4049 44.3174 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 37.9534 36.6721 33.1059 32.8408 33.0551 32.8408 33.0551 32.8403 32.3435	21.3242 23.0269 22.6080 22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-7.2780 -23.9162 -23.6472 -23.3932 -3.4102 -3.2550 -3.9873 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	-0.1585 0.0175 0.0791 0.0904 0.0143 0.0308 0.0233 0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1504	0.0079 0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0686 -0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	0.1223 -0.0347 -0.0073 0.0077 0.0562 -0.0406 -0.0094 -0.0388 -0.0450 -0.0269 -0.0269 -0.0293 -0.0293 -0.0073 -0.0072	0.2004 0.0392 0.0796 0.0918 0.0580 0.0510 0.0252 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	0.0079 0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0388 -0.0450 -0.0269 -0.0269 -0.0293 -0.0293 -0.0073 -0.0072	Y Y Y Y Y Y Y Z Z Z Z Z Z Z Z Z
ADIS TOAMI A Strummark A Stru	44.334 32.9365 20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 34.8296 33.2463 33.2463 33.2055 33.0055 33.0055 33.0055 33.2055 33.0055 33.2055 32.2052 33.2055 33.2055 32.2052	23.0317 22.6136 22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805	-23.6815 -23.6399 -23.4009 -3.4664 -3.2144 -3.9779 -47.2603 -47.1160 -46.9421 -46.9461 -46.9461 -46.6148 -50.0681 -50.0681 -49.9176 -49.7679 -49.5950	44.3/74 32.8574 20.4631 41.3776 34.9169 24.1276 38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8903 32.3435	23.0269 22.6080 22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-23.9162 -23.6472 -23.3932 -3.4102 -3.2550 -3.9873 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0173 0.0904 0.0143 0.0308 0.0233 0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1504	0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0686 -0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	-0.0347 -0.0073 0.0077 0.0562 -0.0406 -0.0094 -0.0388 -0.0450 -0.0269 -0.0293 -0.0293 -0.0073 -0.0072	0.0392 0.0796 0.0918 0.0580 0.0510 0.0252 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	0.0048 0.0056 -0.0139 0.0007 0.0022 0.0019 -0.0388 -0.0450 -0.0269 -0.0269 -0.0293 -0.0073 -0.0073	Y Y Y Y Y Z Z Z Z Z Z Z
Report Si Animum Ani	20.5535 41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 33.2463 33.2055 33.0055 33.0055 33.0055 32.4283 31.2235 27.0924	22.5847 23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805 8.6354	-23.4009 -3.4664 -3.2144 -3.9779 -47.2603 -47.1160 -46.9421 -46.9461 -46.9461 -46.6148 -50.0681 -49.9176 -49.7679 -49.5950	20.4631 20.4631 41.3776 34.9169 24.1276 38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8903 32.3435	22.5986 23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-23.3932 -3.4102 -3.2550 -3.9873 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0904 0.0143 0.0308 0.0233 0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1504	-0.0139 -0.0139 0.0007 0.0022 0.0019 -0.0686 -0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	-0.0077 0.0562 -0.0406 -0.0094 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0293 -0.0073 -0.0072	0.0918 0.0918 0.0580 0.0510 0.0252 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	-0.0139 -0.0139 0.0007 0.0022 0.0019 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	Y Y Y Z Z Z Z Z Z Z Z Z
LYEAD LOAD	41.3919 34.9477 24.1509 38.8086 38.1035 36.8224 34.8296 33.2463 33.0250 33.0055 33.0055 33.0055 32.4283 31.2235 27.0924	23.7899 23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805 8.6354	-3.4664 -3.2144 -3.9779 -47.2603 -47.1160 -46.9421 -46.6148 -50.0681 -49.9176 -49.7679 -49.7679	41.3776 34.9169 24.1276 38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8903 32.3435	23.7892 23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-3.4102 -3.2550 -3.9873 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0143 0.0308 0.0233 0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1504 0.1192	0.0007 0.0022 0.0019 -0.0686 -0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	0.0562 -0.0406 -0.0094 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	0.0580 0.0510 0.0252 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	0.0007 0.0022 0.0019 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	Y Y Y Z Z Z Z Z Z Z Z
AWI 14 15 16 17 18 19 20 21 22 23 002 24 24 23 20 24 24 23 20 24 25 26 27 28 29 30 31 33 33 34	34.9477 24.1509 38.8086 38.1035 36.8224 33.2453 33.0250 33.2055 33.0095 32.4283 31.2235 27.0924	23.5613 22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805 8.6354	-3.2144 -3.9779 -47.2603 -47.1160 -46.9421 -46.9461 -46.6148 -50.0681 -49.9176 -49.7679 -49.7679	34.9169 24.1276 38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8903 32.3435	23.5591 22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-3.2550 -3.9873 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0308 0.0233 0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1504	0.0022 0.0019 -0.0686 -0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	-0.0406 -0.0094 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	0.0510 0.0252 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	0.0022 0.0019 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	Y Y Z Z Z Z Z Z Z Z
<ul> <li>≤</li> <li>15</li> <li>16</li> <li>17</li> <li>18</li> <li>19</li> <li>20</li> <li>21</li> <li>22</li> <li>23</li> <li>24</li> <li>23</li> <li>24</li> <li>23</li> <li>24</li> <li>25</li> <li>26</li> <li>27</li> <li>28</li> <li>30</li> <li>31</li> <li>32</li> <li>33</li> <li>34</li> </ul>	24.1509 38.8086 38.1035 36.8224 33.2463 33.0250 33.2055 33.0095 32.4283 31.2235 27.0924	22.6662 -6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805 8.6354	-3.9779 -47.2603 -47.1160 -46.9421 -46.9461 -46.6148 -50.0681 -49.9176 -49.9176 -49.7679 -49.5950	24.1276 38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8903 32.3435	22.6643 -6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-3.9873 -47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0233 0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1192	0.0019 -0.0686 -0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	-0.0094 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	0.0252 0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	0.0019 -0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	Y Z Z Z Z Z Z Z Z
LIC X- X- A Structure (C) - LOOD (C) -	38.8086 38.1035 36.8224 34.8296 33.2463 33.0250 33.005 33.005 32.4283 31.2235 27.0924	-6.9064 -0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805 8.6354	-47.2603 -47.1160 -46.9421 -46.9461 -46.6148 -50.0681 -49.9176 -49.7679 -49.5950 40.2101	38.6950 37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8903 32.3435	-6.9750 -0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-47.2991 -47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.1136 0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1192	-0.0686 -0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	-0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	0.1383 0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	-0.0388 -0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0073	Z Z Z Z Z Z Z
LTITPU 177 188 19 200 21  222 233 002 24 252 266 277 288 200 24 252 266 277 288 300 301 311 322 333 34	38.1035 36.8224 34.8296 33.2463 33.0250 33.0095 32.4283 31.2235 27.0924	-0.5746 5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805 8.6354	-47.1160 -46.9421 -46.9461 -46.6148 -50.0681 -49.9176 -49.7679 -49.5950 40.2101	37.9534 36.7728 34.6721 33.1059 32.8408 33.0551 32.8903 32.3435	-0.5955 5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-47.1610 -46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.1501 0.0496 0.1575 0.1404 0.1842 0.1504 0.1192	-0.0209 0.0942 0.0258 0.0038 -0.0877 0.0076	-0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	0.1581 0.1098 0.1628 0.1435 0.2041 0.1508	-0.0450 -0.0269 -0.0322 -0.0293 -0.0073 -0.0072	Z Z Z Z Z Z
LTC A Constraint of the second	36.8224 34.8296 33.2463 33.0250 33.0095 33.0095 32.4283 31.2235 27.0924	5.2240 10.1120 12.7585 -8.8910 -4.6293 -0.7604 3.3805 8.6354	-46.9421 -46.9461 -46.6148 -50.0681 -49.9176 -49.7679 -49.5950	36.7728 34.6721 33.1059 32.8408 33.0551 32.8903 32.3435	5.1298 10.0862 12.7547 -8.9787 -4.6217 -0.8350 3.3363	-46.9690 -46.9783 -46.6441 -50.0754 -49.9248 -49.7800	0.0496 0.1575 0.1404 0.1842 0.1504 0.1192	0.0942 0.0258 0.0038 -0.0877 0.0076	-0.0269 -0.0322 -0.0293 -0.0073 -0.0072	0.1098 0.1628 0.1435 0.2041 0.1508	-0.0269 -0.0322 -0.0293 -0.0073 -0.0072	Z Z Z Z Z
(Ž) - J ODU SALANCE	33.2463 33.2463 33.0250 33.2055 33.0095 32.4283 31.2235 27.0924	12.7585 -8.8910 -4.6293 -0.7604 3.3805 8.6354	-46.6148 -50.0681 -49.9176 -49.7679 -49.5950	33.1059 32.8408 33.0551 32.8903 32.3435	12.7547 -8.9787 -4.6217 -0.8350 3.3363	-46.6441 -50.0754 -49.9248 -49.7800	0.1404 0.1842 0.1504 0.1192	0.0038 -0.0877 0.0076	-0.0322 -0.0293 -0.0073 -0.0072	0.1435 0.2041 0.1508	-0.0322 -0.0293 -0.0073 -0.0072	Z Z Z
(Z) - LOON aximum aximum 225 226 227 228 229 300 30 30 30 30 31 229 30 30 30 30 30 30 30 30 30 30 30 30 30	33.0250 33.2055 33.0095 32.4283 31.2235 27.0924	-8.8910 -4.6293 -0.7604 3.3805 8.6354	-50.0681 -49.9176 -49.7679 -49.5950	32.8408 33.0551 32.8903 32.3435	-8.9787 -4.6217 -0.8350 3.3363	-50.0754 -49.9248 -49.7800	0.1842 0.1504 0.1192	-0.0877 0.0076	-0.0073 -0.0072	0.2041 0.1508	-0.0073 -0.0072	Z
Z) - JOON A 22 23 24 24 25 26 27 28 29 30 30 (2, ', 'X) 33 30 31 31 33 33 33 34	33.2055 33.0095 32.4283 31.2235 27.0924	-4.6293 -0.7604 3.3805 8.6354	-49.9176 -49.7679 -49.5950	33.0551 32.8903 32.3435	-4.6217 -0.8350 3.3363	-49.9248 -49.7800	0.1504	0.0076	-0.0072	0.1508	-0.0072	Z
LOON WILLIAN A 23 24 25 26 27 28 29 30 30 30 30 31 31 32 33 34	33.0095 32.4283 31.2235 27.0924	-0.7604 3.3805 8.6354	-49.7679 -49.5950	32.8903 32.3435	-0.8350 3.3363	-49.7800	0 1192				0.0101	7
0 24 25 26 27 28 30 30 (7, 7 33 30 (7, 7 33 33 34	32.4283 31.2235	3.3805	-49.5950	32.3435	3.3363		0.1102	-0.0746	-0.0121	0.1411	-0.0121	2
Z 25 26 27 28 29 30 (C, Y, 33 33 31 32 33 33 34	31.2235	8 6354		01 1005	0.0004	-49.6024	0.0848	0.0442	-0.0074	0.0959	-0.0074	Z
27 27 28 29 30 30 31 32 32 33 34	2 2 1 1 1 2 2 2 4	0.2855	-49.3191	31.1095	8.6304	-49.3135	0.1140	0.0050	0.0056	0.1142	0.0056	2
28 29 30 30 (Z ', ', ' 33 32 33 34	26.9631	-9.2000	-50.6577	26.9243	-4 2237	-50.5820	0.1545	-0.1121	0.0888	0.2010	0.0000	7
29 30 31 X, Y, Z) 33 33 34	26.9103	-0.6191	-50,4620	26.8196	-0.6596	-50.4013	0.0907	-0.0405	0.0607	0.1164	0.0607	Z
30 31 32 32 33 33 33 34	26.6328	2.8763	-50.2973	26.4530	2.8254	-50.2600	0.1798	0.0509	0.0373	0.1906	0.0373	Z
PILLAR aximum X, Y, Z) 33 34 34	26.2639	7.6519	-49.9889	26.1146	7.6653	-49.9670	0.1493	-0.0134	0.0219	0.1515	0.0219	Z
Ar X X X X X X X X X X X X X X X X X X X	51.1867	19.5776	-33.4478	51.0857	19.5674	-33.4994	0.1010	0.0102	-0.0516	0.1139	0.1015	X, Y
1 LL × 33 34	48.3072	18.1122	-35.8906	48.3031	18.1147	-35.8861	0.0041	-0.0025	0.0045	0.0066	0.0061	X,Z
0, e × 34	45.4690	17.4092	-38.0770	45.3893	17.3909	-38.0949	0.0797	0.0183	-0.01/9	0.0837	0.0818	X, Y
15 35	42.0427	15,7176	-40.5132	39 0695	15 7618	-40.5569	0.0654	-0.0124	-0.0237	0.0707	0.0000	A, 1 X
36	35.7503	14,9354	-45.1052	35.7151	14.9885	-45.1536	0.0352	-0.0531	-0.0484	0.0800	0.0352	X
31	51.1867	19.5776	-33.4478	51.0857	19.5674	-33.4994	0.1010	0.0102	-0.0516	0.1139	0.0102	Y
¥E 32	48.3072	18.1122	-35.8906	48.3031	18.1147	-35.8861	0.0041	-0.0025	0.0045	0.0066	-0.0025	Y
33	45.4690	17.4092	-38.0770	45.3893	17.3909	-38.0949	0.0797	0.0183	-0.0179	0.0837	0.0183	Y
La 34	42.0427	16.5353	-40.5132	41.9773	16.5229	-40.5369	0.0654	0.0124	-0.0237	0.0707	0.0124	Y
< ≚ <u>35</u>	39.0814	15.7176	-42.3696	39.0695	15.7618	-42.4468	0.0119	-0.0442	-0.0772	0.0898	-0.0442	Y
36	35.7503	14.9354	-45.1052	35./151	14.9885	-45.1536	0.0352	-0.0531	-0.0484	0.0800	-0.0531	Y Z
	0 4869	17.8/61	-20./203	9 4135	17.8474	-20.0933	0.0244	-0.0185	-0.0133	0.0450	0.0410	X, Z
	13 0786	17.1977	-39,1507	13.0480	17,2050	-39,1643	0.0306	-0.0073	-0.0136	0.0343	0.0306	X
	11.3014	15.8700	-43.2549	11.1508	15.8719	-43.2749	0.1506	-0.0019	-0.0200	0.1519	0.1506	X
<u>μ</u> <sub>Σ</sub> 37	13.9224	19.5717	-28.7263	13.8980	19.5902	-28.6933	0.0244	-0.0185	0.0330	0.0450	-0.0185	Y
al (1	9.4868	17.8461	-35.1857	9.4135	17.8474	-35.1990	0.0733	-0.0013	-0.0133	0.0745	-0.0013	Y
10 Jan 39	13.0786	17.1977	-39.1507	13.0480	17.2050	-39.1643	0.0306	-0.0073	-0.0136	0.0343	-0.0073	Y
<u>ස</u> 40		15.8700	-43.2549	11.1508	15.8719	-43.2749	0.1506	-0.0019	-0.0200	0.1519	-0.0019	Y






Figure D-9. Exterior Vehicle Crush (NASS) - Front, Test No. MOS-5

Year:	2011	-	Make:	Dodge	Model:	Ram	1500
			Driver Side Maxi	mum Deformation			
	Reference Se	et 1			Reference Se	t 2	
Location	Maximum Deformation <sup>A,B</sup> (in.)	MASH Allowable Deformation (in.)	Directions of Deformation <sup>C</sup>	Location	Maximum Deformation <sup>A,B</sup> (in.)	MASH Allowable Deformation (in.)	Directions of Deformation <sup>C</sup>
Roof	0.1	≤ 4	Z	Roof	0.1	≤ 4	Z
Windshield <sup>D</sup>	0.0	≤ 3	X, Z	Windshield <sup>D</sup>	NA	≤ 3	X, Z
A-Pillar Maximum	0.1	≤ 5	Х	A-Pillar Maximum	0.1	≤ 5	Z
A-Pillar Lateral	-0.1	≤ 3	Y	A-Pillar Lateral	0.0	≤ 3	Y
B-Pillar Maximum	0.1	≤ 5	Х	B-Pillar Maximum	0.0	≤ 5	Х
B-Pillar Lateral	-0.1	≤ 3	Y	B-Pillar Lateral	0.0	≤ 3	Y
Toe Pan - Wheel Well	0.2	≤ 9	Z	Toe Pan - Wheel Well	0.0	≤ 9	Х
Side Front Panel	0.0	≤ 12	Y	Side Front Panel	0.0	≤ 12	Y
Side Door (above seat)	-0.1	≤ 9	Y	Side Door (above seat)	0.0	≤ 9	Y
Side Door (below seat)	0.0	≤ 12	Y	Side Door (below seat)	0.0	≤ 12	Y
Floor Pan	0.1	≤ 12	Z	Floor Pan	0.0	≤ 12	Z
Dash - no MASH requirement	0.2	NA	X, Y, Z	Dash - no MASH requirement	0.2	NA	X, Y, Z
Positive values denote deform For Toe Pan - Wheel Well the ( and Z directions. The direction intruding into the occupant com If deformation is observered for and recorded.	ation as inward to direction of defrom of deformation for partment. If directi r the windshield th	ward the occupant of ation may include > Toe Pan -Wheel We on of deformation is nen the windshield	compartment, negati K and Z direction. Fo ell, A-Pillar Maximum s "NA" then no intrus deformation is meas	ve values denote deformations out r A-Pillar Maximum and B-Pillar Max , and B-Pillar Maximum only include ion is recorded and deformation wi sured posttest with an examplar veh	ward away from the wimum the direction e components whe II be 0. licle, therefore only	e occupant compar n of deformation ma pre the deformation y one set of reference	tment. ay include X, Y, is positive and ce is measured
Notes on vehicle interior cr	ush:						

Figure D-10. Maximum Occupant Compartment Deformation, Left, Test No. MOS-5

December 16, 2020 MwRSF Report No. TRP-03-426-20

Date: Year:	4/9/2019 2011	-	Test Name: Make:	MOS-5 Dodge	VIN: Model:	1D7RB1CT2 Ram	2BS657795 1500
		Pa	assenger Side Ma	ximum Deformation			
	Reference Se	et 1			Reference Se	t 2	
Location	Maximum Deformation <sup>A,B</sup> (in.)	MASH Allowable Deformation (in.)	Directions of Deformation <sup>C</sup>	Location	Maximum Deformation <sup>A,B</sup> (in.)	MASH Allowable Deformation (in.)	Directions of Deformation <sup>C</sup>
Roof	0.0	≤ 4	Z	Roof	0.1	≤ 4	Z
Windshield <sup>D</sup>	0.0	≤ 3	X, Z	Windshield <sup>D</sup>	NA	≤ 3	X, Z
A-Pillar Maximum	0.2	≤ 5	Х, Ү	A-Pillar Maximum	0.1	≤ 5	Х, Ү
A-Pillar Lateral	0.0	≤ 3	Y	A-Pillar Lateral	0.0	≤ 3	Y
B-Pillar Maximum	0.2	≤ 5	Х	B-Pillar Maximum	0.2	≤ 5	Х
B-Pillar Lateral	0.0	≤ 3	Y	B-Pillar Lateral	0.0	≤ 3	Y
Toe Pan - Wheel Well	0.2	≤ 9	Z	Toe Pan - Wheel Well	0.1	≤ 9	Х
Side Front Panel	0.0	≤ 12	Y	Side Front Panel	0.0	≤ 12	Y
Side Door (above seat)	0.0	≤ 9	Y	Side Door (above seat)	0.0	≤ 9	Y
Side Door (below seat)	0.0	≤ 12	Y	Side Door (below seat)	0.0	≤ 12	Y
Floor Pan	0.2	≤ 12	Z	Floor Pan	0.0	≤ 12	Z
Dash - no MASH requirement	0.2	NA	X, Y, Z	Dash - no MASH requirement	0.2	NA	X, Y, Z
<sup>1</sup> Positive values denote deform <sup>2</sup> For Toe Pan - Wheel Well the and Z directions. The direction ntruding into the occupant com <sup>2</sup> If deformation is observered for and recorded.	ation as inward to direction of defrom of deformation for partment. If directi or the windshield th	ward the occupant of ation may include X Toe Pan -Wheel We on of deformation is nen the windshield of	compartment, negativ ( and Z direction. For ell, A-Pillar Maximum s "NA" then no intrusi deformation is meas	ve values denote deformations out r A-Pillar Maximum and B-Pillar Max , and B-Pillar Maximum only include ion is recorded and deformation wi sured posttest with an examplar veh	ward away from the kimum the direction e components whe II be 0. licle, therefore only	e occupant compar n of deformation ma ere the deformation y one set of reference	tment. ay include X, Y, is positive and ce is measurec
Notes on vehicle interior cr	ush:						

Figure D-11. Maximum Occupant Compartment Deformation, Right, Test No. MOS-5

Date:	6/12/	2019			Test Name:	МС	)S-6			VIN:	KNA	DE2232965	12940
Year:	20	009			Make:	К	ia			Model:		Rio	
								~					
					VE	HICLE DE	FORMATI	ON					
					DRIVER	SIDE FL	OOR PAN	- SET 1					
		Protect	Protect	Protect		Posttest							Directions
		Y	V	7	Posttest X	V	Posttest Z	$\Delta X^A$	ΔY <sup>A</sup>	ΔZ <sup>A</sup>	Total ∆	Crush <sup>B</sup>	for
	POINT	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	Crush <sup>C</sup>
	1	61.8128	-11.7593	7.2038	61.6657	-11.7489	7.0962	0.1471	0.0104	0.1076	0.1825	0.1823	X, Z
	2	62.0064	-16.3188	7.0223	61.9722	-16.3461	6.8316	0.0342	-0.0273	0.1907	0.1957	0.1937	X, Z
	3	62.3112	-19.5915	6.9105	62.2351	-19.5627	6.7209	0.0761	0.0288	0.1896	0.2063	0.2043	X, Z
żμ	4	62.3161	-21.7595	6.6248	62.2367	-21.7892	6.4727	0.0794	-0.0297	0.1521	0.1741	0.1716	X, Z
∠ ≥ Ñ	5	62.4873	-24.4572	6.8508	62.3859	-24.4856	6.7240	0.1014	-0.0284	0.1268	0.1648	0.1624	X, Z
ШШ Х	6	59.7978	-12.0193	8.3810	59.8460	-11.9959	8.1879	-0.0482	0.0234	0.1931	0.2004	0.1931	Z
2 H	7	59.6291	-16.7326	8.3959	59.5722	-16.6630	8.2673	0.0569	0.0696	0.1286	0.1569	0.1406	X, Z
\$	8	59.7817	-19.1878	8.3361	59.7394	-19.2077	8.1994	0.0423	-0.0199	0.1367	0.1445	0.1431	X, Z
	9	59.6272	-22.6077	8.4202	59.5398	-22.6257	8.3492	0.0874	-0.0180	0.0710	0.1140	0.1126	X, Z
	10	59.6037	-24.8317	8.5327	59.5524	-24.8856	8.4816	0.0513	-0.0539	0.0511	0.0903	0.0724	X, Z
	11	54.5480	-12.7430	8.9774	54.5603	-12.7113	8.8467	-0.0123	0.0317	0.1307	0.1351	0.1307	Z
	12	54.7525	-16.1974	9.1428	54.7523	-16.1919	8.9681	0.0002	0.0055	0.1747	0.1748	0.1747	Z
	13	54.4357	-19.2360	9.1195	54.4279	-19.1863	9.0294	0.0078	0.0497	0.0901	0.1032	0.0901	Z
	14	54.5653	-23.3340	9.0670	54.5701	-23.3638	8.9969	-0.0048	-0.0298	0.0701	0.0763	0.0701	Z
	15	54.4178	-28.0799	9.1454	54.3122	-28.0372	9.0694	0.1056	0.0427	0.0760	0.1369	0.0760	Z
	16	51.2540	-12.1059	9.5253	51.2752	-12.0471	9.4030	-0.0212	0.0588	0.1223	0.1373	0.1223	Z
	17	51.1514	-15.8263	9.5432	51.0857	-15.7492	9.4157	0.0657	0.0771	0.1275	0.1628	0.1275	Z
-	18	51.1496	-19.4233	9.0922	51.0984	-19.3888	9.0446	0.0512	0.0345	0.0476	0.0780	0.0476	Z
AN	19	51.0456	-25.1297	9.2921	51.0477	-25.1182	9.2187	-0.0021	0.0115	0.0734	0.0743	0.0734	Z
Ч Х Г	20	50.5631	-29.3529	9.4062	50.5799	-29.3280	9.3549	-0.0168	0.0249	0.0513	0.0594	0.0513	Z
IO IZ	21	46.0457	-12.2138	9.6147	46.1093	-12.2154	9.5453	-0.0636	-0.0016	0.0694	0.0941	0.0694	Z
10	22	45.8762	-16.0321	9.6286	45.8558	-15.9996	9.5715	0.0204	0.0325	0.0571	0.0688	0.0571	Z
	23	45.8427	-19.3494	9.0445	45.8270	-19.3263	9.0142	0.0157	0.0231	0.0303	0.0412	0.0303	Z
	24	46.1013	-23.9310	9.0151	46.0269	-23.9332	9.0026	0.0744	-0.0022	0.0125	0.0755	0.0125	Z
	25	46.3118	-29.3862	9.4645	46.3381	-29.3666	9.3605	-0.0263	0.0196	0.1040	0.1090	0.1040	Z
	26	41.3811	-12.6581	9.3365	41.3355	-12.5249	9.2659	0.0456	0.1332	0.0706	0.1575	0.0706	Z
	27	41.1590	-16.5367	9.2133	41.1642	-16.5156	9.1961	-0.0052	0.0211	0.0172	0.0277	0.0172	Z
	28	41.0802	-20.8120	8.8823	41.0675	-20.7933	8.8617	0.0127	0.0187	0.0206	0.0306	0.0206	Z
	29	41.0037	-24.6704	8.9820	41.0094	-24.6674	8.9849	-0.0057	0.0030	-0.0029	0.0071	-0.0029	Z
	30	41.0149	-28.0699	9.1375	40.9861	-28.0818	9.0735	0.0288	-0.0119	0.0640	0.0712	0.0640	Z
A Positive v	alues deno	te deformati	on as inwar	toward th		compartme	nt negative	values den	te deformat	ions outwar	d away from	the occur	

compartment.
<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward the occupant compartment. <sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-12. Floor Pan Deformation - Set 1, Left, Test No. MOS-6

Date:	6/12/	2019			Test Name:	MC	) <u>S-6</u>			VIN:	KNAI	DE2232965	12940
rear:	20	09			wake:	n	la			wodel:		RIO	
					VEH	ICLE DE	FORMATI	ON					
					PASSENG	ER SIDE	FLOOR P	AN - SET	1				
				-					-				
		Pretest	Pretest	Pretest		Posttest			4		<b>-</b>	a B	Directions
		Х	Y	Z	Posttest X	Y	Posttest Z	ΔX <sup>¬</sup>	ΔY <sup>Δ</sup>	ΔZ <sup>Δ</sup>	lotal ∆	Crush	for
	POINT	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	Crush <sup>C</sup>
	1	61.3264	0.9264	7.3827	61.2473	0.8861	7.1817	0.0791	0.0403	0.2010	0.2197	0.2160	X, Z
	2	61.2017	5.2537	7.3066	61.0331	5.1970	7.0518	0.1686	0.0567	0.2548	0.3107	0.3055	X, Z
	3	60.9344	8.7567	7.4571	60.7798	8.6941	7.2401	0.1546	0.0626	0.2170	0.2737	0.2664	X, Z
z Щ	4	60.7751	12.4369	7.5204	60.6581	12.3923	7.3204	0.1170	0.0446	0.2000	0.2360	0.2317	X, Z
A ≥ Ω	5	60.4151	16.5302	7.1835	60.2598	16.4944	7.1364	0.1553	0.0358	0.0471	0.1662	0.1623	X, Z
ШЦХ	6	59.0255	0.9341	8.6986	58.9355	0.8808	8.5699	0.0900	0.0533	0.1287	0.1658	0.1570	X, Z
C 분	7	59.3825	5.3460	8.3319	59.2399	5.2899	8.1320	0.1426	0.0561	0.1999	0.2519	0.2455	X, Z
5	8	59.5417	8.9801	8.2519	59.4163	8.9281	8.1099	0.1254	0.0520	0.1420	0.1965	0.1894	X, Z
	9	59.2882	12.5157	8.3733	59.1940	12.4927	8.2515	0.0942	0.0230	0.1218	0.1557	0.1540	X, Z
	10	59.1963	18.0783	8.3107	58.9378	17.9302	8.1774	0.2585	0.1481	0.1333	0.3264	0.2908	X, Z
	11	54.2931	0.8197	9.0594	54.2430	0.7441	8.9335	0.0501	0.0756	0.1259	0.1552	0.1259	Z
	12	54.2384	5.2474	9.2950	54.2094	5.1668	9.1449	0.0290	0.0806	0.1501	0.1728	0.1501	Z
	13	54.3339	10.5190	9.1274	54.3149	10.4646	9.0807	0.0190	0.0544	0.0467	0.0742	0.0467	Z
	14	54.2053	14.7389	9.3974	54.1990	14.7106	9.2675	0.0063	0.0283	0.1299	0.1331	0.1299	Z
	15	54.1313	18.9783	9.4353	54.1633	18.9542	9.3860	-0.0320	0.0241	0.0493	0.0635	0.0493	Z
	16	49.9326	1.0167	9.7297	49.8795	0.9534	9.6221	0.0531	0.0633	0.1076	0.1357	0.1076	Z
	17	49.5251	5.0024	9.6192	49.4702	4.9842	9.4853	0.0549	0.0182	0.1339	0.1459	0.1339	Z
-	18	49.5406	9.4250	9.2256	49.4620	9.4041	9.2647	0.0786	0.0209	-0.0391	0.0902	-0.0391	Z
AA	19	48.9191	13.5072	9.5421	48.9085	13.4703	9.5193	0.0106	0.0369	0.0228	0.0447	0.0228	Z
с К Ñ	20	48.7576	18.5576	9.6541	48.7686	18.5354	9.6145	-0.0110	0.0222	0.0396	0.0467	0.0396	Z
jõ (j	21	44.1425	0.8896	9.7232	44.1186	0.8850	9.6438	0.0239	0.0046	0.0794	0.0830	0.0794	Z
LC LC	22	43.9058	5.4437	9.4629	43.8415	5.3923	9.4545	0.0643	0.0514	0.0084	0.0827	0.0084	Z
-	23	43.7895	9.3371	9.1915	43.7381	9.2816	9.1832	0.0514	0.0555	0.0083	0.0761	0.0083	Z
	24	43.8204	14.0515	9.7289	43.8046	14.0461	9.7686	0.0158	0.0054	-0.0397	0.0431	-0.0397	Z
	25	43.8893	18.7517	9.5030	43.8402	18.7564	9.4072	0.0491	-0.0047	0.0958	0.1078	0.0958	Z
	26	39.7382	0.4289	8.9984	39.7341	0.4684	8.9689	0.0041	-0.0395	0.0295	0.0495	0.0295	Z
	27	39.8576	5.4898	9.2376	39.8424	5.4532	9.2553	0.0152	0.0366	-0.0177	0.0434	-0.0177	Z
	28	39.7664	10.5440	9.2266	39.7368	10.4832	9.2627	0.0296	0.0608	-0.0361	0.0767	-0.0361	Z
	29	39.6307	14.2367	9.3853	39.5881	14.2028	9.4071	0.0426	0.0339	-0.0218	0.0586	-0.0218	Z
	30	39.5079	18.6549	9.3136	39.4933	18.6406	9.2400	0.0146	0.0143	0.0736	0.0764	0.0736	Z
Aparitium				1.1.1							1		

<sup>A</sup> Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-13. Floor Pan Deformation - Set 1, Right, Test No. MOS-6

Date:	6/12/	2019			Test Name:	МС	)S-6			VIN:	KNAI	DE2232965	12940
Year:	20	009			Make:	K	ia			Model:		Rio	
					VE	HICLE DE	FORMATI	ON					
					DRIVER	SIDE FL	OOR PAN	- SET 2					
1	-						1	-					
		Pretest	Pretest	Pretest	Posttest X	Posttest	Posttest Z	ΔX <sup>A</sup>	ΔY <sup>A</sup>	ΔZ <sup>A</sup>	Total ∆	Crush <sup>B</sup>	Directions
		X	Y (L)	Ζ	(in.)	Y	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	for
	POINT	(in.)	(in.)	(in.)	( )	(in.)	( )	()	()	()	( )	()	Crush
	1	61.3187	5.2292	6.2274	60.9815	4.9466	5.7928	0.3372	0.2826	0.4346	0.6184	0.5501	X, Z
	2	61.4955	0.6672	6.0984	61.2648	0.3454	5.5785	0.2307	0.3218	0.5199	0.6535	0.5688	X, Z
. =	3	61.7885	-2.6075	6.0214	61.5132	-2.8734	5.5018	0.2753	-0.2659	0.5196	0.6454	0.5880	X, Z
N H C	4	61.7820	-4.7789	5.7623	61.5009	-5.1028	5.2814	0.2811	-0.3239	0.4809	0.6444	0.5570	X, Z
L V PA	5	61.9490	-7.4742	6.0183	61.6461	-7.7964	5.5628	0.3029	-0.3222	0.4555	0.6349	0.5470	X, Z
Щ Ш С	6	59.3240	4.9901	7.4429	59.1870	4.7204	6.9300	0.1370	0.2697	0.5129	0.5955	0.5309	X, Z
μĦ	7	59.1417	0.2778	7.5187	58.8982	0.0558	7.0740	0.2435	0.2220	0.4447	0.5535	0.5070	X, Z
>	8	59.2858	-2.1784	7.4863	59.0543	-2.4903	7.0340	0.2315	-0.3119	0.4523	0.5962	0.5081	X, Z
	9	59.1226	-5.5965	7.6151	58.8458	-5.9053	7.2311	0.2768	-0.3088	0.3840	0.5652	0.4734	X, Z
	10	59.0946	-7.8188	7.7552	58.8533	-8.1633	7.3913	0.2413	-0.3445	0.3639	0.5562	0.4366	X, Z
	11	54.0835	4.2904	8.1406	53.9158	4.0341	7.7216	0.1677	0.2563	0.4190	0.5190	0.4190	Z
	12	54.2806	0.8377	8.3448	54.0978	0.5546	7.8819	0.1828	0.2831	0.4629	0.5726	0.4629	Z
	13	53.9544	-2.1999	8.3644	53.7640	-2.4375	7.9882	0.1904	-0.2376	0.3762	0.4840	0.3762	Z
	14	54.0708	-6.2987	8.3599	53.8900	-6.6157	8.0044	0.1808	-0.3170	0.3555	0.5095	0.3555	Z
	15	53.9106	-11.0428	8.4991	53.6168	-11.2867	8.1413	0.2938	-0.2439	0.3578	0.5233	0.3578	Z
	16	50.8016	4.9447	8.7387	50.6471	4.7182	8.3465	0.1545	0.2265	0.3922	0.4785	0.3922	Z
	17	50.6882	1.2252	8.8040	50.4444	1.0173	8.4099	0.2438	0.2079	0.3941	0.5079	0.3941	Z
-	18	50.6678	-2.3771	8.3974	50.4350	-2.6267	8.0840	0.2328	-0.2496	0.3134	0.4634	0.3134	Z
AN	19	50.5503	-8.0802	8.6690	50.3675	-8.3532	8.3308	0.1828	-0.2730	0.3382	0.4715	0.3382	Z
2 K D	20	50.0574	-12.3002	8.8434	49.8876	-12.5591	8.5305	0.1698	-0.2589	0.3129	0.4402	0.3129	Z
IQ (7)	21	45.5954	4.8546	8.9213	45.4854	4.5721	8.6121	0.1100	0.2825	0.3092	0.4330	0.3092	Z
-LC	22	45.4148	1.0372	8.9850	45.2187	0.7896	8.6915	0.1961	0.2476	0.2935	0.4312	0.2935	Z
-	23	45.3611	-2.2868	8.4423	45.1646	-2.5437	8.1766	0.1965	-0.2569	0.2657	0.4186	0.2657	Z
	24	45.6055	-6.8692	8.4646	45.3473	-7.1512	8.2178	0.2582	-0.2820	0.2468	0.4551	0.2468	Z
	25	45.8076	-12.3192	8.9771	45.6469	-12.5809	8.6362	0.1607	-0.2617	0.3409	0.4588	0.3409	Z
	26	40.9253	4.4218	8.7308	40.7052	4.2780	8.4488	0.2201	0.1438	0.2820	0.3855	0.2820	Z
	27	40.6895	0.5426	8.6592	40.5177	0.2875	8.4329	0.1718	0.2551	0.2263	0.3818	0.2263	Z
	28	40.5922	-3.7360	8.3821	40.3975	-3.9936	8.1543	0.1947	-0.2576	0.2278	0.3952	0.2278	Z
	29	40.5060	-7.5927	8.5305	40.3281	-7.8656	8.3272	0.1779	-0.2729	0.2033	0.3840	0.2033	Z
	30	40.5098	-10.9901	8.7274	40.2944	-11.2785	8.4589	0.2154	-0.2884	0.2685	0.4491	0.2685	Z

<sup>A</sup> Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-14. Floor Pan Deformation – Set 2, Left, Test No. MOS-6

Date:	6/12/	2019			Test Name:	МС	)S-6			VIN:	KNA	DE2232965	12940
Year:	20	09			Make:	K	ia			Model:		Rio	
				F	VEI PASSENG	HICLE DE ER SIDE	FORMATI	ON AN - SET :	2				
	POINT	Pretest X (in.)	Pretest Y (in.)	Pretest Z (in.)	Posttest X (in.)	Posttest Y (in.)	Posttest Z (in.)	ΔX <sup>A</sup> (in.)	ΔY <sup>A</sup> (in.)	ΔZ <sup>A</sup> (in.)	Total ∆ (in.)	Crush <sup>B</sup> (in.)	Directions for Crush <sup>C</sup>
	1	60.8586	17.9115	6.3637	60.8433	17.8197	5.7592	0.0153	0.0918	0.6045	0.6116	0.6047	X, Z
	2	60.7451	22.2381	6.2435	60.6416	22.1296	5.5834	0.1035	0.1085	0.6601	0.6769	0.6682	X, Z
	3	60.4905	25.7433	6.3609	60.4053	25.6296	5.7363	0.0852	0.1137	0.6246	0.6406	0.6304	X, Z
z Щ	4	60.3428	29.4245	6.3875	60.2989	29.3289	5.7757	0.0439	0.0956	0.6118	0.6208	0.6134	X, Z
A ≥ Ω	5	59.9891	33.5150	6.0129	59.9112	33.4301	5.5526	0.0779	0.0849	0.4603	0.4745	0.4668	X, Z
ЩЩХ	6	58.5795	17.9402	7.7168	58.5643	17.8397	7.2006	0.0152	0.1005	0.5162	0.5261	0.5164	X, Z
ΡΨ	7	58.9432	22.3469	7.2972	58.8744	22.2421	6.7038	0.0688	0.1048	0.5934	0.6065	0.5974	X, Z
\$	8	59.1116	25.9794	7.1759	59.0633	25.8791	6.6346	0.0483	0.1003	0.5413	0.5526	0.5435	X, Z
	9	58.8702	29.5168	7.2637	58.8572	29.4459	6.7393	0.0130	0.0709	0.5244	0.5293	0.5246	X, Z
	10	58.7934	35.0787	7.1432	58.6189	34.8831	6.6070	0.1745	0.1956	0.5362	0.5968	0.5639	X, Z
	11	53.8533	17.8441	8.1559	53.8810	17.7254	7.6745	-0.0277	0.1187	0.4814	0.4966	0.4814	Z
	12	53.8152	22.2742	8.3451	53.8683	22.1504	7.8344	-0.0531	0.1238	0.5107	0.5282	0.5107	Z
	13	53.9232	27.5434	8.1197	53.9914	27.4466	7.7052	-0.0682	0.0968	0.4145	0.4311	0.4145	Z
	14	53.8112	31.7663	8.3467	53.8952	31.6949	7.8446	-0.0840	0.0714	0.5021	0.5141	0.5021	Z
	15	53.7500	36.0061	8.3406	53.8775	35.9397	7.9137	-0.1275	0.0664	0.4269	0.4505	0.4269	Z
	16	49.5049	18.0615	8.8951	49.5356	17.9596	8.4616	-0.0307	0.1019	0.4335	0.4464	0.4335	Z
	17	49.1072	22.0470	8.7487	49.1377	21.9902	8.2868	-0.0305	0.0568	0.4619	0.4664	0.4619	Z
7	18	49.1290	26.4652	8.3077	49.1402	26.4071	8.0142	-0.0112	0.0581	0.2935	0.2994	0.2935	Z
٩٩	19	48.5245	30.5523	8.5907	48.6074	30.4782	8.2336	-0.0829	0.0741	0.3571	0.3740	0.3571	Z
КЧ	20	48.3794	35.6041	8.6514	48.4880	35.5445	8.2722	-0.1086	0.0596	0.3792	0.3989	0.3792	Z
0	21	43.7152	17.9521	8.9843	43.7764	17.9138	8.6177	-0.0612	0.0383	0.3666	0.3736	0.3666	Z
FL	22	43.4874	22.5038	8.6793	43.5113	22.4196	8.3817	-0.0239	0.0842	0.2976	0.3102	0.2976	Z
	23	43.3779	26.3945	8.3683	43.4156	26.3059	8.0670	-0.0377	0.0886	0.3013	0.3163	0.3013	Z
	24	43.4311	31.1142	8.8548	43.5129	31.0766	8.5943	-0.0818	0.0376	0.2605	0.2756	0.2605	Z
	25	43.5099	35.8115	8.5777	43.5570	35.7821	8.1767	-0.0471	0.0294	0.4010	0.4048	0.4010	Z
	26	39.2983	17.4971	8.3364	39.3760	17.5064	8.0496	-0.0777	-0.0093	0.2868	0.2973	0.2868	Z
	27	39.4362	22.5599	8.5196	39.5088	22.4937	8.2745	-0.0726	0.0662	0.2451	0.2641	0.2451	Z
	28	39.3593	27.6139	8.4561	39.4216	27.5238	8.2250	-0.0623	0.0901	0.2311	0.2557	0.2311	Z
	29	39.2369	31.3085	8.5776	39.2897	31.2454	8.3290	-0.0528	0.0631	0.2486	0.2619	0.2486	Z
	30	39.1257	35.7261	8.4608	39.2070	35.6812	8.1117	-0.0813	0.0449	0.3491	0.3612	0.3491	Z
<sup>A</sup> Positive v	alues denot	e deformati	on as inwar	d toward the	e occupant	compartme	nt, negative	values deno	ote deformat	ions outwar	d away fron	n the occup	ant

compartment.
<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-15. Floor Pan Deformation - Set 2, Right, Test No. MOS-6

Date:	6/12/	/2019	-		Test Name:	MC	)S-6			VIN:	KNAI	DE2232965	12940
Tear.	20	109	-		Wake.	r	lid			wouer.		RIU	
					VEH		FORMATI	ON					
				г				SH . SFT	1				
									•				
Ī		Pretest	Pretest	Pretest		Posttest			٥			р	Direction
		Х	Y	Z	Posttest X	Y	Posttest Z	ΔX <sup>A</sup>	ΔY <sup>A</sup>	ΔZ <sup>A</sup>	Total ∆	Crush <sup>□</sup>	for
	POINT	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	Crush
	1	52 3345	-25 5844	-19 4977	52 6824	-25 7208	-19 0128	-0.3479	-0 1364	0 4849	0.6122	0.6122	XYZ
	2	49,9890	-16.6143	-21,9096	50.3394	-16.7864	-21.4315	-0.3504	-0.1721	0.4781	0.6172	0.6172	X Y. Z
HS .	3	49.9856	-4,4809	-19.5073	50.3793	-4.5335	-18.9384	-0.3937	-0.0526	0.5689	0.6938	0.6938	X Y.
λ Υ	4	49.4523	-27.0716	-8.3126	49.5760	-27.3473	-7.8964	-0.1237	-0.2757	0.4162	0.5143	0.5143	X.Y.
ч <u>с</u>	5	49.9161	-15.6394	-6.6920	50.1217	-15.9208	-6.1496	-0.2056	-0.2814	0.5424	0.6447	0.6447	X Y. Z
Ì	6	44,4463	-5.1622	-10.2790	44.6931	-5.3823	-9.8172	-0.2468	-0.2201	0.4618	0.5680	0.5680	X.Y.Z
–	7	54 8920	-31 9154	0 7363	54 7786	-32 2306	1 2846	0 1134	-0.3152	0.5483	0.6425	-0.3152	Y
ĭ⊇≌⊊	8	54 1939	-32 7120	4 8234	53 9981	-33 0263	5 1764	0 1958	-0.3143	0.3530	0.5116	-0.3143	Ý
RA )	9	58.0176	-32,5932	4.8433	57.8481	-32,9380	5.2713	0.1695	-0.3448	0.4280	0.5752	-0.3448	Y
	10	47 1386	-33 5016	-15 1015	47 4177	-33 6486	-14 7953	-0 2701	-0 1470	0.3062	0.5064	-0 1470	v
Ö	11	36 1237	-33 7442	-15 9698	36 3519	-33 8903	-15 7652	-0.2782	-0.1461	0.3302	0.3395	-0.1461	Y
N N	12	24 9869	-34 1006	-17 1744	25 1454	-34 2115	-17 2240	-0.2202	-0.1401	-0.0496	0.0000	-0.1401	
50C	13	45 1583	-33 6936	-2 6472	45 1433	-33 9788	-2 3160	0.0150	-0.2852	0.3312	0.1337	-0.2852	Y
d D	14	38 0061	-34 3521	-1 0037	38 9586	-34 6363	-0.8292	0.0130	-0.2002	0.3312	0.3356	-0.2002	v v
≥ .	15	30.8182	-34 2588	-0.0790	30,8186	-34 5543	-0.0232	-0.0004	-0.2042	0.0342	0.3330	-0.2042	v
	16	20.4121	21.0722	27 2044	20.0901	21.0141	27 1490	0.5770	0.0501	0.0012	0.2010	0.1561	7
r	10	29.4121	17 0/0/	27 4005	29.9091	17 7020	-37.1460	-0.5770	0.0591	0.1001	0.0007	0.1001	
·	18	29.9321	-11.0404	-37.4993	31 0010	-14.0446	-37.3003	-0.5734	-0.0354	0.1990	0.0095	0.1990	7
ŀ	10	20.0210	10 4142	27 7502	31.0919	10 2004	-37.3201	-0.0207	-0.0104	0.2000	0.0700	0.2000	7
·	20	30.0319	-10.4142	-37.6874	31.0259	-10.3094	-37 3745	-0.5970	0.0240	0.2009	0.0044	0.2009	7
-	20	26 6054	-22 08/18	-37 7854	27 0490	-22 0313	-37 6025	-0.3000	0.0023	0.0129	0.0090	0.0129	7
(Z	21	20.0004	-12 0106	-38 0215	27.0490	-17 8852	-37,8806	-0.4430	0.0000	0.0929	0.4304	0.0323	7
Ľ.	22	20.3004	-13 4482	-38 1510	28.0534	-13 /030	-37.0000	-0.5782	0.1234	0.1409	0.5304	0.1403	7
8	20	28.02/1	-0 1286	-38 1510	28 5925	-9.0513	-37.9460	-0.5784	0.0773	0.2000	0.6242	0.2000	7
х Х	25	27 7544	-5 7154	-38 10/17	28 4273	-5.6768	-37.9039	-0.5004	0.0775	0.2400	0.0242	0.2400	7
	26	23 7124	-21 7644	-38 1941	24 2825	-21 6706	-38 1192	-0.5701	0.0000	0.2077	0.7320	0.2077	7
·	20	23.8134	-18 0600	-38 /351	24.2023	-18 0370	-38 3232	-0.5735	0.0000	0.0743	0.5020	0.0740	7
·	28	23.0134	-13 7600	-38 6105	24.3009	-13 7265	-38 4674	-0.5735	0.0230	0.1119	0.5040	0.1113	7
·	20	24 5587	-0 5803	-38 6448	25 1712	-9 5/59	-38 4471	-0.6125	0.0000	0.1021	0.6451	0.1021	7
r	30	24.5307	-6.11/2	-38 6535	25.1712	-6.0433	-38 /211	-0.6681	0.0404	0.1377	0.0401	0.1377	7
	21	E4 5202	20 5774	21 0222	E4 9600	20 6505	21 2290	0.0001	0.0703	0.2024	0.6052	0.2024	7
~ ~ ~ ~	31	52 17/2	-30.3774	-21.0223	54.6090	20 1077	-21.3209	-0.3400	-0.0621	0.4934	0.0000	0.4934	
LAI Nu V	33	48 2265	-20 3038	-26 3430	48 6562	-29 44/0	-25.2002	-0.3003	-0.0511	0.4406	0.5302	0.4406	7
금보신	3/	43 0862	-28 6645	-28 5007	44 52/12	-28 6884	-28 2446	-0 5380	-0 0220	0 3551	0.6/51	0 3551	7
₩ A A	35	40 8972	-28 0989	-30 2108	41 4602	-28 0913	-20.2440	-0.5630	0.0233	0.3331	0.6277	0.3331	¥ 7
	36	38 2808	-27.6452	-31 /316	38 8747	-27 6172	-20.0004	-0.5030	0.0070	0.2774	0.6351	0.2770	V 7
	21	54 5202	20 5774	21 0222	54,9600	20.6505	21 2290	0.0000	0.0200	0.2232	0.0001	0.2243	1, Z
~ <u>~</u>	32	52 17/2	-30.3774	-21.0223	52 5549	-30.0095	-21.3209	-0.3400	-0.0645	0.4934	0.0003	-0.0645	I V
5 P	33	18 2265	-20 3032	-26 3/20	18 6562	-20 10/1	-25.2002	-0.3003	-0.0040	0.4345	0.5902	-0.0043	I V
eral	3/	13 0863	-28 6645	-28 5007	14 5242	-28 6884	-28.2446	-0.5380	-0.0311	0.3551	0.6451	-0.0311	
A-F ate	35	40.8072	-28 0040	-30 2109	41 4602	-28 0012	-20.2440	-0.5630	0.0233	0.3331	0.6277	0.0239	V
	36	38 2808	-27 6452	-31 4316	38 8747	-27 6172	-31 2084	-0.5030	0.0070	0.2232	0.6351	0.0070	Y Y
К с с	27	16 2502	20.5020	22 1024	16 7004	20.5204	22.2064	0.4200	0.0200	0.1022	0.4442	0.0520	v
Ψ μ Ω .	38	14 0856	-20.0000	-32.1031	14 4324	-20.0004	-32.2004	-0.3469	0.0032	-0.1033	0.4443	0.0032	T V
Ľ, ×, ⊢		14.0000	-30.0103	-21.0404	19,4324	-30.000/	-21.9104	-0.3400	0.0030	-0.1330	0.3/14	0.0030	
ЧЧа	39	14 5262	-31.0002	-23.3404	14 0202	-31.0070	-23.30/8	-0.3439	-0.0308	-0.0414	0.3521	0.0000	
~ ~	40	14.0202	-32.2132	-22.1091	14.9302	-32.3079	-22.3295	-0.4040	-0.0327	-0.1704	0.4397	0.0000	N/A
AF.	3/	16.3593	-28.5836	-32.1831	16.7881	-28.5304	-32.2864	-0.4288	0.0532	-0.1033	0.4443	0.0532	Y V
al ILL	38	14.0856	-30.6103	-21.8454	14.4324	-30.6067	-21.9/84	-0.3468	0.0036	-0.1330	0.3/14	0.0036	↓ Y
3-P ate	39	18.3262	-31.8062	-23.5464	18.6/21	-31.8570	-23.5878	-0.3459	-0.0508	-0.0414	0.3521	-0.0508	Y
ш _	40	14.5262	-32.2752	-22.1591	14.9302	-32.3079	-22.3295	-0.4040	-0.0327	-0.1704	0.4397	-0.0327	I Y

A Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.

Figure D-16. Occupant Compartment Deformation - Set 1, Left, Test No. MOS-6

VIN: KNADE223296512940

Year:	20	009	-		Make:	ĸ	la			Model:		Rio	
					VE	HICLE DE	FORMATI	ON					
				PAS	SENGER	SIDE INT	ERIOR C	RUSH - S	ET 1				
1		Pretest	Pretest	Pretest	-	Posttest		A		A		a i B	Directio
		Х	Y	Z	Posttest X	Y	Posttest Z	∆X <sup>n</sup>	ΔY <sup>Δ</sup>	ΔZ <sup>r</sup>	lotal ∆	Crush	for
	POINT	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(In.)	(in.)	(in.)	(in.)	Crush
	1	50.8602	15.6851	-19.1651	51.2089	15.8288	-18.3964	-0.3487	-0.1437	0.7687	0.8562	0.8562	Χ, Υ,
<sub>T</sub> Ñ	2	50.1755	3.5757	-19.7011	50.5051	3.6823	-19.1006	-0.3296	-0.1066	0.6005	0.6933	0.6933	X, Y,
ASł Y,	3	50.0242	-4.4182	-19.5098	50.2652	-4.2575	-18.9741	-0.2410	0.1607	0.5357	0.6090	0.6090	X, Y,
Ъ,	4	47.1318	18.9671	-9.8523	47.2936	19.0517	-9.1058	-0.1618	-0.0846	0.7465	0.7685	0.7685	
	5	47.4144	3.1703	-8.5000	47.6715	3.2522	-7.9688	-0.2571	-0.0819	0.5312	0.5958	0.5958	
-	6	44.4479	-5.2044	-10.2469	44.6649	-5.0623	-9.8403	-0.2170	0.1421	0.4066	0.4823	0.4823	<u>, , , , , , , , , , , , , , , , , , , </u>
J H C		53.5037	21.3375	0.8845	53.5539	21.2931	1.8579	-0.0502	0.0444	0.9734	0.9757	0.0444	Y
SII SAN	8	53.2564	22.1499	4.6052	53.1832	22.0601	5.4962	0.0732	0.0898	0.8910	0.8985	0.0898	Y
ш	9	50.0030	21.7464	4.7541	50.0303	21.6709	5.6992	0.0455	0.0775	0.9451	0.9494	0.0775	ľ
DE	10	45.1896	22.6742	-15.6691	45.4215	22.8142	-14.8446	-0.2319	-0.1400	0.8245	0.8679	-0.1400	Y Y
N R	11	34.8578	22.3901	-16.1131	35.1271	22.5399	-15.4671	-0.2693	-0.1498	0.6460	0.7157	-0.1498	Y Y
385	12	43.0680	22.1754	-10.0203	/3 1353	22.3300	-10.3343	-0.2462	-0.1552	0.4920	0.9725	-0.1552	
DD	1/	35 2511	22.0203	0 /817	35 2217	22.0109	1 1230	0.0073	0.0030	0.6422	0.6137	0.0030	
Σ	15	28 5484	22.0773	-0 1182	28 5301	22.0404	0.4228	0.0204	0.0013	0.0422	0.0430	0.0313	
	16	28 6801	10.4500	-37 008/	20.0001	10.8610	-36 6650	-0 5731	-0./110	0.04325	0.0400	0.04325	7
	17	20.0001	7 4404	-37 2801	29.2552	7 76/1	-36 8785	-0.5731	-0.4113	0.4323	0.8030	0.4325	7
	18	30 1288	3 2673	-37 4285	30 5843	3 6494	-37 0734	-0.4555	-0.3821	0.3551	0.6925	0.3551	7
	19	30 1668	-1 2689	-37 6433	30 8201	-0.9393	-37 2944	-0 6533	0.3296	0.3489	0.8107	0.3489	7
	20	30,4008	-5.5789	-37.6974	31.0034	-5.2139	-37.3954	-0.6026	0.3650	0.3020	0.7665	0.3020	Z
	21	25.7356	10.7449	-37.5737	26.3691	11.1137	-37.1779	-0.6335	-0.3688	0.3958	0.8331	0.3958	Z
N N	22	26.3426	7.0863	-37.8279	26.8310	7.4836	-37.4807	-0.4884	-0.3973	0.3472	0.7190	0.3472	Z
н	23	26.8175	2.7825	-38.0591	27.3751	3.2128	-37.7346	-0.5576	-0.4303	0.3245	0.7755	0.3245	Z
õ	24	27.5371	-2.0285	-38.1573	28.1132	-1.6115	-37.8678	-0.5761	0.4170	0.2895	0.7678	0.2895	Z
Ľ.	25	27.7923	-5.7813	-38.1886	28.2980	-5.3985	-37.9455	-0.5057	0.3828	0.2431	0.6792	0.2431	Z
	26	23.1977	10.6424	-37.9103	23.7219	10.9862	-37.5769	-0.5242	-0.3438	0.3334	0.7100	0.3334	Z
	27	23.5971	6.7823	-38.2129	24.0693	7.1733	-37.9117	-0.4722	-0.3910	0.3012	0.6831	0.3012	Z
	28	23.9723	2.5880	-38.4521	24.5680	2.9555	-38.1728	-0.5957	-0.3675	0.2793	0.7536	0.2793	Z
	29	24.4327	-2.6764	-38.6061	24.9250	-2.2778	-38.3843	-0.4923	0.3986	0.2218	0.6711	0.2218	Z
	30	24.6074	-6.0140	-38.6417	25.1797	-5.7152	-38.4382	-0.5723	0.2988	0.2035	0.6769	0.2035	<u>Z</u>
	31	53.6298	20.3037	-21.5199	54.0353	20.4876	-20.5863	-0.4055	-0.1839	0.9336	1.0343	0.9336	Z
ar Z	32	51.6781	19.8843	-22.8938	52.0996	20.0863	-22.0066	-0.4215	-0.2020	0.8872	1.0028	0.8872	Z
,≺ ä F	33	49.0743	19.3128	-24.6000	49.5459	19.5383	-23.7495	-0.4716	-0.2255	0.8505	0.9983	0.8505	
Aax (X, P	34	46.5485	18.6675	-26.3734	47.0332	18.9115	-25.5666	-0.4847	-0.2440	0.8068	0.9723	0.8068	
~~	35	44.2998	18.1192	-27.6872	44.7871	18.3578	-26.9829	-0.4873	-0.2386	0.7043	0.8891	0.7043	<u> </u>
	30	41.0070	17.4975	-29.1626	42.1059	17.7430	-26.5019	-0.4463	-0.2463	0.0009	0.0357	0.6609	
~ ~	31	53.6298	20.3037	-21.5199	54.0353	20.4876	-20.5863	-0.4055	-0.1839	0.9336	1.0343	-0.1839	Y
Ϋ́́	32	51.0781	19.8843	-22.8938	52.0996	20.0863	-22.0066	-0.4215	-0.2020	0.8872	1.0028	-0.2020	Y Y
PILI	34	49.0743	19.3120	-26.3734	49.0409	19.0000	-25.7495	-0.4710	-0.2235	0.0000	0.9903	-0.2255	
A-F -ate	35	40.0400	18 1102	-27 6872	47.0332	18 3578	-26.0820	-0.4047	-0.2440	0.0000	0.9723	-0.2440	
_	36	41 6576	17 4975	-29 1628	42 1059	17 7438	-28.5019	-0 4483	-0.2463	0.6609	0.8357	-0.2300	
Ύ́с	37	12 6001	16.0916	-30 5211	13 0509	17 2719	-30 2704	-0 4/17	-0.2002	0.2507	0.58/0	0.2-100	7
nun , z	38	16.3084	18 5546	-26 7202	16 6902	18 8143	-26 4167	-0.3818	-0.2502	0.3035	0.5526	0.2007	7
PIL Xin L	39	13.2448	19,5158	-22,9631	13,6610	19,7510	-22,6685	-0.4162	-0.2352	0.2946	0.5615	0.2946	7
- ¥ ×	40	17.6087	20.1318	-20.2235	17.8736	20.3201	-19.9244	-0.2649	-0.1883	0.2991	0.4417	0.2991	
К.	37	12 6091	16,9816	-30 5211	13 0508	17 2718	-30 2704	-0 4417	-0.2902	0 2507	0.5849	-0.2902	
AL LA	38	16.3084	18.5546	-26.7202	16.6902	18.8143	-26.4167	-0.3818	-0.2597	0.3035	0.5526	-0.2597	Υ Y
에 era	39	13.2448	19.5158	-22 9631	13 6610	10 7510	-22 6685	-0 4162	-0 2352	0 2946	0.5615	-0 2352	
ш								-V. TIV/					

Test Name:

MOS-6

Date: 6/12/2019

A Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.

Figure D-17. Occupant Compartment Deformation - Set 1, Right, Test No. MOS-6

-0.2455

Date:	6/12/	/2019	_		Test Name:	МС	)S-6	_		VIN:	KNAI	DE2232965	12940
Year:	20	009	-		Make:	K	lia	-		Model:		Rio	
					VEI	HICLE DE	FORMAT	ION					
				0	DRIVER SI	DE INTER	RIOR CRU	SH - SET	2				
		Pretest	Pretest	Pretest	Posttest X	Posttest	Posttest 7	۸X <sup>A</sup>	۸V <sup>A</sup>	۸.7 <sup>A</sup>	Total A	Cruch <sup>B</sup>	Directions
		X (in.)	Y (in.)	Z (in.)	(in.)	Y (in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	for Cruch <sup>C</sup>
	1	51 /170	-0.0622	-20.0276	51 3075	-0.3724	-20 3440	0.0105	-0.3102	-0.3173	0.4442	0.4442	
	2	49.0655	-0.1063	-20.0270	48 9572	-9.3724	-20.3449	0.0195	-0.3102	-0.3173	0.4442	0.4442	X Y 7
H <sup>N</sup>	3	49 1321	12 0477	-20 1914	49 0936	11 7927	-20 5655	0.0385	0.2550	-0.3741	0.4544	0.4544	XYZ
ς, γ	4	48.6859	-10.4418	-8.7909	48.6630	-10.7634	-9.0805	0.0229	-0.3216	-0.2896	0.4334	0.4334	X.Y.Z
- 0	5	49.2067	1.0027	-7.2782	49.3194	0.6684	-7.5679	-0.1127	0.3343	-0.2897	0.4565	0.4565	X, Y, Z
	6	43.7195	11.4652	-10.8817	43.7600	11.1874	-11.1775	-0.0405	0.2778	-0.2958	0.4078	0.4078	X, Y, Z
	7	54.2359	-15.2228	0.2243	54.2669	-15.4888	-0.0916	-0.0310	-0.2660	-0.3159	0.4141	-0.2660	Y
ΞΫε	8	53.5922	-15.9811	4.3276	53.5797	-16.2308	3.9678	0.0125	-0.2497	-0.3598	0.4381	-0.2497	Y
2 d -	9	57.4161	-15.8742	4.2934	57.2930	-16.1475	3.9471	0.1231	-0.2733	-0.3463	0.4580	-0.2733	Y
ш	10	46.2574	-16.9247	-15.5800	46.2240	-17.1921	-15.8241	0.0334	-0.2674	-0.2441	0.3636	-0.2674	Y
	11	35.2321	-17.1394	-16.2035	35.0953	-17.4221	-16.3906	0.1368	-0.2827	-0.1871	0.3656	-0.2827	Y
- NC	12	24.0787	-17.4713	-17.2505	23.8898	-17.7327	-17.4074	0.1889	-0.2614	-0.1569	0.3587	-0.2614	Y
Ϋ́Ó́ Ϋ́Ó́	13	44.4508	-17.0000	-3.0082	44.4412	-17.2739	-3.2773	0.0096	-0.2739	-0.2691	0.3841	-0.2739	Y
<b>₽</b> –	14	38.3101	-17.6246	-1.2738	38.3732	-17.8675	-1.5805	-0.0631	-0.2429	-0.3067	0.3963	-0.2429	Y
=	15	30.1461	-17.4973	-0.2368	30.1621	-17.7672	-0.4416	-0.0160	-0.2699	-0.2048	0.3392	-0.2699	Y
	16	28.2608	-5.5357	-37.5461	28.0522	-5.8470	-37.7257	0.2086	-0.3113	-0.1796	0.4155	-0.1796	Z
	17	28.7905	-1.4144	-37.7852	28.5388	-1.7556	-37.9785	0.2517	-0.3412	-0.1933	0.4660	-0.1933	Z
	18	29.3401	2.4032	-37.9003	29.1181	2.0520	-38.0953	0.2220	0.3512	-0.1950	0.4590	-0.1950	Z
	19	28.9093	6.0169	-38.1110	28.6715	5.6719	-38.3132	0.2378	0.3450	-0.2022	0.4653	-0.2022	Z
	20	29.3299	10.8486	-38.0886	29.1232	10.5580	-38.2933	0.2067	0.2906	-0.2047	0.4112	-0.2047	Z
Ñ	21	25.4474	-5.6427	-37.9874	25.2121	-5.9522	-38.1526	0.2353	-0.3095	-0.1652	0.4224	-0.1652	Z
	22	25.8174	-1.5719	-38.2646	25.5251	-1.7626	-38.4488	0.2923	-0.1907	-0.1842	0.3946	-0.1842	Z
Ь	23	26.3382	2.9875	-38.4415	26.1285	2.7017	-38.6150	0.2097	0.2858	-0.1735	0.3947	-0.1735	Z
õ	24	26.9001	7.3053	-38.4882	26.6422	7.0241	-38.6754	0.2579	0.2812	-0.1872	0.4250	-0.1872	Z
-	25	26.6402	10.7188	-38.5575	26.4824	10.3790	-38.7315	0.1578	0.3398	-0.1740	0.4131	-0.1740	Z
	26	22.5500	-5.3168	-38.3589	22.3035	-5.6090	-38.5032	0.2465	-0.2922	-0.1443	0.4086	-0.1443	Z
	27	22.6588	-1.6150	-38.6341	22.4842	-1.9182	-38.7731	0.1746	-0.3032	-0.1390	0.3765	-0.1390	Z
	28	22.8086	2.6827	-38.8584	22.5579	2.3715	-39.0068	0.2507	0.3112	-0.1484	0.4263	-0.1484	Z
	29	23.4268	6.8512	-38.9290	23.2209	6.5518	-39.0829	0.2059	0.2994	-0.1539	0.3946	-0.1539	Z
	30	23.4194	10.3260	-38.9682	23.2768	10.1099	-39.1219	0.1426	0.2161	-0.1537	0.3011	-0.1537	
	31	53.5631	-14.0823	-22.3381	53.5618	-14.3529	-22.6221	0.0013	-0.2706	-0.2840	0.3923	0.0013	<u> </u>
AR Mu (S	32	51.1843	-13.6376	-24.2216	51.0522	-13.9133	-24.4525	0.1321	-0.2757	-0.2309	0.3831	0.1321	X
,≺ ëi E	33	47.2029	-12.9188	-26.7823	47.0997	-13.1914	-27.0337	0.1032	-0.2726	-0.2514	0.3849	0.1032	X
A-P √a	34	42.9341	-12.1960	-28.9855	42.8265	-12.45//	-29.2468	0.1076	-0.2617	-0.2613	0.3852	0.1076	X
~~	35	39.8246	-11.6349	-30.5586	39.7181	-11.8943	-30.8084	0.1065	-0.2594	-0.2498	0.3755	0.1065	
	30	57.1929	-11.1037	-31.7470	37.2099	-11.4334	-32.0051	-0.0170	-0.2497	-0.2561	0.3595	0.0000	INA
~ ~	31	53.5631	-14.0823	-22.3381	53.5618	-14.3529	-22.6221	0.0013	-0.2706	-0.2840	0.3923	-0.2706	Y
Ψ,Υ	32	51.1843	-13.03/0	-24.2216	17.0022	-13.9133	-24.4525	0.1321	-0.2757	-0.2309	0.3831	-0.2757	Y
eral Pral	33	47.2029	-12.9100	-20.7023	47.0997	10 4577	-27.0337	0.1032	-0.2720	-0.2514	0.3049	-0.2720	r V
A-F -ate		42.9341	-12.1900	-20.9000	42.6203	-12.45/7	-29.2400	0.1076	-0.2017	-0.2013	0.3052	-0.2017	r V
· _	36	39.0240	-11 1937	-31 7/70	37 2000	-11 /33/	-30.0004	-0.0170	-0.2394	-0.2490	0.3755	-0.2394	V I
×	30	45.0600	10.0500	-31.7470	15.0000	40.0050	-32.0031	0.0170	0.2437	0.2001	0.0000	0.2437	
-AF	<u>3/</u>	12.0400	-12.0596	-32.1865	12.0222	14 2024	-32.291/	0.2381	-0.2356	-0.1052	0.3511	0.4765	X
μ, χ, μ	<u> </u>	17 2274	-14.0409	22 5407	17 2470	15 4505	-21.0138	0.1700	-0.2422	0.0765	0.3000	0.0000	
A B A	39 <u>70</u>	13 5552	-15.2122	-23.3497	13 /620	-15 0025	-23.0202	0.0092	-0.2443	-0.0762	0.2735	0.0092	
~ ~	40	10.0000	40.0500	22.1000	15.4020	10.0020	-22.1020	0.0000	-0.2400	0.1050	0.2133	0.0300	
Ϋ́F	31	12.0400	-12.0596	-32.1865	12 9644	14 2024	-32.2917	0.2381	-0.2356	0.1052	0.3511	-0.2356	Y V
91LL eral	30	17 2274	-15 2122	-23 5407	17 2470	-14.2031	-21.0138	0.1700	-0.2422	-0.0765	0.3000	-0.2422	
-ate	39	13 5552	-15 6570	-23.3497	13 4620	-15.0025	-23.0202	0.0092	-0.2443	-0.0762	0.2725	-0.2443	
	40	10.0001	- 10.00/U	-22, IUDA	1 13.4020	IO. SUZD	-22. IO/U	0.0900	-U.2400	-U.U/D/	U.2(00	) -U.2400	· T

<sup>A</sup> Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

 13.5553
 -15.6570
 -22.1058
 13.4620
 -15.9025
 -22.1820
 0.0933
 -0.2455
 -0.0762
 0.2735

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.

Figure D-18. Occupant Compartment Deformation - Set 2, Left, Test No. MOS-6

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KNADE223296512940

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VIN:

Model

i cai.	20	109	-		Mare.	P	la			wouer.		TND	
				DAG					ET 2				
		Pretest	Pretest	Pretest		Posttest							Direction
		X	Y	Z	Posttest X (in.)	Y	Posttest Z (in.)	ΔX <sup>*</sup> (in.)	ΔY <sup>A</sup> (in.)	$\Delta Z^{\wedge}$ (in.)	Total ∆ (in.)	Crush <sup>b</sup> (in.)	for
	POINT	(in.)	(in.)	(in.)	( )	(in.)	( )	()	()	()	( )	()	Crush
	1	50.0847	31.9643	-20.0406	50.1359	32.1494	-20.1980	-0.0512	-0.1851	-0.1574	0.2483	0.2483	X, Y, Z
цŶ	2	49.3333	11 9617	-20.4599	49.3909	12.0560	-20.0017	-0.0450	-0.1301	-0.1410	0.2031	0.2031	
AS, Y	3	49.1709	25.2407	10 7064	49.1532	25 5021	-20.2031	0.0257	-0.1952	0.1752	0.2102	0.2102	
	4 5	40.4907	10 5555	-0.2184	40.4701	10 823/	-10.0017	-0 1212	-0.2324	-0.1755	0.3079	0.3079	
	5	40.7403	11 1758	-10 8/08	43.8020	11 /733	-10.9866	-0.1212	-0.2075	-0.1710	0.3400	0.3400	X Y 2
_	7	F2 0240	27 70/1	0.0904	52 0262	20.0750	0.1466	0.0114	0.2010	0.0662	0.0004	0.0004	
ЦЩ П	/ Q	52 8320	38 6300	3 6360	52 7654	38 0273	3 / 917	-0.0114	-0.2910	-0.0002	0.2994	-0.2910	
S IAC	0	58 2597	38 2116	3 7132	58 2235	38 5331	3.4017	0.0000	-0.2973	-0.1043	0.3413	-0.2973	V V
-	10	44 4950	20,0020	46 5000	44 4550	20.0055	10.0500	0.0002	0.0210	0.1070	0.00-0	0.0210	- V
DE	10	24.4009	39.0030	16 9264	24 1 474	39.2233	16 0900	0.0306	-0.2225	0.1249	0.2570	-0.2225	
S R	10	22 2507	20 5602	17 2742	22 2270	20 7474	17 5217	0.0007	-0.2037	-0.1033	0.2020	-0.2037	
385	12	42.3007	20.0702	2 5 4 0 5	12 5492	20 2494	-17.5317	0.0317	-0.1791	-0.1575	0.2400	-0.1791	
A Q	13	42.0000	20 1016	-2.0490	42.0402	20 4420	-2.0329	0.0101	-0.2092	-0.1034	0.2000	-0.2092	
Σ	14	29.0621	20.0525	-0.2410	34.0923	20 2012	-0.4143	0.0604	-0.2023	0.1723	0.3241	0.2023	
	10	20.0021	39.0000	-0.7474	27.9932	39.2012	-0.9301	0.0009	-0.2277	-0.1627	0.3000	-0.2277	
	10	27.6406	20.0402	-37.0175	27.0805	26.8015	-37.7457	-0.0459	-0.1553	-0.1282	0.2065	-0.1282	<u> </u>
	17	28.1965	23.6331	-37.7894	28.2815	23.6985	-37.9029	-0.0850	-0.0654	-0.1135	0.1562	-0.1135	
	10	29.0013	19.4559	-37.9041	26.9976	19.5791	-36.0222	0.0037	-0.1232	-0.1101	0.1022	-0.1101	<u></u>
	19	29.0816	14.9180	-38.0793	29.2218	14.9861	-38.1432	-0.1402	-0.0681	-0.0639	0.1685	-0.0639	
	20	29.3000	10.0000	-30.0905	29.3974	10.7100	-30.1503	-0.0966	-0.1032	-0.0516	0.1000	-0.0516	
(Z)	21	24.0900	20.9407	-30.0545	24.7699	27.0400	-30.1000	-0.0991	-0.0999	-0.1305	0.1919	-0.1305	<u></u>
		25.2823	23.2840	-38.2847	25.2390	23.4097	-38.4161	0.0433	-0.1257	-0.1314	0.1869	-0.1314	
Ō	23	25.7400	10.9/0/	-30.4044	25.7711	14.0057	-30.0000	-0.0311	-0.1303	-0.1014	0.1091	-0.1014	
RC	24	20.4420	14.1027	-30.5500	20.4990	14.3057	-30.0273	-0.0570	-0.1430	-0.0773	0.1723	-0.0773	
	25	20.0002	10.4009	-30.5510	20.0770	26 0147	-30.0224	0.0074	-0.1067	-0.0706	0.1299	-0.0706	
	20	22.1401	20.0490	-30.3349	22.1327	20.9147	-38.3090	0.0154	-0.0049	-0.1341	0.1079	-0.1341	
	21	22.5307	10 7004	-30.0209	22.4003	10 0700	-30.7049	0.0629	-0.1007	-0.1300	0.1000	-0.1300	
	20	22.0090	10.7004	-30.0301	22.9520	12 6224	-30.9417	-0.0036	-0.0623	0.0017	0.1404	-0.1050	
	29	23.3301	10.1020	20 0504	23.2911	10 1052	-39.0410	0.0524	-0.1121	-0.0917	0.1404	-0.0917	- <u>-</u>
	30	50,0000	10.1030	-30.3304	23.3403	26 7512	-39.0229	-0.0334	-0.0123	-0.0043	0.0040	-0.0043	
~ ~ ~ ~	31	52.0302	30.3520	-22.4743	52.9072	30.7513	-22.5710	-0.0710	-0.1967	-0.0967	0.2321	0.0000	
AF Z	32	10.0043	36.1278	-23.8173	50.9333	36.3208	-23.9285	-0.0690	-0.1930	-0.1112	0.2332	0.0000	
, ≺ in	24	40.2332	24 9076	-23.4021	40.3320	25.7373	-20.0000	-0.0974	-0.1073	-0.1004	0.2304	0.0000	
A-F Ma	35	43.0020	34.0970	-28 /021	43.7700	34 4010	-28.6634	-0.0000	-0.1750	-0.1071	0.2237	0.0000	
• –	36	40.7400	33 7105	-20.4321	40.7641	33 8/70	-20.0034	-0.0713	-0.1430	-0.1713	0.2300	0.0000	
	30	40.7433 50.0000	30.7130	-29.9233	50.0070	26 7512	-30.0340	-0.0142	-0.1273	-0.1033	0.2124	0.0000	
~ ~	20	52.0302	30.3320	-22.4743	52.9072	30.7513	-22.5710	-0.0710	-0.1967	-0.0967	0.2321	-0.1967	Y Y
₹, Ç	<u>32</u>	30.0043	30.1270	-23.0173	10.9333	30.3200	-23.9203	-0.0690	-0.1930	0.1064	0.2332	-0.1930	T V
PILL eral	33	40.2302	35.5500	-20.4021	40.3320	35.7373	-20.0000	-0.0974	-0.1073	-0.1004	0.2304	-0.1073	
A-F -ate	25	43.0020	34.0970	-27.2140	43.7700	24 4010	-27.3217	-0.0000	-0.1750	-0.1071	0.2237	-0.1750	
` _	30	43.4144	22 7105	20.4921	43.4003	22 9470	-20.0034	-0.0719	-0.1430	-0.1713	0.2300	-0.1430	
~ ~	30	40.7499	33.7193	-29.9253	40.7041	33.0470	-30.0940	-0.0142	-0.12/5	-0.1093	0.2124	-0.12/3	
AF UT	37	11.6838	33.2894	-30.8759	11.6/12	33.3866	-31.0634	0.0126	-0.0972	-0.18/5	0.2116	0.0126	
,≺ ši Ľ	38	15.4407	34.8833	-27.1408	15.4158	35.0111	-27.3464	0.0249	-0.1278	-0.2056	0.2434	0.0249	
Аау (X, Чау	39	12.4327	35.8879	-23.3502	12.4905	36.0396	-23.5402	-0.0578	-0.1517	-0.1900	0.2499	0.0000	
ш <i>с</i>	40	16.8362	36.5133	-20.6769	16.7767	36.6643	-20.9252	0.0595	-0.1510	-0.2483	0.2966	0.0595	<u> </u>
(X) AR	37	11.6838	33.2894	-30.8759	11.6712	33.3866	-31.0634	0.0126	-0.0972	-0.1875	0.2116	-0.0972	Y
alL	38	15.4407	34.8833	-27.1408	15.4158	35.0111	-27.3464	0.0249	-0.1278	-0.2056	0.2434	-0.1278	<u> </u>
3-P	39	12.4327	35.8879	-23.3502	12.4905	36.0396	-23.5402	-0.0578	-0.1517	-0.1900	0.2499	-0.1517	<u> </u>
шï	40	16.8362	36.5133	-20.6769	16.7767	36.6643	-20.9252	0.0595	-0.1510	-0.2483	0.2966	-0.1510	Y

Test Name:

Mako

MOS-6

Kia

6/12/2019

2000

Date:

<sup>A</sup> Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.

Figure D-19. Occupant Compartment Deformation - Set 2, Right, Test No. MOS-6



Figure D-20. Exterior Vehicle Crush (NASS) - Front, Test No. MOS-6

Reference Set 1Maximum Deformation <sup>A,B</sup> MASH AllowableLocation(in.)Deformation (in.)Roof0.3 $\leq 4$ Windshield <sup>D</sup> 0.0 $\leq 3$ A-Pillar Maximum0.5 $\leq 5$ A-Pillar Lateral0.0 $\leq 3$ B-Pillar Maximum0.1 $\leq 5$ B-Pillar Lateral0.1 $\leq 3$ Toe Pan - Wheel Well0.2 $\leq 9$ Side Door (above seat)-0.1 $\leq 9$ Side Door (below seat)-0.3 $\leq 12$ Floor Pan0.2 $\leq 12$ Dash - no MASH requirement0.7NAA Items highlighted in red do not meet MASH allowable deformations <sup>B</sup> Positive values denote deformation as inward toward the occupant c For Toe Pan - Wheel Well the direction of deformation may include 2	Driver Side Maxi	mum Deformations	Reference Se	• 2	
Reference Set 1Maximum DeformationMASH Allowable Deformation (in.)Roof0.3 $\leq 4$ Windshield <sup>D</sup> 0.0 $\leq 3$ A-Pillar Maximum0.5 $\leq 5$ A-Pillar Maximum0.1 $\leq 5$ B-Pillar Lateral0.0 $\leq 3$ B-Pillar Lateral0.1 $\leq 5$ B-Pillar Lateral0.1 $\leq 5$ B-Pillar Deformation $\leq 12$ Side Front Panel-0.3 $\leq 12$ Side Door (above seat)-0.1 $\leq 9$ Side Door (below seat)-0.3 $\leq 12$ Floor Pan0.2 $\leq 12$ Dash - no MASH requirement0.7NAA Items highlighted in red do not meet MASH allowable deformations <sup>B</sup> Positive values denote deformation as inward toward the occupant <sup>C</sup> For Toe Pan - Wheel Well the direction of deformation may include 2 and Z directions. The direction of deformation for Toe Pan - Wheel W			Reference Se	4 <b>0</b>	
Maximum Deformation (in.)MASH Allowable Deformation (in.)Roof0.3 $\leq 4$ Windshield <sup>D</sup> 0.0 $\leq 3$ A-Pillar Maximum0.5 $\leq 5$ A-Pillar Maximum0.1 $\leq 5$ B-Pillar Lateral0.0 $\leq 3$ B-Pillar Lateral0.1 $\leq 5$ B-Pillar Lateral0.2 $\leq 9$ Side Front Panel-0.3 $\leq 12$ Side Door (above seat)-0.1 $\leq 9$ Side Door (below seat)-0.3 $\leq 12$ Floor Pan0.2 $\leq 12$ Dash - no MASH requirement0.7NAA Items highlighted in red do not meet MASH allowable deformations B Positive values denote deformation as inward toward the occupant C For Toe Pan - Wheel Well the direction of deformation may include 2				12	
Roof $0.3$ $\leq 4$ Windshield <sup>D</sup> $0.0$ $\leq 3$ A-Pillar Maximum $0.5$ $\leq 5$ A-Pillar Lateral $0.0$ $\leq 3$ B-Pillar Maximum $0.1$ $\leq 5$ B-Pillar Lateral $0.1$ $\leq 5$ B-Pillar Lateral $0.1$ $\leq 5$ B-Pillar Lateral $0.1$ $\leq 3$ Toe Pan - Wheel Well $0.2$ $\leq 9$ Side Front Panel $-0.3$ $\leq 12$ Side Door (above seat) $-0.1$ $\leq 9$ Side Door (below seat) $-0.3$ $\leq 12$ Floor Pan $0.2$ $\leq 12$ Dash - no MASH requirement $0.7$ NAA Items highlighted in red do not meet MASH allowable deformationsB Positive values denote deformation as inward toward the occupant $^{C}$ For Toe Pan - Wheel Well the direction of deformation may include 2and Z directions. The direction of deformation for Toe Pan - Wheel W	Directions of Deformation <sup>C</sup>	Location	Maximum Deformation <sup>A,B</sup> (in.)	MASH Allowable Deformation (in.)	Directions of Deformation <sup>C</sup>
Windshield <sup>D</sup> $0.0 \le 3$ A-Pillar Maximum $0.5 \le 5$ A-Pillar Maximum $0.5 \le 5$ A-Pillar Lateral $0.0 \le 3$ B-Pillar Maximum $0.1 \le 5$ B-Pillar Lateral $0.1 \le 5$ B-Pillar Lateral $0.1 \le 3$ Toe Pan - Wheel Well $0.2 \le 9$ Side Front Panel $-0.3 \le 12$ Side Door (above seat) $-0.1 \le 9$ Side Door (below seat) $-0.3 \le 12$ Floor Pan $0.2 \le 12$ Dash - no MASH requirement $0.7$ NAA Items highlighted in red do not meet MASH allowable deformationsB Positive values denote deformation as inward toward the occupantC For Toe Pan - Wheel Well the direction of deformation may include 2 and 2 directions. The direction of deformation for Toe Pan - Wheel W	Z	Roof	-0.1	≤ 4	Z
A-Pillar Maximum $0.5$ $\leq 5$ A-Pillar Lateral $0.0$ $\leq 3$ B-Pillar Maximum $0.1$ $\leq 5$ B-Pillar Lateral $0.1$ $\leq 3$ Toe Pan - Wheel Well $0.2$ $\leq 9$ Side Front Panel $-0.3$ $\leq 12$ Side Door (above seat) $-0.1$ $\leq 9$ Side Door (below seat) $-0.3$ $\leq 12$ Floor Pan $0.2$ $\leq 12$ Dash - no MASH requirement $0.7$ NAA Items highlighted in red do not meet MASH allowable deformationsB Positive values denote deformation as inward toward the occupant $^{C}$ For Toe Pan - Wheel Well the direction of deformation may include 2and Z directions. The direction of deformation for Toe Pan - Wheel W	X, Z	Windshield <sup>D</sup>	NA	≤ 3	X, Z
A-Pillar Lateral0.0≤ 3B-Pillar Maximum0.1≤ 5B-Pillar Lateral0.1≤ 3Toe Pan - Wheel Well0.2≤ 9Side Front Panel-0.3≤ 12Side Door (above seat)-0.1≤ 9Side Door (below seat)-0.3≤ 12Floor Pan0.2≤ 12Dash - no MASH requirement0.7NAAltems highlighted in red do not meet MASH allowable deformationsBPositive values denote deformation as inward toward the occupantCC For Toe Pan - Wheel Well the direction of deformation may include 2and Z directions. The direction of deformation for Toe Pan - Wheel W	Z	A-Pillar Maximum	0.1	≤ 5	X
B-Pillar Maximum0.1≤ 5B-Pillar Lateral0.1≤ 3Toe Pan - Wheel Well0.2≤ 9Side Front Panel-0.3≤ 12Side Door (above seat)-0.1≤ 9Side Door (below seat)-0.3≤ 12Floor Pan0.2≤ 12Dash - no MASH requirement0.7NAAlterns highlighted in red do not meet MASH allowable deformationsBPositive values denote deformation as inward toward the occupantCC For Toe Pan - Wheel Well the direction of deformation may include 2and Z directions. The direction of deformation for Toe Pan - Wheel W	Y	A-Pillar Lateral	-0.2	≤ 3	Y
B-Pillar Lateral $0.1$ $\leq 3$ Toe Pan - Wheel Well $0.2$ $\leq 9$ Side Front Panel $-0.3$ $\leq 12$ Side Door (above seat) $-0.1$ $\leq 9$ Side Door (below seat) $-0.3$ $\leq 12$ Floor Pan $0.2$ $\leq 12$ Dash - no MASH requirement $0.7$ NAA Items highlighted in red do not meet MASH allowable deformationsB Positive values denote deformation as inward toward the occupantC For Toe Pan - Wheel Well the direction of deformation may include 2 and 2 directions. The direction of deformation for Toe Pan - Wheel W	Y	B-Pillar Maximum	0.2	≤ 5	Х
Toe Pan - Wheel Well $0.2 \leq 9$ Side Front Panel $-0.3 \leq 12$ Side Door (above seat) $-0.1 \leq 9$ Side Door (below seat) $-0.3 \leq 12$ Floor Pan $0.2 \leq 12$ Dash - no MASH requirement $0.7$ A Items highlighted in red do not meet MASH allowable deformationsB Positive values denote deformation as inward toward the occupantC For Toe Pan - Wheel Well the direction of deformation may include 2and Z directions. The direction of deformation for Toe Pan - Wheel W	Y	B-Pillar Lateral	-0.2	≤ 3	Y
Side Front Panel       -0.3 $\leq$ 12         Side Door (above seat)       -0.1 $\leq$ 9         Side Door (below seat)       -0.3 $\leq$ 12         Floor Pan       0.2 $\leq$ 12         Dash - no MASH requirement       0.7       NA <sup>A</sup> Items highlighted in red do not meet MASH allowable deformations <sup>B</sup> Positive values denote deformation as inward toward the occupant <sup>C</sup> For Toe Pan - Wheel Well the direction of deformation may include 2 and Z directions. The direction of deformation for Toe Pan -Wheel W	X, Z	Toe Pan - Wheel Well	0.6	≤ 9	X, Z
Side Door (above seat)       -0.1 $\leq 9$ Side Door (below seat)       -0.3 $\leq 12$ Floor Pan       0.2 $\leq 12$ Dash - no MASH requirement       0.7       NA <sup>A</sup> Items highlighted in red do not meet MASH allowable deformations <sup>B</sup> Positive values denote deformation as inward toward the occupant <sup>C</sup> For Toe Pan - Wheel Well the direction of deformation for Toe Pan - Wheel W       and Z directions. The direction of deformation for Toe Pan - Wheel W	Y	Side Front Panel	-0.2	≤ 12	Y
Side Door (below seat)       -0.3 $\leq 12$ Floor Pan       0.2 $\leq 12$ Dash - no MASH requirement       0.7       NA         A Items highlighted in red do not meet MASH allowable deformations       B Positive values denote deformation as inward toward the occupant         C For Toe Pan - Wheel Well the direction of deformation may include 2 and 2 directions. The direction of deformation for Toe Pan - Wheel W	Y	Side Door (above seat)	-0.3	≤ 9	Y
Floor Pan $0.2$ $\leq 12$ Dash - no MASH requirement $0.7$ NA         A Items highlighted in red do not meet MASH allowable deformations       B Positive values denote deformation as inward toward the occupant         C For Toe Pan - Wheel Well the direction of deformation may include 2 and 2 directions. The direction of deformation for Toe Pan - Wheel W	Y	Side Door (below seat)	-0.2	≤ 12	Y
Dash - no MASH requirement         0.7         NA <sup>A</sup> Items highlighted in red do not meet MASH allowable deformations <sup>B</sup> Positive values denote deformation as inward toward the occupant <sup>B</sup> Forsitive values denote deformation as inward toward the occupant <sup>C</sup> For Toe Pan - Wheel Well the direction of deformation may include 2           and Z directions. The direction of deformation for Toe Pan - Wheel W         Itel Activity	Z	Floor Pan	0.5	≤ 12	Z
<sup>A</sup> Items highlighted in red do not meet MASH allowable deformations <sup>B</sup> Positive values denote deformation as inward toward the occupant <sup>C</sup> For Toe Pan - Wheel Well the direction of defromation may include 2 and Z directions. The direction of deformation for Toe Pan -Wheel W	X, Y, Z	Dash - no MASH requirement	0.7	NA	X, Y, Z
ntruding into the occupant compartment. If direction of deformation i <sup>9</sup> If deformation is observered for the windshield then the windshield and recorded.	compartment, negat X and Z direction. Fc /ell, A-Pillar Maximum is "NA" then no intrus deformation is meas	ive values denote deformations out or A-Pillar Maximum and B-Pillar Max n, and B-Pillar Maximum only include ion is recorded and deformation wi sured posttest with an examplar veh	vard away from the simum the direction e components whe I be 0. icle, therefore only	e occupant compart n of deformation ma ere the deformation vone set of reference	ment. ay include X, Y, is positive and ce is measured
Notes on vehicle interior crush:					

Figure D-21. Maximum Occupant Compartment Deformation, Left, Test No. MOS-6

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Passenger Side MaxReference Set 1Maximum Deformation $^{A,B}$ MASH Allowable Deformation (in.)Directions of Deformation $^C$ Roof0.4 $\leq 4$ ZWindshield <sup>D</sup> 0.0 $\leq 3$ X, ZA-Pillar Maximum0.9 $\leq 5$ ZA-Pillar Maximum0.3 $\leq 5$ ZB-Pillar Lateral-0.2 $\leq 3$ YB-Pillar Lateral-0.2 $\leq 3$ YToe Pan - Wheel Well0.3 $\leq 9$ X, ZSide Front Panel0.1 $\leq 12$ Y	Location Location Roof Windshield <sup>D</sup> A-Pillar Maximum A-Pillar Lateral B-Pillar Maximum	Reference Se Maximum Deformation <sup>A,B</sup> (in.) -0.1 NA 0.0	t 2 MASH Allowable Deformation (in.) ≤ 4	Directions of Deformation
Reference Set 1Maximum Deformation^A,BMASH Allowable Deformation (in.)Directions of Deformation <sup>C</sup> Roof $0.4$ $\leq 4$ ZWindshield <sup>D</sup> $0.0$ $\leq 3$ X, ZA-Pillar Maximum $0.9$ $\leq 5$ ZA-Pillar Lateral $-0.2$ $\leq 3$ YB-Pillar Maximum $0.3$ $\leq 5$ ZB-Pillar Lateral $-0.2$ $\leq 3$ YToe Pan - Wheel Well $0.3$ $\leq 9$ X, ZSide Front Panel $0.1$ $\leq 12$ Y	Location Roof Windshield <sup>D</sup> A-Pillar Maximum A-Pillar Lateral B-Pillar Maximum	Reference Se Maximum Deformation <sup>A,B</sup> (in.) -0.1 NA 0.0	t 2 MASH Allowable Deformation (in.) ≤ 4	Directions of
Maximum Deformation (in.)MASH AllowableDirections of Deformation CeformationRoof $0.4$ $\leq 4$ ZWindshield <sup>D</sup> $0.0$ $\leq 3$ X, ZA-Pillar Maximum $0.9$ $\leq 5$ ZA-Pillar Lateral $-0.2$ $\leq 3$ YB-Pillar Maximum $0.3$ $\leq 5$ ZB-Pillar Lateral $-0.2$ $\leq 3$ YToe Pan - Wheel Well $0.3$ $\leq 9$ X, ZSide Front Panel $0.1$ $\leq 12$ Y	Location Roof Windshield <sup>D</sup> A-Pillar Maximum A-Pillar Lateral B-Pillar Maximum	Maximum Deformation <sup>A,B</sup> (in.) -0.1 NA 0.0	MASH Allowable Deformation (in.) ≤ 4	Directions of Deformation <sup>C</sup>
Roof $0.4$ $\leq 4$ ZWindshield <sup>D</sup> $0.0$ $\leq 3$ X, ZA-Pillar Maximum $0.9$ $\leq 5$ ZA-Pillar Lateral $-0.2$ $\leq 3$ YB-Pillar Maximum $0.3$ $\leq 5$ ZB-Pillar Lateral $-0.2$ $\leq 3$ YToe Pan - Wheel Well $0.3$ $\leq 9$ X, ZSide Front Panel $0.1$ $\leq 12$ Y	Roof Windshield <sup>D</sup> A-Pillar Maximum A-Pillar Lateral B-Pillar Maximum	-0.1 NA 0.0	≤ 4	7
Windshield0.0 $\leq$ 3X, ZA-Pillar Maximum0.9 $\leq$ 5ZA-Pillar Lateral-0.2 $\leq$ 3YB-Pillar Maximum0.3 $\leq$ 5ZB-Pillar Lateral-0.2 $\leq$ 3YToe Pan - Wheel Well0.3 $\leq$ 9X, ZSide Front Panel0.1 $\leq$ 12Y	Windshield <sup>D</sup> A-Pillar Maximum A-Pillar Lateral B-Pillar Maximum	NA 0.0	10	Z
A-Pillar Maximum $0.9$ $\leq 5$ ZA-Pillar Lateral $-0.2$ $\leq 3$ YB-Pillar Maximum $0.3$ $\leq 5$ ZB-Pillar Lateral $-0.2$ $\leq 3$ YToe Pan - Wheel Well $0.3$ $\leq 9$ X, ZSide Front Panel $0.1$ $\leq 12$ Y	A-Pillar Maximum A-Pillar Lateral B-Pillar Maximum	0.0	<u> </u>	X, Z
A-Pillar Lateral $-0.2$ $\leq 3$ YB-Pillar Maximum $0.3$ $\leq 5$ ZB-Pillar Lateral $-0.2$ $\leq 3$ YToe Pan - Wheel Well $0.3$ $\leq 9$ X, ZSide Front Panel $0.1$ $\leq 12$ Y	A-Pillar Lateral B-Pillar Maximum		≤ 5	NA
B-Pillar Maximum $0.3$ $\leq 5$ ZB-Pillar Lateral $-0.2$ $\leq 3$ YToe Pan - Wheel Well $0.3$ $\leq 9$ X, ZSide Front Panel $0.1$ $\leq 12$ Y	B-Pillar Maximum	-0.1	≤ 3	Y
B-Pillar Lateral         -0.2         ≤ 3         Y           Toe Pan - Wheel Well         0.3         ≤ 9         X, Z           Side Front Panel         0.1         ≤ 12         Y	B T mai maximani	0.1	≤ 5	Х
Toe Pan - Wheel Well         0.3         ≤ 9         X, Z           Side Front Panel         0.1         ≤ 12         Y	B-Pillar Lateral	-0.1	≤ 3	Y
Side Front Panel 0.1 ≤ 12 Y	Toe Pan - Wheel Well	0.7	≤ 9	X, Z
	Side Front Panel	-0.3	≤ 12	Y
Side Door (above seat) -0.1 ≤ 9 Y	Side Door (above seat)	-0.2	≤ 9	Y
Side Door (below seat) 0.0 ≤ 12 Y	Side Door (below seat)	-0.2	≤ 12	Y
Floor Pan 0.2 ≤ 12 Z	Floor Pan	0.5	≤ 12	Z
Dash - no MASH requirement 0.9 NA X, Y, Z	Dash - no MASH requirement	0.9	NA	X, Y, Z
<sup>3</sup> Positive values denote deformation as inward toward the occupant compartment, negati <sup>2</sup> For Toe Pan - Wheel Well the direction of defromation may include X and Z direction. Fo and Z directions. The direction of deformation for Toe Pan -Wheel Well, A-Pillar Maximum ntruding into the occupant compartment. If direction of deformation is "NA" then no intrus <sup>3</sup> If deformation is observered for the windshield then the windshield deformation is meas and recorded.	ve values denote deformations out r A-Pillar Maximum and B-Pillar Ma I, and B-Pillar Maximum only includ ion is recorded and deformation wi sured posttest with an examplar vel	ward away from the ximum the directio e components whe II be 0. nicle, therefore only	e occupant compar n of deformation ma pre the deformation y one set of reference	tment. ay include X, Y, is positive and ce is measured

Figure D-22. Maximum Occupant Compartment Deformation, Right, Test No. MOS-6

Date: Year:	6/28/ 20	2019 109			Test Name: Make:	MC K	ia			VIN: Model:	KNAI	DE2238965 Rio	80563
					VE <del>I</del> DRIVER	HICLE DE SIDE FL	FORMATI OOR PAN	ON - SET 1					
	POINT	Pretest X (in.)	Pretest Y (in.)	Pretest Z (in.)	Posttest X (in.)	Posttest Y (in.)	Posttest Z (in.)	ΔX <sup>A</sup> (in.)	ΔY <sup>A</sup> (in.)	ΔZ <sup>A</sup> (in.)	Total ∆ (in.)	Crush <sup>B</sup> (in.)	Direction for Crush
	1	61,1909	-28,4860	4,5783	61,1870	-28,5136	4,7017	0.0039	-0.0276	-0.1234	0.1265	0.0039	X
	2	61.6807	-23.3711	6.0481	61.6469	-23,3903	6.2276	0.0338	-0.0192	-0.1795	0.1837	0.0338	X
	3	61.2850	-17.4446	6.1176	61.2433	-17.3741	6.3085	0.0417	0.0705	-0.1909	0.2077	0.0417	X
. II	4	60.5833	-11.4799	6.3429	60.5790	-11.4855	6.5230	0.0043	-0.0056	-0.1801	0.1802	0.0043	X
≥ Ñ	5	58.5788	-7.9013	5.3805	58.6094	-7.8938	5.5619	-0.0306	0.0075	-0.1814	0.1841	0.0000	NA
Ц×	6	58.7630	-28.2712	7.7132	58.6933	-28.3044	7.8865	0.0697	-0.0332	-0.1733	0.1897	0.0697	X
발	7	58.0239	-23.6108	7.8377	57.9761	-23.6411	8.0046	0.0478	-0.0303	-0.1669	0.1762	0.0478	X
\$	8	57.5583	-17.8989	7.7502	57.4785	-17.8717	7.9299	0.0798	0.0272	-0.1797	0.1985	0.0798	X
	9	56.7553	-12.2504	7.8188	56.7487	-12.2380	7.9937	0.0066	0.0124	-0.1749	0.1755	0.0066	X
	10	55.5706	-8.1527	5.3965	55.5687	-8.1403	5.5581	0.0019	0.0124	-0.1616	0.1621	0.0019	X
	11	54.4274	-28.5697	7.9601	54.3795	-28.5988	8.1001	0.0479	-0.0291	-0.1400	0.1508	-0.1400	Z
Í	12	53.7818	-23.8555	8.1013	53.7160	-23.8761	8.2523	0.0658	-0.0206	-0.1510	0.1660	-0.1510	Z
	13	52.8816	-18.0998	7.9552	52.8346	-18.0608	8.1081	0.0470	0.0390	-0.1529	0.1646	-0.1529	Z
	14	52.2219	-12.4914	8.3433	52.2034	-12.4562	8.4963	0.0185	0.0352	-0.1530	0.1581	-0.1530	Z
	15	51.5646	-8.2823	5.7883	51.5167	-8.2748	5.9356	0.0479	0.0075	-0.1473	0.1551	-0.1473	Z
	16	50.7900	-28.6721	8.1837	50.7553	-28.7047	8.3020	0.0347	-0.0326	-0.1183	0.1275	-0.1183	Z
	17	50.3641	-23.9360	8.3456	50.3691	-23.9833	8.4938	-0.0050	-0.0473	-0.1482	0.1556	-0.1482	Z
-	18	49.7640	-17.8825	7.9992	49.6956	-17.8827	8.1421	0.0684	-0.0002	-0.1429	0.1584	-0.1429	Z
Å	19	49.4687	-12.6148	8.6554	49.4256	-12.6035	8.8052	0.0431	0.0113	-0.1498	0.1563	-0.1498	Z
μ Π Π	20	49.5898	-8.4968	5.5697	49.5899	-8.5067	5.7516	-0.0001	-0.0099	-0.1819	0.1822	-0.1819	Z
891	21	47.9240	-28.7991	8.2817	47.8932	-28.8337	8.3804	0.0308	-0.0346	-0.0987	0.1090	-0.0987	Z
	22	47.4639	-23.9090	8.4373	47.4337	-23.8905	8.5517	0.0302	0.0185	-0.1144	0.1198	-0.1144	Z
_	23	47.1490	-18.3623	8.0599	47.0943	-18.3910	8.1922	0.0547	-0.0287	-0.1323	0.1460	-0.1323	Z
	24	46.6393	-11.6437	8.7436	46.5823	-11.6084	8.8741	0.0570	0.0353	-0.1305	0.1467	-0.1305	Z
	25	46.6958	-8.6699	5.6516	46.6707	-8.6619	5.7813	0.0251	0.0080	-0.1297	0.1323	-0.1297	Z
	26	40.5278	-27.6576	8.2916	40.5199	-27.6641	8.3831	0.0079	-0.0065	-0.0915	0.0921	-0.0915	Z
	27	40.6480	-23.9530	8.2500	40.6488	-23.9093	8.3459	-0.0008	0.0437	-0.0959	0.1054	-0.0959	Z
	28	40.9227	-18.7769	8.1618	40.8591	-18.7243	8.2697	0.0636	0.0526	-0.1079	0.1358	-0.1079	Z
ļ	29	41.0541	-11.6562	8.3419	40.9816	-11.6445	8.4376	0.0725	0.0117	-0.0957	0.1206	-0.0957	Z
	30	41.0901	-8.9378	5.7064	41 0390	-8 9915	5 9246	0.0511	-0.0537	-0 2182	0 2304	-0 2182	7

compartment. <sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment. <sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-23. Floor Pan Deformation Data – Set 1, Left, Test No. MOS-7

Date: Year:	6/28/	2019 109			Test Name: Make:	MC K	)S-7 lia			VIN: Model:	KNAI	DE2238965 Rio	80563
				F	VEI PASSENG	HICLE DE ER SIDE	FORMATI	ON AN - SET	1				
		Pretest	Pretest	Pretest	Destinativ	Posttest	D +++ - 7	A XA	a x A	• <del>7</del> 4	Tatal A	O B	Directions
		Х	Y	Z	Posttest X	Y	Posttest Z	$\Delta X^{+}$	$\Delta Y^{(in)}$	$\Delta Z^{\prime}$	lotal ∆ (in.)	Crusn-	for
	POINT	(in.)	(in.)	(in.)	(11.)	(in.)	(11.)	(m.)	(m.)	(m.)	(III.)	(III.)	Crush <sup>C</sup>
	1	60.8908	0.4812	4.6952	60.8867	0.2687	4.8235	0.0041	0.2125	-0.1283	0.2483	0.0041	Х
	2	62.4413	4.6320	4.7716	62.4610	4.4170	4.8944	-0.0197	0.2150	-0.1228	0.2484	0.0000	NA
1	3	62.7127	10.1059	4.4184	62.7208	9.8639	4.5593	-0.0081	0.2420	-0.1409	0.2801	0.0000	NA
чЩ	4	62.6186	15.1764	4.2348	62.6074	14.9447	4.4025	0.0112	0.2317	-0.1677	0.2862	0.0112	X
A N	5	59.9892	20.4465	3.1160	60.0228	20.1829	3.2286	-0.0336	0.2636	-0.1126	0.2886	0.0000	NA
ШШХ	6	57.3062	0.5074	5.0477	57.3564	0.2933	5.1705	-0.0502	0.2141	-0.1228	0.2519	0.0000	NA
2 분	7	58.1558	4.6134	7.3294	58.1322	4.4644	7.4620	0.0236	0.1490	-0.1326	0.2008	0.0236	X
5	8	58.3633	10.1321	7.0261	58.3345	9.9004	7.1750	0.0288	0.2317	-0.1489	0.2769	0.0288	X
	9	59.0312	15.6591	6.5442	59.0044	15.4161	6.7050	0.0268	0.2430	-0.1608	0.2926	0.0268	X
	10	58.6885	20.3799	5.9569	58.6863	20.1498	6.1071	0.0022	0.2301	-0.1502	0.2748	0.0022	X
	11	53.7249	0.4336	5.1423	53.7630	0.2058	5.2316	-0.0381	0.2278	-0.0893	0.2476	-0.0893	Z
	12	54.6945	4.7356	7.8404	54.7249	4.5049	7.9645	-0.0304	0.2307	-0.1241	0.2637	-0.1241	Z
	13	54.7731	10.0997	7.8113	54.7516	9.8985	7.9479	0.0215	0.2012	-0.1366	0.2441	-0.1366	Z
	14	54.5897	15.3792	7.8329	54.5752	15.1435	7.9795	0.0145	0.2357	-0.1466	0.2780	-0.1466	Z
	15	54.0839	19.9188	7.8462	54.0558	19.6810	8.0011	0.0281	0.2378	-0.1549	0.2852	-0.1549	Z
	16	50.3887	0.3382	5.3544	50.3819	0.1105	5.4500	0.0068	0.2277	-0.0956	0.2470	-0.0956	Z
	17	50.7972	4.3595	8.4662	50.7972	4.1297	8.5804	0.0000	0.2298	-0.1142	0.2566	-0.1142	Z
-	18	51.0304	10.3483	7.9187	51.0333	10.0707	8.0467	-0.0029	0.2776	-0.1280	0.3057	-0.1280	Z
AP	19	50.9991	15.7422	8.0899	50.9913	15.5407	8.2329	0.0078	0.2015	-0.1430	0.2472	-0.1430	Z
н Н Н	20	51.0782	19.8263	8.1679	51.0594	19.6096	8.3141	0.0188	0.2167	-0.1462	0.2621	-0.1462	Z
	21	46.3665	0.3836	5.8320	46.3565	0.1404	5.9041	0.0100	0.2432	-0.0721	0.2539	-0.0721	Z
	22	45.1620	4.0334	8.7674	45.1531	3.8027	8.8676	0.0089	0.2307	-0.1002	0.2517	-0.1002	Z
-	23	46.0294	9.3260	7.9967	45.9777	9.1000	8.1113	0.0517	0.2260	-0.1146	0.2586	-0.1146	Z
	24	46.7676	15.8290	8.4400	46.7580	15.6110	8.5744	0.0096	0.2180	-0.1344	0.2563	-0.1344	Z
	25	47.0385	20.0861	8.3454	47.0053	19.8850	8.4767	0.0332	0.2011	-0.1313	0.2425	-0.1313	Z
	26	38.8879	0.1025	5.9835	38.9575	-0.1275	6.0603	-0.0696	0.2300	-0.0768	0.2523	-0.0768	Z
	27	38.5333	3.9834	8.1528	38.5024	3.7445	8.2381	0.0309	0.2389	-0.0853	0.2555	-0.0853	Z
	28	38.3738	8.3317	8.1106	38.3726	8.0991	8.2036	0.0012	0.2326	-0.0930	0.2505	-0.0930	Z
	29	38.5273	14.4675	8.1305	38.4456	14.1860	8.2333	0.0817	0.2815	-0.1028	0.3106	-0.1028	Z
	30	38.5989	19.2469	8.1885	38.5745	18.9944	8.3012	0.0244	0.2525	-0.1127	0.2776	-0.1127	Z

<sup>A</sup> Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-24. Floor Pan Deformation Data - Set 1, Right, Test No. MOS-7

Date:	6/28/	2019			Test Name:	MC	S-7			VIN:	KNAI	DE2238965	80563
Year:	20	009			Make:	K	ia			Model:		Rio	
					VEI DRIVER	HICLE DE	FORMATI OOR PAN	ION - SET 2					
	DOINT	Pretest X	Pretest Y	Pretest Z	Posttest X (in.)	Posttest Y	Posttest Z (in.)	ΔX <sup>A</sup> (in.)	ΔY <sup>A</sup> (in.)	ΔZ <sup>A</sup> (in.)	Total ∆ (in.)	Crush <sup>B</sup> (in.)	Directions for
	PUINT	(111.)	(11.)	(111.)	E0 040E	(11.)	4 4476	0.0051	0.0251	0.0527	0.0644	0.0527	Crush
ŀ	i	09.0434	-14.0344	4.4713	0 75 40	-14.0095	4.4170	-0.0051	-0.0351	0.0007	0.0044	0.0537	
	2	60 8832	-0.9130	5.9174	60 8679	-0.9907	5.9007	0.0100	-0.0219	0.0007	0.0200	0.0170	
<u>. 1</u>	3	60,6032	2 0690	6 1620	60 7110	-2.9007	6 1 2 6 2	0.0154	0.0001	0.0071	0.0702	0.0170	
A N N N	5	58 9995	6 7014	5 1881	59 0497	6 6998	5 1646	-0.0174	0.0100	0.0237	0.0555	0.0237	7
ШЧ	6	57 4505	-13 5999	7 6104	57 4026	-13 6295	7 6158	0.0302	-0.0296	-0.0255	0.0566	0.0200	X
ËŦ`	7	57 1121	-8.8929	7 7159	57 0877	-8 9214	7 7092	0.0473	-0.0285	0.0007	0.0381	0.0473	X 7
	,	57 1355	-3 1626	7 6042	57 0849	-3 1311	7 6014	0.0211	0.0200	0.0028	0.0597	0.0507	X 7
	9	56 8175	2 5341	7 6494	56 8401	2 5447	7 6345	-0.0226	-0.0106	0.0149	0.0291	0.0007	7
,	10	55.9808	6.7077	5.2116	55,9990	6.7144	5.1806	-0.0182	-0.0067	0.0310	0.0366	0.0310	Z
	11	53 1059	-13 5262	7 8678	53 0808	-13 5525	7 8570	0.0251	-0.0263	0.0108	0.0379	0.0108	7
	12	52.8653	-8.7735	7.9896	52.8248	-8.7895	7.9838	0.0405	-0.0160	0.0058	0.0439	0.0058	Z
ľ	13	52,4591	-2.9627	7.8199	52,4431	-2.9211	7.8086	0.0160	0.0416	0.0113	0.0460	0.0113	Z
Ĩ	14	52.2814	2.6832	8.1847	52.2961	2.7191	8.1657	-0.0147	-0.0359	0.0190	0.0432	0.0190	Z
Ì	15	51.9794	6.9221	5.6124	51.9529	6.9293	5.5830	0.0265	-0.0072	0.0294	0.0402	0.0294	Z
	16	49.4736	-13.3168	8.0996	49.4623	-13.3467	8.0812	0.0113	-0.0299	0.0184	0.0369	0.0184	Z
	17	49.4538	-8.5610	8.2415	49.4825	-8.6086	8.2459	-0.0287	-0.0476	-0.0044	0.0558	-0.0044	Z
_	18	49.3716	-2.4799	7.8696	49.3311	-2.4748	7.8602	0.0405	0.0051	0.0094	0.0419	0.0094	Z
AN	19	49.5285	2.7965	8.5031	49.5180	2.8118	8.4920	0.0105	-0.0153	0.0111	0.0216	0.0111	Z
и И П	20	49.9929	6.8761	5.3990	50.0122	6.8621	5.4120	-0.0193	0.0140	-0.0130	0.0272	-0.0130	Z
Q (1)	21	46.6074	-13.1984	8.2042	46.6002	-13.2299	8.1774	0.0072	-0.0315	0.0268	0.0420	0.0268	Z
L L	22	46.5667	-8.2862	8.3391	46.5663	-8.2646	8.3207	0.0004	0.0216	0.0184	0.0284	0.0184	Z
<u> </u>	23	46.7253	-2.7345	7.9380	46.6962	-2.7584	7.9290	0.0291	-0.0239	0.0090	0.0387	0.0090	Z
	24	46.7926	4.0059	8.5930	46.7707	4.0469	8.5717	0.0219	-0.0410	0.0213	0.0511	0.0213	Z
Î	25	47.0950	6.9510	5.4878	47.0907	6.9574	5.4601	0.0043	-0.0064	0.0277	0.0288	0.0277	Z
[	26	39.3357	-11.4298	8.2247	39.3541	-11.4337	8.2169	-0.0184	-0.0039	0.0078	0.0204	0.0078	Z
	27	39.7715	-7.7491	8.1666	39.8035	-7.7039	8.1556	-0.0320	0.0452	0.0110	0.0565	0.0110	Z
	28	40.4867	-2.6158	8.0549	40.4560	-2.5564	8.0458	0.0307	0.0594	0.0091	0.0675	0.0091	Z
	29	41.2257	4.4685	8.2033	41.1847	4.4878	8.1689	0.0410	-0.0193	0.0344	0.0569	0.0344	Z
	30	41.4870	7.1627	5.5557	41.4525	7.1117	5.6391	0.0345	0.0510	-0.0834	0.1037	-0.0834	Z

compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment. <sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-25. Floor Pan Deformation Data – Set 2, Left, Test No. MOS-7

Date:	6/28/	2019			Test Name:	МС	)S-7			VIN:	KNAI	DE2238965	80563
Year:	20	09			Make:	K	lia			Model:		Rio	
				F	VEI PASSENG	HICLE DE ER SIDE	FORMATI	ON AN - SET	2				
		Pretest	Pretest	Pretest	Deatteat V	Posttest	Deattest 7	A XA	AXA	<b>A 7</b> A	Total A	OnushB	Directions
		Х	Y	Z		Y	Fositest Z		ΔY (in )	ΔZ (im.)	Total ∆	Crush (in )	for
	POINT	(in.)	(in.)	(in.)	(m.)	(in.)	(In.)	(in.)	(in.)	(in.)	(in.)	(in.)	Crush <sup>C</sup>
	1	62.0239	14.6136	4.3197	62.0165	14.6397	4.3268	0.0074	-0.0261	-0.0071	0.0280	0.0074	X
	2	63.9223	18.6174	4.3833	63.9397	18.6386	4.3653	-0.0174	-0.0212	0.0180	0.0328	0.0180	Z
_i	3	64.6567	24.0481	4.0227	64.6612	24.0418	4.0002	-0.0045	0.0063	0.0225	0.0238	0.0225	Z
'''	4	64.9936	29.1081	3.8341	64.9809	29.1130	3.8178	0.0127	-0.0049	0.0163	0.0212	0.0207	X, Z
A ≥ Ñ	5	62.8163	34.5822	2.7236	62.8444	34.5473	2.6346	-0.0281	0.0349	0.0890	0.0996	0.0890	Z
ыЩХ	6	58.4565	14.9450	4.6913	58.5039	14.9673	4.6979	-0.0474	-0.0223	-0.0066	0.0528	0.0000	NA
2 분	7	59.6647	18.9652	6.9639	59.6497	19.0673	6.9623	0.0150	-0.1021	0.0016	0.1032	0.0151	X, Z
5	8	60.3396	24.4460	6.6535	60.3132	24.4648	6.6458	0.0264	-0.0188	0.0077	0.0333	0.0275	X, Z
	9	61.4729	29.8958	6.1620	61.4481	29.9009	6.1426	0.0248	-0.0051	0.0194	0.0319	0.0315	X, Z
	10	61.5301	34.6283	5.5714	61.5310	34.6417	5.5224	-0.0009	-0.0134	0.0490	0.0508	0.0490	Z
	11	54.8824	15.1764	4.8050	54.9167	15.1873	4.7841	-0.0343	-0.0109	0.0209	0.0416	0.0209	Z
	12	56.2292	19.3819	7.4932	56.2620	19.4010	7.4880	-0.0328	-0.0191	0.0052	0.0383	0.0052	Z
	13	56.7640	24.7199	7.4579	56.7489	24.7725	7.4433	0.0151	-0.0526	0.0146	0.0566	0.0146	Z
	14	57.0306	29.9958	7.4747	57.0213	30.0134	7.4489	0.0093	-0.0176	0.0258	0.0326	0.0258	Z
	15	56.9132	34.5619	7.4857	56.8913	34.5788	7.4505	0.0219	-0.0169	0.0352	0.0448	0.0352	Z
	16	51.5514	15.3654	5.0350	51.5414	15.3821	5.0263	0.0100	-0.0167	0.0087	0.0213	0.0087	Z
	17	52.3175	19.3393	8.1402	52.3212	19.3654	8.1328	-0.0037	-0.0261	0.0074	0.0274	0.0074	Z
7	18	53.0566	25.2862	7.5850	53.0598	25.2621	7.5667	-0.0032	0.0241	0.0183	0.0304	0.0183	Z
AP	19	53.4854	30.6632	7.7505	53.4863	30.7165	7.7249	-0.0009	-0.0533	0.0256	0.0591	0.0256	Z
Ч Н Ц	20	53.9123	34.7258	7.8236	53.9021	34.7650	7.7845	0.0102	-0.0392	0.0391	0.0563	0.0391	Z
ō O	21	47.5502	15.7533	5.5340	47.5367	15.7578	5.5078	0.0135	-0.0045	0.0262	0.0298	0.0262	Z
	22	46.6767	19.4942	8.4718	46.6721	19.5231	8.4605	0.0046	-0.0289	0.0113	0.0314	0.0113	Z
_	23	47.9872	24.6933	7.6908	47.9404	24.7270	7.6711	0.0468	-0.0337	0.0197	0.0609	0.0197	Z
	24	49.2787	31.1102	8.1230	49.2771	31.1496	8.0951	0.0016	-0.0394	0.0279	0.0483	0.0279	Z
	25	49.9104	35.3287	8.0223	49.8877	35.3865	7.9735	0.0227	-0.0578	0.0488	0.0790	0.0488	Z
	26	40.0759	16.1099	5.7257	40.1432	16.1236	5.7163	-0.0673	-0.0137	0.0094	0.0693	0.0094	Z
	27	40.0646	20.0083	7.8926	40.0362	20.0302	7.8771	0.0284	-0.0219	0.0155	0.0391	0.0155	Z
	28	40.2755	24.3543	7.8466	40.2784	24.3798	7.8209	-0.0029	-0.0255	0.0257	0.0363	0.0257	Z
	29	40.9508	30.4548	7.8589	40.8710	30.4383	7.8186	0.0798	0.0165	0.0403	0.0909	0.0403	Z
	30	41.4292	35.2108	7.9114	41.4105	35.2183	7.8607	0.0187	-0.0075	0.0507	0.0546	0.0507	Z

Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment. <sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Figure D-26. Floor Pan Deformation Data – Set 2, Right, Test No. MOS-7

Date:	6/28	/2019			Test Name:	MC	)S-7			VIN:	KNAI	DE2238965	80563
Year:	20	009			Make:	K	ia			Model:		Rio	
_				D	Ve <del>l</del> River Si	HICLE DE DE INTER		ON SH - SET	1				
		Pretest X	Pretest Y	Pretest Z	Posttest X	Posttest Y	Posttest Z	ΔX <sup>A</sup>	ΔY <sup>A</sup>	ΔZ <sup>A</sup>	Total ∆	Crush <sup>B</sup>	Direction for
	POINT	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	Crush
	1	49.9781	-27.1457	-19.5214	50.0658	-27.2007	-19.3278	-0.0877	-0.0550	0.1936	0.2195	0.2195	X, Y, Z
ŦÑ	2	46.2136	-17.7226	-23.1970	46.2920	-17.7564	-22.9991	-0.0784	-0.0338	0.1979	0.2155	0.2155	X, Y, Z
,≺ Š	3	47.8538	-2.7893	-20.4733	47.9385	-2.7844	-20.2664	-0.0847	0.0049	0.2069	0.2236	0.2236	X, Y, Z
۵×	4	49.0075	-27.3302	-9.3737	49.0919	-27.3338	-9.0982	-0.0844	-0.0036	0.2755	0.2882	0.2882	X, Y, Z
-	5	48.0004	-16.6918	-8.8664	48.0944	-16.7141	-8.6718	-0.0940	-0.0223	0.1946	0.2173	0.2173	X, Y, Z
	6	43.7678	-3.6726	-13.2017	43.8192	-3.7086	-12.9632	-0.0514	-0.0360	0.2385	0.2466	0.2466	X, Y, Z
ШЦ ПЦ	7	54.6353	-30.3319	0.6572	54.6539	-30.3369	0.8586	-0.0186	-0.0050	0.2014	0.2023	-0.0050	Y
ΒĂΣ	8	58.9316	-30.1337	2.2282	58.8912	-30.1419	2.4734	0.0404	-0.0082	0.2452	0.2486	-0.0082	Y
0 2	9	57.0739	-31.0388	3.2993	57.0640	-31.0579	3.4699	0.0099	-0.0191	0.1706	0.1720	-0.0191	Y
ш	10	27.4095	-33.1816	-17.6781	27.4683	-33.1917	-17.5712	-0.0588	-0.0101	0.1069	0.1224	-0.0101	Y
0	11	36.7714	-32.6348	-17.4466	36.8151	-32.6522	-17.2275	-0.0437	-0.0174	0.2191	0.2241	-0.0174	Y
SR ⊂	12	45.0835	-32.2875	-17.0477	45.1908	-32.3045	-16.8125	-0.1073	-0.0170	0.2352	0.2591	-0.0170	Y
SQS	13	27.4127	-32.8553	-9.2744	27.4941	-32.8538	-9.0974	-0.0814	0.0015	0.1770	0.1948	0.0015	Y
<u>4</u>	14	36.7391	-32,7280	-8.7396	36.8069	-32.7353	-8.5453	-0.0678	-0.0073	0.1943	0.2059	-0.0073	Y
≤	15	44,7896	-31,9861	-8.3146	44.8134	-32,0229	-8,1369	-0.0238	-0.0368	0.1777	0.1830	-0.0368	Y
	16	34 4082	-5 8957	-35 5318	34 5514	-5 8971	-35 4054	-0 1432	-0.0014	0 1264	0 1910	0 1264	7
	17	34 5640	-10 8159	-35 4514	34 7284	-10 8107	-35 3199	-0 1644	0.0052	0.1204	0.2106	0.1207	7
	18	34 5165	-14 0491	-35 3665	34 7383	-14 0597	-35 2145	-0.2218	-0.0106	0.1520	0.2691	0.1520	7
	10	34 2564	-17 3683	-35 2561	34 4123	-17 3074	-35 1248	-0 1559	-0.0201	0.1313	0.2001	0.1313	7
	20	33 5090	-23 6013	-34 0826	33,6606	-23 7250	-34 8474	-0.1516	-0.0237	0.1313	0.2050	0.1313	7
-	20	28 7065	-23.0313	-38 3888	28 8125	-6 /251	-38 2020	-0.1010	-0.0337	0.1002	0.2000	0.1002	7
Ñ	21	28 3724	-10 6546	-38 3070	28.6168	-10 6270	-38 2795	-0.2444	0.0252	0.0343	0.1442	0.0343	7
Ľ.	22	28.3724	-13 0060	-38 2717	28,6580	-13 8031	-38 1639	-0.2444	0.0207	0.1104	0.2129	0.1104	7
8	23	28 5866	-17 /1/8	-38 0676	28 7234	-17 4333	-37 9644	-0.1368	-0.0185	0.1070	0.2140	0.1070	7
Х Х	24	27 9571	-22 2014	-37 7953	28 1282	-17.4333	-37.6056	-0.1300	0.0103	0.1032	0.1724	0.1032	7
	20	21.3371	-6 2311	-30 2857	21.6730	-6 2478	-39 2078	-0.1830	-0.0167	0.0337	0.2040	0.0337	7
	20	21.5840	-0.2311	-30 2357	21.0750	-0.7850	-30 1582	-0.1821	-0.010/	0.0775	0.1000	0.0775	7
	28	21.5040	-12 2522	-30 12/3	21.7001	-13 2865	-30.0483	-0.1021	0.0658	0.0760	0.1902	0.0760	7
	20	21.0300	-17 5605	-38 88/8	21.0392	-17 55/1	-39.7002	-0.2000	0.0050	0.0700	0.2244	0.0700	7
	29	21.3334	21 9766	20 5/66	22.1710	21 9505	20 4700	-0.2302	0.0154	0.0050	0.2317	0.0000	
	30	22.1370	-21.0750	-30.3400	22.2704	-21.0090	-30.4700	-0.1300	0.0101	0.0730	0.1300	0.0730	2
~ ~ ~	<u>30</u>	53 0777	-28.0190	-21.0437	53 2204	-29.3909	-21.4143	-0.0004	-0.0173	0.2294	0.2404	0.2294	
A nu	<u></u>	40.2520	-20.9922	-23.1000	40.2907	-29.0102	-23.3430	-0.1321	-0.0100	0.2229	0.2700	0.2229	<u>ک</u>
⊐ × ×	34	45.2000	-20.4120	-20.2103	45.0001	-20.4300	-20.0403	-0.1301	-0.0242	0.2300	0.2003	0.2300	
A-F Ma	35	40.0200	-27 1356	-20.4201	40.9004	-27.1560	-20.23/3	-0.1390	-0.0150	0.1020	0.2303	0.1020	7
	30	41.209U	-26 2450	-30.0224	37 0760	-26 6209	-30.4500	-0.1000	-0.0213	0.1724	1 0952	0.1724	<u> </u>
	30	50.0227	-20.3452	-32.9004	50.0400	-20.0398	-32.0030	-0.0042	-0.2940	0.0004	0.0454	0.00004	
~ ~	31	56.1336	-29.3796	-21.6437	56.2190	-29.3969	-21.4143	-0.0854	-0.0173	0.2294	0.2454	-0.0173	Y V
Ч, С	32	53.0777	-28.9922	-23.7685	53.2304	-29.0102	-23.5456	-0.1527	-0.0180	0.2229	0.2708	-0.0180	Y V
al LL	33	49.2536	-28.4126	-20.2703	49.3897	-28.4368	-20.0403	-0.1361	-0.0242	0.2300	0.2003	-0.0242	Y V
A-P .ate	34	45.8288	-27.8120	-28.4201	45.9684	-21.82/0	-28.23/5	-0.1396	-0.0150	0.1826	0.2303	-0.0150	Y V
~ _	35	41.2890	-27.1356	-30.6224	41.4495	-27.1569	-30.4500	-0.1605	-0.0213	0.1/24	0.2365	-0.0213	Y
	36	36.5227	-26.3452	-32.9684	37.0769	-26.6398	-32.0830	-0.5542	-0.2946	0.8854	1.0853	-0.2946	I Y
AR MAR	37	15.3038	-27.6250	-33.2039	15.4280	-27.6281	-33.1658	-0.1242	-0.0031	0.0381	0.1299	0.0381	∣ Z
∃ Ē, ,	38	13.1424	-29.3436	-29.7590	13.2303	-29.3418	-29.7412	-0.0879	0.0018	0.0178	0.0897	0.0179	Y, Z
X ax	39	16.8613	-30.2946	-27.0941	16.9733	-30.2813	-27.0965	-0.1120	0.0133	-0.0024	0.1128	0.0133	<u> </u>
ш≥ ╰	40	14.6657	-31.7344	-22.9702	14.7500	-31.7399	-22.9474	-0.0843	-0.0055	0.0228	0.0875	0.0228	Z
3 K	37	15.3038	-27.6250	-33.2039	15.4280	-27.6281	-33.1658	-0.1242	-0.0031	0.0381	0.1299	-0.0031	Y
a F	38	13.1424	-29.3436	-29.7590	13.2303	-29.3418	-29.7412	-0.0879	0.0018	0.0178	0.0897	0.0018	Y
	20	16 8613	-30 2946	-27 0941	16 9733	-30 2813	-27 0065	-0 1120	0.0133	-0.0024	0 1128	0.0133	V V
수 끝	39	10.0015	00.2010	21.0011	10.5755	-30.2013	-27.0905	-0.1120	0.0155	0.0024	0.1120	0.0155	; I

<sup>A</sup> Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.

Figure D-27. Occupant Compartment Deformation Data - Set 1, Left, Test No. MOS-7

VIN: KNADE223896580563

rear.	20	09	-		Make:	ĸ	la			Model:		Rio	
					VEH	IICLE DE	FORMATI	ON					
				PAS	SENGER	SIDE INT	ERIOR C	RUSH - S	ET 1				
		Pretest	Pretest	Pretest	Deathaat V	Posttest	Deatheat 7	A XA	AXA	• 7 <sup>A</sup>	Total A	OnuchB	Directio
		Х	Y	Z	Posttest X	Y	Posttest Z	ΔX <sup>1</sup> (in.)	$\Delta Y^{(in)}$	ΔZ <sup>1</sup>	in )	Crush-	for
	POINT	(in.)	(in.)	(in.)	(11.)	(in.)	(11.)	(11.)	(11.)	(11.)	(11.)	(11.)	Crush
	1	48.1650	17.1265	-19.7155	48.2564	16.8349	-19.5332	-0.0914	0.2916	0.1823	0.3558	0.3558	X, Y,
ŢÑ	2	47.8643	6.4355	-20.3371	47.9216	6.1505	-20.1455	-0.0573	0.2850	0.1916	0.3482	0.3482	X, Y,
ASF ,≺	3	47.8417	-2.7650	-20.4676	47.9363	-3.0210	-20.3238	-0.0946	-0.2560	0.1438	0.3085	0.3085	X, Y,
Ъ.Х́	4	45.8207	17.1020	-13.5391	45.8737	16.9361	-13.3601	-0.0530	0.1659	0.1790	0.2497	0.2497	<u>X, Y,</u>
	5	46.2882	6.8041	-13.4074	46.3399	6.5145	-13.2338	-0.0517	0.2896	0.1736	0.3416	0.3416	<u>X, Y,</u>
	6	43.7695	-3.6664	-13.1960	43.8168	-3.9230	-13.0360	-0.0473	-0.2566	0.1600	0.3061	0.3061	<u>X, Y,</u>
	7	52.7950	22.8985	1.4795	52.7759	22.6402	1.6426	0.0191	0.2583	0.1631	0.3061	0.2583	Y Y
SIC SIC	8	53.6756	22.7836	-2.7972	53.7876	22.5329	-2.5705	-0.1120	0.2507	0.2267	0.3561	0.2507	Y
Ц	y	56.7370	23.0338	-2.7487	56.7306	22.7770	-2.5939	0.0064	0.2568	0.1548	0.2999	0.2568	Y
Ш	10	24.0649	23.0759	-17.8256	24.1165	22.8303	-17.7259	-0.0516	0.2456	0.0997	0.2700	0.2456	Y
ы В с	11	34.8253	23.5157	-17.3251	34.9054	23.2935	-17.0794	-0.0801	0.2222	0.2457	0.3408	0.2222	Y
385	12	41.9770	23.8524	-16.9827	42.0247	23.61/1	-16.8152	-0.0477	0.2353	0.1675	0.2927	0.2353	Y
ΑĞ	13	24.0133	22.8354	-8.7752	24.6065	22.5913	-8.7095	0.0068	0.2441	0.0657	0.2529	0.2441	Y
Σ	14	34.7442	23.5222	-8.4037	34.8026	23.2898	-8.3210	-0.0584	0.2324	0.0827	0.2535	0.2324	Y
	15	41.8497	23.5147	-8.7711	41.8828	23.2730	-8.6619	-0.0331	0.2417	0.1092	0.2673	0.2417	Y T
	16	34.1989	-3.9061	-35.5550	34.3584	-4.1196	-35.4530	-0.1595	-0.2135	0.1020	0.2854	0.1020	<u></u>
	17	33.8923	0.9682	-35.4932	33.9947	0.7703	-35.4019	-0.1024	0.1979	0.0913	0.2408	0.0913	
	10	33.4000	4.2521	-35.4217	33.3474	4.0749	-35.3309	-0.0000	0.1772	0.0020	0.2000	0.0020	Z
	19	32.3/0/	0.3025	-35.3475	32.7030	0.1019	-35.2512	-0.1271	0.2006	0.0903	0.2003	0.0903	2 7
	20	20 1016	2 4751	-33.0940	21.0017	2 7107	-35.0057	-0.1077	0.2200	0.0003	0.2070	0.0003	
(Z	21	20.4040	-3.4731	-30.4037	20.0302	-3.7197	-30.3130	-0.1730	-0.2440	0.0099	0.3131	0.0099	- <u>-</u>
Ľ.	22	27.0921	3 4783	-38 /110	27.7213	3 2/2/	-38 3373	-0.1294	0.1000	0.0039	0.2270	0.0039	7
0	23	20.3237	7 0802	-38 2518	26 5547	6 8130	-38 1701	-0.0933	0.2333	0.0737	0.2042	0.0737	7
R	24	25 4585	11 7586	-37 9574	25 6194	11 5721	-37 8704	-0.1609	0.2755	0.0870	0.3319	0.0870	7
	26	22 3866	-3 4358	-39 1906	22 4907	-3.6653	-39 1321	-0 1041	-0 2295	0.0585	0.2587	0.0585	7
	27	21 5769	0.0090	-39 1763	21 7641	-0 1712	-39 1104	-0 1872	0 1802	0.0659	0.2681	0.0659	7
	28	21.0833	3.1995	-39.0856	21.2445	2.9097	-39.0258	-0.1612	0.2898	0.0598	0.3370	0.0598	Z
	29	20.8357	6.9736	-38.8807	20.9541	6.7115	-38.8197	-0.1184	0.2621	0.0610	0.2940	0.0610	Z
	30	20.7232	10.7279	-38.5761	20.8785	10.4753	-38.5135	-0.1553	0.2526	0.0626	0.3031	0.0626	Z
	31	54 0218	22 0766	-21 4204	54 0297	21 8266	-21 2402	-0.0079	0.2500	0 1802	0.3083	0.3082	Y 7
᠘ᢄᡬ	32	50.6290	21.3171	-23.8678	50.7491	21.0836	-23.6611	-0.1201	0.2335	0.2067	0.3342	0.3118	Y. Z
A un .	33	47.3501	20.4548	-26.1790	47.4720	20.2255	-25.9777	-0.1219	0.2293	0.2013	0.3286	0.3051	Y. Z
X, X	34	45.0472	19.8265	-27.6446	45.1451	19.5885	-27.4820	-0.0979	0.2380	0.1626	0.3044	0.2882	Y, Z
Ϋ́́ΞΎ	35	40.5785	18.6107	-30.1577	40.7822	18.3981	-29.9736	-0.2037	0.2126	0.1841	0.3473	0.2812	Y, Z
	36	35.9541	17.4252	-32.3624	36.1119	17.2001	-32.2274	-0.1578	0.2251	0.1350	0.3063	0.2625	Y, 2
	31	54.0218	22.0766	-21.4204	54.0297	21.8266	-21,2402	-0.0079	0.2500	0.1802	0.3083	0.2500	Y
K (C	32	50.6290	21.3171	-23.8678	50.7491	21.0836	-23.6611	-0.1201	0.2335	0.2067	0.3342	0.2335	Y
al C	33	47.3501	20.4548	-26.1790	47.4720	20.2255	-25.9777	-0.1219	0.2293	0.2013	0.3286	0.2293	Y
PIL	34	45.0472	19.8265	-27.6446	45.1451	19.5885	-27.4820	-0.0979	0.2380	0.1626	0.3044	0.2380	Y
La -	35	40.5785	18.6107	-30.1577	40.7822	18.3981	-29.9736	-0.2037	0.2126	0.1841	0.3473	0.2126	Y
	36	35.9541	17.4252	-32.3624	36.1119	17.2001	-32.2274	-0.1578	0.2251	0.1350	0.3063	0.2251	Y
μ ΕΩ	37	13.0133	15.4885	-34.4132	13.1617	15.2633	-34.3772	-0.1484	0.2252	0.0360	0.2721	0.2281	Y, 2
⊢TA Anura	38	11.2119	17.7715	-30.1715	11.2693	17.5741	-30.0838	-0.0574	0.1974	0.0877	0.2235	0.2160	Y. 2
A in A	39	14.5450	19.4341	-26.5486	14.6937	19.1851	-26.5552	-0.1487	0.2490	-0.0066	0.2901	0.2490	Ý
₩Ξ Ĉ	40	12.4592	20.7048	-21.9000	12.5492	20.4712	-21.8513	-0.0900	0.2336	0.0487	0.2550	0.2386	Y, 2
щΩ	37	13.0133	15.4885	-34.4132	13.1617	15.2633	-34.3772	-0.1484	0.2252	0.0360	0.2721	0.2252	Y
AC	38	11.2119	17.7715	-30.1715	11.2693	17.5741	-30.0838	-0.0574	0.1974	0.0877	0.2235	0.1974	Y
							,					,	
PILL eral	39	14,5450	19,4341	-26.5486	14.6937	19,1851	-26,5552	-0.1487	0.2490	-0.0066	0.2901	0,2490	Y

Test Name:

MOS-7

Date: 6/28/2019

<sup>A</sup> Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment.

<sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.



Year         209         Mate         Kis         Model         Ro           VILCE DEFORMATION DURCE NOE INTERCE NOE NET 2           VILCE NOE NETCON CONSTRUCT         VILCE NOE NETCON CONSTRUCT         No	Date:	6/28/	/2019			Test Name:	MC	)S-7			VIN:	KNA	DE2238965	30563
<section-header>          Purper         Participant Presidence         <t< td=""><td>Year:</td><td>20</td><td>009</td><td></td><td></td><td>Make:</td><td>K</td><td>ia</td><td></td><td></td><td>Model:</td><td></td><td>Rio</td><td></td></t<></section-header>	Year:	20	009			Make:	K	ia			Model:		Rio	
PERCENCIPACING DISCRPTION           VALUE DEFENDATION														
UDRURE SIDE INTERIOR CRUSH - SET 2           POINT         (n)         (n) <td></td> <td></td> <td></td> <td></td> <td></td> <td>VEI</td> <td>HICLE DE</td> <td>FORMATI</td> <td>ON</td> <td></td> <td></td> <td></td> <td></td> <td></td>						VEI	HICLE DE	FORMATI	ON					
Pretest         Pretest         Prestest         Posttest         Posttest         Ax <sup>A</sup> Ax <sup>A</sup> Ax <sup>A</sup> Ax <sup>A</sup> Crush         Directions (in)         Directions (in) <thdirections (in)         <thdirections (in)         <thd< td=""><td></td><td></td><td></td><td></td><td>0</td><td>ORIVER SI</td><td>DE INTER</td><td>NOR CRU</td><td>SH - SET</td><td>2</td><td></td><td></td><td></td><td></td></thd<></thdirections </thdirections 					0	ORIVER SI	DE INTER	NOR CRU	SH - SET	2				
$ \left[ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1		-	_	-	1	-	1						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $			Pretest	Pretest	Pretest	Posttest X	Posttest	Posttest Z	ΔX <sup>A</sup>	ΔY <sup>A</sup>	$\Delta Z^A$	Total ∆	Crush <sup>B</sup>	Directions
UNI         UNID		DONT	X (in)	Y (in.)	Z (in.)	(in.)	Y (in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	
$ \begin{bmatrix} 1 \\ 2 \\ - 46 \\ - 784 \\ - $		POINT	(In.)	(III.)	(III.)	10 7074	(III.)	10, 1500	0.0000	0.0704	0.4054	0.4507	0.4507	Crush <sup>2</sup>
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		1	48.7052	-12.1032	-19.5846	48.7674	-12.1736	-19.4592	-0.0622	-0.0704	0.1254	0.1567	0.1567	
Q         d         47.744         1.21.108         20.205         20.2032         0.0088         0.0088         0.0088         0.0022         0.0222         0.0222         X.Y.Z           G         4.4.6134         1.1.2103         4.8.6742         -0.0287         0.0018         0.0108         0.1008	Н, С,	2	43.7341	-2.4000	-23.2975	43.7923	12 3280	-20.5700	-0.0302	-0.0007	0.1100	0.1310	0.1310	X X Z
S         5         47/853         14/738         14/738         14/738         14/738         14/738         14/738         14/738         14/738         11/200	JAS , Y	4	47 7446	-12 1580	-9 4344	47 8285	-12 1512	-9 2255	-0.0333	0.0101	0.0737	0.0004	0.2252	X Y 7
G         44.5432         11.8441         13.3837         44.5611         11.8080         13.2464         -0.0778         0.0811         0.1173         0.1240         X,Y,Z           B         C         7         63.1164         15.5688         0.0003         53.175         15.56485         0.7333         -0.0112         0.0114         0.0181         0.1188         0.1172         0.0514         Y           B         55.4172         116.4472         3.2413         55.0666         14.6488         3.3413         -0.0177         0.0024         0.1086         0.0184         Y           B         55.4172         11.7778         0.4494         0.0144         0.0026         0.1182         0.1049         0.0002         Y           11         35.611         11.7778         0.4497         16.8286         0.0029         0.0026         0.1893         0.1447         0.0044         Y           12         43.3046         16.8497         77.7081         43.4471         16.8487         8.8287         0.0722         0.0060         11.84         0.0332         11.83         0.0327         7.2083         0.0428         0.0277         0.0488         0.1275         0.0448         0.0277         0.0582	ĽČ	5	47.6539	-1.4703	-8.9750	47.7366	-1.4824	-8.8742	-0.0827	-0.0121	0.1008	0.1309	0.1309	X Y. Z
Image of the state         7         63.1164         15.5848         0.003         0.0142         0.0142         0.0143         0.1432         0.0143         Y           Image of the state         6         67.7173         15.7465         2.1266         57.4022         15.8681         0.0177         0.0384         0.1000         0.1086         0.0384         Y           Image of the state         25.7064         16.1742         17.76265         25.7101         16.2144         17.575         0.0444         0.0082         0.0183         0.1125         0.0402         Y           Image of the state         11         3.50.676         15.8115         0.2147         1.63.807         1.68.888         0.0045         0.0032         0.1183         0.1175         0.0044         1.0383         0.1447         0.0060         Y           11         3.50.601         16.8161         8.7531         35.1324         16.8376         9.1066         0.0084         0.0027         0.0060         Y           14         3.5661         3.4064         3.1121         16.4376         16.3307         35.6633         35.0473         10.0287         0.0277         1.0638         0.0277         1.0638         0.0277         1.0638         0.0		6	44.5432	11.8441	-13.3637	44.5611	11.8080	-13.2464	-0.0179	0.0361	0.1173	0.1240	0.1240	X, Y, Z
G         8         67.4173         15.7495         2.1265         67.4029         -15.6981         2.3315         0.0144         0.0184         0.1086         0.1771         0.0384         Y           US         55.098         -16.4488         3.3413         -0.0177         0.0384         0.1000         0.1086         0.0384         Y           US         -11         35.0171         -16.1742         -17.2713         -0.0299         -0.0020         0.1822         0.1949         0.0362         Y           11         35.0181         -16.70781         -3.8797         16.8286         -0.0484         -0.0020         0.1822         0.1949         -0.0362         Y           13         25.7600         15.8115         9.2705         25.8408         15.8199         9.1066         -0.0844         -0.0026         -0.0323         0.1318         0.1363         0.1947         -0.0084         Y           14         35.6661         16.34177         10.2453         -8.2442         -0.0266         -0.0323         0.1318         0.1365         0.0277         Z         17         3.4484         -1.0853         -3.3451         -0.0171         0.0752         0.0277         0.0655         Z         2.0174		7	53,1164	-15.5858	0.6003	53.1576	-15.5445	0.7333	-0.0412	0.0413	0.1330	0.1452	0.0413	Y
B         C         9         55.4912         1-16.4972         3.2413         65.0989         1-16.4488         3.3413         -0.0177         0.0384         V         0.0384         V           US         5000         -         1.1         35.0613         -16.4727         1.17.6726         57510         -16.2144         -17.5775         0.0322         0.1082         0.0182         0.1949         -0.0362         Y           11         35.0613         -16.4307         -17.6605         35.1112         -16.4669         -17.2713         -0.0229         0.0382         0.1083         0.1140         -0.0022         Y           13         25.7500         -15.8116         -0.2703         0.0488         -0.0044         0.0684         0.0144         0.1797         -0.0060         Y           14         35.001         -16.41816         -0.331         -13.5124         -16.4538         -0.2233         0.0762         0.0227         1.1085         0.0277         Z         0.0680         X         Z         0.0762         0.0271         0.0168         0.0772         0.0271         0.0168         0.0772         0.0271         Z         Z         Z         Z         Z         Z         Z         Z<	ΞΨ(	8	57.4173	-15.7495	2.1626	57.4029	-15.6981	2.3315	0.0144	0.0514	0.1689	0.1771	0.0514	Y
Underson         10         257064         -16.1742         1.77.626         25.7510         -16.2144         -17.775         0.04462         0.0492         0.0182         0.1182         0.0402         V           11         35.061         -16.4307         -17.4605         35.7510         -16.8888         -0.0299         -0.0382         0.1882         0.1940         -0.0322         Y           13         25.7600         -15.8115         -9.2702         25.6408         -15.8199         -0.0166         -0.0044         0.0983         0.0144         0.0084         0.1983         0.1477         -0.0060         Y           14         35.6001         16.8115         -9.2708         26.4408         +8.2442         -0.0283         0.0184         0.1777         0.0468         0.0277         C1080         0.0277         C1080         0.0277         C1080         0.0478         C175         0.4458         0.0174         0.0458         0.1275         0.0468         0.1277         0.0643         0.1577         0.0468         C1767         0.0687         0.1577         0.0443         0.752         C178         0.0468         C1767         0.0687         0.1577         0.0443         C178         0.0473         1.1433         0.04	S A -	9	55.4912	-16.4872	3.2413	55.5089	-16.4488	3.3413	-0.0177	0.0384	0.1000	0.1086	0.0384	Y
Image: Constraint of the stand of	ш	10	25.7064	-16.1742	-17.6726	25.7510	-16.2144	-17.5775	-0.0446	-0.0402	0.0951	0.1125	-0.0402	Y
L         12         43.3934         1:6.7954         1:7.0781         43.4879         1:6.8288         0.0942         0.1983         0.2140         -0.0322         Y           13         25.7560         1:5.811         92.706         25.8408         1:5.8498         1:6.8888         -0.0948         0.0084         0.0084         1:6.4316         0.1823         VY           15         43.1455         1:6.4306         8.3460         43.1721         1:6.4388         8.2142         0.0266         0.0233         0.1318         0.1386         -0.0237         VY           16         34.9766         0.3307         35.6663         35.0473         10.2245         -35.6386         0.0687         0.0772         0.063         0.0277         Z           18         34.3882         2:1988         34.4854         2.1070         -35.3279         0.0143         0.0167         0.0473         0.1673         0.0493         0.1527         0.0443         1.1527         0.0443         1.1527         0.0443         1.1527         0.0443         1.1527         0.0443         1.1527         0.0443         1.1527         0.0443         1.1527         0.0413         1.1527         0.0413         1.1527         0.0413         0.1425 <td>Dio 11</td> <td>11</td> <td>35.0813</td> <td>-16.4307</td> <td>-17.4605</td> <td>35.1112</td> <td>-16.4669</td> <td>-17.2713</td> <td>-0.0299</td> <td>-0.0362</td> <td>0.1892</td> <td>0.1949</td> <td>-0.0362</td> <td>Y</td>	Dio 11	11	35.0813	-16.4307	-17.4605	35.1112	-16.4669	-17.2713	-0.0299	-0.0362	0.1892	0.1949	-0.0362	Y
Y         13         25.7560         15.8115         9.2705         25.8408         -15.8199         9.1066         -0.0848         0.1039         0.1839         0.1384         0.1085         0.0080         Y           15         43.455         16.4305         -8.3660         30.471         16.433         -5.6386         0.0687         0.0772         0.0480         0.1275         0.0468         2           19         33.8484         1.0833         -35.3363         3.9351         1.1003         -35.2723         0.0903         0.1050         0.0672         0.1947         0.0752         1.944         0.0302         2         2         2         2.8510         6.0337         -38.4952         2.87721         1.0483         3.0457         0.0481         0.1105         0.0080         2         2         2         2.8510         6.0337         -38.4952         2.8771         0.0661         -01066         0.0466 </td <td>S QR</td> <td>12</td> <td>43.3934</td> <td>-16.7954</td> <td>-17.0781</td> <td>43.4879</td> <td>-16.8276</td> <td>-16.8888</td> <td>-0.0945</td> <td>-0.0322</td> <td>0.1893</td> <td>0.2140</td> <td>-0.0322</td> <td>Y</td>	S QR	12	43.3934	-16.7954	-17.0781	43.4879	-16.8276	-16.8888	-0.0945	-0.0322	0.1893	0.2140	-0.0322	Y
14         35.0601         16.4816         8.7531         35.124         -16.4876         8.5887         -0.0723         -0.0060         0.1644         0.1797         -0.0080         Y           15         43.1455         -16.44363         -8.2404         -4.533         -8.2142         -0.0266         -0.0233         0.1318         -0.0233         V1           16         34.9786         10.3307         -35.6663         35.0473         10.2545         -35.6396         -0.0687         0.0772         0.1063         0.0277         Z           18         34.3882         2.1986         -35.631         34.6425         2.1070         -35.3723         -0.0918         0.0752         0.1947         0.0643         0.1527         0.0643         0.1527         0.0643         2.2           0         32.5509         -7.3197         -35.022         28.5501         6.0237         -38.456         -00190         0.0168         0.0752         0.1167         0.0080         Z           21         22.84551         0.6337         -38.4992         28.721         6.0237         -38.456         -01701         0.0766         0.1033         0.0429         0.1838         0.0429         Z         22         28.7149 <t< td=""><td>DO DO</td><td>13</td><td>25.7560</td><td>-15.8115</td><td>-9.2705</td><td>25.8408</td><td>-15.8199</td><td>-9.1066</td><td>-0.0848</td><td>-0.0084</td><td>0.1639</td><td>0.1847</td><td>-0.0084</td><td>Y</td></t<>	DO DO	13	25.7560	-15.8115	-9.2705	25.8408	-15.8199	-9.1066	-0.0848	-0.0084	0.1639	0.1847	-0.0084	Y
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	MP	14	35.0601	-16.4816	-8.7531	35.1324	-16.4876	-8.5887	-0.0723	-0.0060	0.1644	0.1797	-0.0060	Y
Inf         34.9786         10.3307         -35.6663         35.0473         10.2545         -35.6386         -0.0687         0.0727         0.1063         0.0277         Z           17         34.17124         5.4167         -35.6631         34.8076         5.3443         -35.5173         -0.0987         0.0744         0.0486         0.1277         0.0468         Z           19         33.8448         -1.0853         -35.3366         33.9351         -1.1903         -35.2723         -0.0903         0.01050         0.0667         0.1677         0.06843         Z           20         32.5590         -7.3197         -35.0326         2.0239         0.0176         0.00867         0.1673         0.0687         2.72           21         22.2485         10.3022         -38.5106         2.92722         10.1946         -38.5026         -0.0133         0.0778         0.0413         0.1435         0.0448         Z         2.2         2.8510         6.0336         0.0466         Z         2.2         2.8510         6.0346         0.1303         0.0466         Z         2.0         2.1         2.2         2.2         2.8177         4.33.393         2.1610         7.4746         3.39354         2.167784         -	_	15	43.1455	-16.4305	-8.3460	43.1721	-16.4538	-8.2142	-0.0266	-0.0233	0.1318	0.1365	-0.0233	Y
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		16	34.9786	10.3307	-35.6663	35.0473	10.2545	-35.6386	-0.0687	0.0762	0.0277	0.1063	0.0277	Z
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		17	34.7124	5.4157	-35.5631	34.8076	5.3443	-35.5173	-0.0952	0.0714	0.0458	0.1275	0.0458	Z
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		18	34.3882	2.1988	-35.4631	34.5425	2.1070	-35.3879	-0.1543	0.0918	0.0752	0.1947	0.0752	Z
V         20         32.599         -7.319         -33.502         33.493         -34.943         -0.1056         0.0067         0.1105         0.0080         Z           V         21         22.9483         10.302         -38.4912         10.916         -0.0195         0.0076         0.0080         Z           22         28.510         6.0937         -38.492         28.711         6.0237         -38.4963         -0.1133         0.0078         0.0429         0.1436         0.0443         Z           24         28.8157         0.6583         -38.178         28.2518         -0.769         -38.0912         -0.0661         -0.1056         0.0466         0.1330         0.0466         Z           25         27.1490         5.3722         37.8419         27.2601         5.4101         37.784         0.1111         0.0032         0.1586         0.0132         0.0165         0.1032         0.022         1.1586         0.0032         Z           28         21.6092         3.9788         39.2010         21.7344         38.9017         0.1665         0.0322         0.1560         0.1175         0.0325         0.1197         0.1385         0.0475         Z           29         21.5401 </td <td></td> <td>19</td> <td>33.8448</td> <td>-1.0853</td> <td>-35.3366</td> <td>33.9351</td> <td>-1.1903</td> <td>-35.2723</td> <td>-0.0903</td> <td>-0.1050</td> <td>0.0643</td> <td>0.1527</td> <td>0.0643</td> <td>Z 7</td>		19	33.8448	-1.0853	-35.3366	33.9351	-1.1903	-35.2723	-0.0903	-0.1050	0.0643	0.1527	0.0643	Z 7
C         21         25.242         10.3930         38.4563         -0.0239         0.1078         0.00480         0.1189         0.0429         Z           22         22.5510         6.0937         -38.4992         28.7214         10.1940         -38.4563         -0.1170         0.0708         0.0443         0.1489         0.0429         Z           23         28.3726         2.8454         -38.3500         28.4659         2.7676         -38.3467         -0.1133         0.0466         0.1330         0.0466         Z           24         28.1857         -0.6533         -38.1378         28.221697         10.9700         -39.3922         -0.9966         0.1167         0.0032         0.1528         0.0032         Z           25         27.1490         7.5476         -39.3290         21.9628         7.4373         -39.1813         -0.1030         0.0132         0.1666         0.0122         Z           28         21.6092         3.9798         39.2010         21.7394         -3.84511         -0.0165         -0.0084         0.0405         0.1122         0.0405         Z           29         21.5440         -0.2462         -38.5413         21.4508         -4.6310         -38.5418		20	32.5590	-7.3197	-35.0322	32.0309	10 10/6	-34.9455	-0.0919	-0.1096	0.0007	0.1073	0.0007	7
1         23         28.3726         2.3845         -38.382         28.4767         -38.3767         -0.1133         0.0778         0.0412         0.1033         0.0422         2           24         28.1767         -0.6583         -38.1378         28.2518         -0.7639         -38.3167         -0.1133         0.0778         0.0416         0.1330         0.0466         Z           25         27.1490         -5.3722         -37.8149         27.2601         -5.4101         -37.7854         0.0116         -0.0379         0.0666         0.1330         0.0466         Z           26         22.0711         11.0867         -39.3954         22.1697         10.9700         -39.3824         0.0118         0.0122         0.1506         0.0172         2           27         21.8610         -0.2462         -38.9422         21.7099         -0.3346         -38.917         0.1659         0.0084         0.0405         0.1977         0.1560         0.0425         Z           30         21.3774         4.5522         -38.843         21.4508         -4.8310         -38.941         0.0734         0.0425         0.1153         0.0425         0.1153         0.0425         0.1153         0.0425         0.1153     <	(Z)	21	29.2403	6 0937	-38 /002	29.2722	6.0237	-38.4563	-0.0239	0.1070	0.0000	0.1105	0.0000	7
Q         24         28.1857         -0.6583         -38.1378         28.2518         -0.7639         -38.0912         -0.0661         -0.1056         0.0466         0.1330         0.0466         Z           26         22.0711         11.0867         -39.3954         22.1697         10.9700         -39.3922         -0.0986         0.1167         0.0032         0.1528         0.0032         Z           27         21.610         7.5476         -39.3920         21.9628         7.4373         -39.3168         0.01167         0.0032         0.1528         0.0032         Z         2           28         21.6902         3.9798         -39.201         21.7394         3.9436         -38.9017         0.1659         0.00884         0.0405         0.1923         0.0405         Z           29         21.5440         0.2462         -38.9422         21.7099         -0.3346         -38.9017         0.1659         -0.0884         0.0405         0.1923         0.0405         Z         Z           30         21.3774         45.522         38.5418         -0.0774         0.0458         -0.0774         0.0168         0.0616         0.1663         0.2040         0.1663         Z         Z         34	, L	23	28 3726	2 8454	-38 3580	28 4859	2 7676	-38 3167	-0.1133	0.0700	0.0413	0.1005	0.0413	7
X         25         27.1490         -5.3722         -37.8419         27.2001         -5.4101         -37.7854         -0.1111         -0.0379         0.0565         0.1303         0.0565         Z           26         22.0711         11.0867         -39.3924         22.1697         10.9700         -39.3922         -0.0386         0.1167         0.0032         0.1528         0.0032         Z         2           27         21.8610         7.5476         -39.3200         21.9734         3.9439         -39.3168         -0.1018         0.1103         0.0122         0.1566         0.0132         0.2566         0.1336         0.0197         Z           29         21.5440         -0.2462         -38.9422         21.709         -0.3346         -38.9017         -0.1659         -0.0884         0.0405         0.1923         0.0405         Z           30         21.3774         4.522         -38.5483         21.4514         -0.0734         -0.0786         0.0425         0.1158         0.0425         Z         Z           31         54.6420         14.8860         -21.7074         54.7960         -13.3953         -26.1599         -0.1008         -0.0617         0.1133         0.1234         Z         Z<	8	24	28,1857	-0.6583	-38,1378	28.2518	-0.7639	-38.0912	-0.0661	-0.1056	0.0466	0.1330	0.0466	Z
26         22.0711         11.0867         -39.3954         22.1697         10.9700         -39.3922         -0.0986         0.1167         0.0032         0.1528         0.0032         Z           27         21.8610         7.5476         -39.3290         21.9628         7.4373         -39.3168         -0.1018         0.1103         0.0122         0.1566         0.0122         Z           28         21.6902         3.9798         -39.2901         21.7344         3.9439         -39.181         -0.1320         0.0359         0.0197         0.1565         0.0197         Z           29         21.5440         -0.2462         -38.9422         21.7099         -0.346         -38.9017         -0.1659         -0.0884         0.0405         0.1158         0.0425         Z           31         54.6420         -14.8660         -21.7074         54.7035         -14.8926         -21.5514         -0.0615         -0.0322         0.1568         0.2030         0.1538         Z         Z           32         51.6258         1.42276         -23.8748         -12.83493         0.0998         -0.0617         0.1234         0.1707         0.3222         Y           45         40.0247         -11.3985 <t< td=""><td>Ϋ́</td><td>25</td><td>27.1490</td><td>-5.3722</td><td>-37.8419</td><td>27.2601</td><td>-5.4101</td><td>-37.7854</td><td>-0.1111</td><td>-0.0379</td><td>0.0565</td><td>0.1303</td><td>0.0565</td><td>Z</td></t<>	Ϋ́	25	27.1490	-5.3722	-37.8419	27.2601	-5.4101	-37.7854	-0.1111	-0.0379	0.0565	0.1303	0.0565	Z
27         21.8610         7.5476         -39.3290         21.9628         7.4373         -39.3168         -0.1018         0.1103         0.0122         0.1506         0.0122         Z           28         21.6092         3.9798         -39.2010         21.7394         3.9439         -39.8181         -0.1302         0.0355         0.0197         0.1365         0.0197         Z           29         21.5440         -0.2462         -38.6432         21.7099         -0.3346         -38.9017         -0.1659         -0.0884         0.0405         0.1923         0.0405         Z           30         21.3774         4.5522         -38.6432         21.4508         -6.6310         -38.5418         -0.0754         0.0425         0.1158         0.0425         0.1158         0.0425         Z         5.33         47.8600         -13.3337         -26.3262         47.9608         -13.3953         -26.1599         -0.1008         -0.0616         0.1663         0.2040         0.1633         2.2040         0.1234         Z         Z         3.347         4.4.946         -2.4514         -2.61599         -0.0108         -0.0616         0.1663         0.2040         0.1234         Z         Z         3.3         3.333         -10.2130 <td></td> <td>26</td> <td>22.0711</td> <td>11.0867</td> <td>-39.3954</td> <td>22.1697</td> <td>10.9700</td> <td>-39.3922</td> <td>-0.0986</td> <td>0.1167</td> <td>0.0032</td> <td>0.1528</td> <td>0.0032</td> <td>Z</td>		26	22.0711	11.0867	-39.3954	22.1697	10.9700	-39.3922	-0.0986	0.1167	0.0032	0.1528	0.0032	Z
28         21.6092         3.9798         -39.2010         21.7394         3.9439         -39.1813         -0.1302         0.0359         0.0197         0.1365         0.0197         Z           29         21.5440         -0.2462         -38.9422         21.7099         -0.336         -38.5017         -0.1659         -0.0884         0.0405         0.1923         0.0405         Z           30         21.3774         4-5.522         -38.5843         21.4508         -4.6310         -38.5418         -0.0734         0.0425         0.1158         0.0405         Z           31         54.6420         -14.8660         -21.7074         54.7035         -14.8982         -21.5514         -0.0615         -0.0322         0.1560         0.1707         0.1538         Z           33         47.8600         -13.3337         -26.3262         47.9608         -13.3953         -26.1599         -0.108         -0.0616         0.1663         0.2040         0.1633         Z           34         44.4946         12.4513         -38.5149         -0.0505         -0.1146         -0.0796         0.1194         0.1836         0.1194         Z         Z           36         35.385         -10.2130         -33.0111		27	21.8610	7.5476	-39.3290	21.9628	7.4373	-39.3168	-0.1018	0.1103	0.0122	0.1506	0.0122	Z
29         21.5440         -0.2462         -38.9422         21.7099         -0.3346         -38.9017         -0.1659         -0.0884         0.0405         0.1923         0.0405         Z           30         21.3774         4.5522         -38.5843         21.4508         -4.6310         -38.5418         -0.0734         0.0738         0.0425         0.1158         0.0425         Z           31         54.6420         -14.8660         -21.0774         54.7035         -14.8982         -21.5514         -0.0615         -0.0322         0.1560         0.1707         0.1588         Z           33         47.8600         -13.3337         -26.3262         47.9608         -13.3953         -26.1599         -0.1008         -0.0616         0.1663         0.2040         0.1638         Z           34         44.4946         -12.4515         -28.4727         44.5944         -12.512         -28.3493         -0.0998         -0.0617         0.1234         0.1703         0.1234         Z           35         40.0247         -11.3985         -30.6699         40.1393         -11.4716         -23.6748         -0.1238         -0.0470         0.1538         0.2030         -0.0322         1.6568         -14.276         -23.8748		28	21.6092	3.9798	-39.2010	21.7394	3.9439	-39.1813	-0.1302	0.0359	0.0197	0.1365	0.0197	Z
30         21.3774         4.5522         -38.5843         21.4508         -4.6310         -38.5418         -0.0734         -0.0788         0.0425         0.1158         0.0425         Z           31         54.6420         -14.8660         -21.7074         54.7035         -14.8982         -21.5514         -0.0125         -0.0322         0.1560         0.1707         0.1560         Z           32         51.6258         -14.2276         -23.6748         -0.1238         -0.0470         0.1538         0.2030         0.1633         Z         Z         51.6258         -0.0470         0.1663         0.2040         0.1663         Z         Z         Z         S1.6258         -14.2276         -23.6748         -0.1238         -0.0470         0.1538         0.2040         0.1663         Z         Z         Z         S1.6420         -14.8660         -12.477         44.5944         -12.5132         -28.3493         -0.098         -0.0617         0.1133         0.1633         0.2040         0.1683         0.2040         0.1683         0.2040         -0.0162         23.25         1.0433         0.3394         Z         Z         S1.6420         -14.8660         -21.7074         54.7035         -14.2746         -23.6748         -0.1238<		29	21.5440	-0.2462	-38.9422	21.7099	-0.3346	-38.9017	-0.1659	-0.0884	0.0405	0.1923	0.0405	Z
Normal         31         54.6420         -14.8660         -21.7074         54.7035         -14.8982         -21.5514         -0.0615         -0.0322         0.1560         0.1707         0.1560         Z           32         51.6258         14.2276         -23.8286         51.7496         14.2276         -23.6748         -0.108         -0.0616         0.1663         0.2040         0.1538         Z           33         47.8600         -13.3337         -26.3262         47.9608         -13.3953         -26.1599         -0.108         -0.0616         0.1663         0.2040         0.1633         Z           34         44.4946         -12.4515         -28.4727         44.5944         -12.5132         -28.3493         -0.0988         -0.0616         0.1194         0.1836         0.1194         Z           36         35.3385         -10.2130         -33.0111         35.8194         -10.6037         -32.1717         -0.4809         -0.3907         0.8394         1.0433         0.8394         Z           31         54.6420         -14.8660         -21.7074         54.7096         -14.2746         -23.6748         -0.1238         -0.0470         0.1588         0.2030         -0.0470         1.9385         -0.6616		30	21.3774	-4.5522	-38.5843	21.4508	-4.6310	-38.5418	-0.0734	-0.0788	0.0425	0.1158	0.0425	Z
N         S         32         51.6258         -14.2276         -23.8286         51.7496         -14.2746         -23.6748         -0.0470         0.1538         0.2030         0.1538         Z           S         33         47.8600         -13.333         -26.3262         47.9608         -13.333         -26.1599         -0.1008         -0.0616         0.1663         0.2040         0.1633         Z           34         44.4946         -12.4515         -28.4727         44.5944         -12.5132         -28.393         -0.0988         -0.0616         0.1663         0.2040         0.1633         Z           36         35.3385         -10.2130         -33.0111         35.8194         -10.6037         -32.1717         -0.4809         -0.3907         0.8394         1.0433         0.8394         Z           31         54.6420         -14.8660         -21.7074         54.7035         -14.8982         -21.5514         -0.0615         -0.0322         0.1538         0.2030         -0.0470         V           32         51.6258         14.2276         -23.8286         51.7496         -14.8746         -23.6748         -0.1238         -0.0470         0.1538         0.2030         -0.0617         V		31	54.6420	-14.8660	-21.7074	54.7035	-14.8982	-21.5514	-0.0615	-0.0322	0.1560	0.1707	0.1560	Z
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	AR Z)	32	51.6258	-14.2276	-23.8286	51.7496	-14.2746	-23.6748	-0.1238	-0.0470	0.1538	0.2030	0.1538	Z
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	, Kirk	33	47.8600	-13.3337	-26.3262	47.9608	-13.3953	-26.1599	-0.1008	-0.0616	0.1663	0.2040	0.1663	Z
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	A-P ∖X,	34	44.4946	-12.4515	-28.4727	44.5944	-12.5132	-28.3493	-0.0998	-0.0617	0.1234	0.1703	0.1234	Z
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	~ ~	35	40.0247	-11.3985	-30.6699	40.1393	-11.4781	-30.5505	-0.1146	-0.0796	0.1194	0.1836	0.1194	Z 7
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		30	35.3365	-10.2130	-33.0111	35.6194	-10.6037	-32.1717	-0.4609	-0.3907	0.6394	1.0433	0.6394	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	~ ~	31	54.6420	-14.8660	-21.7074	54.7035	-14.8982	-21.5514	-0.0615	-0.0322	0.1560	0.1707	-0.0322	Y
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	ΑF	<u> </u>	17 9600	-14.2270	-23.0200	17 0609	12 2052	-23.0740	-0.1230	-0.0470	0.1530	0.2030	-0.0470	r V
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	eral	34	47.0000	-12/1515	-20.3202	47.9000	-12 5132	-20.1399	-0.1008	-0.0010	0.1003	0.2040	-0.0010	V I
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	A-F Lati	35	40 0247	-11 3985	-30 6699	40 1393	-11 4781	-30 5505	-0.1146	-0.0796	0.1204	0.1705	-0.0796	Y
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	_	36	35 3385	-10 2130	-33 0111	35 8194	-10 6037	-32 1717	-0 4809	-0.3907	0.8394	1 0433	-0.3907	Ŷ
N         38         11.7943         -11.821         -29.7457         11.8397         -11.2574         -29.7248         0.0454         0.0455         0.0200         0.0904         0.0002         Z           39         15.4239         -12.4362         -27.0831         15.5006         -12.4921         -27.0866         -0.0753         0.0209         0.0905         0.0000         NA           40         13.1220         -13.6640         -22.9486         13.1791         -13.7276         -22.9189         -0.0571         -0.0636         0.0297         0.0905         0.0297         Z           40         13.1220         -13.6640         -22.9486         13.1791         -13.7276         -22.9189         -0.0571         -0.0636         0.0297         0.0905         0.0297         Z           37         14.0875         -9.6706         -33.2025         14.1604         -9.7605         -33.1698         -0.0753         0.0297         0.0904         -0.0753         Y           38         11.7943         -11.1821         -29.7457         11.8397         -12.4921         -27.0866         -0.0753         0.0209         0.0904         -0.0753         Y           38         11.7943         -11.827         -29.724	<u> ۲ ۲ ۲ ۲</u>	37	14 0875	-9.6706	-33 2025	14 1604	-9 7605	-33 1698	-0.0729	-0.0899	0.0327	0 1203	0.0327	7
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	LAI nun	38	11.7943	-11,1821	-29,7457	11,8397	-11.2574	-29,7248	-0.0454	-0.0753	0.0209	0.0904	0.0209	Z
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	PIL , , Y	39	15.4239	-12.4362	-27.0831	15.5006	-12.4921	-27.0866	-0.0767	-0.0559	-0.0035	0.0950	0.0000	NA
Y         37         14.0875         -9.6706         -33.2025         14.1604         -9.7605         -33.1698         -0.0729         -0.0899         0.0327         0.1203         -0.0899         Y           38         11.7943         -11.1821         -29.7457         11.8397         -11.2574         -29.7248         -0.0454         -0.0753         0.0209         0.0904         -0.0753         Y           39         15.4239         -12.4362         -27.0831         15.5006         -12.4921         -27.0866         -0.0767         -0.0559         -0.0035         0.0905         -0.0559         Y           40         13.1220         -13.6640         -22.9486         13.1791         -13.7276         -22.9189         -0.0571         -0.0636         0.0297         0.0905         -0.0636         Y	Ğ B −	40	13.1220	-13.6640	-22.9486	13.1791	-13.7276	-22.9189	-0.0571	-0.0636	0.0297	0.0905	0.0297	Z
Section         38         11.7943         -11.1821         -29.7457         11.8397         -11.2574         -29.7248         -0.0454         -0.0753         0.0209         0.0904         -0.0753         Y           In graph         39         15.4239         -12.4362         -27.0831         15.5006         -12.4921         -27.0866         -0.0767         -0.0559         -0.0035         0.0950         -0.0559         Y           40         13.1220         -13.6640         -22.9486         13.1791         -13.7276         -22.9189         -0.0571         -0.0636         0.0297         0.0905         -0.0636         Y	КĊ	37	14.0875	-9.6706	-33,2025	14,1604	-9,7605	-33,1698	-0.0729	-0.0899	0.0327	0.1203	-0.0899	Y
ā         ž         39         15.4239         -12.4362         -27.0831         15.5006         -12.4921         -27.0866         -0.0767         -0.0559         -0.0035         0.0950         -0.0559         Y           m         40         13.1220         -13.6640         -22.9486         13.1791         -13.7276         -22.9189         -0.0571         -0.0636         0.0297         0.0905         -0.0636         Y		38	11.7943	-11.1821	-29.7457	11.8397	-11.2574	-29.7248	-0.0454	-0.0753	0.0209	0.0904	-0.0753	Ý
<u>d</u> <u>d</u> 40 13.1220 -13.6640 -22.9486 13.1791 -13.7276 -22.9189 -0.0571 -0.0636 0.0297 0.0905 -0.0636 Y	PIL	39	15.4239	-12.4362	-27.0831	15.5006	-12.4921	-27.0866	-0.0767	-0.0559	-0.0035	0.0950	-0.0559	Y
	Га	40	13.1220	-13.6640	<u>-22.948</u> 6	13.1791	<u>-13.727</u> 6	-22.9189	-0.0571	-0.0636	0.0297	0.0905	-0.0636	Y

A Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment. <sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.

Figure D-29. Occupant Compartment Deformation Data - Set 2, Left, Test No. MOS-7

Date:	6/28/	/2019	_		Test Name:	МС	)S-7			VIN:	KNAI	DE2238965	80563
Year:	20	009	-		Make:	K	lia			Model:		Rio	
							FORMAT						
					VEI	HICLE DE	FORMALI						
				PAS	SENGER	SIDE INT	ERIOR CI	RUSH - S	ET 2				
		Brotoot	Brotost	Drotoct		Poettoot		1	1	1	1		Directions
		Y	V	7	Posttest X	V	Posttest Z	ΔX <sup>A</sup>	ΔY <sup>A</sup>	ΔZ <sup>A</sup>	Total ∆	Crush <sup>B</sup>	for
	POINT	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	Crush <sup>C</sup>
	1	50.6657	32,1856	-20.0062	50.6946	32,1031	-19.9895	-0.0289	0.0825	0.0167	0.0890	0.0890	X. Y. Z
Ω.	2	49.4438	21.5586	-20.5975	49.4464	21.4831	-20.5378	-0.0026	0.0755	0.0597	0.0963	0.0963	X, Y, Z
SH ∕, Z	3	48.6292	12.3939	-20.7029	48.6779	12.3429	-20.6629	-0.0487	0.0510	0.0400	0.0811	0.0811	X, Y, Z
A Y	4	48.3542	32.3774	-13.8203	48.3656	32.4400	-13.8043	-0.0114	-0.0626	0.0160	0.0656	0.0656	X, Y, Z
0	5	47.9347	22.0778	-13.6626	47.9423	22.0175	-13.6199	-0.0076	0.0603	0.0427	0.0743	0.0743	X, Y, Z
	6	44.5256	11.8634	-13.4125	44.5397	11.8344	-13.3477	-0.0141	0.0290	0.0648	0.0724	0.0724	X, Y, Z
ш Ш	7	55.8651	37.5879	1.1542	55.8175	37.6145	1.1274	0.0476	-0.0266	-0.0268	0.0608	-0.0266	Y
ΞΫ£	8	56.7143	37.3875	-3.1257	56.7915	37.3989	-3.0904	-0.0772	-0.0114	0.0353	0.0856	-0.0114	Y
S 4 -	9	59.7861	37.3735	-3.0902	59.7444	37.3909	-3.1312	0.0417	-0.0174	-0.0410	0.0610	-0.0174	Y
ш	10	27.1750	40.1908	-18.0353	27.1649	40.1453	-18.0863	0.0101	0.0455	-0.0510	0.0691	0.0455	Y
	11	37.9353	39.7044	-17.5795	37.9577	39.6899	-17.5009	-0.0224	0.0145	0.0786	0.0830	0.0145	Y
S R C	12	45.0909	39.4253	-17.2668	45.0800	39.4065	-17.2772	0.0109	0.0188	-0.0104	0.0241	0.0188	Y
Ο Õ Č	13	27.7391	39.9253	-8.9866	27.6859	39.9134	-9.0714	0.0532	0.0119	-0.0848	0.1008	0.0119	Y
AP. I	14	37.8930	39.7389	-8.6578	37.9066	39.7417	-8.7423	-0.0136	-0.0028	-0.0845	0.0856	-0.0028	Y
=	15	44.9699	39.1192	-9.0538	44.9574	39.1192	-9.1214	0.0125	0.0000	-0.0676	0.0687	0.0000	Y
	16	34.8749	12.3951	-35.7320	34.9669	12.3259	-35.7116	-0.0920	0.0692	0.0204	0.1169	0.0204	Z
	17	34.9890	17.2779	-35.6823	35.0217	17.2292	-35.6869	-0.0327	0.0487	-0.0046	0.0588	-0.0046	Z
	18	34.8618	20.5852	-35.6180	34.8582	20.5602	-35.6408	0.0036	0.0250	-0.0228	0.0340	-0.0228	Z
	19	34.3118	24.6984	-35.5512	34.3636	24.6447	-35.5719	-0.0518	0.0537	-0.0207	0.0774	-0.0207	Z
	20	33.6761	30.1656	-35.3079	33.7023	30.0860	-35.3515	-0.0262	0.0796	-0.0436	0.0945	-0.0436	Z
Ω.	21	29.2068	13.3095	-38.5589	29.3047	13.1953	-38.5437	-0.0979	0.1142	0.0152	0.1512	0.0152	Z
	22	28.6684	17.4501	-38.6041	28.7256	17.4168	-38.6066	-0.0572	0.0333	-0.0025	0.0662	-0.0025	Z
ЪF	23	28.2518	20.3712	-38.5788	28.2650	20.2716	-38.5988	-0.0132	0.0996	-0.0200	0.1024	-0.0200	Z
õ	24	28.0276	24.0152	-38.4272	28.1080	23.8705	-38.4499	-0.0804	0.1447	-0.0227	0.1671	-0.0227	Z
LL.	25	27.5043	28.7480	-38.1417	27.5835	28.6927	-38.1728	-0.0792	0.0553	-0.0311	0.1015	-0.0311	Z
	26	23.1315	13.8713	-39.3212	23.1596	13.7712	-39.3289	-0.0281	0.1001	-0.0077	0.1043	-0.0077	Z
	27	22.6212	17.3730	-39.3131	22.7337	17.3146	-39.3236	-0.1125	0.0584	-0.0105	0.1272	-0.0105	Z
	28	22.4043	20.5944	-39.2290	22.4792	20.4289	-39.2541	-0.0749	0.1655	-0.0251	0.1834	-0.0251	Z
	29	22.4831	24.3763	-39.0334	22.5153	24.2427	-39.0685	-0.0322	0.1336	-0.0351	0.1418	-0.0351	Z
	30	22.6953	28.1271	-38.7386	22.7627	28.0009	-38.7838	-0.0674	0.1262	-0.0452	0.1500	-0.0452	Z
	31	56.9193	36.6094	-21.7481	56.8624	36.5750	-21.7568	0.0569	0.0344	-0.0087	0.0671	0.0665	X, Y
AR⊑Ω	32	53.4634	36.1388	-24.1798	53.5161	36.1016	-24.1555	-0.0527	0.0372	0.0243	0.0689	0.0444	Y, Z
,≺ iž Ľ	33	50.1126	35.5563	-26.4753	50.1641	35.5138	-26.4493	-0.0515	0.0425	0.0260	0.0717	0.0498	Y, Z
, A lax	34	47.7580	35.1251	-27.9300	47.7825	35.0696	-27.9371	-0.0245	0.0555	-0.0071	0.0611	0.0555	Y
∢≥	35	43.1907	34.2923	-30.4217	43.3194	34.2424	-30.3981	-0.1287	0.0499	0.0236	0.1400	0.0552	Y, Z
	36	38.4722	33.5039	-32.6046	38.5508	33.4351	-32.6196	-0.0786	0.0688	-0.0150	0.1055	0.0688	Y
	31	56.9193	36.6094	-21.7481	56.8624	36.5750	-21.7568	0.0569	0.0344	-0.0087	0.0671	0.0344	Y
ЗAR	32	53.4634	36.1388	-24.1798	53.5161	36.1016	-24.1555	-0.0527	0.0372	0.0243	0.0689	0.0372	Y
리교	33	50.1126	35.5563	-26.4753	50.1641	35.5138	-26.4493	-0.0515	0.0425	0.0260	0.0717	0.0425	Y
-P	34	47.7580	35.1251	-27.9300	47.7825	35.0696	-27.9371	-0.0245	0.0555	-0.0071	0.0611	0.0555	Y
L, A	35	43.1907	34.2923	-30.4217	43.3194	34.2424	-30.3981	-0.1287	0.0499	0.0236	0.1400	0.0499	Y
	36	38.4722	33.5039	-32.6046	38.5508	33.4351	-32.6196	-0.0786	0.0688	-0.0150	0.1055	0.0688	Y
AR	37	15.4413	33.5432	-34.5576	15.5068	33.4516	-34.6336	-0.0655	0.0916	-0.0760	0.1359	0.0916	Y
, K ii F	38	13.8610	35.9827	-30.3149	13.8436	35.9383	-30.3435	0.0174	0.0444	-0.0286	0.0556	0.0477	Χ, Υ
X ax	39	17.3401	37.3609	-26.7099	17.4136	37.2701	-26.8429	-0.0735	0.0908	-0.1330	0.1770	0.0908	<u> </u>
m ≥ ⊂	40	15.3911	38.8174	-22.0565	15.4144	38.7594	-22.1351	-0.0233	0.0580	-0.0786	0.1004	0.0580	Y
β	37	15.4413	33.5432	-34.5576	15.5068	33.4516	-34.6336	-0.0655	0.0916	-0.0760	0.1359	0.0916	Y
al -	38	13.8610	35.9827	-30.3149	13.8436	35.9383	-30.3435	0.0174	0.0444	-0.0286	0.0556	0.0444	Y
ater	39	17.3401	37.3609	-26.7099	17.4136	37.2701	-26.8429	-0.0735	0.0908	-0.1330	0.1770	0.0908	Y
ш	40	15.3911	38.8174	-22.0565	15.4144	38.7594	-22.1351	-0.0233	0.0580	-0.0786	0.1004	0.0580	Y

A Positive values denote deformation as inward toward the occupant compartment, negative values denote deformations outward away from the occupant compartment.

<sup>B</sup> Crush calculations that use multiple directional components will disregard components that are negative and only include positive values where the component is deforming inward toward the occupant compartment. <sup>C</sup> Direction for Crush column denotes which directions are included in the crush calculations. If "NA" then no intrusion is recorded, and Crush will be 0.

Figure D-30. Occupant Compartment Deformation Data - Set 2, Right, Test No. MOS-7



Figure D-31. Exterior Vehicle Crush (NASS) - Front, Test No. MOS-7

Date: Year:	6/28/2019 2009	-	Test Name: Make:	MOS-7 Kia	VIN: Model:	KNADE223 Ri	896580563 o
		-		-			-
			Driver Side Maxin	num Deformations			
	Reference Se	et 1			Reference Se	t 2	
Location	Maximum Deformation <sup>A,B</sup> (in.)	MASH Allowable Deformation (in.)	Directions of Deformation <sup>C</sup>	Location	Maximum Deformation <sup>A,B</sup> (in.)	MASH Allowable Deformation (in.)	Directions o
Roof	0.2	≤ 4	Z	Roof	0.1	≤ 4	Z
Nindshield <sup>D</sup>	0.0	≤ 3	X, Z	Windshield <sup>D</sup>	NA	≤ 3	X, Z
A-Pillar Maximum	0.9	≤ 5	Z	A-Pillar Maximum	0.8	≤ 5	Z
A-Pillar Lateral	-0.3	≤ 3	Y	A-Pillar Lateral	-0.4	≤ 3	Y
B-Pillar Maximum	0.0	≤ 5	Z	B-Pillar Maximum	0.0	≤ 5	Z
B-Pillar Lateral	-0.3	≤ 3	Y	B-Pillar Lateral	-0.1	≤ 3	Y
Toe Pan - Wheel Well	0.1	≤ 9	Х	Toe Pan - Wheel Well	0.1	≤ 9	Z
Side Front Panel	0.0	≤ 12	Y	Side Front Panel	0.1	≤ 12	Y
Side Door (above seat)	0.0	≤ 9	Y	Side Door (above seat)	0.0	≤ 9	Y
Side Door (below seat)	0.0	≤ 12	Y	Side Door (below seat)	0.0	≤ 12	Y
Floor Pan	-0.2	≤ 12	Z	Floor Pan	0.0	≤ 12	Z
Dash - no MASH requirement	0.3	NA	X, Y, Z	Dash - no MASH requirement	0.3	NA	X, Y, Z
Positive values denote deform For Toe Pan - Wheel Well the and Z directions. The direction ntruding into the occupant com If deformation is observered for and recorded.	ation as inward to direction of defrom of deformation for partment. If direction or the windshield th	ward the occupant of ation may include > Toe Pan -Wheel We on of deformation is then the windshield	compartment, negative ( and Z direction. For ell, A-Pillar Maximum s "NA" then no intrusi deformation is meas	ve values denote deformations out r A-Pillar Maximum and B-Pillar Ma: , and B-Pillar Maximum only include ion is recorded and deformation wi ured posttest with an examplar veh	ward away from the kimum the direction e components whe II be 0. hicle, therefore only	e occupant compart n of deformation ma ere the deformation v one set of reference	ment. ay include X, Y, is positive and ce is measured

Figure D-32. Maximum Occupant Compartment Deformation, Left, Test No. MOS-7

Date:	6/28/2019	-	Test Name:	MOS-7	VIN:	KNADE223	896580563
Year	2009	-	Make:	Kia	Model:	R	0
		Pa	ssenger Side Max	cimum Deformations			
	Reference Se	t 1			Reference Se	t 2	
Location	Maximum Deformation <sup>A,B</sup> (in.)	MASH Allowable Deformation (in.)	Directions of Deformation <sup>C</sup>	Location	Maximum Deformation <sup>A,B</sup> (in.)	MASH Allowable Deformation (in.)	Directions o
oof	0.1	<u>≤ 4</u>	Z	Roof	0.0	<u>≤ 4</u>	Z
/indshield <sup>D</sup>	0.0	≤ 3	X, Z	Windshield <sup>D</sup>	NA	≤ 3	X, Z
-Pillar Maximum	0.3	≤ 5	Y, Z	A-Pillar Maximum	0.1	≤ 5	Y
-Pillar Lateral	0.3	≤ 3	Y	A-Pillar Lateral	0.1	≤ 3	Y
-Pillar Maximum	0.2	≤ 5	Y	B-Pillar Maximum	0.1	≤ 5	Y
-Pillar Lateral	0.2	≤ 3	Y	B-Pillar Lateral	0.1	≤ 3	Y
pe Pan - Wheel Well	0.0	≤ 9	Х	Toe Pan - Wheel Well	0.1	≤ 9	Z
ide Front Panel	0.3	≤ 12	Y	Side Front Panel	0.0	≤ 12	Y
ide Door (above seat)	0.2	≤ 9	Y	Side Door (above seat)	0.0	≤ 9	Y
ide Door (below seat)	0.2	≤ 12	Y	Side Door (below seat)	0.0	≤ 12	Y
loor Pan	-0.2	≤ 12	Z	Floor Pan	0.1	≤ 12	Z
ash - no MASH requirement	0.4	NA	X, Y, Z	Dash - no MASH requirement	0.1	NA	X, Y, Z
Positive values denote deform For Toe Pan - Wheel Well the nd Z directions. The direction truding into the occupant com If deformation is observered for nd recorded.	ation as inward to direction of defrom of deformation for partment. If directi r the windshield th	ward the occupant of ation may include > Toe Pan -Wheel We on of deformation is nen the windshield of	compartment, negativ ( and Z direction. For ell, A-Pillar Maximum s "NA" then no intrusi deformation is meas	ve values denote deformations out r A-Pillar Maximum and B-Pillar Max , and B-Pillar Maximum only include on is recorded and deformation wi ured posttest with an examplar veh	ward away from the kimum the directio e components whe II be 0. Licle, therefore only	e occupant compar n of deformation ma ere the deformation y one set of reference	ment. ay include X, Y, is positive and ce is measured
otes on vehicle crush:							

Figure D-33. Maximum Occupant Compartment Deformation, Right, Test No. MOS-7

Appendix E. Accelerometer and Rate Transducer Data Plots, Test No. MOS-5



Figure E-1. 10-ms Average Longitudinal Deceleration (SLICE-1), Test No. MOS-5



Figure E-2. Longitudinal Occupant Impact Velocity (SLICE-1), Test No. MOS-5



Figure E-3. Longitudinal Occupant Displacement (SLICE-1), Test No. MOS-5



Figure E-4. 10-ms Average Lateral Deceleration (SLICE-1), Test No. MOS-5



Figure E-5. Lateral Occupant Impact Velocity (SLICE-1), Test No. MOS-5



Figure E-6. Lateral Occupant Displacement (SLICE-1), Test No. MOS-5



Figure E-7. Vehicle Angular Displacements (SLICE-1), Test No. MOS-5



Figure E-8. Acceleration Severity Index (SLICE-1), Test No. MOS-5



Figure E-9. 10-ms Average Longitudinal Deceleration (SLICE-2), Test No. MOS-5



Figure E-10. Longitudinal Occupant Impact Velocity (SLICE-2), Test No. MOS-5


Figure E-11. Longitudinal Occupant Displacement (SLICE-2), Test No. MOS-5



Figure E-12. 10-ms Average Lateral Deceleration (SLICE-2), Test No. MOS-5



Figure E-13. Lateral Occupant Impact Velocity (SLICE-2), Test No. MOS-5



Figure E-14. Lateral Occupant Displacement (SLICE-2), Test No. MOS-5



Figure E-15. Vehicle Angular Displacements (SLICE-2), Test No. MOS-5



Figure E-16. Acceleration Severity Index (SLICE-2), Test No. MOS-5

Appendix F. Accelerometer and Rate Transducer Data Plots, Test No. MOS-6



Figure F-1. 10-ms Average Longitudinal Deceleration (SLICE-1), Test No. MOS-6



Figure F-2. Longitudinal Occupant Impact Velocity (SLICE-1), Test No. MOS-6



Figure F-3. Longitudinal Occupant Displacement (SLICE-1), Test No. MOS-6



Figure F-4. 10-ms Average Lateral Deceleration (SLICE-1), Test No. MOS-6



Figure F-5. Lateral Occupant Impact Velocity (SLICE-1), Test No. MOS-6



Figure F-6. Lateral Occupant Displacement (SLICE-1), Test No. MOS-6



Figure F-7. Vehicle Angular Displacements (SLICE-1), Test No. MOS-6



Figure F-8. Acceleration Severity Index (SLICE-1), Test No. MOS-6



Figure F-9. 10-ms Average Longitudinal Deceleration (SLICE-2), Test No. MOS-6



Figure F-10. Longitudinal Occupant Impact Velocity (SLICE-2), Test No. MOS-6



Figure F-11. Longitudinal Occupant Displacement (SLICE-2), Test No. MOS-6



Figure F-12. 10-ms Average Lateral Deceleration (SLICE-2), Test No. MOS-6



Figure F-13. Lateral Occupant Impact Velocity (SLICE-2), Test No. MOS-6



Figure F-14. Lateral Occupant Displacement (SLICE-2), Test No. MOS-6



Figure F-15. Vehicle Angular Displacements (SLICE-2), Test No. MOS-6



Figure F-16. Acceleration Severity Index (SLICE-2), Test No. MOS-6

Appendix G. Accelerometer and Rate Transducer Data Plots, Test No. MOS-7



Figure G-1. 10-ms Average Longitudinal Deceleration (SLICE-1), Test No. MOS-7



Figure G-2. Longitudinal Occupant Impact Velocity (SLICE-1), Test No. MOS-7



Figure G-3. Longitudinal Occupant Displacement (SLICE-1), Test No. MOS-7



Figure G-4. 10-ms Average Lateral Deceleration (SLICE-1), Test No. MOS-7



Figure G-5. Lateral Occupant Impact Velocity (SLICE-1), Test No. MOS-7



Figure G-6. Lateral Occupant Displacement (SLICE-1), Test No. MOS-7



Figure G-7. Vehicle Angular Displacements (SLICE-1), Test No. MOS-7



Figure G-8. Acceleration Severity Index (SLICE-1), Test No. MOS-7



Figure G-9. 10-ms Average Longitudinal Deceleration (SLICE-2), Test No. MOS-7



Figure G-10. Longitudinal Occupant Impact Velocity (SLICE-2), Test No. MOS-7



Figure G-11. Longitudinal Occupant Displacement (SLICE-2), Test No. MOS-7



Figure G-12. 10-ms Average Lateral Deceleration (SLICE-2), Test No. MOS-7


Figure G-13. Lateral Occupant Impact Velocity (SLICE-2), Test No. MOS-7



Figure G-14. Lateral Occupant Displacement (SLICE-2), Test No. MOS-7



Figure G-15. Vehicle Angular Displacements (SLICE-2), Test No. MOS-7

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Figure G-16. Acceleration Severity Index (SLICE-2), Test No. MOS-7

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