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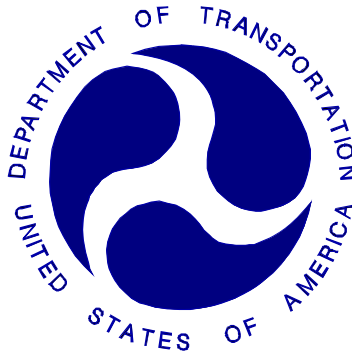
**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

**Toyota Motor Manufacturing
2011 Toyota Sienna LE
7-Passenger Minivan**

NHTSA NUMBER: MB5103

CALSPAN TEST NUMBER: tr2448

**CALSPAN CORPORATION
TRANSPORTATION SCIENCES CENTER
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June 23, 2010

FINAL REPORT

PREPARED FOR:

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

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Date: September 1, 2010

FINAL REPORT ACCEPTANCE BY OCWS:

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

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

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2011 Toyota Sienna LE 7-Passenger Minivan in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at the Calspan Corporation's crash test facility in Buffalo, New York on June 23, 2010. The impact velocity of the vehicle was 56.6 km/h, and the ambient temperature at the barrier face at the time of impact was 21.7°C. The target vehicle post-test maximum crush was 535 mm at Right Side of Vehicle. The test vehicle's performance is as follows:							
		Driver ATD			Pass. ATD		
	Measurement Description	Units	Threshold	Result	Units	Threshold	Result
	Head Injury Criteria (HIC ₁₅)	N/A	700	239	N/A	700	567
	Maximum Chest Compression	mm	63	21	mm	52	29
	Nij	n/a	1	0.27	n/a	1	0.72
	Neck Tension	Newtons	4170	916	Newtons	2620	1094
	Neck Compression	Newtons	4000	60	Newtons	2520	180
	Left Femur Force	Newtons	10008	-1388	Newtons	6805	-2829
	Right Femur Force	Newtons	10008	-2295	Newtons	6805	-1513
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SECTION 1

PURPOSE AND SUMMARY OF TEST

1.1 PURPOSE

This 56.6 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-06-D-00024. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.6 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Indicant Test procedure.

1.2 TEST PROCEDURE

A load cell barrier consisting of 36 load cells was impacted by a 2011 Toyota Sienna LE 7-Passenger Minivan at a velocity of 56.6 kph. The test was performed at Calspan on June 23, 2010. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and 14 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

One Part 572E, 50th percentile male anthropomorphic test devices (ATDs), was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger according to dummy placement instructions specified in the Frontal NCAP Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis triaxial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 061) and the right-front passenger (position 2) ATD (Serial No.273) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 129 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 535 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: Face and Upper Torso with Frontal airbag with the back of head with the head restraint; both knees contacted the knee airbag. The passenger's visible contact points were as follows: Face and Upper Torso with Frontal airbag with the back of head with the head restraint; both knees contacted the glove box.

The occupant data is summarized below.

ATD Position	HIC ₁₅	T ¹	T ²	Chest Disp. (mm)	Nij	Neck Tension (N)	Neck Comp (N)	Left Femur (N)	Right Femur (N)
Driver (50th)	239.3	71.3	86.3	-21	0.27	916	60	-1388	-2295
Passenger (5 th)	567.2	68.8	83.8	-29	0.72	1094	180	-2829	-1513

SECTION 2
DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

TEST VEHICLE INFORMATION

NHTSA No.	MB5103
Make	Toyota
Model	Sienna LE
Body Style	7-Passenger Minivan
VIN	5TDJK3DC9BS002737
Color	Tan
Delivery Date	6/2/2010
Odometer Reading (mi)	184
Odometer Reading (km)	296
Dealer	Romano Toyota
Transmission	6-Speed
Final Drive	Automatic
Type/No. Cyl	VVT/ 6 cylinder
Engine Disp. (L)	3.5
Engine Placement	Transverse
Roof Rack	Yes
Sunroof/T-Top	No
Tinted Glass	No
Traction Control	Yes
Power Brakes	Yes
Front Disc	Yes
Rear Disc	Yes

TEST VEHICLE OPTIONS

Anti-Lock Brakes	Yes
All-Wheel Drive	Yes
Power Steering	Yes
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	Yes
Driver Torso/Pelvis Airbag	No
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Pass. Front Airbag	Yes
Pass. Curtain Airbag	Yes
Pass. Head/Torso Airbag	No
Pass. Torso Airbag	Yes
Pass. Torso/Pelvis Airbag	No
Pass. Pelvis Airbag	No
Pass. Knee Airbag	No
Pretensioners	Yes
Load Limiters	Yes
Automatic Door Locks	Yes
Tilt Steering	Yes
Other	No

Does owner's manual provide instructions to turn off automatic door locks?

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Manufacturing	GVWR (kg)	2715
Date of Manufacture	2/10	GAWR Front (kg)	1405
		GAWR Rear (kg)	1405

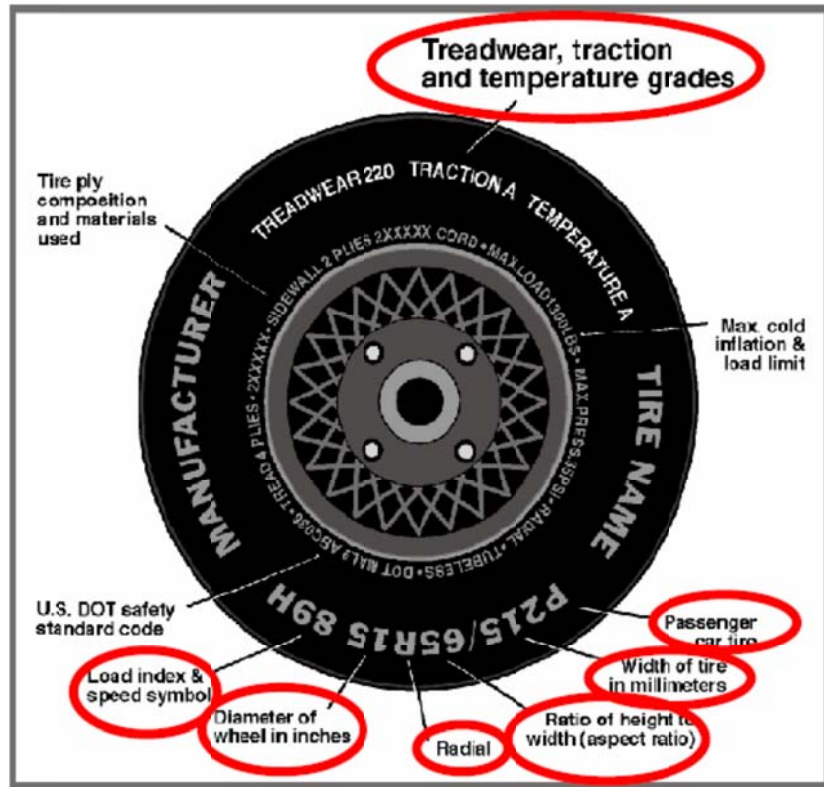
VEHICLE SEATING AND WEIGHT CAPACITY

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket	Split Bench	
Number of Occupants	2	2	3	7
Capacity Wt. (VCW) (kg)				612 *
Cargo Wt. (RCLW) (kg)				135.7

* A separate placard on vehicle stated the vehicle capacity was reduced by 8 kg from the tire placard stated cargo and passenger total weight (VCW)

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

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010



Measured Parameter	Front	Rear
Maximum Tire Pressure	300	300
Cold Pressure (kPa)	240	240
Recommended Tire Size	P235/55R18	P235/55R18
Tire Size on Vehicle	P235/55RF18	P235/55RF18
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Turanza	Turanza
Treadwear	400	400
Traction	B	B
Temperature Grades	B	B
Tire Plies Sidewall	1 Rayon + 2 Steel + 1 Nylon	1 Rayon + 2 Steel + 1 Nylon
Tire Plies Body	2 Rayon	2 Rayon
Load Index/Speed Symbol	99T	99T
Tire Material	-	-
DOT Safety Code Right	EL7C CCB 5009	EL7C CCB 4909
DOT Safety Code Left	EL7C CCB 4909	EL7C CCB 4909

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

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	578.0	465.0		617.0	570.0	
Right	kg	594.0	431.0		602.0	547.5	
Ratio	%	56.7	43.3		52.2	47.8	
Totals	kg	1172.0	896.0	2068.0	1219.0	1117.5	2336.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2068.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	135.7
Calculated Vehicle Target Weight (TVTW)	kg	2344.3

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	788	796	801	805	1312
As Tested	mm	182	791	770	771	1449
Post Test	mm	-	-	-	-	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3029
Total Vehicle Length at Left Side	mm	5038
Total Vehicle Length at Centerline	mm	5089
Total Vehicle Length at Right Side	mm	5038
Weight of Ballast in Cargo Area	kg	132
Weight of Vehicle Components Removed	kg	0
Amount of Stoddard Solvent in Fuel Tank	L	72.7

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT: None

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

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	5089
2	Total Width	1982
3	Bumper Top Height	447
4	Bumper Bottom Height	628
5	Longitudinal Member Top Height	536
6	Distance Between Longitudinal Members	1116
7	Longitudinal Member Width	94
8	Engine Top Height	187
9	Engine Bottom Height	921
10	Engine and Gearbox Width	422
11	Front Bumper-Engine Distance	503
12	Front Shock Absorber Fixing Height	555
13	Bonnet Leading Edge Height	286
14	Front Shock Absorber Fixing Width	-
15	Front Bumper – Front Axle Distance	953
16	Front Axle – A Pillar Distance	423
17	A- Pillar – B-Pillar Distance	1116
18	B-Pillar – Rear Axle Distance	1490
19	B-Pillar – C-Pillar Distance	1225
20	Roof Sill Bottom Height	1585
21	Roof Sill Top Height	1704
22	Floor Sill Bottom Height	411
23	Floor Sill Top Height	443

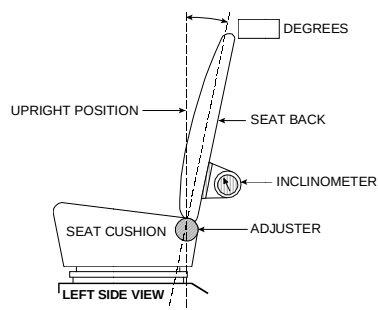
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

NORMAL DESIGN RIDING POSITION

Driver seat: An inclinometer was placed on the head restraint post and the seat was positioned to 3.0 degrees with the ATD in Seat.

Passenger Seat: The seat back was set to the forward-most locked position to achieve the head level requirement for the HYIII 5th female final position.

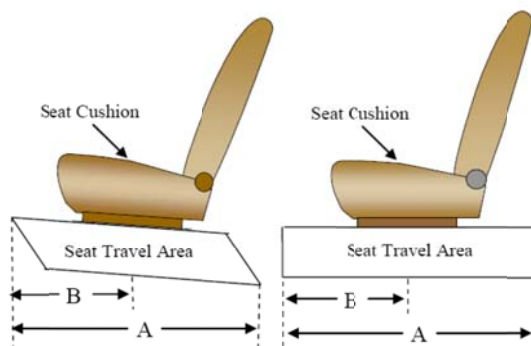


	Deg
Driver Seat Back Angle	3.0
Passenger Seat Back Angle	Head Level

SEAT FORE/AFT POSITIONS

The front left outboard seat was placed in the mid-travel position while the seat cushion was placed in the lowest position. The front right outboard seat was placed in the most forward fore/aft position.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	290	Mid-Travel
Passenger Seat	240	0 (full forward)



SEAT BELT UPPER ANCHORAGES

The driver seating position was placed in the first detent down from full up position. The left rear outboard seating position was placed in the lowest position.

	Total # of Positions	Placed in Position #
Driver Seat	4	2
Passenger Seat	4	4

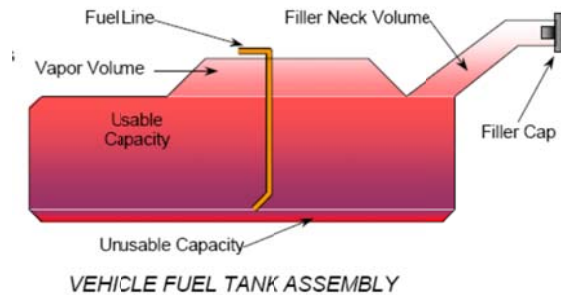
DATA SHEET NO. 2 (CONTINUED)
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

FUEL TANK CAPACITY

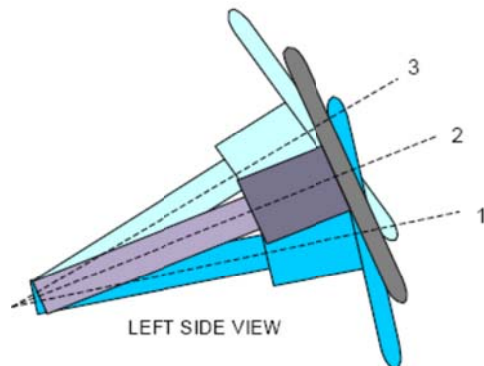
	Liters
Usable Capacity of "Standard Tank"	78.0
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	71.8 – 73.3
Actual Amount of Solvent Used	72.5
1/3 of Usable Capacity	26.0

The fuel pump will operate when the key is in the "ON" position for approximately two seconds. The fuel filler pipe is located left rear side of vehicle.



STEERING COLUMN ADJUSTMENT

A flat plate was placed on the top and bottom of the steering wheel. The inclinometer was placed on the flat plate to measure the angle



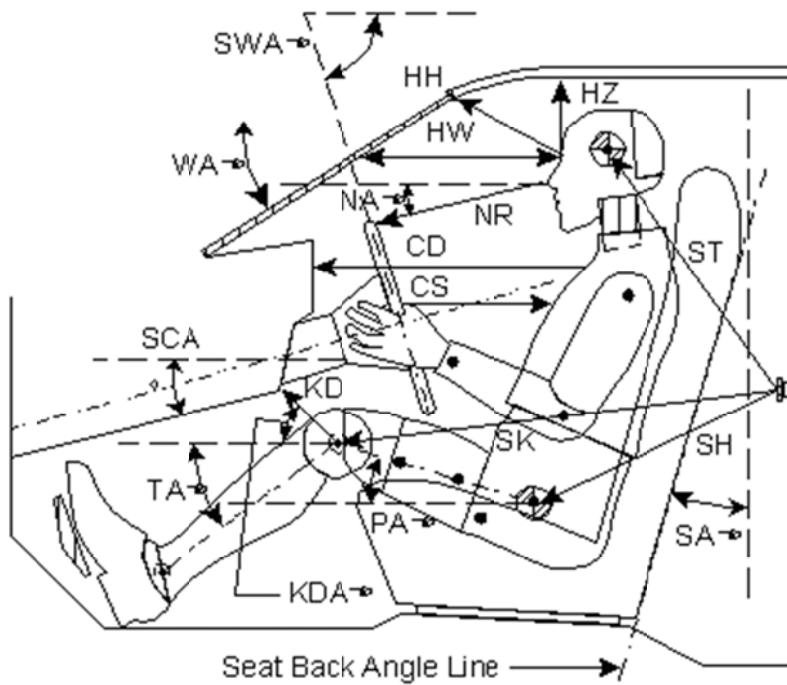
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

	Degrees	Fore/Aft Position (mm)
Lowermost position No. 1	24.7	
Geometric center position No. 2	26.7	
Uppermost position No. 3	28.7	
Telescoping Steering Wheel Travel		40
Test Position	26.7	20

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

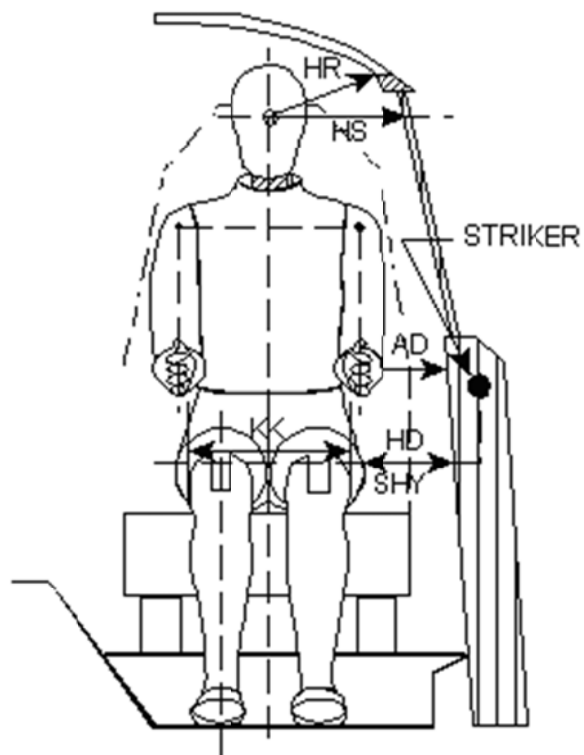
Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010



Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle(°)	Length (mm)	Angle (°)
WA°	Windshield Angle		27.7		
SWA°	Steering Wheel Angle		63.3		
SCA°	Steering Column Angle		26.7		
SA°	Seat Back Angle (on headrest post)		4.3		0.7
HZ	Head to Roof (Z)	278	-	285	
HH	Head to Header	428	26	385	39
HW	Head to Windshield	767	-	745	-
NR	Nose to Rim	410	4	-	-
CD	Chest to Dash	531		-	
CS	Chest to Steering Hub	327	-		
RA	Rim to Abdomen	203	-		
KDL	Left Knee to Dash	175	15	71	-
KDR	Right Knee to Dash	135	-	73	19
PA°	Pelvic Angle		22.1		19.2
TA°	Tibia Angle		51.0		71.0
SK	Striker to Knee	648	98	730	100
ST	Striker to Head	455	71	471	57
SH	Striker to H-Point	326	133	377	120

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

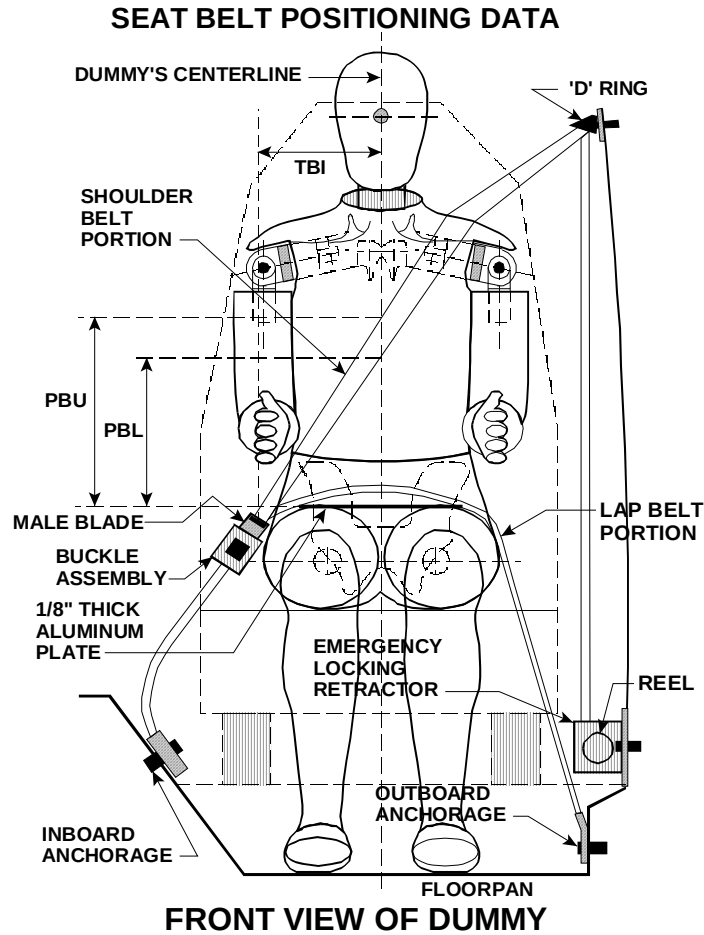
Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010



Code	Description	Driver	Passenger
AD	Arm to Door	142	210
HD	H-Point to Door	147	173
HR	Head to Side Header	275	315
HS	Head to Side Window	382	401
KK	Knee to Knee	325	218
SHY	Striker to H-Point (Y Direction)	300	320
AA	Ankle to Ankle	310	205

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference plate to belt upper edge	mm	360	305
PBL — Top surface of reference plate to belt lower edge	mm	285	220

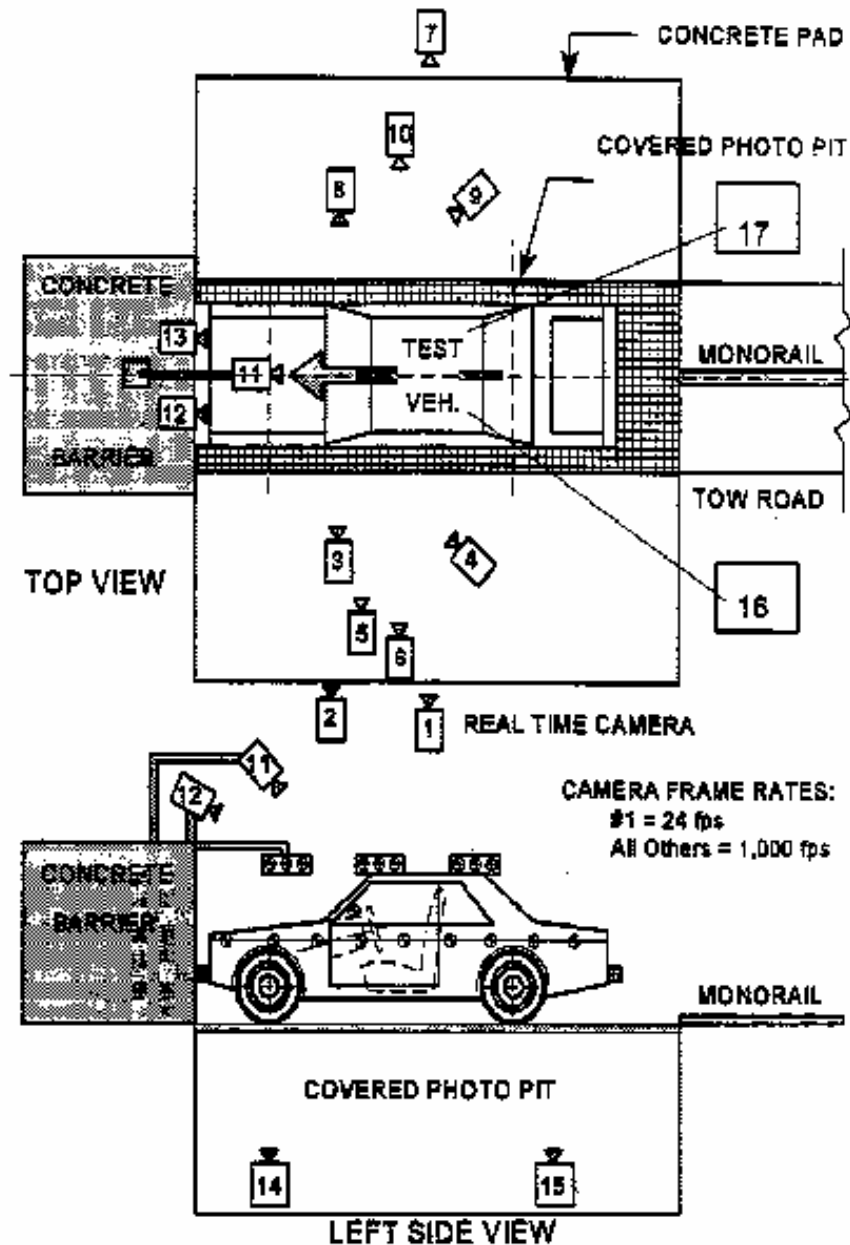
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	900	940
Lap Belt Length as measured on ATD	mm	770	820
Remainder of belt on reel	mm	-	-
Total belt length for continuous webbing systems	mm	1670	1760

DATA SHEET NO. 6
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

CAMERA LOCATIONS

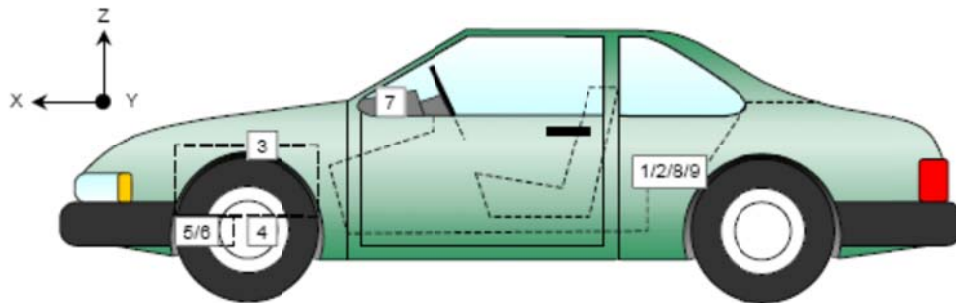
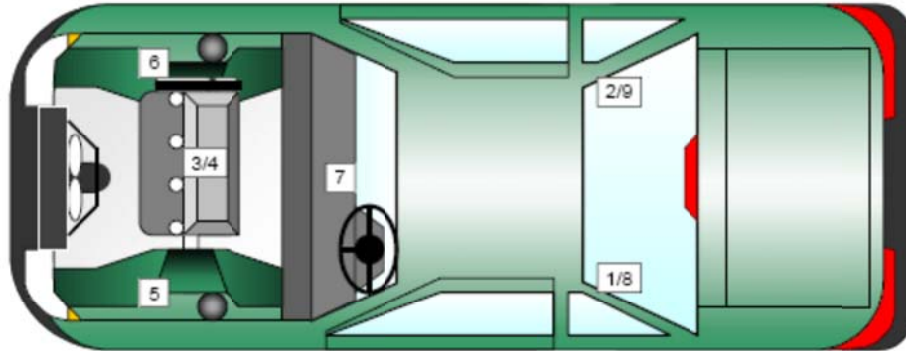
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View	-	-	-	-	24
2	Left Front View	1740	8330	970	28	1000
3	Steering Column Top	2080	7770	1780	24-70	1000
4	Steering Column Bottom	2080	7770	1175	28-70	1000
5	Driver Close-Up	1340	9284	950	50	1000
6	Driver Angle	2870	6436	1950	50	1000
7	Right Overall	1960	7780	930	24	1000
8	Right Passenger Half	1910	8430	1160	50	1000
9	Right Close-Up	1430	9350	920	50	1000
10	Right Angle	2820	5702	1820	50	1000
11	Windshield	0	-530	3374	25	500
12	Top Driver	620	-92	1987	24	500
13	Top Passenger	620	-92	1987	24	500
14	Pit Front	0	615	-3048	12.5	1000
15	Pit Rear	0	2870	-3048	12.5	1000
16	Onboard Driver Side (Optional)	N/A	N/A	N/A	N/A	N/A
17	Onboard Passenger Side (Optional)	N/A	N/A	N/A	N/A	N/A

* COORDINATES:

- +X = forward of impact plane
- +Y = right of monorail center
- +Z = into ground

DATA SHEET NO. 7
VEHICLE ACCELEROMETER DATA

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	2484	-727	466
2	Right Rear X-Member X	2486	725	649
3	Engine Top X	4387	372	278
4	Engine Bottom X	-	-	-
5	Left Brake Caliper X	4107	-709	716
6	Right Brake Caliper X	4083	636	415
7	Instrument Panel X	-	-	-
8	Left Rear X-Member Z	2484	-727	466
9	Right Rear X-Member Z	2486	725	649

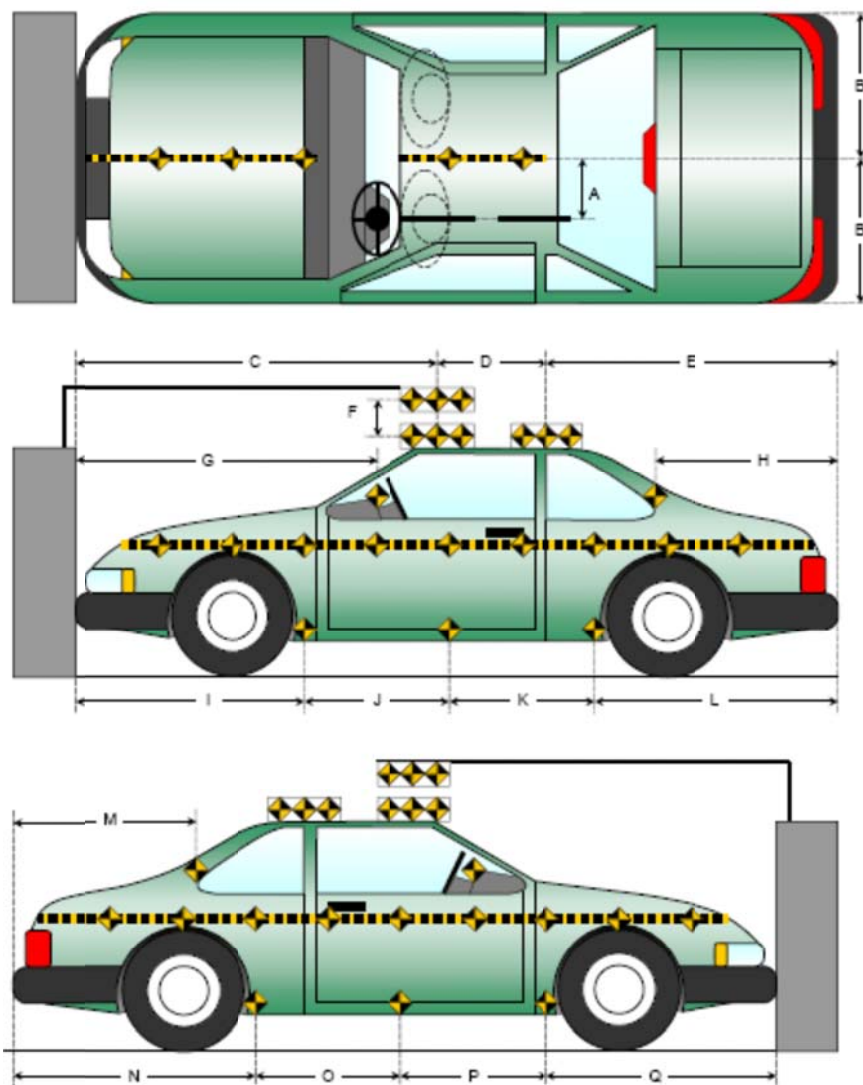
Reference Points: X – Rear Surface of Vehicle (+ forward)
 Y – Vehicle Centerline (+ to right)
 Z – Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

Item	Value
A	424
B	991
C	2376
D	1219
E	1494
F	-
G	-
H	1382
I	1421
J	1047
K	1051
L	1569
M	1382
N	1569
O	1050
P	1051
Q	1419

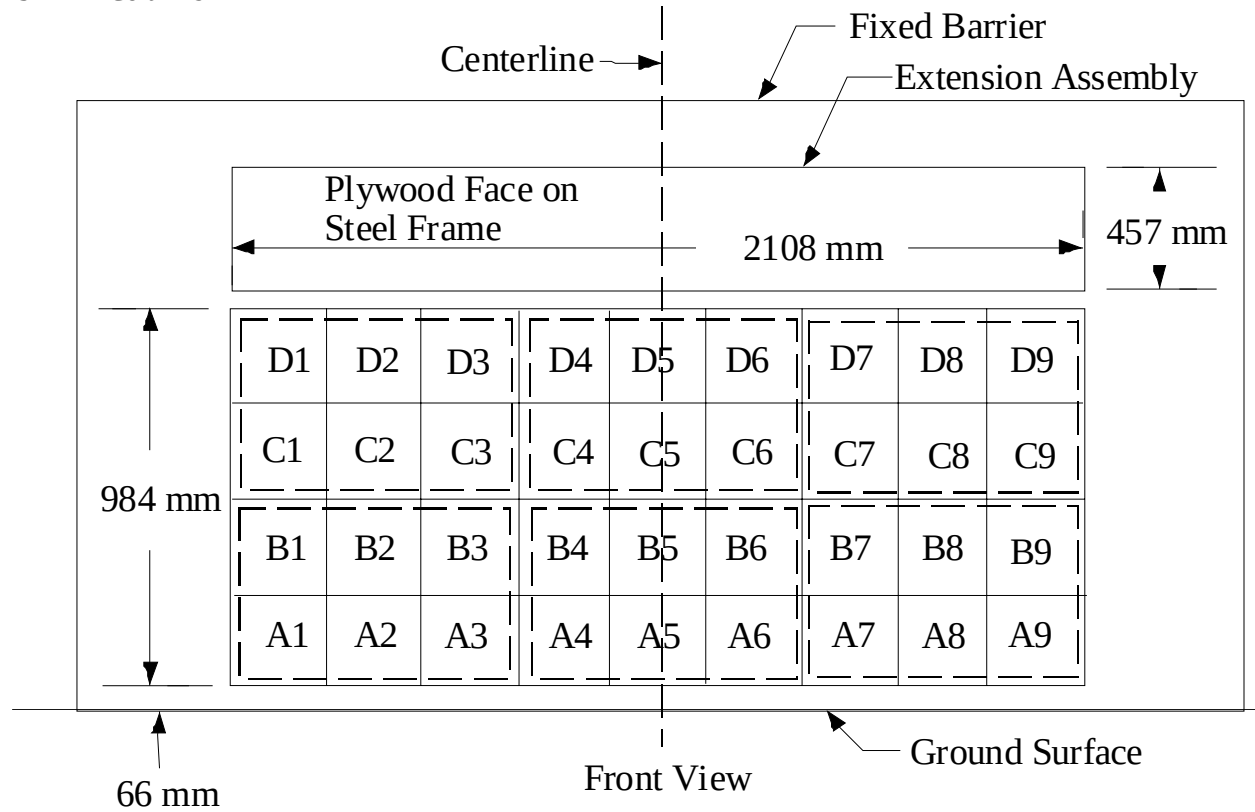
All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

36 Load Cells
 4 Rows
 9 Columns



DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2011 Toyota Sienna NHTSA No: MB5103
Test Program: Frontal NCAP Test Date June 23, 2010

INSTRUMENTATION

Driver Dummy Channels	40
Passenger Dummy Channels	40
Belt load cells	4
Vehicle Structure Accelerometers	8
Barrier load cells	36
Total	128

CAMERA COVERAGE

High-Speed Vehicle Onboard	0
High-Speed Offboard	14
Real-Time Panning	1
Total	15

DATA SHEET NO. 11
POST TEST OBSERVATIONS

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

TEST DUMMY INFORMATION AND CONTACT

Description	Driver	Passenger
Dummy Type/Serial No.	061	273
Head Contact	Face - Frontal Airbag Back of head – Head restraint	Face - Frontal Airbag Back of head – Head restraint
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	No Contact	No Contact
Left Knee Contact	Knee Airbag	Glove Box
Right Knee Contact	Knee Airbag	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed/Operational	Closed/Operational
Rear Door Opening	Closed/Operational	Closed/Operational
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None
Glazing Damage	None	

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracking on lower left side
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

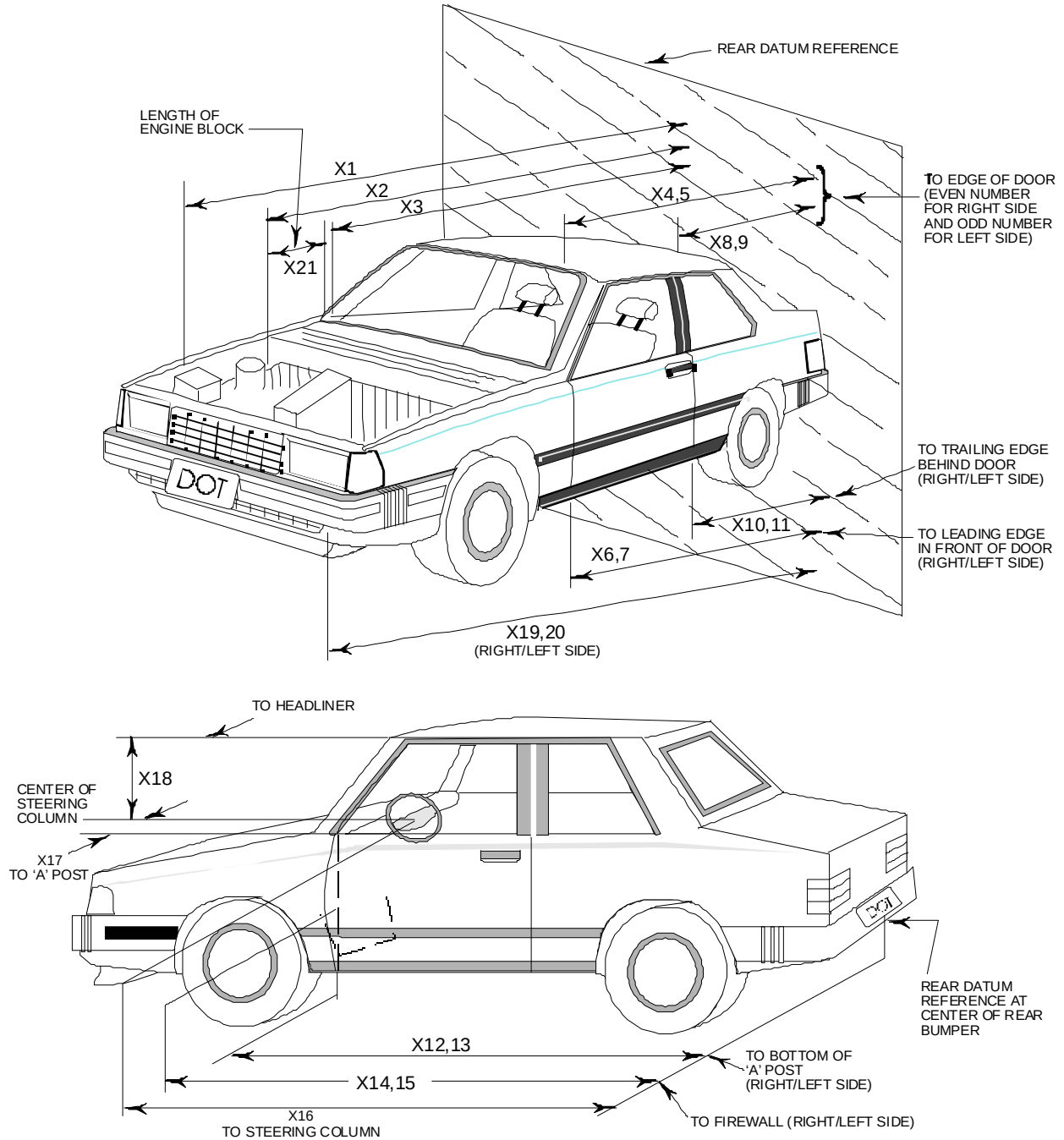
Measured Parameter	Units	Value
Left Side	mm	723
Center	mm	791
Right Side	mm	828
Average	mm	781

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Installed	Operated	Installed	Operated
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 – Side Curtain	Yes	No	Yes	No
Side Airbag 2 – Side Torso	Yes	No	Yes	No
Knee Airbag	Yes	Yes	No	No
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes

DATA SHEET NO. 12 **VEHICLE PROFILE MEASUREMENTS**

Test Vehicle:	<u>2011 Toyota Sienna</u>	NHTSA No:	<u>MB5103</u>
Test Program:	<u>Frontal NCAP</u>	Test Date	<u>June 23, 2010</u>



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	5089	4617	472
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4586	4354	232
3	RSOV to Firewall	4297	4247	50
4	RSOV to Upper Leading Edge of Right Door	3712	3711	1
5	RSOV to Upper Leading Edge of Left Door	3712	3714	-2
6	RSOV to Lower Leading Edge of Right Door	3627	3625	2
7	RSOV to Lower Leading Edge of Left Door	3622	3627	-5
8	RSOV to Upper Trailing Edge of Right Door	2603	2601	2
9	RSOV to Upper Trailing Edge of Left Door	2604	2604	0
10	RSOV to Lower Trailing Edge of Right Door	2609	2608	1
11	RSOV to Lower Trailing Edge of Left Door	2608	2614	-6
12	RSOV to Bottom of "A" Post of Right Side	3866	3864	2
13	RSOV to Bottom of "A" Post of Left Side	3864	3867	-3
14	RSOV to Firewall, Right Side	4257	4146	111
15	RSOV to Firewall, Left Side	4246	4221	25
16	RSOV to Steering Column	3258	3298	-40
17	Center of Steering Column to "A" Post	312	300	12
18	Center of Steering Column to Headliner	447	465	-18
19	RSOV to Right Side of Front Bumper	5038	4503	535
20	RSOV to Left Side of Front Bumper	5038	4565	473
21	Length of Engine Block	529	529	0
RD	RSOV to Right Side of Dash Panel	3457	3452	5
CD	RSOV to Center of Dash Panel	3504	3496	8
LD	RSOV to Left Side of Dash Panel	3456	3456	0

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

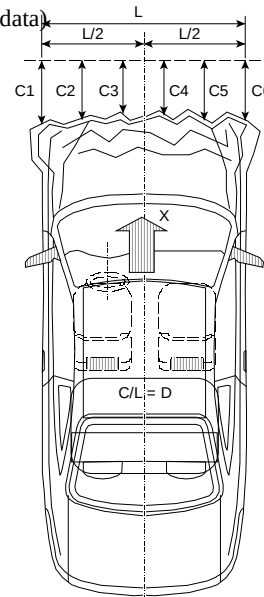
Test Vehicle: 2011 Toyota Sienna NHTSA No: MB5103
 Test Program: Frontal NCAP Test Date: June 23, 2010

VEHICLE INFORMATION

VIN 5TDJK3DC9BS002737 Wheelbase (mm) 3029
 Vehicle Size Category Minivan Test Weight (kg) 2336.5

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on page 2-13
 Cal. Procedure/Interval: Calspan Procedure / 6 month
 Integration Algorithm: Trapezoidal Linearity: > 99%
 Impact Velocity (km/h): 56.6
 Velocity Change (km/h): Could not be measured (Questionable accelerometer data)
 Time of Separation (msec): Could not be measured



CRUSH PROFILE

Collision Deformation Classification: 12FDEW4
 Midpoint of Damage: 861
 Damage Region Length (mm): 1722
 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4839	4493	346
C2	Crush zone 2 at left side	mm	5024	4545	479
C3	Crush zone 3 at left side	mm	5081	4610	471
C4	Crush zone 4 at right side	mm	5081	4609	472
C5	Crush zone 5 at right side	mm	5025	4501	524
C6	Crush zone 6 at right side	mm	4843	4591	252
L	C1 to C6	mm	1722		

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

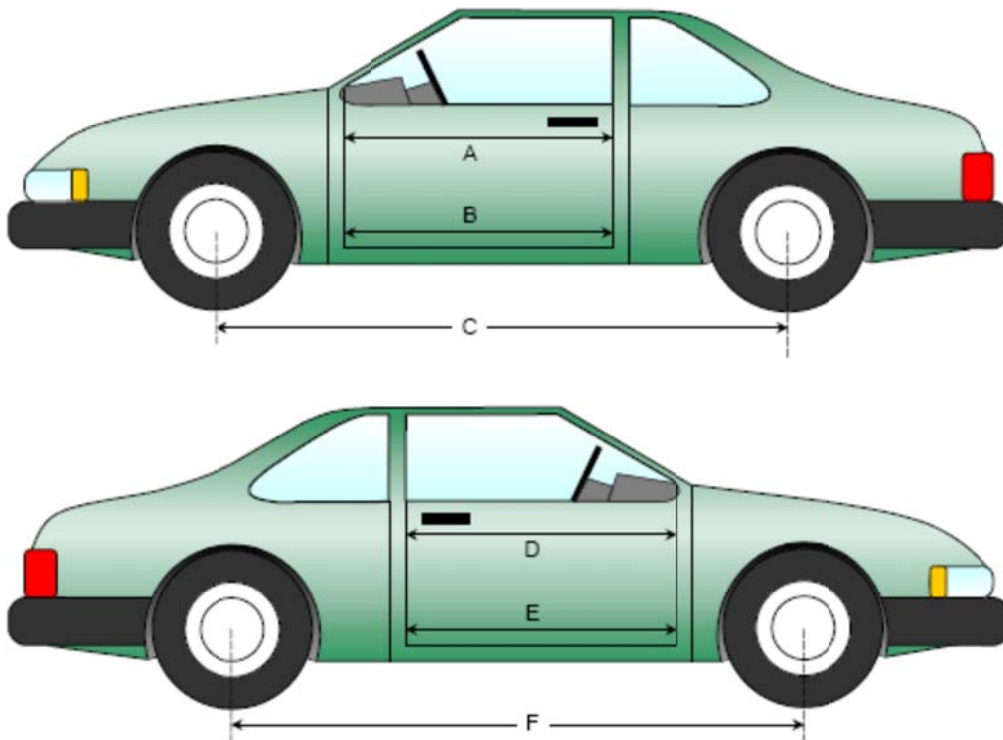
Test Vehicle: 2011 Toyota Sienna NHTSA No: MB5103
Test Program: Frontal NCAP Test Date: June 23, 2010

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1108	1110	-2
B	Left Side Lower	mm	1014	1013	1
D	Right Side Upper	mm	1109	1110	-1
E	Right Side Lower	mm	1018	1017	1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3029	2946	84
F	Right Side Wheelbase	mm	3029	2926	101



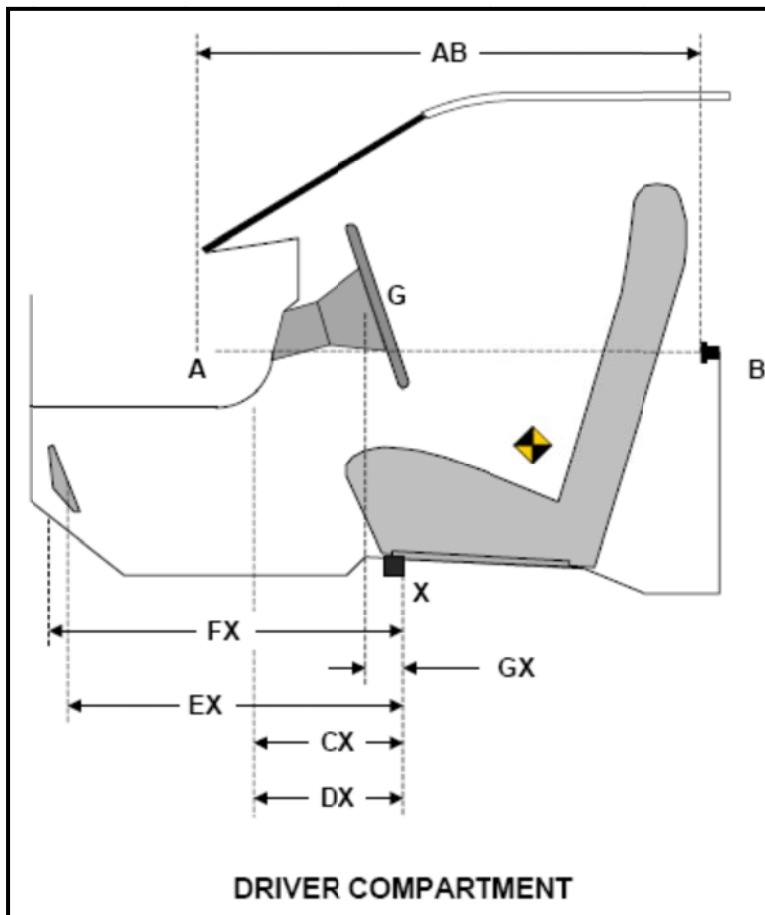
DATA SHEET NO.14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Toyota Sienna NHTSA No: MB5103
 Test Program: Frontal NCAP Test Date: June 23, 2010

DRIVER COMPARTMENT INTRUSION

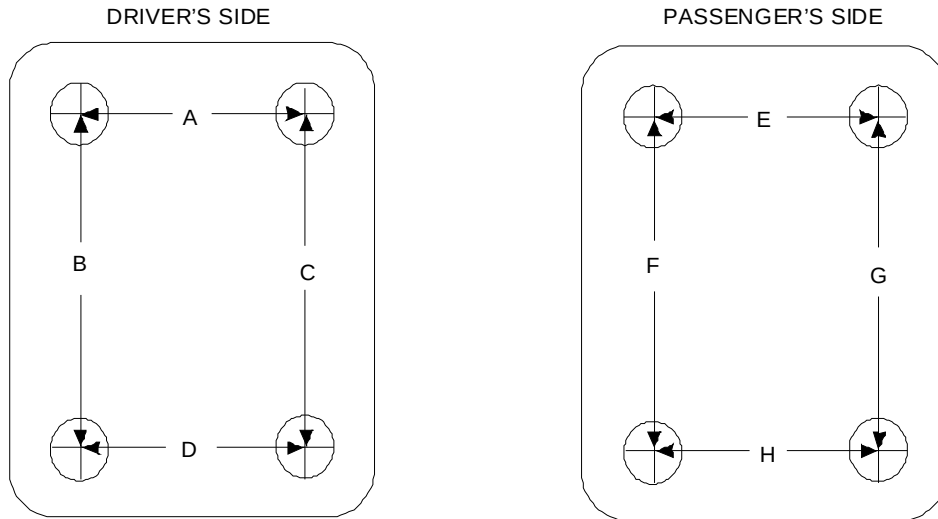
Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	1005	1005	0
CX	Left Knee Bolster to X	mm	326	323	3
DX	Right Knee Bolster to X	mm	318	308	10
EX	Brake Pedal to X	mm	539	536	3
FX	Foot Rest to X	mm	-	-	-
GX	Center of Steering Column Wheel Hub to X	mm	74	115	41

X = Front of Seat Track (Stationary)



DATA SHEET NO.14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Toyota Sienna NHTSA No: MB5103
 Test Program: Frontal NCAP Test Date June 23, 2010



TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	572	559	13
B	285	298	-13
C	299	274	25
D	593	580	13
E	566	559	6
F	349	342	7
G	333	312	21
H	586	580	6

All units in millimeters

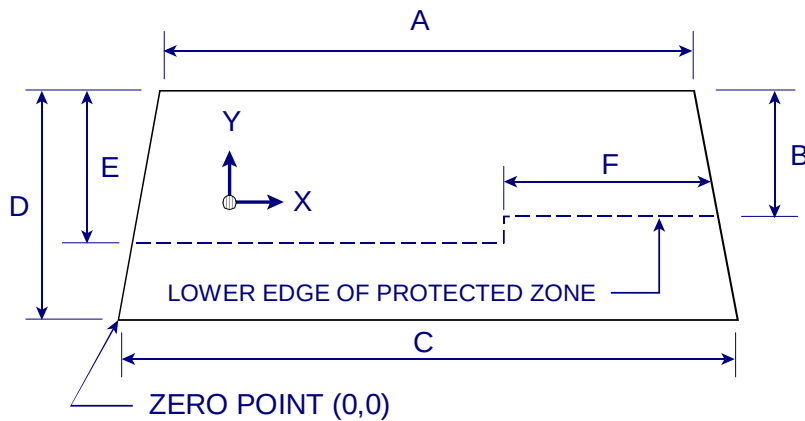
DATA SHEET NO. 15
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.
 The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.
 Temperature of windshield molding during test: 21.3°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2395	2395	100
Right Side	2395	2395	100
Total	4790	4790	100



Item	Units	Value
A	mm	1380
B	mm	616
C	mm	1680
D	mm	865
E	mm	616
F	mm	630

AREAS OF PROTECTED ZONE FAILURES

A. Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.

X	Y
-	-
-	-
-	-
-	-

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

X	Y
-	-
-	-
-	-
-	-

DATA SHEET NO. 15 (CONTINUED)
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle:	<u>2011 Toyota Sienna</u>	NHTSA No:	<u>MB5103</u>
Test Program:	<u>Frontal NCAP</u>	Test Date	<u>June 23, 2010</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

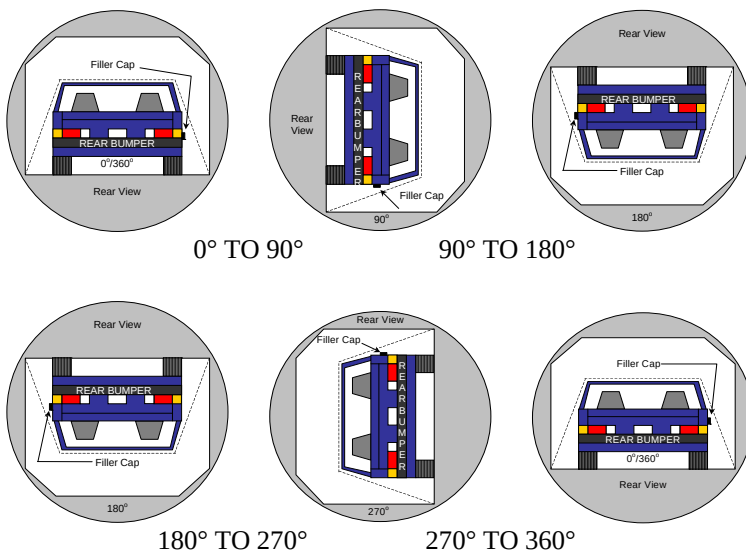
Temperature at Time of Impact: 21.7° C Test Time: 3:49 PM

Stoddard Solvent Spillage Measurements

A.	From impact until vehicle motion ceases: (Maximum allowable = 1 oz.)	<u>0</u>	oz
B.	For the 5-minute period after motion ceases: (Maximum allowable = 5 oz.)	<u>0</u>	oz
C.	For the following 25 minutes: (Maximum allowable = 1 oz./minute)	<u>0</u>	oz
D.	Spillage	<u>0</u>	oz

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
2. Details of Stoddard Solvent spillage:
None

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	1:08	5:00	6:08
90° to 180°	1:07	5:00	6:07
180° to 270°	1:02	5:00	6:02
270° to 360°	1:09	5:00	6:09

FMVSS 301 SPILLAGE TABLE

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

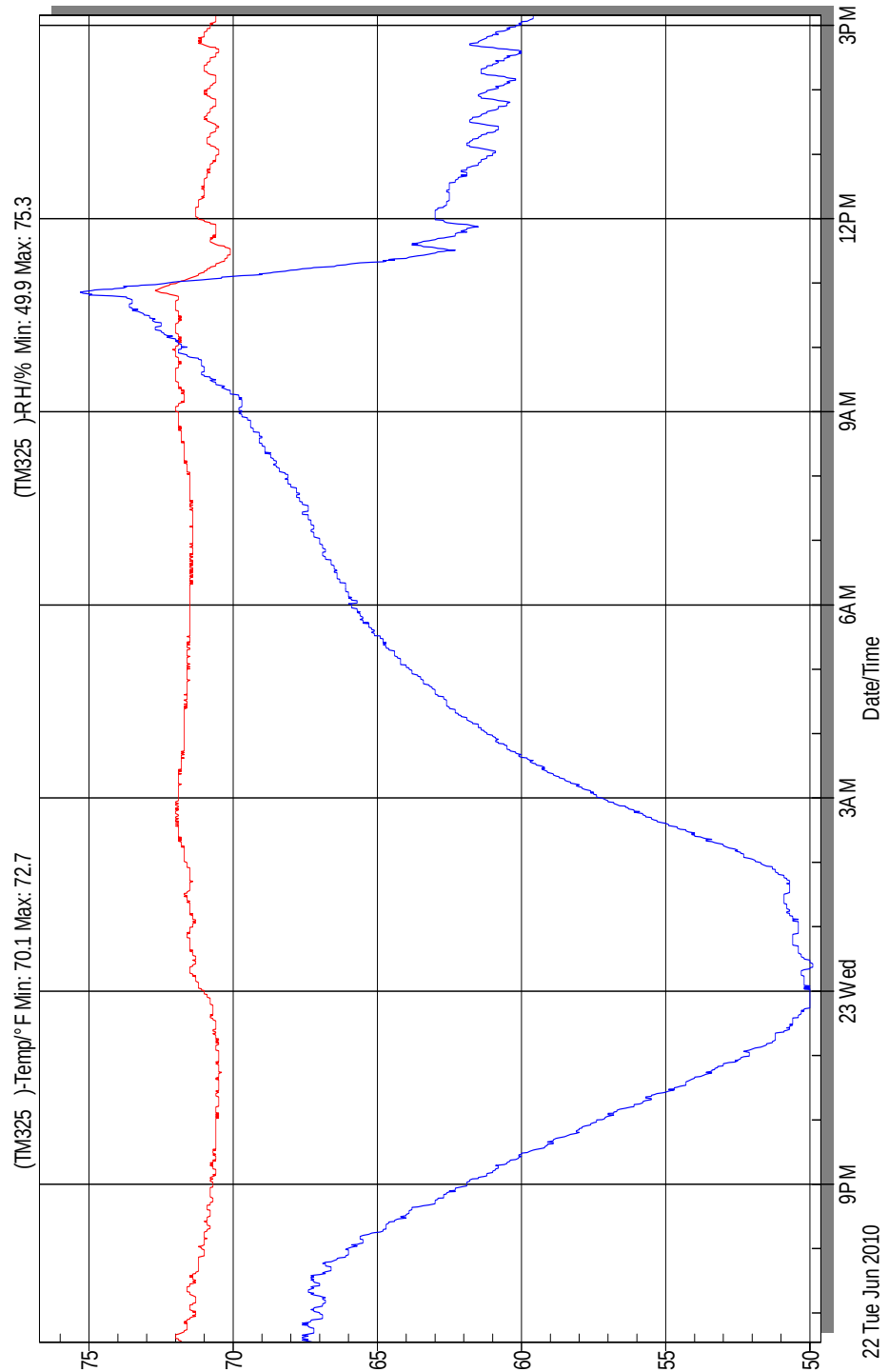
SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle:	2011 Toyota Sienna	NHTSA No:	MB5103
Test Program:	Frontal NCAP	Test Date	June 23, 2010

Downloaded Data - Wednesday, June 23, 2010



APPENDIX A
PHOTOGRAPHS

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2	Load Cell Wall	A-5
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4	Tire Placard	A-6
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6	Left Rear $\frac{3}{4}$ View, as Received	A-7
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9	Pre-test Left View of Test Vehicle	A-9
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15	Pre-test Left Rear $\frac{3}{4}$ View	A-12
16	Post-test Left Rear $\frac{3}{4}$ View	A-12
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18	Pre-test Windshield View	A-13
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25	Pre-test Rear Underbody View	A-17
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27	Pre-test Dummy Cable Routing	A-18
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33	Pre-test Driver Dummy and Vehicle Interior View	A-21
34	Post-test Driver Dummy and Vehicle Interior View	A-21
35	Pre-test Driver's Seat Fore-Aft Markings	A-22
36	Post-test Driver's Seat Fore-Aft Markings	A-22
37	Pre-test Driver Dummy Feet	A-23
38	Post-test Driver Dummy Feet	A-23
39	Pre-test Driver's Side Knee Bolster	A-24
40	Post-test Driver's Side Knee Bolster	A-24
41	Pre-test Driver's Side Floorpan	A-25
42	Post-test Driver's Side Floorpan	A-25
43a	Post-test Driver Dummy Contact With Airbag	A-26
43b	Post-Test Driver Dummy Contact With Head Restraint	A-26
44	Pre-test View of the Steering Column Shear Capsule	A-27
45	Post-test View of the Steering Column Shear Capsule	A-27
46	Pre-test Passenger Dummy Front View	A-28
47	Post-test Passenger Dummy Front View	A-28
48	Pre-test Passenger Dummy Window View	A-29
49	Post-test Passenger Dummy Window View	A-29
50	Pre-test Passenger Dummy and Vehicle Interior View	A-30
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52	Pre-test Passenger's Seat Fore-Aft Markings	A-31
53	Post-test Passenger's Seat Fore-Aft Markings	A-31
54	Pre-test Passenger Dummy Feet	A-32
55	Post-test Passenger Dummy Feet	A-32
56	Pre-test Passenger's Side Knee Bolster	A-33
57	Post-test Passenger's Side Knee Bolster	A-33
58	Pre-test Passenger's Side Floorpan	A-34
59	Post-test Passenger's Side Floorpan	A-34

60a	Post-test Passenger Dummy Contact With Airbag	A-35
60b	Post-test Passenger Dummy Contact with Head Restraint	A-35
61	Photograph of ballast installed in vehicle	A-36
62	Post-test Stoddard solvent spillage location view, if required	A-36
63	Post-test Speed Trap Read-out	A-37
64	Vehicle at 0° on Static Rollover Device	A-37
65	Vehicle at 90° on Static Rollover Device	A-38
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68	Vehicle at 360° on Static Rollover Device	A-39
69	Impact Photograph (video still)	A-40
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Figure A-1: Load Cell Location



Figure A-2: Load Cell Wall

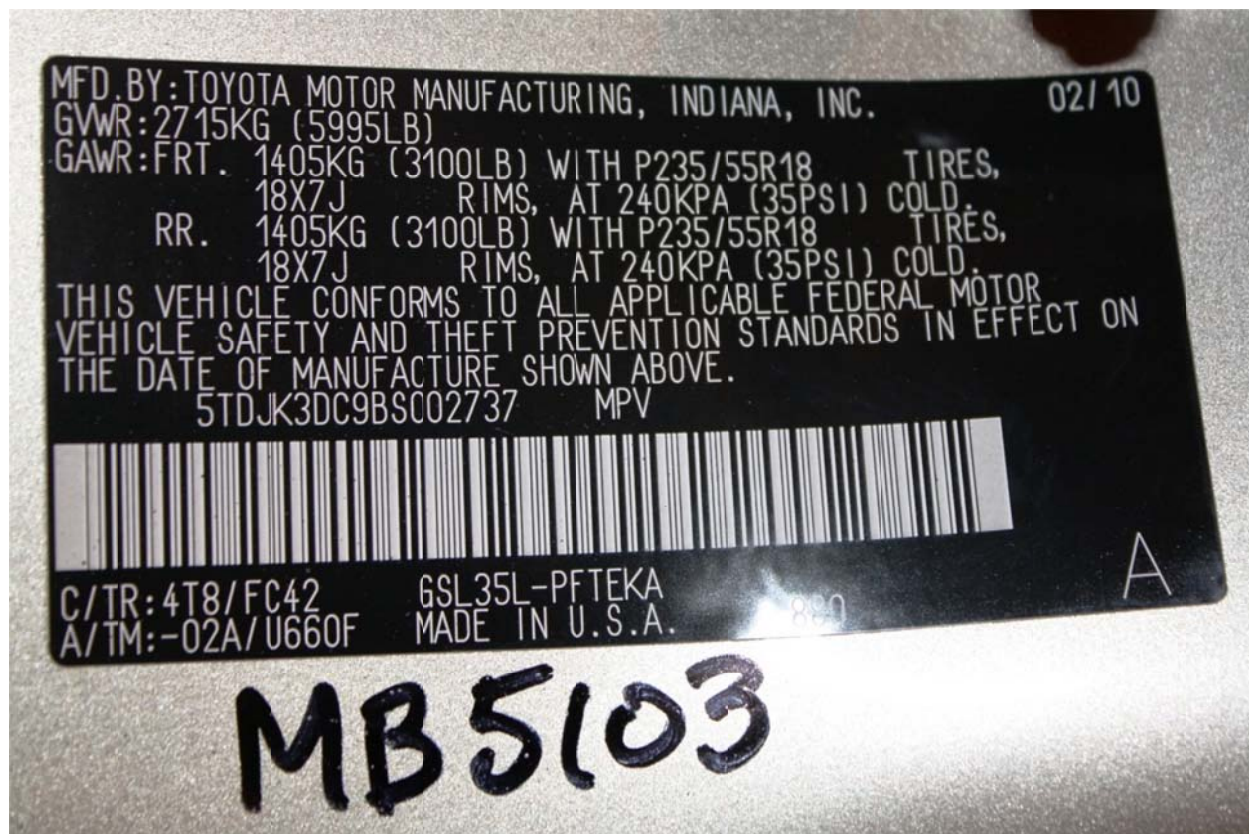


Figure A-3: Manufacturer Label

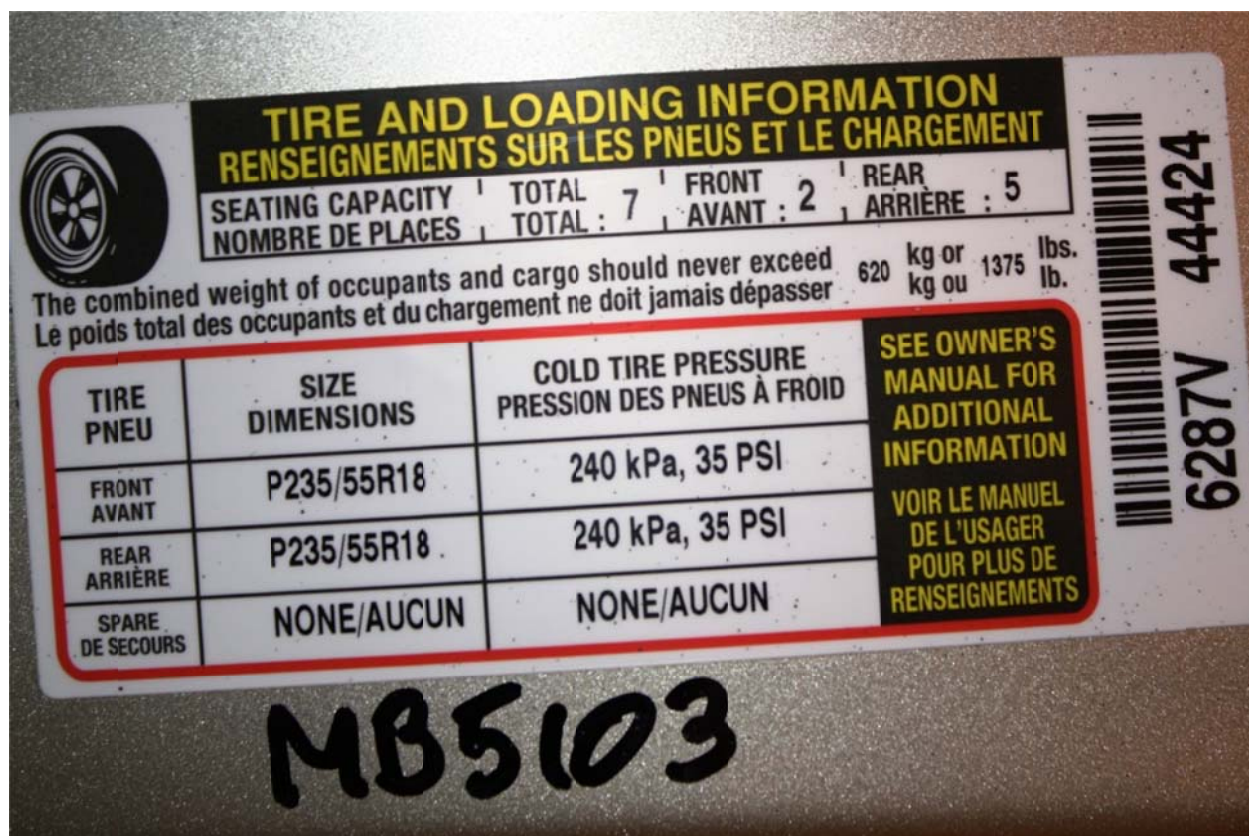


Figure A-4: Tire Placard



Figure A-5: Right Front $\frac{3}{4}$ View, as Received



Figure A-6: Left Rear $\frac{3}{4}$ View, as Received



Figure A-7: Pre-Test Front View of Test Vehicle

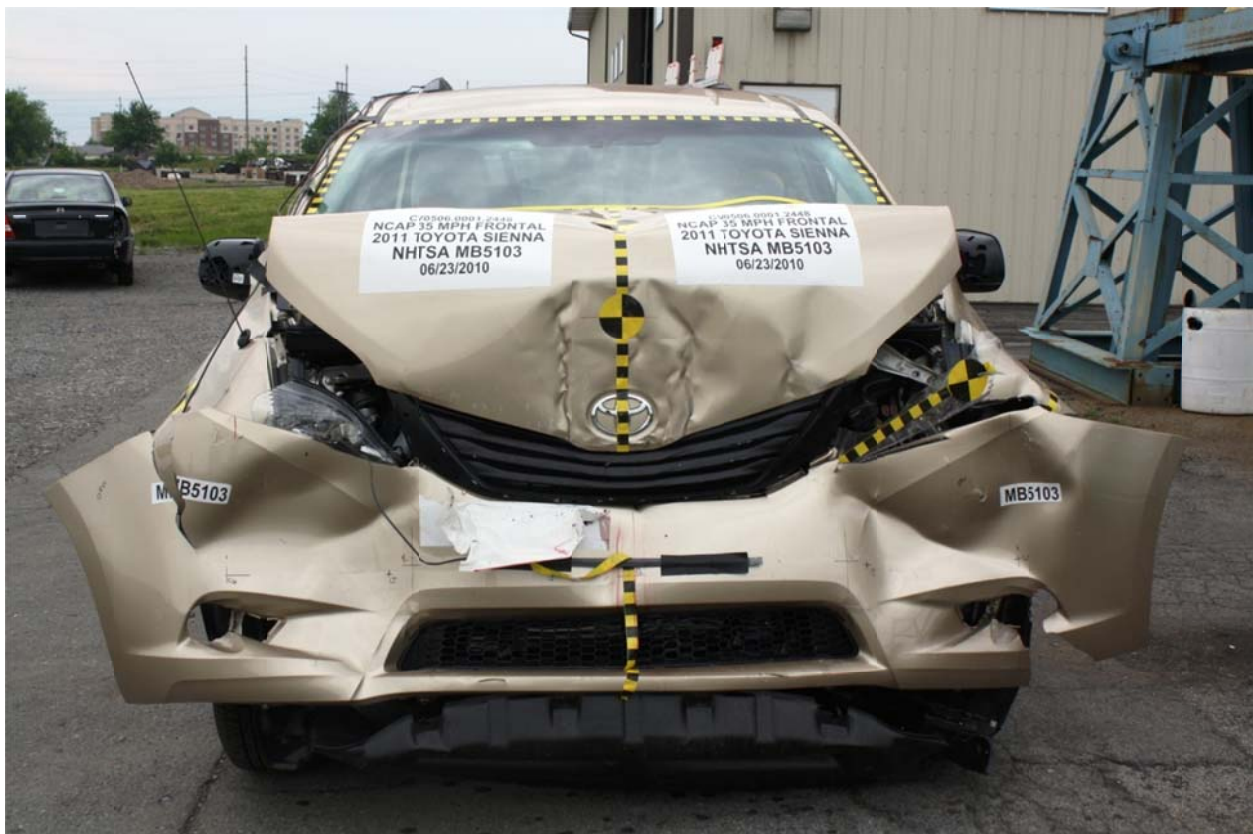


Figure A-8: Post-Test Front View of Test Vehicle



Figure A-9: Pre-Test Left View of Test Vehicle



Figure A-10 – Post-Test Left View of Vehicle



Figure A-11: Pre-Test Right View of Test Vehicle



Figure A-12: Post-Test Right View of Test Vehicle



Figure A-13: Pre-Test Right $\frac{3}{4}$ View



Figure A-14: Post-Test Right $\frac{3}{4}$ View



Figure A-15: Pre-Test Left Rear $\frac{3}{4}$ View



Figure A-16: Post-Test Left Rear $\frac{3}{4}$ View



Figure A-17: Pre-Test Windshield View

PHOTOGRAPH NOT AVAILABLE

Figure A-18: Post-Test Windshield View



Figure A-19: Pre-Test Engine Compartment View



Figure A-20: Post-Test Engine Compartment View



Figure A-21: Pre-Test Fuel Filter Cap View

PHOTOGRAPH NOT AVAILABLE

Figure A-22: Post-Test Fuel Filter Cap View

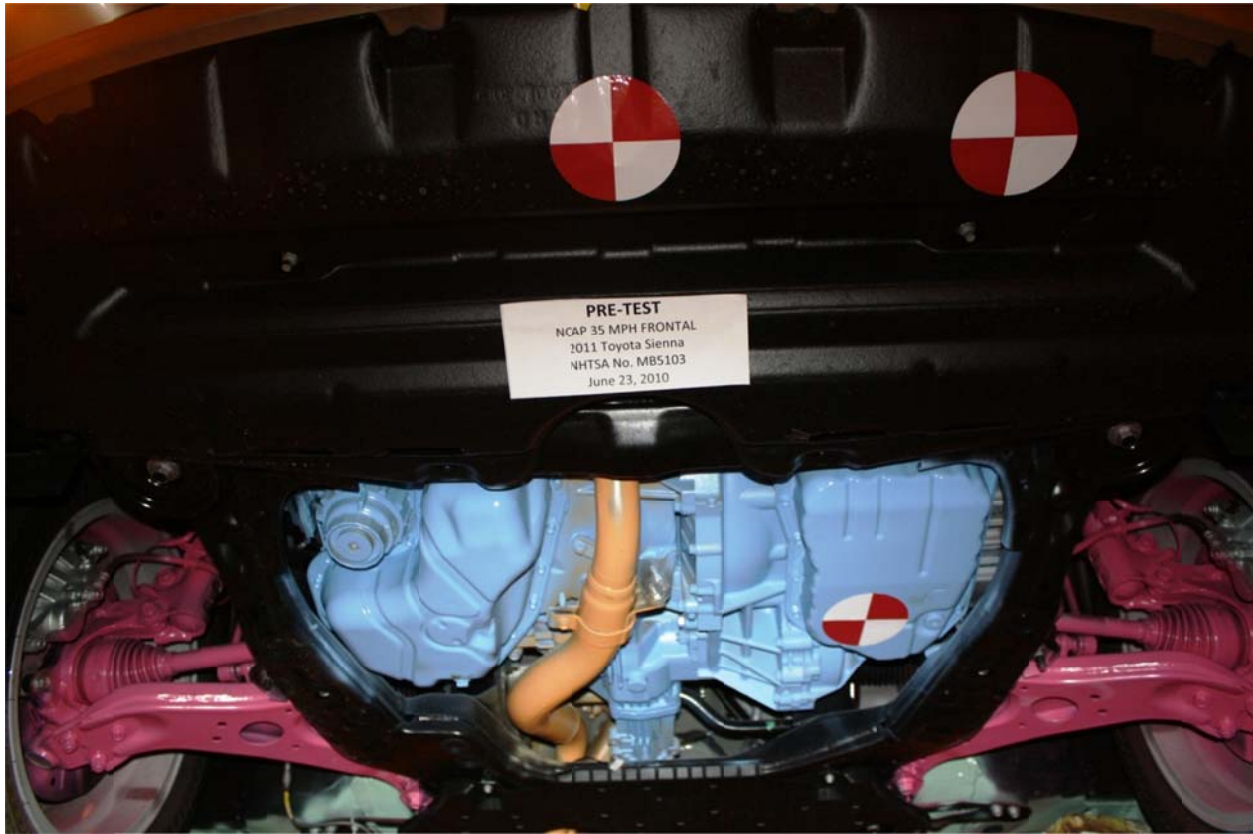


Figure A-23: Pre-Test Front Underbody View



Figure A-24: Post-Test Front Underbody View



Figure A-25: Pre-Test Rear Underbody View



Figure A-26: Post-Test Rear Underbody View



Figure A-27: Pre-Test Dummy Cable Routing

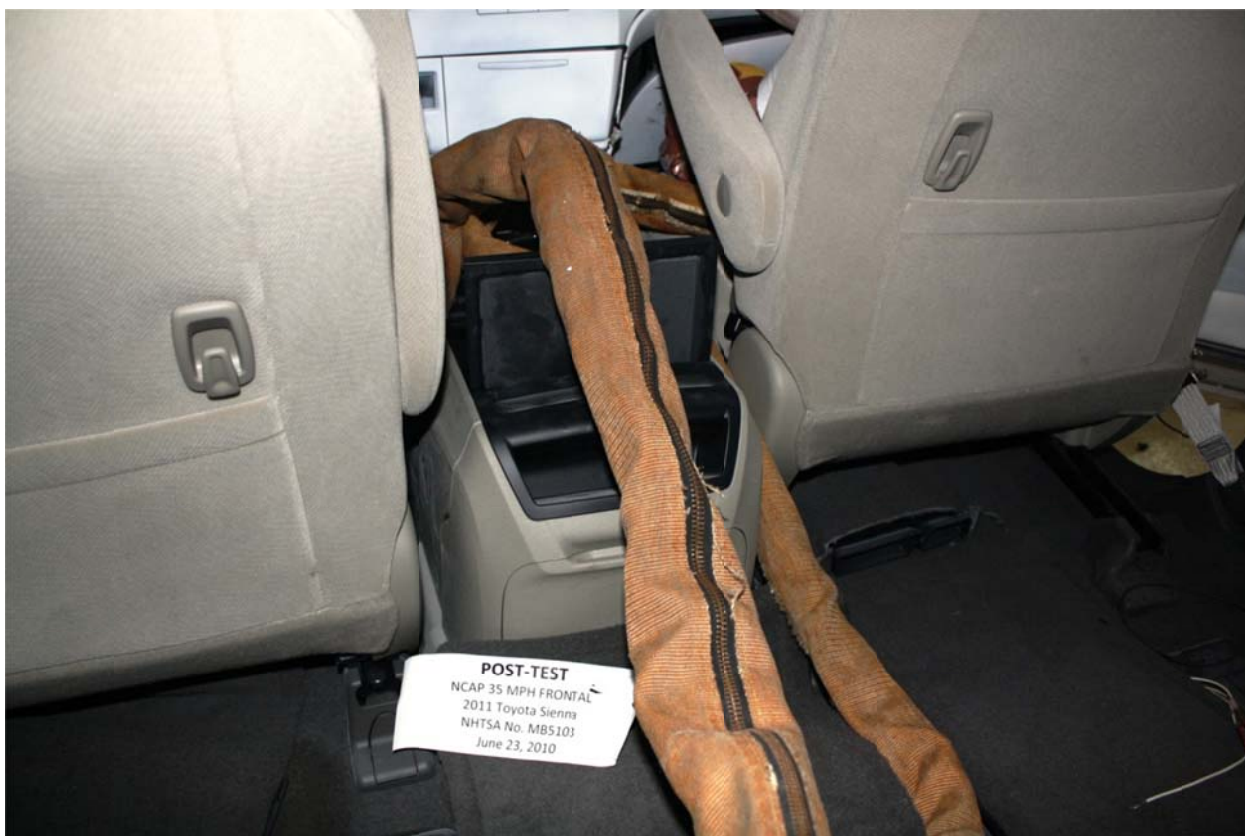


Figure A-28: Post-Test Dummy Cable Routing



Figure A-29: Pre-Test Driver Dummy Front View



Figure A-30: Post-Test Driver Dummy Front View



Figure A-31: Pre-Test Driver Dummy Window View



Figure A-32: Post-Test Driver Dummy Window View



Figure A-33: Pre-Test Driver Dummy and Vehicle Interior View



Figure A-34: Post-Test Driver Dummy and Vehicle Interior View



Figure A-35: Pre-Test Driver's Seat Fore-Aft Markings



Figure A-36: Post-Test Driver's Seat Fore-Aft Markings



Figure A-37: Pre-Test Driver Dummy Feet



Figure A-38: Post-Test Driver Dummy Feet



Figure A-39: Pre-Test Driver's Side Knee Bolster



Figure A-40: Post-Test Driver's Side Knee Bolster



Figure A-41: Pre-Test Driver's Side Floorplan

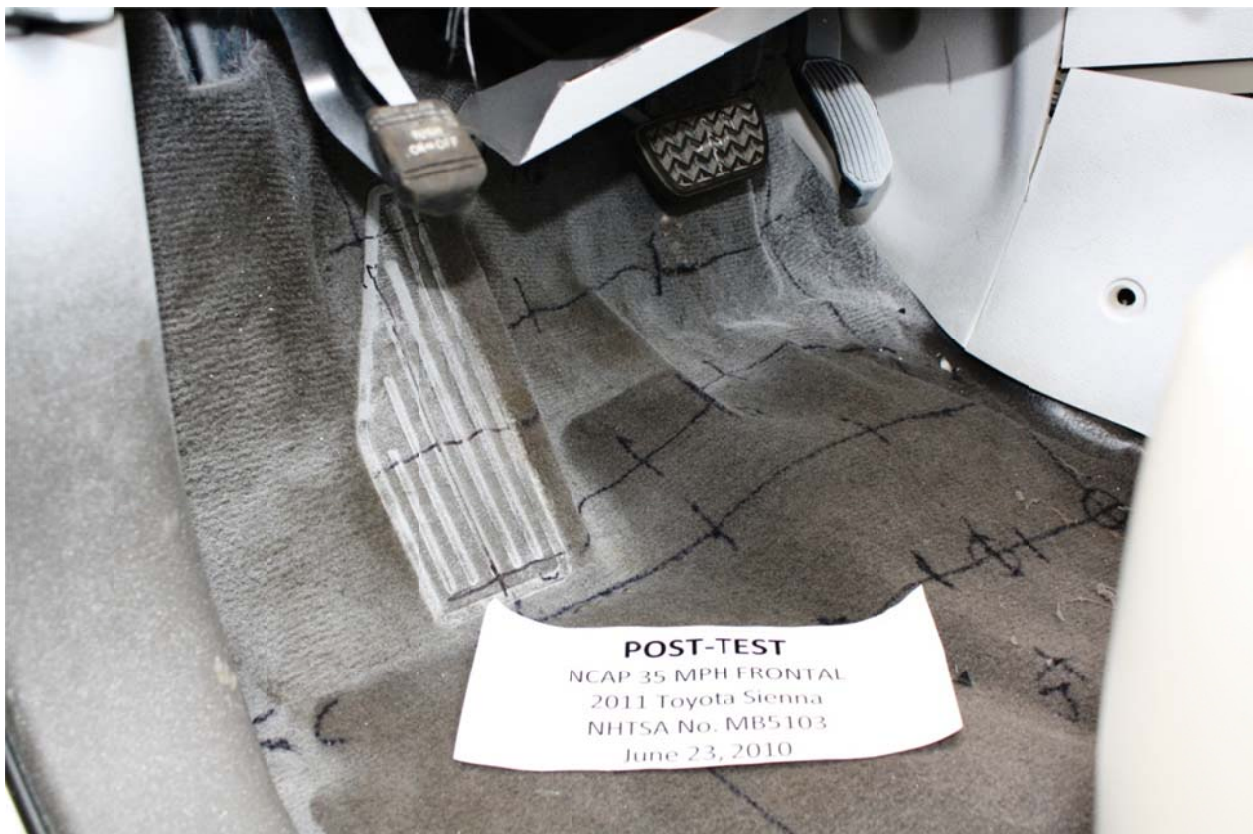


Figure A-42: Post-Test Driver's Side Floorplan



Figure A-43a: Post-Test Diver Dummy Contact with Airbag



Figure A-43b: Post-Test Driver Dummy Contact with Head Restraint

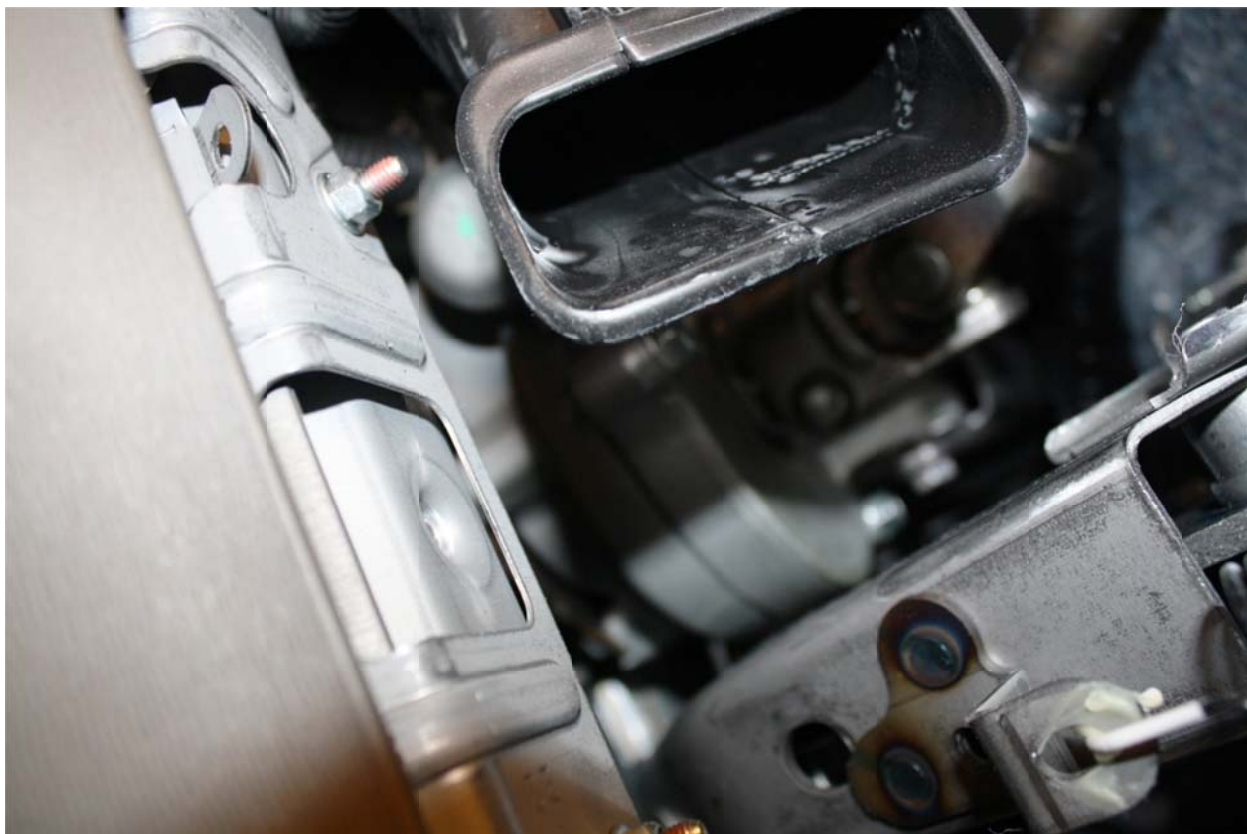


Figure A-44: Pre-Test View of the Steering Clumn Shear Capsule

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Figure A-45: Post-Test View of the Steering Column Shear Capsule



Figure A-46: Pre-Test Passenger Dummy Front View

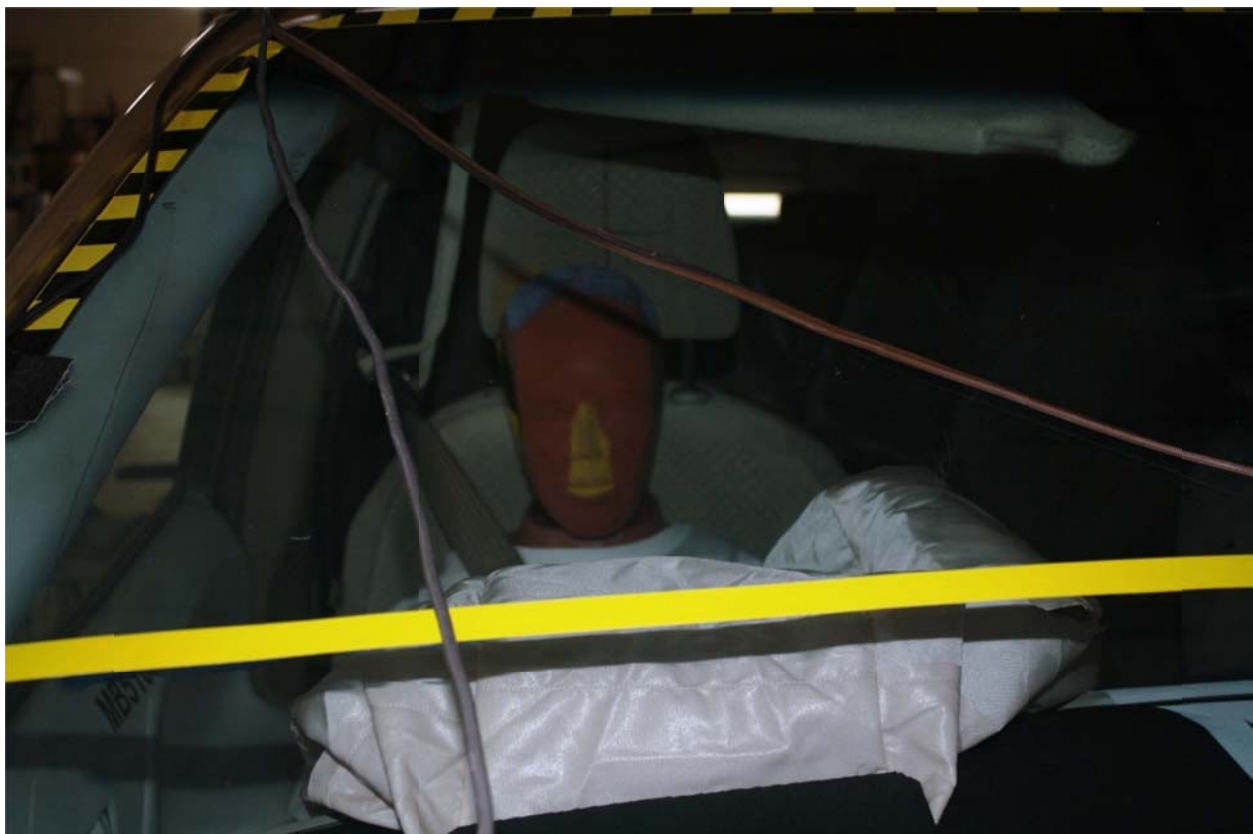


Figure A-47: Post-Test Passenger Dummy Front View



Figure A-48: Pre-Test Passenger Dummy Window View



Figure A-49: Post-Test Passenger Dummy Window View



Figure A-50: Pre-Test Passenger Dummy and Vehicle Interior View



Figure A-51: Post-Test Passenger Dummy and Vehicle Interior View

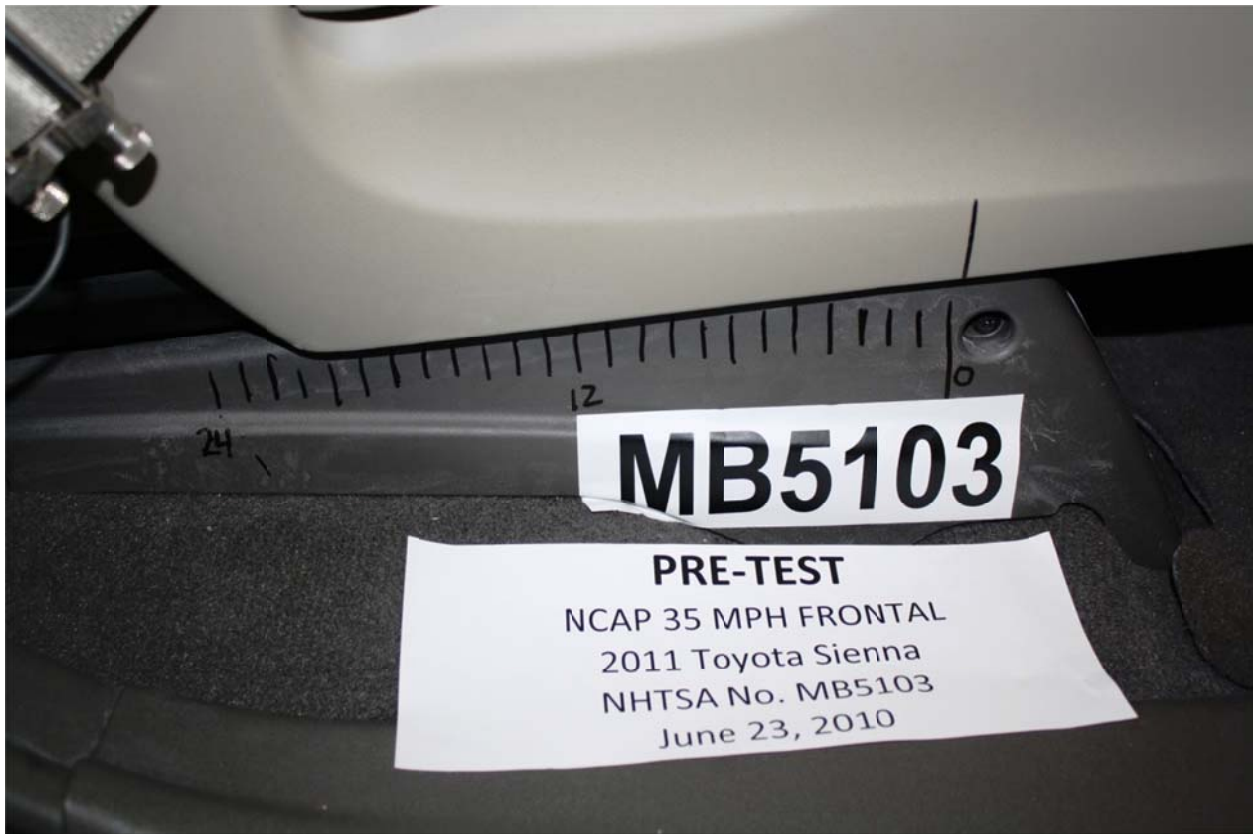


Figure A-52: Pre-Test Passenger's Seat Force-Aft Markings



Figure A-53: Post-Test Passenger's Seat Force-Aft Markings



Figure A-54: Pre-Test Passenger Dummy Feet

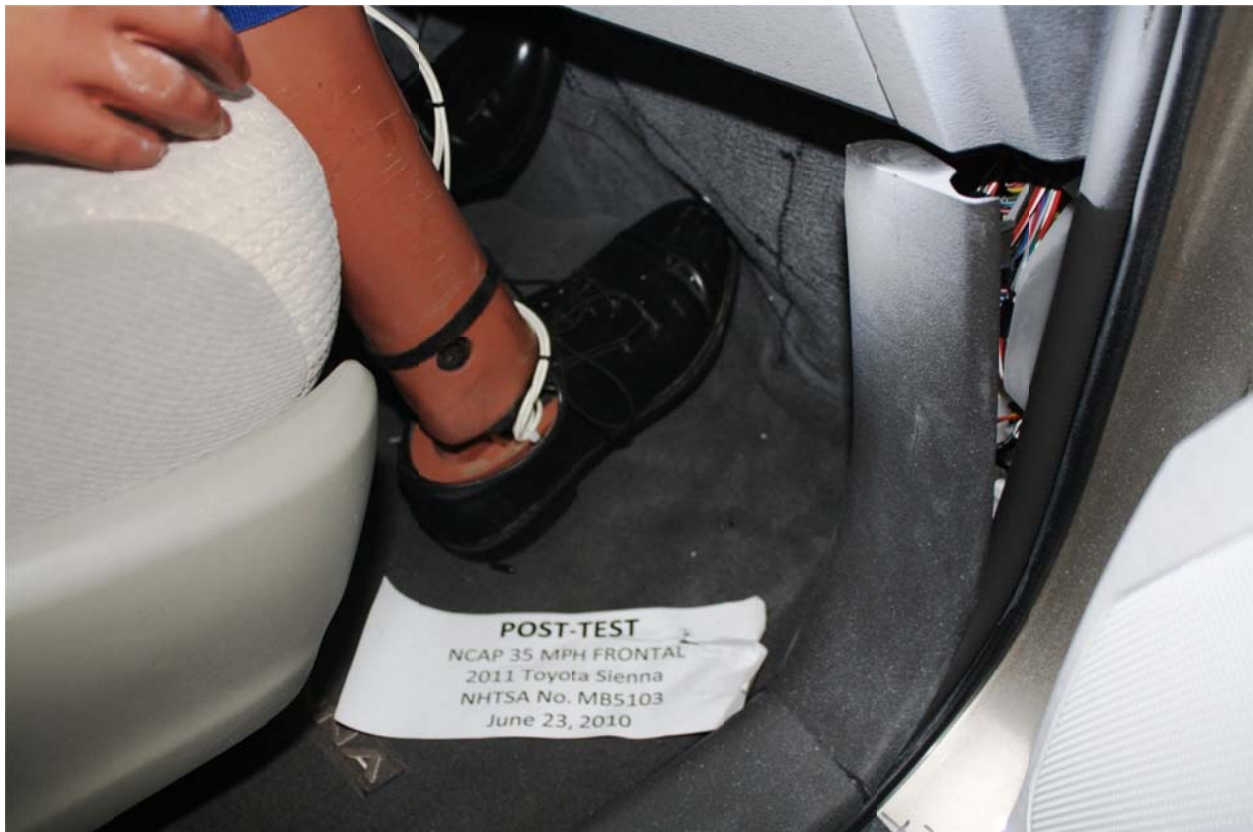


Figure A-54: Post-Test Passenger Dummy Feet

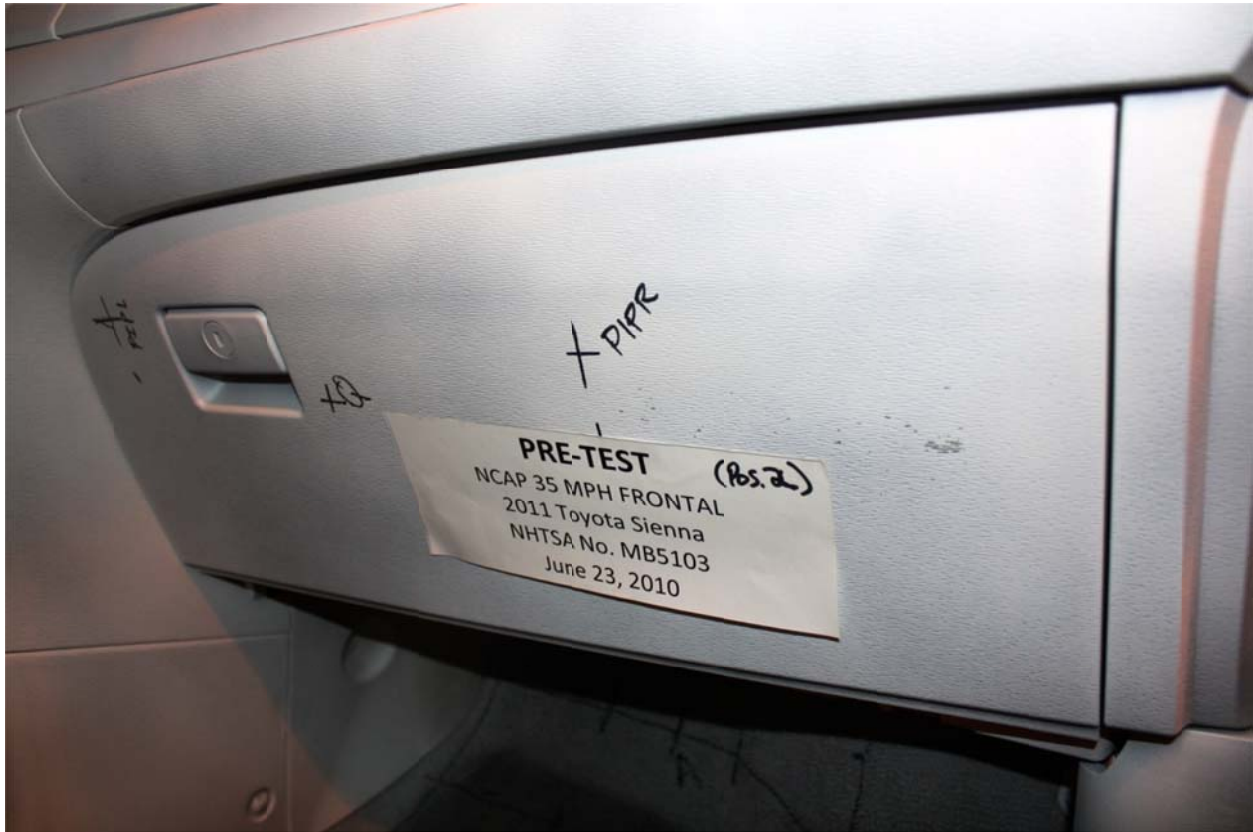


Figure A-56: Pre-Test Passenger's Side Knee Bolster



Figure A-57: Post-Test Passenger's Side Knee Bolster



Figure A-58: Pre-Test Passenger's Side Floorplan



Figure A-59: Post-Test Passenger's Floorplan



Figure A-60a: Post-Test Passenger Dummy Conatact with Airbag



Figure A-60b: Post-Test Passenger Dummy Contact with Head Restraint



Figure A-61: Photograph of Ballast Installed Vehicle

PHOTOGRAPH NOT AVAILABLE

Figure A-62: Post-Test Stoddard Solvent Spillage Location View



Figure A-63: Post-Test Speed Trap Read Out



Figure A-64: Vehicle at 0° on Static Rollover Device



Figure A-65: Vehicle at 90° on Static Rollover Device



Figure A-66: Vehicle at 180° on Static Rollover Device



Figure A-67: Vehicle at 270° on Static Rollover Device



Figure A-68: Vehicle at 360° on Static Rollover Device



Figure A-69: Impact Photograph

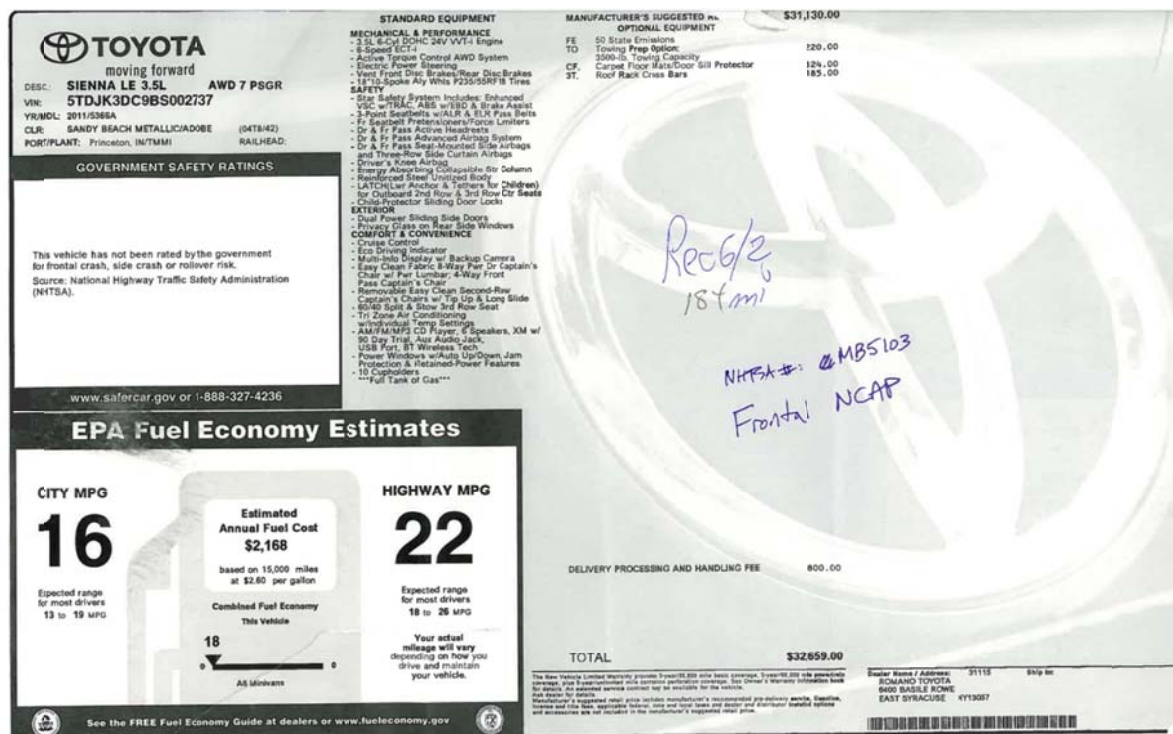


Figure A-70: Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

Fig. No.	List of Data Plots Provided In The Test Report	Page No.
1	Driver Head X Acceleration vs. Time Primary	B-5
2	Driver Head Y Acceleration vs. Time Primary	B-5
3	Driver Head Z Acceleration vs. Time Primary	B-6
4	Driver Head Resultant Acceleration vs. Time Primary	B-6
5	Driver Chest X Deflection vs. Time	B-7
6	Driver Chest X Acceleration vs. Time Primary	B-7
7	Driver Chest Y Acceleration vs. Time Primary	B-8
8	Driver Chest Z Acceleration vs. Time Primary	B-8
9	Driver Chest Resultant Acceleration vs. Time Primary	B-9
10	Driver Upper Neck Force X vs. Time Primary	B-9
11	Driver Upper Neck Force Z vs. Time Primary	B-10
12	Driver Upper Neck Moment Y vs. Time Primary	B-10
13	Driver Nij vs. Time Primary	B-11
14	Driver Left Femur Force vs. Time	B-11
15	Driver Right Femur Force vs. Time	B-12
16	Passenger Head X Acceleration vs. Time Primary	B-12
17	Passenger Head Y Acceleration vs. Time Primary	B-13
18	Passenger Head Z Acceleration vs. Time Primary	B-13
19	Passenger Head Resultant Acceleration vs. Time Primary	B-14
20	Passenger Chest X Deflection vs. Time	B-14
21	Passenger Chest X Acceleration vs. Time Primary	B-15
22	Passenger Chest Y Acceleration vs. Time Primary	B-15
23	Passenger Chest Z Acceleration vs. Time Primary	B-16
24	Passenger Chest Resultant Acceleration vs. Time Primary	B-16
25	Passenger Upper Neck Force X vs. Time Primary	B-17
26	Passenger Upper Neck Force Z vs. Time Primary	B-17
27	Passenger Upper Neck Moment Y vs. Time Primary	B-18
28	Passenger Nij vs. Time Primary	B-18

29	Passenger Left Femur Force vs. Time	B-19
30	Passenger Right Femur Force vs. Time	B-19

The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

Driver Head X Acceleration Redundant
 Driver Head Y Acceleration Redundant
 Driver Head Z Acceleration Redundant
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Acceleration Redundant
 Driver Chest Y Acceleration Redundant
 Driver Chest Z Acceleration Redundant
 Driver Pelvis X
 Driver Pelvis Y
 Driver Pelvis Z
 Driver Shoulder Belt Force
 Driver Lap Belt Force
 Driver Left Upper Tibia Moment X
 Driver Left Upper Tibia Moment Y
 Driver Left Upper Tibia Force Z
 Driver Left Lower Tibia Moment X
 Driver Left Lower Tibia Moment Y
 Driver Left Lower Tibia Force Z
 Driver Right Upper Tibia Moment X
 Driver Right Upper Tibia Moment Y
 Driver Right Upper Tibia Force Z
 Driver Right Lower Tibia Moment X
 Driver Right Lower Tibia Moment Y
 Driver Right Lower Tibia Force Z
 Driver Left Foot Fore Z
 Driver Left Foot Aft X
 Driver Left Foot Aft Z
 Driver Right Foot Fore Z
 Driver Right Foot Aft X
 Driver Right Foot Aft Z
 Passenger Head X Acceleration Redundant
 Passenger Head Y Acceleration Redundant
 Passenger Head Z Acceleration Redundant
 Passenger Upper Neck Force X
 Passenger Upper Neck Force Z
 Passenger Upper Neck Moment Y
 Passenger Chest X Acceleration Redundant
 Passenger Chest Y Acceleration Redundant
 Passenger Chest Z Acceleration Redundant
 Passenger Pelvis X
 Passenger Pelvis Y
 Passenger Pelvis Z
 Passenger Shoulder Belt Force
 Passenger Lap Belt Force
 Passenger Left Upper Tibia Moment X
 Passenger Left Upper Tibia Moment Y
 Passenger Left Upper Tibia Force Z
 Passenger Left Lower Tibia Moment X
 Passenger Left Lower Tibia Moment Y

Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Vehicle Engine Top X
Vehicle Engine Bottom X
Vehicle Left Brake Caliper X
Vehicle Right Brake Caliper X
Load Cell Barrier A1-A9
Load Cell Barrier B1-A9
Load Cell Barrier C1-A9
Load Cell Barrier D1-A9

APPENDIX C

PART 572 E/O DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA SHEETS

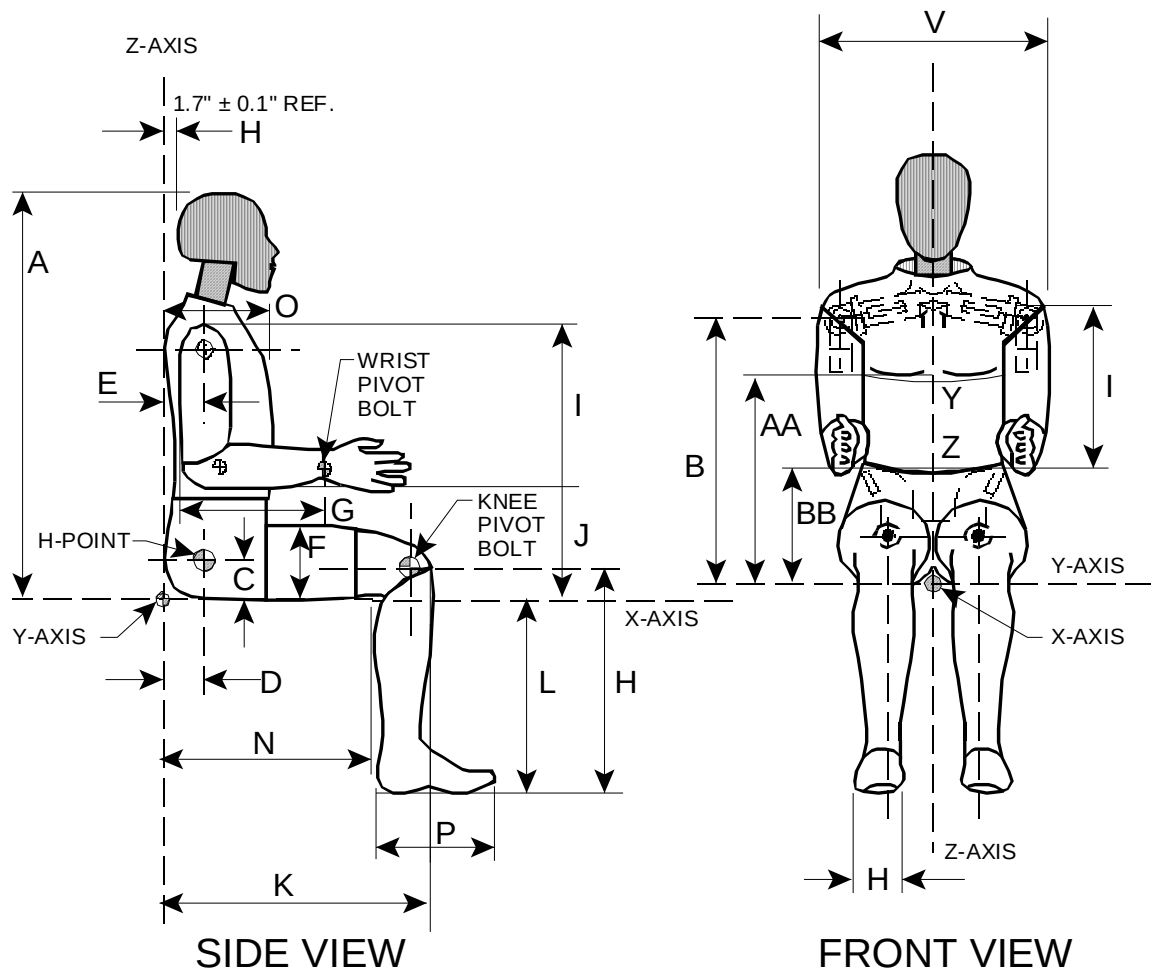
The tests were conducted at the Dummy Certification Test Facility of Calspan. A summary of the test results, and Part 572 specifications are included in this Appendix.

Dummy serial numbers and certification dates are:

<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	061	6/21/2010; 7/7/2010
#2/Right Front Passenger	273	6/21/2010; 7/3/2010

DUMMY CONFIGURATION DIMENSIONS

EXTERNAL DIMENSIONS SPECIFICATIONS



NOTE: Figure is referenced to the erect seated position. The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude.
(REF: S572.31(A)(6))

CALIBRATION TEST RESULTS

PRE-TEST

DRIVER DUMMY

S/N: 061

CALIBRATION TEST RESULTS

PRE-TEST

RIGHT-FRONT PASSENGER DUMMY

S/N: 273

CALIBRATION TEST RESULTS

POST-TEST

DRIVER DUMMY

S/N: 061

CALIBRATION TEST RESULTS

POST-TEST

RIGHT-FRONT PASSENGER DUMMY

S/N: 273