

REPORT NUMBER: 301-CAL-10-4

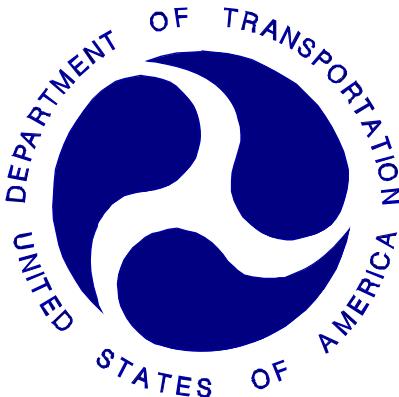
**SAFETY COMPLIANCE TESTING FOR FMVSS 301
FUEL SYSTEM INTEGRITY – REAR IMPACT**

Honda Motor Co., LTD.

2010 Honda Insight
4 door sedan

NHTSA NUMBER: CA5302

CALSPAN
TRANSPORTATION SCIENCES CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225



August 6, 2010

FINAL REPORT

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance (NVS-224)
1200 New Jersey Avenue, SE
Washington, DC 20590

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-06-C-00031. This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufactures' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared By: Ed Dutton
Ed Dutton, Project Engineer

Approved By: David J. Travale
David J. Travale, Program Manager
Transportation Sciences Center

Approval Date: 8/27/2010

FINAL REPORT ACCEPTANCE BY:

Accepted By: Edward E. Chan
Digitally signed by Edward E. Chan
DN: cn=Edward E. Chan, o=National Highway Traffic
Safety Administration, ou=Office of Vehicle Safety
Compliance, email=ed.chan@dot.gov, c=US
Date: 2010.12.22 15:51:34 -05'00'

Acceptance Date: _____

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. 301-CAL-10-4	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Final Report of FMVSS 301 Compliance Rear Impact Testing of a 2010 Honda Insight 4 door sedan NHTSA No.: CA5302		5. Report Date August 6, 2010	
		6. Performing Organization Code CAL	
7. Author(s) Ed Dutton, Project Engineer David J. Travale, Program Manager		8. Performing Organization Report No.	
9. Performing Organization Name and Address Calspan Transportation Sciences Center P.O. Box 400 Buffalo, New York 14225		10. Work Unit No.	
		11. Contract or Grant No. DTNH22-06-C-00031	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance- Enforcement 1200 New Jersey Avenue, SE Room W43-503 Washington, D.C. 20590		13. Type of Report and Period Covered Final Report, August 2010	
		14. Sponsoring Agency Code NVS-220	
15. Supplementary Notes			
16. Abstract Compliance tests were conducted on the subject 2010 Honda Insight 4 door sedan in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301R-02 for the determination of FMVSS 301 compliance. Test failures identified were as follows: The test vehicle appeared to comply with all requirements of FMVSS 301R-02 "Fuel System Integrity – Rear Impact."			
17. Key Words Compliance Testing Safety Engineering FMVSS 301		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Reference Division (TIS) (NPO-230) 1200 New Jersey Avenue, SE Washington, D.C. 20590 Telephone No. (202) 366-4946	
19. Security Classification of Report UNCLASSIFIED	20. Security Classification of Page UNCLASSIFIED	21. No. of Pages 38	22. Price

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	PURPOSE AND TEST PROCEDURE	1-1
2	COMPLIANCE TEST RESULTS SUMMARY	2-1
3	SUMMARY OF TEST RESULTS	3-1
	Data Sheet 1 - Test Vehicle Specifications	3-2
	Data Sheet 2 – Pre-Test Data	3-3
	Data Sheet 3 - Moving Deformable Barrier (MDB) Data	3-5
	Data Sheet 4 - High Speed Camera Locations and Data Summary	3-6
	Data Sheet 5 – Post-Test Data	3-7
	Data Sheet 6 – FMVSS 301 Rollover Data	3-9
APPENDIX A	PHOTOGRAPHS	A-1

SECTION 1

PURPOSE AND TEST PROCEDURE

This rear impact test is part of the FMVSS 301 Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-06-C-00031. The purpose of this test was to determine if the subject vehicle, a 2010 Honda Insight 4 door sedan, meets the performance requirements of FMVSS No. 301R-02 "Fuel System Integrity – Rear Impact." The test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-301R-02, dated January 17, 2007).

SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

A 1427 kg 2010 Honda Insight 4 door sedan was impacted from the rear by a 1357 kg moving barrier at a velocity of 78.6 kph (48.9 mph). The test was performed by Calspan Corporation on August 6, 2010.

The test vehicle was equipped with a 40.0 liter fuel tank which was filled to 92 percent capacity with stoddard fluid prior to impact. Additional ballast (40.0 kg) was secured in the rear passenger footwell. Two ballast Part 572E 50th percentile male Anthropomorphic Test Device (ATD) were placed in the front occupant seating positions.

The crash event was recorded by three high-speed cameras and one real-time camera. High-speed camera locations and other pertinent camera information are found on page 3-6 of this report. Pre- and post-test photographs of the vehicle can be found in Appendix A.

There was no fuel system fluid spillage following the impact or during any portion of the static rollover test. The average vehicle longitudinal crush was 306 millimeters. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

SECTION 3

SUMMARY OF TEST RESULTS

DATA SHEET 1

TEST VEHICLE SPECIFICATIONS

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2010 Honda Insight 4 door sedan
 Vehicle Body Color: _____ NHTSA Number: CA5302
 Engine Data: 4 Cylinders; _____ CID; 1.3 Liters; _____ cc
 Transmission: CV Speed; _____ Manual; x Automatic; _____ Overdrive
 Final Drive: _____ Rear Wheel Drive; x Front Wheel Drive; _____ Four Wheel Drive

MAJOR TEST VEHICLE OPTIONS:

x AC; x Pwr Steering; X Power Brakes; x Power Locks; x Power Seats
x ABS; x Tilt Wheel; x Stab Control x Traction Control x Anti-Theft

DEALER AND DELIVERY INFORMATION:

Date Received: 2-23-2010 ; Odometer Reading 56 km
 Selling Dealer: _____
 Dealer Address: _____

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufacturer: Honda Motor Co., LTD.
 Vehicle Build Date: 07/09
 VIN:: JHMZE2H5XAS018594
 GVWR: 1650 kg; GAWR: 855 kg FRONT; 810 kg REAR

DATA FROM VEHICLE'S TIRE LABEL AND SIDEWALL:

Location of Tire Placard: Driver sill
 Type of Spare Tire: T135/80D15 99M

	<u>Front</u>	<u>Rear</u>
Maximum Tire Pressure (sidewall - kPa)	300	300
Cold Pressure (tire placard - kPa) – test pressure	230	230
Recommended Tire Size (tire placard)	175/65R15	175/65R15
Vehicle Tire Size with load index & speed symbol	175/65R15 84S	175/65R15 84S
Tire Manufacturer	Dunlop	Dunlop
Tire Name	SP37 AS	SP37 AS
Treadwear, Traction, Temperature	320, A, B	320, A, B

VEHICLE CAPACITY DATA:

Type of Front Seats: _____ Bench; x Bucket; _____ Split Bench
 Number of Occupants: 2 Front; _____ Rear; 5 Total
 Vehicle Capacity Weight (VCW) = 385 kg
 No. of Occupants x 68.04 kg = 340.2 kg
 Rated Cargo/Luggage Weight (RCLW) = 44.8 kg

DATA SHEET 2

PRE-TEST DATA

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids)= UDW:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	377.0	353.0	51.1	730.0
Rear =	254.0	250.0	48.9	504.0
Total Delivered Weight (UDW) =				1234.0

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW) =	1234.0	kg
Rated Cargo/Luggage Weight (RCLW) =	44.8	kg
Weight of 2 p.572E Dummies @ 78 each =	156	kg
TARGET TEST WEIGHT =	1434.8	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 40.0 KG OF CARGO WEIGHT:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	419.0	410.0	54.6	829.0
Rear =	305.0	293.0	45.4	598.0
Total Vehicle Test Weight (ATW) =				1427.0

Weight of Ballast Secured in Vehicle¹ = 40.0 kg Ballast Type Shot bag

Method of securing Ballast: Taped to rear seat floor pan in front of seat

Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimension in millimeters):

	Left Front	Right Front	Left Rear	Right Rear	CG ²
AS DELIVERED:	661	668	672	671	1246.1
AS TESTED:	642	645	650	657	1256.2

Vehicle's Wheel Base: 2550 Mm

¹Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

²Rearward of the front axle centerline.

VEHICLE PRE-TEST WIDTH AND IMPACT OFFSET MEASUREMENT:

Vehicle Width at Widest Point: 1703 mm

Location: B- Pillar

Centerline offset for impact line: 340.6 mm

Filler neck side (left/right) left

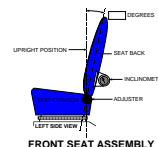
DATA SHEET 2 (continued)

PRE-TEST DATA

Vehicle: 2010 Honda Insight 4 door sedan

NHTSA No. CA5302

Nominal Design Riding Position for adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.



Seat back angle for driver's seat: See below

Measurement instructions: Seat back reclined 8° from full upright position. Measured on headrest post. 4 notches from full up.

Seat back angle for passenger's seat: See below

Measurement instructions: Seat back reclined 8° from full upright position. Measured on headrest post. 4 notches from full up.

2. SEAT FORE AND AFT POSITIONING:

Positioning of the driver's seat: Full fore/aft travel range measured at 276 mm. Seat positioned at 138 mm. In full down position. Notch 10 from 0.

Positioning of the passenger's seat: Notches 0 to 20, set at notch 10 from 0

3. FUEL TANK CAPACITY DATA:

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 40.0 liters

B. "Usable Capacity" of the optional equipment fuel tank is n/a liters

C. "Usable Capacity" of the vehicle(s) used for certification testing to requirements of FMVSS 301 = 36.8 to 37.6 liters

3.2 Actual Amount of Stoddard solvent added to vehicle for test = 37.0 liters

Stoddard Fluid: specific gravity: 0.764; kinematic viscosity: 0.96 centistokes; color: Purple

3.3 Is vehicle equipped with electric fuel pump? Yes- x; No-

If YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

Fuel pump operates with ignition in on position and vehicle engine running .

4. STEERING COLUMN ADJUSTMENTS:

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the geometric center.

Operational Instructions: Telescoping column set at midrange of travel. Wheel tilt set at mid tilt angle when measured on face of wheel.

5. SEAT BELT UPPER ANCHORAGE:

Nominal design riding position:

Anchorage set at furthest up position.

6. COMMENTS:

DATA SHEET 3

MOVING DEFORMABLE BARRIER (MDB) DATA

Vehicle: 2010 Honda Insight 4 door sedan

NHTSA No. CA5302

MDB FACE MANUFACTURER AND SERIAL NUMBER:

Plascore 1209043

MDB DETAILS:

Overall Width of Framework Carriage	=	<u>1250</u>	millimeters
Overall Length of MDB (incl. honeycomb impact face)	=	<u>4120</u>	millimeters
Wheelbase of Framework Carriage	=	<u>2591</u>	millimeters
Tread of Framework Carriage (Front & Rear)	=	<u>1875</u>	millimeters
C.G. Location Rearward of Front Axle	=	<u>1136</u>	millimeters

MDB WEIGHT:

Left Front	=	<u>358.0</u>	kg	Left Rear	=	<u>322.0</u>	kg
Right Front	=	<u>404.0</u>	kg	Right Rear	=	<u>273.0</u>	kg
TOTAL FRONT =		<u>762.0</u>	kg	TOTAL REAR =		<u>595.0</u>	kg
TOTAL MDB WEIGHT =		<u>1357.0</u>	kg				

Tires (Mfr, line, size): Dunlop Radial Rover AT P205/75-R15

TIRE PRESSURE:

Left Front	=	<u>207</u>	kPa	Left Rear	=	<u>207</u>	kPa
Right Front	=	<u>207</u>	kPa	Right Rear	=	<u>207</u>	kPa

Brake Abort System? (Yes/No) Yes

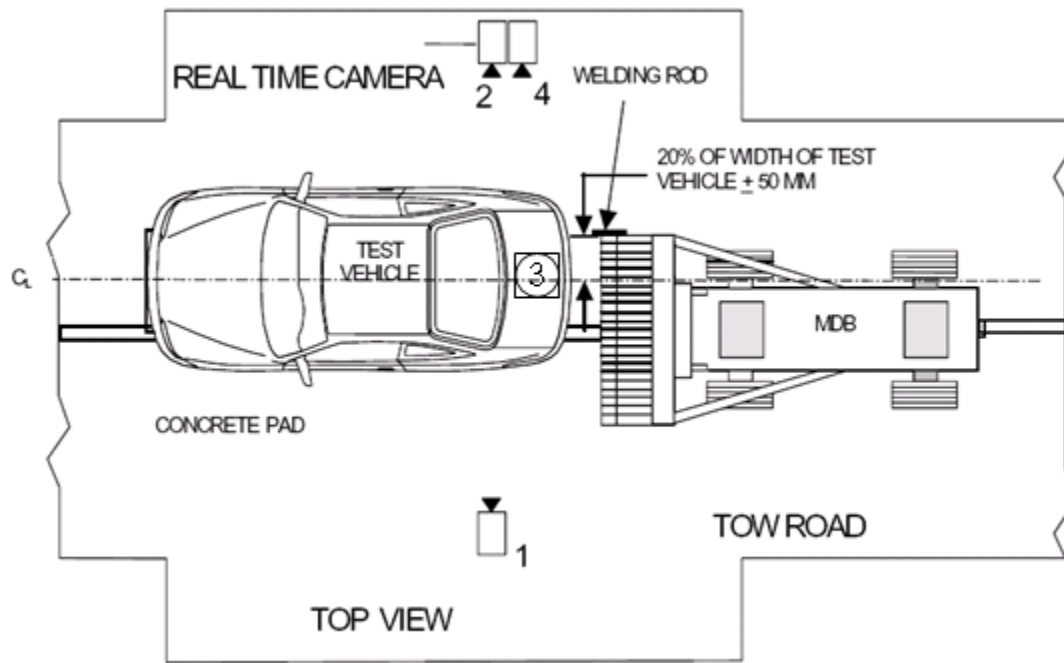
Date of Last Calibration: 5/15/2010

DATA SHEET 4

HIGH SPEED CAMERA LOCATIONS AND DATA SUMMARY

Vehicle: 2010 Honda Insight 4 door sedan

NHTSA No. CA5302



Camera No.	View	Coordinates (millimeters)			Angle (deg.)	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Left Side View	6980	1240	925	-1.5	24	1000
2	Real-Time Camera	-	-	-	-	-	30
3	Overhead View	0	405	4900	-90	20	1000
4	Right Side View	7160	1290	920	-2	24	1000

* Reference (from point of impact); all measurements accurate to within ± 6 mm.

X = (Impact Point) + Forward

Y = (Impact Point) + To Right

Z = (Ground Level) + Down

DATA SHEET 5

POST-TEST DATA (Continued)

Vehicle: 2010 Honda Insight 4 door sedan

NHTSA No. CA5302

POST TEST SEAT DATA

LOCATION	SEAT MOVEMENT (mm)	SEAT BACK FAILURE
P1 (Left Front)	none	Slightly reclined
P2 (Right Front)	None	Slightly reclined

POST TEST ATD CONTACT DATA

LOCATION	Position 1 (Driver)	Position 2 (Passenger)
Head	Headrest	Headrest
Chest	n/a	n/a
Abdomen	n/a	n/a
Left Knee	n/a	n/a
Right Knee	n/a	n/a

VEHICLE DIMENSIONS:

Vehicle length:

	Left Side	Centerline	Right Side
Pre-Test	4238	4378	4240
Post-Test	3802	3897	3948
Crush	436	481	292

Vehicle Wheel Base:

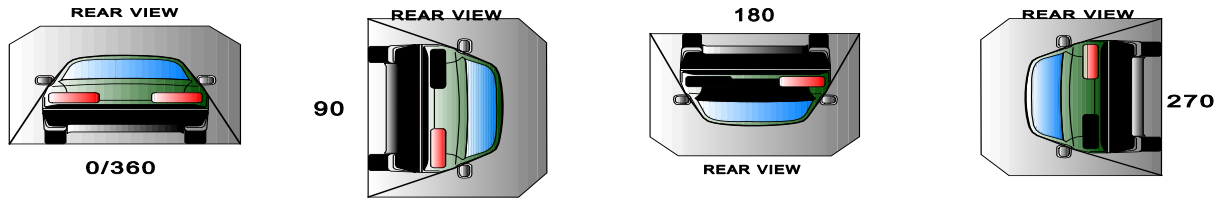
	Left Side	Right Side
Pre-Test	2550	2548
Post-Test	2507	2550
Crush	43	-2

DATA SHEET 6

FMVSS 301 ROLLOVER DATA

Vehicle: 2010 Honda Insight 4 door sedan

NHTSA No.: CA5302



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Stage	Rotation Time (spec. 1 -3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
	1	minutes	09	seconds	5	minutes	6	minutes	9	seconds	7	minutes
0° - 90°	1	minutes	03	seconds	5	minutes	6	minutes	3	seconds	7	minutes
90° - 180°	1	minutes	02	seconds	5	minutes	6	minutes	2	seconds	7	minutes
180°-270°	1	minutes	09	seconds	5	minutes	6	minutes	9	seconds	7	minutes

II. FMVSS 301 REQUIREMENTS: (Maximum allowable solvent spillage):

First 5 minutes from onset of rotation	6th min.	7th min.	8th min. (if required)
142 g	28 g	28 g	28 g

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

Rollover Stage	First 5 minutes from onset of rotation (g)	6th min. (g)	7th min. (g)	8th min. (if required) (g)
0° - 90°	0	0	n/a	N/A
90° - 180°	0	0	n/a	N/A
180°-270°	0	0	n/a	N/A
270°-360°	0	0	n/a	N/A

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

Rollover Stage	Spillage Location
0° - 90°	None
90° - 180°	None
180°-270°	None
270°-360°	None

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Figure	Photograph Title	Page
Figure A- 1	VEHICLE PLACARD	A- 3
Figure A- 2	TIRE PLACARD	A- 3
Figure A- 3	PRE-TEST FRONT VIEW	A- 4
Figure A- 4	POST-TEST FRONT VIEW	A- 4
Figure A- 5	PRE-TEST LEFT SIDE VIEW	A- 5
Figure A- 6	POST-TEST LEFT SIDE VIEW	A- 5
Figure A- 7	PRE-TEST RIGHT SIDE VIEW	A- 6
Figure A- 8	POST-TEST RIGHT SIDE VIEW	A- 6
Figure A- 9	PRE-TEST LEFT FRONT THREE-QUARTER VIEW	A- 7
Figure A- 10	POST-TEST LEFT FRONT THREE-QUARTER VIEW	A- 7
Figure A- 11	PRE-TEST RIGHT FRONT THREE-QUARTER VIEW	A- 8
Figure A- 12	POST-TEST RIGHT FRONT THREE-QUARTER VIEW	A- 8
Figure A- 13	PRE-TEST LEFT REAR THREE-QUARTER VIEW	A- 9
Figure A- 14	POST-TEST LEFT REAR THREE-QUARTER VIEW	A- 9
Figure A- 15	PRE-TEST RIGHT REAR THREE-QUARTER VIEW	A- 10
Figure A- 16	POST-TEST RIGHT REAR THREE-QUARTER VIEW	A- 10
Figure A- 17	PRE-TEST REAR VIEW	A- 11
Figure A- 18	POST-TEST REAR VIEW	A- 11
Figure A- 19	PRE-TEST MDB FRONT VIEW	A- 12
Figure A- 20	POST-TEST MDB FRONT VIEW	A- 12
Figure A- 21	PRE-TEST MDB LEFT SIDE VIEW	A- 13
Figure A- 22	POST-TEST MDB LEFT SIDE VIEW	A- 13
Figure A- 23	PRE-TEST MDB RIGHT SIDE VIEW	A- 14
Figure A- 24	POST-TEST MDB RIGHT SIDE VIEW	A- 14
Figure A- 25	PRE-TEST MDB TOP VIEW	A- 15
Figure A- 26	POST-TEST MDB TOP VIEW	A- 15
Figure A- 27	PRE-TEST OVERHEAD VEHICLE AND MDB VIEW	A- 16
Figure A- 28	POST-TEST IMPACT TARGET VIEW	A- 16
Figure A- 29	PRE-TEST FRONT UNDERBODY VIEW	A- 17
Figure A- 30	POST-TEST FRONT UNDERBODY VIEW	A- 17
Figure A- 31	PRE-TEST MID UNDERBODY VIEW	A- 18
Figure A- 32	POST-TEST MID UNDERBODY VIEW	A- 18
Figure A- 33	PRE-TEST REAR UNDERBODY VIEW	A- 19
Figure A- 34	POST-TEST REAR UNDERBODY VIEW	A- 19
Figure A- 35	PRE-TEST FUEL FILLER CAP VIEW	A- 20
Figure A- 36	POST-TEST FUEL FILLER CAP VIEW	A- 20
Figure A- 37	IMPACT VIEW	A- 21
Figure A- 38	IMPACT VELOCITY	A- 21
Figure A- 39	ROLLOVER 90° VIEW	A- 22
Figure A- 40	ROLLOVER 180° VIEW	A- 22
Figure A- 41	ROLLOVER 270° VIEW	A- 23
Figure A- 42	ROLLOVER 360° VIEW	A- 23



Figure A-1: Vehicle Certification Placard



Figure A-2: Vehicle Tire Placard



Figure A-3: Pre-Test Front View



Figure A-4: Post-Test Front View



Figure A-5: Pre-Test Left Side View



Figure A-6: Post-Test Left Side View



Figure A-7: Pre-Test Right Side View



Figure A-8: Post-Test Right Side View



Figure A-9: Pre-Test Left Front Three-Quarter View



Figure A-10: Post-Test Left Front Three-Quarter View



Figure A-11: Pre-Test Right Front Three-Quarter View



Figure A-12: Post-Test Right Front Three-Quarter View



Figure A-13: Pre-Test Left Rear Three-Quarter View



Figure A-14: Post-Test Left Rear Three-Quarter View



Figure A-15: Pre-Test Right Rear Three-Quarter View



Figure A-16: Post-Test Right Rear Three-Quarter View



Figure A-17: Pre-Test Rear View



Figure A-18: Post-Test Rear View



Figure A-19: Pre-Test MDB Front View



Figure A-20: Post-Test MDB Front View



Figure A-21: Pre-Test MDB Left Side View



Figure A-22: Post-Test MDB Left Side View



Figure A-23: Pre-Test MDB Right Side View



Figure A-24: Post-Test MDB Right Side View



Figure A-25: Pre-Test MDB Top View



Figure A-26: Post-Test MDB Top View



Figure A-27: Pre-Test Overhead Vehicle and MDB View



Figure A-28: Post-Test Impact Target View



Figure A-29: Pre-Test Front Underbody View



Figure A-30: Post-Test Front Underbody View



Figure A-31: Pre-Test Mid Underbody View



Figure A-32: Post-Test Mid Underbody View



Figure A-33: Pre-Test Rear Underbody View



Figure A-34: Post-Test Rear Underbody View



Figure A-35: Pre-Test Fuel Filler Cap View



Figure A-36: Post-Test Fuel Filler Cap View



Figure A-37: Impact View



Figure A-38: Impact Velocity



Figure A-39: Rollover 90° View



Figure A-40: Rollover 180° View



Figure A-41: Rollover 270° View



Figure A-42: Rollover 360° View