HSNO 638058

REPORT NUMBER TR-P25007-01-NC

FMVSS 301-FUEL SYSTEM INTEGRITY

GM DAEWOO AUTO & TECHNOLOGY COMPANY
2005 SUZUKI RENO
4-DOOR SEDAN

NHTSA NUMBER: C50507

PREPARED BY:
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9270 HOLLY ROAD
ADELANTO, CALIFORNIA 92301

8/5/05

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
ROOM 6115 (NVS-221)
400 SEVENTH STREET, SW
WASHINGTON, D.C. 20590

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-01-C-31025.

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Technical Report Documentation Page

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7. Authors Mr. Matt Ivory, Project Engineer, Karco Mr. Frank Richardson, Program Manager, Karco		**8. Performing Organization Report No.** TR-P25007-01-NC
9. Performing Organization Name and Address Karco Engineering, LLC 9270 Holly Rd. Adelanto, CA, 92301		**10. Work Unit No.** **11. Contract or Grant No.** DTNH22-01-C-31025
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance (NSA-31) 400 Seventh Street, SW, Room 6115 Washington, D.C. 20590		**13. Type of Report and Period Covered** Final Test Report **14. Sponsoring Agency Code** NSA-31

15. Supplementary Notes

16. Abstract

This 30 mph rear moving barrier impact test is a part of the Federal Motor Vehicle Safety Standard (FMVSS) 301 Compliance Test Program conducted for the National Highway Traffic Safety Administration (NHTSA) by KARCO Engineering, LLC Laboratories under Contract No. DTNH22-01-C-31025. The purpose of this test was to determine if the subject vehicle, a 2005 Suzuki Reno 4-Door Sedan, meets the performance requirements of FMVSS No. 301, "Fuel System Integrity." The test was conducted on August 5, 2005 in accordance with the Office of Vehicle Safety Compliance Laboratory Test Procedure TP-301-03, dated February 28, 2003. The impact velocity was 47.84 Km/h. The ambient temperature at the time of impact was 35.0 degrees Celsius. The vehicle's maximum post-test static crush was 363 mm right of the vehicle's centerline

17. Key Words FMVSS 301 2005 Suzuki Reno 4-Door Sedan NHTSA No. C50507		**18. Distribution of Statement** Copies of this report available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 400 Seventh St., SW, Room 5108 Washington, D.C. 20590	
19. Security Classification (this report) Unclassified	**20. Security Classification (this page)** Unclassified	**21. No. of Pages** 42	**22. Price**

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SECTION 1

PURPOSE OF TEST

1. PURPOSE

The purpose of this test was to determine if the subject vehicle, a 2005 Suzuki Reno 4-Door Sedan, meets the performance requirements of FMVSS No. 301, "Fuel System Integrity." The test was conducted in accordance with the Office of Vehicle Safety Compliance Laboratory Test Procedure TP-301-03, dated February 28, 2003.

SECTION 2

SUMMARY OF TEST

2. SUMMARY

A 1485 kg 2005 Suzuki Reno 4-Door Sedan was impacted from the rear by a 1799 kg moving barrier at a velocity of 47.84 Km/h (29.73 mph). The test was performed by KARCO Engineering, LLC on August 5, 2005.

The vehicle was prepared and tested following the Office of Vehicle Safety Compliance Test Procedure for Federal Motor Vehicle Safety Standard (FMVSS) 301R (OVSC TP-301-03, dated February 28., 2003).

The crash event was recorded by eleven (11) high speed and three (3) real time cameras. Camera locations and other pertinent camera information are found in the data sheets. Appendix A contains Pre- and Post-Test Photographs.

There was no fuel system fluid spillage following the impact event or during any portion of the static rollover test. The maximum longitudinal crush was 363 millimeters. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Suzuki Reno 4-Door Sedan NHTSA No.: C50507
Test Program: FMVSS 301-Fuel System Integrity Test Date: 8/5/05

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	C50507
Make	Suzuki
Model	Reno
Body Style	4-Door
Vin No.	KL5JD66Z85K073474
Color	Blue
Delivery Date	5/5/05
Odometer	83
Dealer	Suzuki Riverside
Transmission	4 Speed Automatic
Final Drive	Front
Type/No. Cyl.	4
Engine Disp. (L)	2.0
Engine Placement	Transverse
Roof Rack	No
Sunroof/T-Top	No
Tinted Glass	No
Traction Control	No
Power Brakes	Yes
Front Disc	Yes
Rear Disc	Yes

Anti-Lock Brakes	No
All Wheel Drive	No
Power Steering	Yes
Driver Front Airbag	Yes
Driver Side Airbag	Yes
Driver Head Airbag	No
Driver Curtain Airbag	No
Pass. Airbag	Yes
Pass. Side Airbag	Yes
Pass. Head Airbag	No
Pass. Curtain Airbag	No
Pre-Tensioners	
Load Limiters	
Bucket Seats	Yes
Air. Cond.	Yes
AM/FM Cassette	Yes
Tilt Steering	Yes
Automatic Door Locks	Yes
Power Windows	Yes
Power Seats	No
Other	

DATA FROM CERTIFICATION LABEL

Manufactured By	GM DAEWOO AUTO & TECHNOLOGY CO.
Date of Manufacture	Aug-04

GVWR (kg)	1680
GAWR Front (kg)	920
GAWR Rear (kg)	845

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	None	
Number of Occupants	2	3	0	5
Capacity Weight (VCW) (kg)				398
Cargo Weight (RCLW) (kg)				56

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

Test Vehicle: 2005 Suzuki Reno 4-Door Sedan NHTSA No.: C50507

Test Program: FMVSS 301-Fuel System Integrity Test Date: 8/5/05

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	406	245		439	308	
Right	kg	397	238		434	304	
Ratio	%	62.5%	37.5%		58.8%	41.2%	
Totals	kg	803	483	1286	873	612	1485

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1286
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Wt. (RCLW)	kg	56
Calculated Vehicle Target Wt. (TVTW)	kg	1494

TEST VEHICLE ATTITUDE AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	655	664	664	677	974
As Tested	mm	632	632	618	618	1070

Vehicle Wheel Base (mm) 2595

Weight of Ballast Secured in cargo area (kg) 13.6

Vehicle Components Removed

* Ballast weight does not include cameras, instrumentation and brake abort system.

FUEL SYSTEM DATA

Fuel System Capacity From Owners Manual (L) 54.89

Usable Capacity Furnished by COTR (L) 54.89

Actual Test Volume with entire fuel System Filled (L) 51.10

1/3 of Usable Capacity (L) N/A

Test Fluid Type: Stoddard Solvent

Kinematic Viscosity: as per ASTM Standard D484-71 Purple

Is Vehicle Fuel Pump Electric or Mechanical? Electric

If electric, does pump operate with ignition switch "On" & engine "OFF" Yes

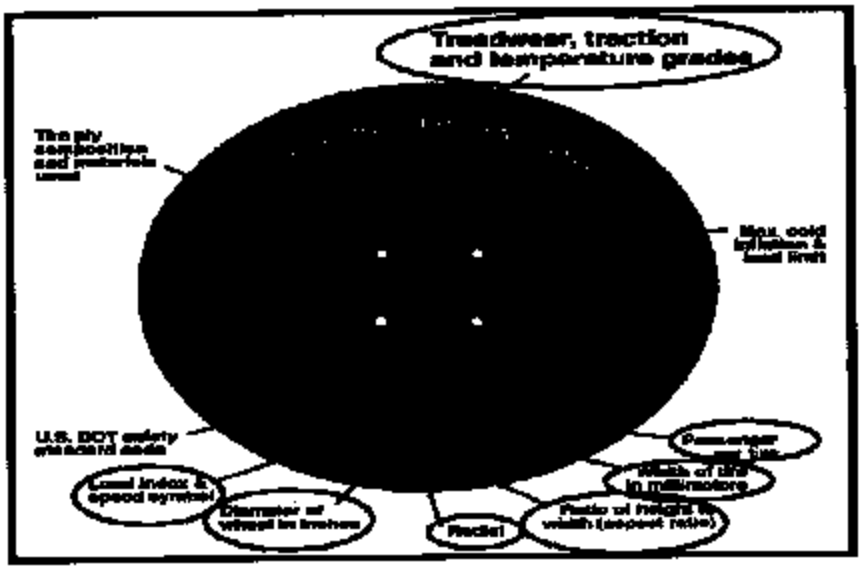
Fuel System Particulars: The fuel filler door is located on the right rear fender. The standard fuel tank occupies the area under the rear seat.

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

Test Vehicle: 2005 Suzuki Reno 4-Door Sedan NHTSA No.: C50507

Test Program: FMVSS 301-Fuel System Integrity Test Date: 8/5/05

Collect year, make, model, VIN, items circled in red, and tire manufacturer and tire name.



TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	300	300
Cold Pressure (kpa)	210	230
Recommended Tire Size	195/55/R15	195/55/R15
Tire Size on Vehicle	195/55/R15	195/55/R15
Tire Manufacturer	Hankook	Hankook
Treadwear	420	420
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester + 2 Steel	1 Polyester + 2 Steel
Load Index/Speed Symbol	84 V	84 V
Tire Material	Polyester + Steel + Rubber	Polyester + Steel + Rubber
DOT Safety Code Right	T7AMCHH2904	T7AMCHH2904
DOT Safety Code Left	T7AMCHH2904	T7AMCHH2904

DATA SHEET NO. 2
MOVING BARRIER DATA

Test Vehicle: 2005 Suzuki Reno 4-Door Sedan NHTSA No.: C50507

Test Program: FMVSS 301-Fuel System Integrity Test Date: 8/5/05

BARRIER SPECIFICATIONS

Measurement Description	mm
Barrier Face Height	1525
Barrier Face Width	1980
Barrier Face Ground Clearance	115
Tread Width	200
Wheelbase	3045
Tread Width	1530

LOCATION OF BARRIER CG

Measurement Description	mm
X-distance rearward of front wheel center	1372
Y-distance from longitudinal-vertical plane of symmetry	1523

BARRIER WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	494	405	
Right	kg	494	406	
Ratio	%	54.9%	45.1%	
Totals	kg	988	811	1799

BARRIER TIRES

Manufacturer	Maximum II
Model	Remington
Size	205-75-R15
Pressure (kPa)	241

BARRIER IMPACT VELOCITY

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	46.51 to 48.12	47.84
Trap No. 2 Velocity (Redundant)	km/h	46.51 to 48.12	47.79

DATA SHEET NO. 3
FUEL SYSTEM INTEGRITY POST- IMPACT DATA

Test Vehicle: 2005 Suzuki Reno 4-Door Sedan NHTSA No.: C50507

Test Program: FMVSS 301-Fuel System Integrity Test Date: 8/5/05

Test Time: 5:43 PM Temperature: 35.0 Deg. C.

STODDARD SOLVENT SPILLAGE MEASUREMENTS

A. From Impact until vehicle motion ceases: 0.0 oz.
(Maximum Allowable = 1 ounce)

B. For the 5 minute period after motion ceases: 0.0 oz.
(Maximum Allowable = 5 ounces)

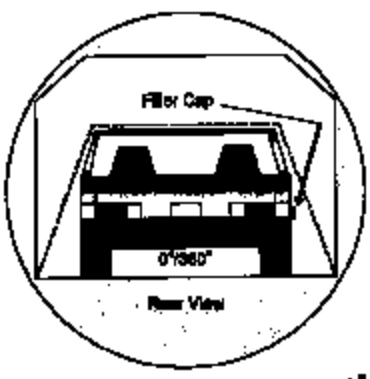
C. For the following 25 minutes: 0.0 oz.
(Maximum Allowable = 1 oz./minute)

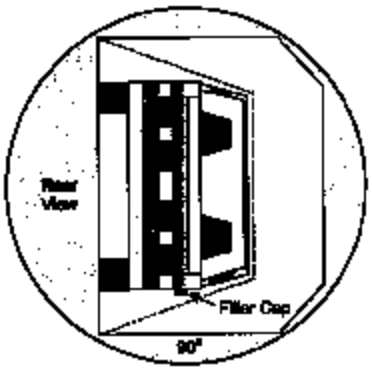
D. Spillage Location Details: No leakage occurred

DATA SHEET NO. 4
STATIC ROLLOVER DATA

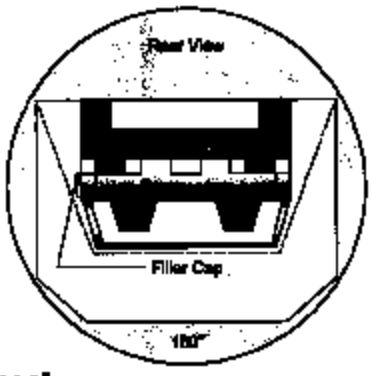
Test Vehicle: 2005 Suzuki Reno 4-Door Sedan NHTSA No.: C50507

Test Program: FMVSS 301-Fuel System Integrity Test Date: 8/5/05

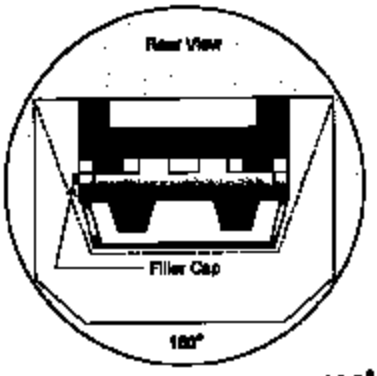




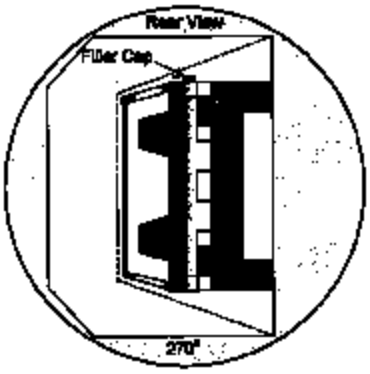
0° to 90°

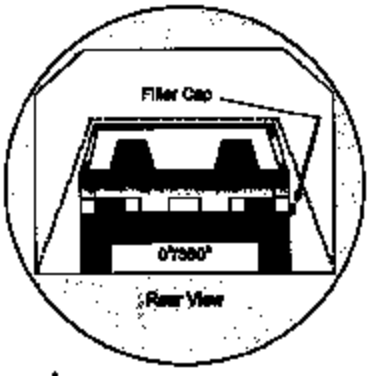


90° to 180°



180° to 270°





270° to 360°

1. The specified fixture rollover rate for each 90° of rotation is 60 to 120 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. No solvent leakage occurred during rollover.

DATA SHEET NO. 4...(CONTINUED)
STATIC ROLLOVER DATA

Test Vehicle: 2005 Suzuki Reno 4-Door Sedan NHTSA No.: C50507

Test Program: FMVSS 301-Fuel System Integrity Test Date: 8/5/05

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	89	311	400
90° to 180°	78	300	378
180° to 270°	78	313	391
270° to 360°	74	300	374

FMVSS 301 SPILLAGE TABLE REQUIREMENT (oz.)

First 5 Minutes	5.0
Sixth Minute	1.0
Seventh Minute	1.0
Eighth Minute	1.0

ACTUAL TEST VEHICLE SOLVENT SPILLAGE TABLE (oz.)

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. 5
CAMERA LOCATIONS

Test Vehicle: 2005 Suzuki Reno 4-Door Sedan NHTSA No.: C50507
Test Program: FMVSS 301-Fuel System Integrity Test Date: 8/5/05

VEHICLE CAMERA MEASUREMENT TABLE

No.	Camera View	Location (mm)			Angle (deg.)	Lens (mm)	Speed (fps)
		X	Y	Z			
1	Real Time, Documentary	2068	1528	-1862	-7.0	Zoom	30
2	Left Side	560	-12192	-1700	0.0	35mm	1000
3	Right Side	2286	-11856	-1700	0.0	35mm	1000
4	Overhead	1220	2860	-5486	-90.0	20mm	1000
5	Moving Barrier	0	0	-2340	64.0	7mm	860
6	Rear Underside	3050	0	1832	90.0	12mm	1000
7	Mid Underside	1840	0	1849	90.0	12mm	1000
8	Front Underside	620	0	1822	90.0	13mm	1000
9	Underside Close-Up	770	270	1851	64.0	25mm	1000
10	Driver Side On-Board	-1622	72	-1142	-2.0	14mm	1000
11	Passenger On-Board	-1630	-74	-1139	-2.0	8mm	1000
12	Real Time Left Side	700	-12192	-1800	-2.0	Zoom	30
13	Real Time Right Side	2000	-11200	1800	-2.0	Zoom	30

X = Monorail Centerline Y = Impact Location Z = Ground DNR = Did Not Run NTM = No Timing Marks

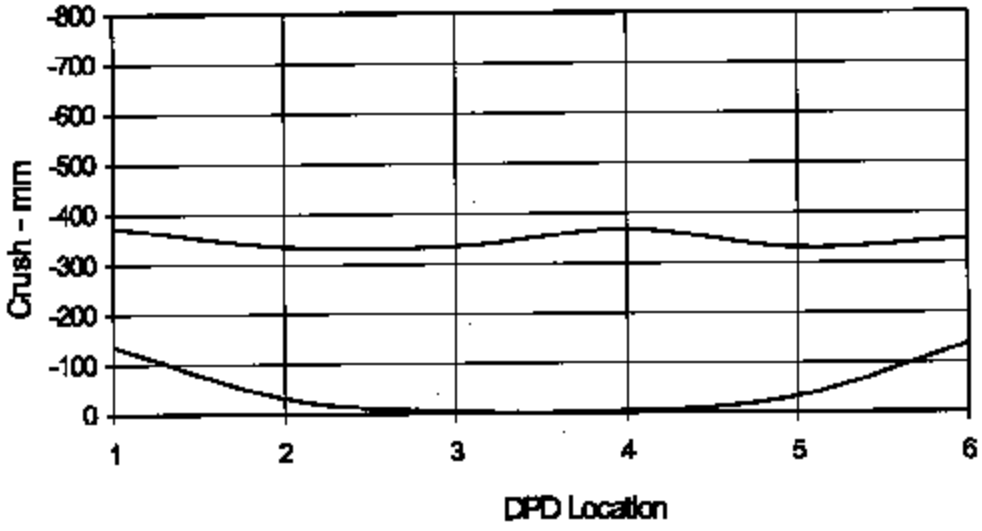
DATA SHEET NO. 6
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2005 Suzuki Reno 4-Door Sedan NHTSA No.: C50507
Test Program: FMVSS 301-Fuel System Integrity Test Date: 8/5/05

CRUSH PROFILE

Damage Region Length (mm): 1316 Midpoint of Damage: Centerline
Impact Mode: Rear Impact (0 Deg.)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	-136	-374	238
C2	Crush zone 2 on left side	mm	-32	-335	303
C3	Crush zone 3 on left side	mm	-4	-335	331
C4	Crush zone 4 on right side	mm	-4	-367	363
C5	Crush zone 5 on right side	mm	-32	-330	298
C6	Crush zone 6 at right side	mm	-137	-347	210



APPENDIX A

PHOTOGRAPHS

LIST OF PHOTOGRAPHS

Figure A-1: Left Front ¾ View, As Received

Figure A-2: Right Rear ¾ View, as Received

Figure A-3. Vehicle Certification Label

Figure A-4 Vehicle Tire Label

Figure A-5: Pre-Test Front View

Figure A-6: Post-Test Front View

Figure A-7: Pre-Test Left Side View

Figure A-6. Post-Test Left Side View

Figure A-8: Pre-Test Right Side View

Figure A-10. Post-Test Right Side View

Figure A-11: Pre-Test Left Front ¾ View

Figure A-12: Post-Test Left Front ¾ View (Vehicle Moved)

Figura A-13. Pre-Test Right Rear ¾ View

Figure A-14: Post-Test Right Rear ¾ View

Photograph Not Available

Figure A-15: Pre-Test Front Underbody

Figure A-16: Post-Test Front Underbody

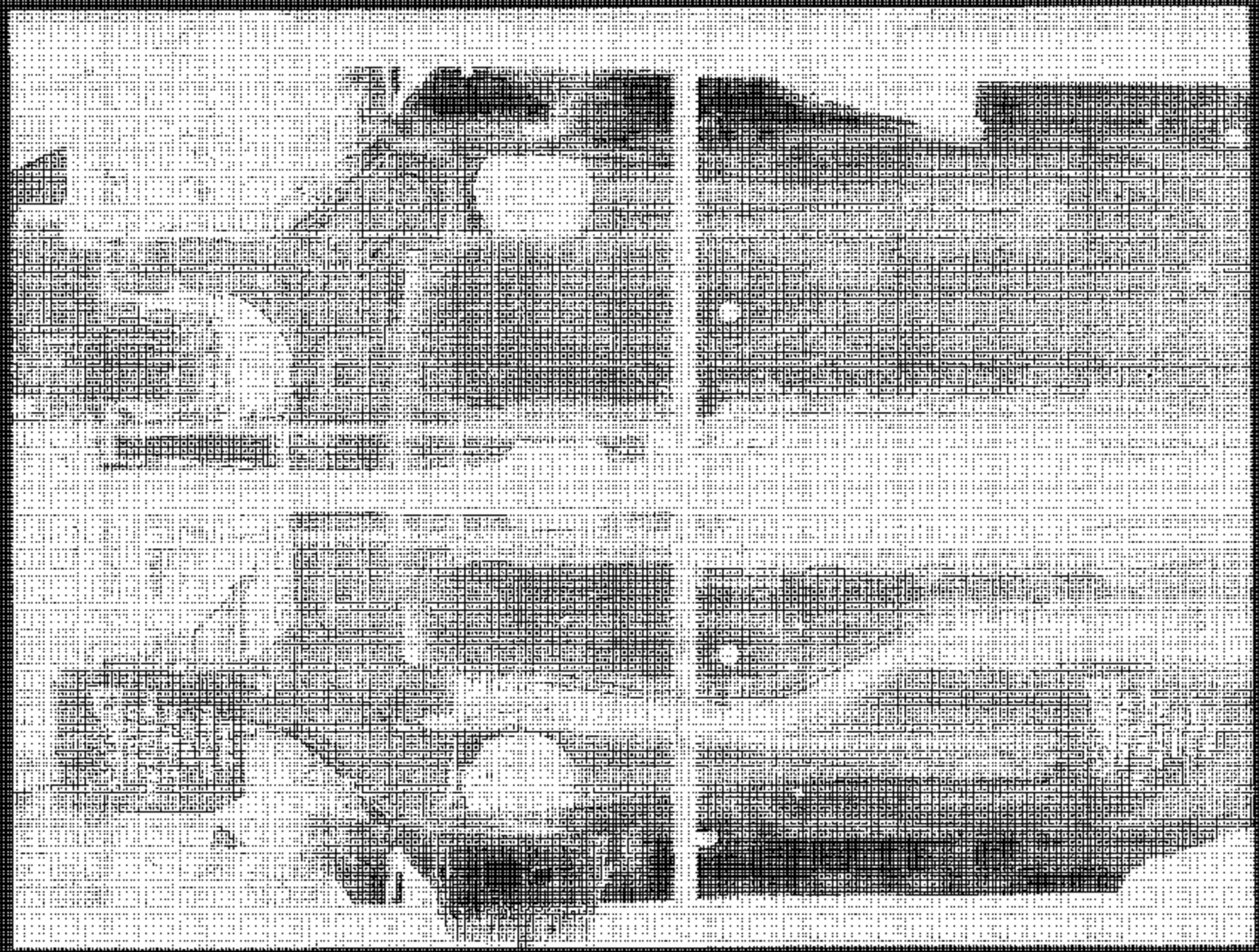


Figure A-17: Pre-Test Mid Underbody

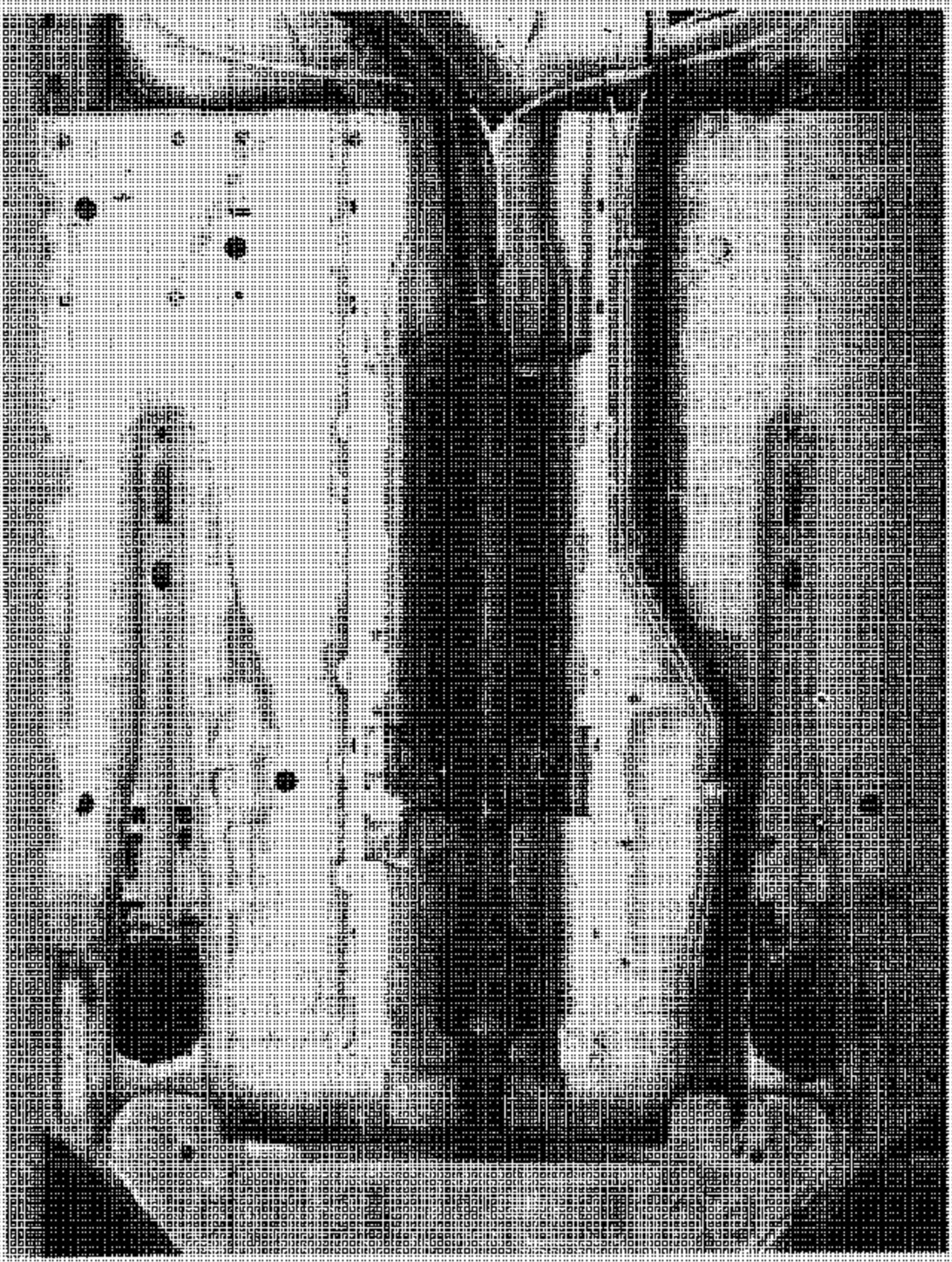


Figure A-16: Post-Test MH Underbody

Figure A-19: Pre-Test Rear Underbody

Figure A-20: Post-Test Rear Undercody

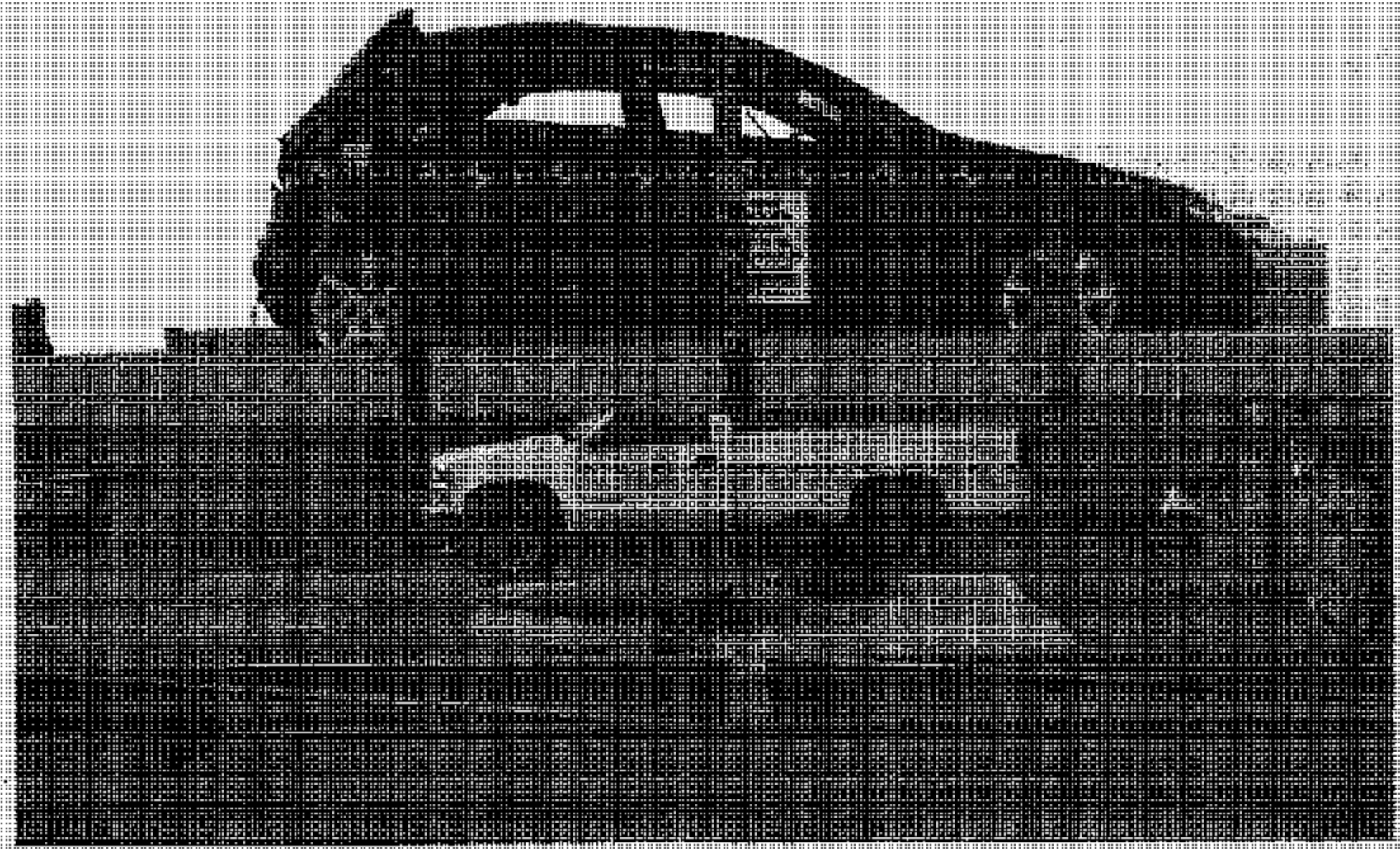


Figure A-21: Vehicle on Rollover Device at 0°

Figure A-22. Vehicle on Rollover Device at 90°

Figure A-23. Vehicle on Rollover Device at 180°

Photograph Not Available

Figure A-24: Vehicle on Rollover Device at 270°

Figure A-25. Vehicle During Impact