REPORT NUMBER: 301-CAL-03-04

SAFETY COMPLIANCE TESTING FOR FMVSS 301
FUEL SYSTEM INTEGRITY

GENERAL MOTORS CORPORATION
2003 CHEVROLET S-10
PICKUP

NHTSA NUMBER: C30113
VERIDIAN TEST NUMBER: 8655-F301-13

August 4, 2003

VERIDIAN ENGINEERING
P.O. BOX 400
BUFFALO, NEW YORK 14225

FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
Safety Assurance
Office of Vehicle Safety Compliance
400 Seventh Street, S. W.
Room No. 6115 (NVS-220)
Washington, DC 20590
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Approval Date:  
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16. Abstract
   Compliance tests were conducted on the subject 2003 Chevrolet S-10 Pickup in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301-03 for the determination of FMVSS 301 compliance. For the purpose of acquiring information for applied research, two instrumented Anthropomorphic Test Devices (ATDs) were placed in the front occupant seating positions and various instrumentation was added to the test vehicle. Test failures identified were as follows:

   The test vehicle appeared to comply with all requirements of FMVSS 301 "Fuel System Integrity."

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SECTION 1

PURPOSE OF COMPLIANCE TEST

This 30 mph rear moving barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 301 Compliance Test Program conducted for the National Highway Traffic Safety Administration (NHTSA) by Veridian Engineering under Contract No. DTNH22-01-C-01025. The purpose of this test was to determine if the subject vehicle, a 2003 Chevrolet S 10 Pickup, meets the performance requirements of FMVSS No. 301, "Fuel System Integrity." This compliance test was conducted using the requirements found in the ONSC Laboratory Test Procedure No. TP.301.03, dated February 28, 2003.
SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

A 1703.0 kg, 2003 Chevrolet S-10 Pickup was impacted from the rear by an 1797 kg moving barrier at a velocity of 47.96 kph (29.8 mph). The test was performed by Veridian Engineering on August 4, 2003.

The test vehicle was equipped with a 65.4 liter fuel tank which was filled to 92.5 percent capacity with standard fluid prior to impact. Additional ballast (82.5 kg) was secured in the vehicle cargo area. For the purpose of acquiring information for applied research, one instrumented Part 572 J; 50th percentile male Anthropomorphic Test Device (ATD) and one instrumented Part 572 O.5th percentile female ATD were placed in the driver and right front occupant seating positions respectively and various instruments were added to the test vehicle. Research data is presented in a separate report.

The crash event was recorded by ten high-speed cameras and one real-time camera. Camera locations and other pertinent camera information are found on pages 3-9 and 3-10 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 357 millimeters. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."
SECTION 3

COMPLIANCE TEST DATA
DATA SHEET 1

TEST VEHICLE SPECIFICATIONS

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2003 Chevrolet S-10 Pickup

NHTSA No.: C30113; Color: White

Engine Data: 4 Cylinders; CID: 2.2 Liters; cc

Placement: X Longitudinal or In-Line; Transverse or Lateral

Transmission Data: 4 Speeds; Manual; X Automatic; X Overdrive

Final Drive: X Rear Wheel Drive; Front Wheel Drive; Four Wheel Drive

Major Options: X A/C; X Power Steering; X Power Brakes

X Power Windows; X Power Door Locks; X Tilt Wheel

Date Received: May 6, 2003; Odometer Reading: 36,360 km

Selling Dealer: West Herr Chevrolet of Hamburg

Address: 5025 Southwestern Boulevard Hamburg, NY 14075

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: General Motors Corp

Date of Manufacture: 11/02

VIN: 1GCE8148X38178402

GVWR: 1905 kg; GAWR-FRONT: 1135 kg; GAWR-REAR: 1043 kg

DATA FROM VEHICLE'S TIRE LABEL:

Location of Placard on Vehicle: Driver Door

Recommended Tire Size: P205/75R15 97s

* Recommended Cold Tire Pressure: FRONT: 240 kPa; REAR: 240 kPa

DATA FROM TIRE SIDEWALL:

Size of Tires on Test Vehicle: P205/75R15 97s

Manufacturer: Uniroyal

Tire Pressure with Maximum Capacity Vehicle Load: FRONT: 337 kPa; REAR: 337 kPa

Type of Spare Tire: T145/80D16

VEHICLE CAPACITY DATA:

Type of Front Seats: Bench; Bucket; X Split Bench

Number of Occupants: 3 Front; 0 Rear; 3 Total

Vehicle Capacity Weight (VCW) = 482.0 kg

No. of Occupants x 68.04 kg = 204.1 kg

Rated Cargo/Luggage Weight (RCLW) = 277.9 kg (136.1 kg maximum)

*Tire pressure used for test
DATA SHEET 2

PRE-TEST DATA

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

<table>
<thead>
<tr>
<th>Side</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Front</td>
<td>415.0</td>
</tr>
<tr>
<td>Left Front</td>
<td>418.5</td>
</tr>
<tr>
<td>TOTAL FRONT</td>
<td>833.5</td>
</tr>
<tr>
<td>Right Rear</td>
<td>286.0</td>
</tr>
<tr>
<td>Left Rear</td>
<td>303.5</td>
</tr>
<tr>
<td>TOTAL REAR</td>
<td>589.5</td>
</tr>
</tbody>
</table>

TOTAL DELIVERED WEIGHT = 1423 kg

% of Total Front of Vehicle Weight = 58.6% of Total Rear Weight = 41.4%

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Delivered Weight</td>
<td>1423</td>
</tr>
<tr>
<td>Rated Cargo/Luggage Weight (RCLW)</td>
<td>136.1</td>
</tr>
<tr>
<td>Weight of 2 p.572 Dummies, 74.4 kg</td>
<td>148.8</td>
</tr>
<tr>
<td>TARGET TEST WEIGHT</td>
<td>1707.9</td>
</tr>
</tbody>
</table>

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 131.2 KG OF CARGO WEIGHT:

<table>
<thead>
<tr>
<th>Side</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Front</td>
<td>486.5</td>
</tr>
<tr>
<td>Left Front</td>
<td>498.0</td>
</tr>
<tr>
<td>TOTAL FRONT</td>
<td>984.5</td>
</tr>
<tr>
<td>Right Rear</td>
<td>352.0</td>
</tr>
<tr>
<td>Left Rear</td>
<td>366.5</td>
</tr>
<tr>
<td>TOTAL REAR</td>
<td>718.5</td>
</tr>
</tbody>
</table>

TOTAL TEST WEIGHT = 1703 kg

% of Total Front of Vehicle Weight = 57.8% of Total Rear Weight = 42.2%

Weight of Ballast Secured in Vehicle Trunk Area = 82.5 kg

Type of Ballast: Lead Shot

Method of Securing Ballast: Anchored to bed

Vehicle Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimension in millimeters):

<table>
<thead>
<tr>
<th>Condition</th>
<th>RF</th>
<th>LF</th>
<th>RR</th>
<th>LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS DELIVERED</td>
<td>797</td>
<td>779</td>
<td>813</td>
<td>795</td>
</tr>
<tr>
<td>AS TESTED</td>
<td>776</td>
<td>754</td>
<td>787</td>
<td>772</td>
</tr>
</tbody>
</table>

Vehicle's Wheel Base = 2755 mm

Location of Vehicle's C.G = 1162 mm rearward of front wheel center.

FUEL SYSTEM DATA:

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel System Capacity From Owner's Manual</td>
<td>65.4 liters</td>
</tr>
<tr>
<td>Usable Capacity Figure Furnished by COITR</td>
<td>65.4 liters</td>
</tr>
<tr>
<td>Test Volume Range (91 to 94% of Usable Capacity)</td>
<td>59.51 to 61.48 liters</td>
</tr>
<tr>
<td>Actual Test Volume (with entire fuel system filled)</td>
<td>60.5 liters</td>
</tr>
</tbody>
</table>

* Ballast weight includes the RCLW, the weight of drained vehicle fluids and the weight of any removed vehicle components less the weight of onboard instrumentation, cameras, and hardware.
**FUEL SYSTEM DATA (continued):**

<table>
<thead>
<tr>
<th>Test Fluid Type</th>
<th>Standard Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Fluid Specific Gravity</td>
<td>0.764</td>
</tr>
<tr>
<td>Test Fluid Kinematic Viscosity</td>
<td>0.96 centistokes</td>
</tr>
<tr>
<td>Test Fluid Color</td>
<td>Orange</td>
</tr>
<tr>
<td>Type of Vehicle Fuel Pump</td>
<td>Electric</td>
</tr>
</tbody>
</table>

**Electric Fuel Pump Operation with Ignition Switch ON and Engine OFF:**
- Fuel pump operated.

**Details of Fuel System:** The fuel tank is located on the left side of the vehicle ahead of the rear axle with the fuel lines located inboard of the left frame rail. The filler neck is located on the left side of the vehicle ahead of the rear axle.

**Comments:** None
DATA SHEET 3

MOVING BARRIER DATA

WEIGHT OF MOVING BARRIER:

Right Front = 504.9 kg
Left Front = 499.9 kg
TOTAL FRONT = 1004.8 kg

Right Rear = 393.7 kg
Left Rear = 398.3 kg
TOTAL REAR = 792.0 kg

TOTAL BARRIER WEIGHT = 1796.8 kg

MOVING BARRIER DIMENSIONS:

Barrier Face Height: 1524 mm
Barrier Face Width: 1981 mm
Barrier Face Ground Clearance: 127 mm
Tread Width: 1511 mm
Wheel Base: 3048 mm

Location of C.G.:
X: 1344 mm rearward of front wheel center.
Y: 0 mm from longitudinal-vertical plane of symmetry.
Z: 414 mm above ground.

MOVING BARRIER TIRES:

Manufacturer: Classic
Model: Poly IV
Size: 215/75D15

Recommended Max Pressure: 240 kPa

MOVING BARRIER ABORT SYSTEM:

Type: Trailing cable
DATA SHEET 4

POST TEST DATA

TYPE OF TEST:

Type of Test: Rear Barrier
Impact Angle: 0º

Test Date: August 4, 2003
Time: 10:56
Temperature: 24.4 °C

Vehicle NHTSA No.: C30113
VIN: 1GCS044380078062

Required Impact Velocity Range: 46.51 to 48.12 kph

BARRIER IMPACT VELOCITY: (Speed traps within 5 feet of impact plane.)

Trap No. 1 = 47.96 kph, Trap No. 2 = 47.96 kph

Average Impact Speed = 47.96 kph

VEHICLE STATIC CRUSH:

Vehicle Length:

Pre-Test
Left = 4720; C/L = 4830; Right = 4720

Post-Test
Left = 4385; C/L = 4445; Right = 4370

Crush
Left = 335; C/L = 335; Right = 350

AVERAGE = 357 millimeters

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POST TEST DATA

TEST VEHICLE NHTSA NO.: C30113              TEST DATE: August 4, 2003
Vehicle Mfg./Make/Model: 2003 Chevrolet S-10 Pickup

Test vehicle fuel tank filled to 91% to 94% of manufacturer's "usable" capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPE:
- Frontal (42.28 kph target velocity)
- Oblique (42.28 kph target velocity) with ____ barrier face first contacting ____ (driver/passenger) side
- Rear Moving Barrier (42.28 kph target velocity)
- Lateral Moving Barrier (32.19 kph target velocity)

FUEL SPILLAGE MEASUREMENT:

1. From impact until vehicle motion ceases
   Actual: 0
   Max Allowed: 28 g

2. For five minute period after vehicle motion ceases
   Actual: 0
   Max Allowed: 28 g

3. For next 25 minutes
   Actual: 0
   Max Allowed: 28 g/min

SOLVENT SPILLAGE DETAILS:

None
DATA SHEET 5
STATIC ROLLOVER TEST DATA

Table 7. FMVSS NO. 301 - STATIC ROLLOVER DATA SHEET

Vehicle: 2003 Chevrolet S-10 Pickup
NHTSA No.: C30113

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

<table>
<thead>
<tr>
<th>Rollover Stage</th>
<th>Rotation Time (spec. 1 -3 min)</th>
<th>FMVSS 301 Hold Time</th>
<th>Total Time</th>
<th>Next Whole Minute Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>0° - 90°</td>
<td>1 minutes 29 seconds</td>
<td>5 minutes</td>
<td>6 minutes 29 seconds</td>
<td>7 minutes</td>
</tr>
<tr>
<td>90° - 180°</td>
<td>1 minutes 03 seconds</td>
<td>5 minutes</td>
<td>6 minutes 3 seconds</td>
<td>7 minutes</td>
</tr>
<tr>
<td>180° - 270°</td>
<td>1 minutes 02 seconds</td>
<td>5 minutes</td>
<td>6 minutes 2 seconds</td>
<td>7 minutes</td>
</tr>
<tr>
<td>270° - 360°</td>
<td>1 minutes 12 seconds</td>
<td>5 minutes</td>
<td>6 minutes 12 seconds</td>
<td>7 minutes</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>First 5 minutes from onset of rotation (g)</th>
<th>6th min. (g)</th>
<th>7th min. (g)</th>
<th>8th min. (if required) (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>42 g</td>
<td>28 g</td>
<td>28 g</td>
<td>28 g</td>
</tr>
</tbody>
</table>

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

<table>
<thead>
<tr>
<th>Rollover Stage</th>
<th>First 5 minutes from onset of rotation (g)</th>
<th>6th min. (g)</th>
<th>7th min. (g)</th>
<th>8th min. (if required) (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0° - 90°</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>90° - 180°</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>180° - 270°</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>270° - 360°</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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

IV. SOLVENT SPILLAGE LOCATION(S):

<table>
<thead>
<tr>
<th>Rollover Stage</th>
<th>Spillage Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0° - 90°</td>
<td>None</td>
</tr>
<tr>
<td>90° - 180°</td>
<td>None</td>
</tr>
<tr>
<td>180° - 270°</td>
<td>None</td>
</tr>
<tr>
<td>270° - 360°</td>
<td>None</td>
</tr>
</tbody>
</table>
DATA SHEET 6

HIGH SPEED CAMERA LOCATIONS

REAL TIME CAMERA

NO STEEL GRATING ALLOWED OVER PHOTO PIT

CONCRETE PAD

TOW ROAD

TOP VIEW

MOVING BARRIER

PHOTO PIT

LEFT SIDE VIEW
## DATA SHEET 6 (continued)

### HIGH SPEED CAMERA LOCATIONS

**NHTSA No.: C30113**  
**Vehicle: 2003 Chevrolet S-10 Pickup**

<table>
<thead>
<tr>
<th>CAMERA NO.</th>
<th>VIEW</th>
<th>CAMERA POSITIONS (mm)*</th>
<th>ANGLE** (degrees)</th>
<th>LENS (mm)</th>
<th>SPEED (fps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Real-Time Camera</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Right Side View</td>
<td>16822</td>
<td>2088</td>
<td>1138</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>Left Side View</td>
<td>16652</td>
<td>1438</td>
<td>1390</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>Vehicle Front Underbody View</td>
<td>0</td>
<td>2853</td>
<td>-1956</td>
<td>90</td>
</tr>
<tr>
<td>5</td>
<td>Vehicle Mid-Section Underbody View</td>
<td>0</td>
<td>2000</td>
<td>-1956</td>
<td>90</td>
</tr>
<tr>
<td>6</td>
<td>Vehicle Rear Underbody View</td>
<td>0</td>
<td>966</td>
<td>-1956</td>
<td>90</td>
</tr>
<tr>
<td>7</td>
<td>Moving Barrier View</td>
<td>0</td>
<td>0</td>
<td>2515</td>
<td>-105</td>
</tr>
<tr>
<td>8</td>
<td>Overhead Overall View</td>
<td>-508</td>
<td>0</td>
<td>9804</td>
<td>-90</td>
</tr>
<tr>
<td>9†</td>
<td>Onboard Driver View</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10†</td>
<td>Onboard Passenger View</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* X = film plant to monorail centerline (+ to left of rail)  
  Y = film plane to impact location (+ ahead of impact location)  
  Z = film plane to ground (- above ground)  
** = referenced to horizontal plane

† Research cameras.
Appendix A

PHOTOGRAPHS
# LIST OF PHOTOGRAPHS

<table>
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<th>Figure</th>
<th>Photograph Title</th>
<th>Page</th>
</tr>
</thead>
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<td>POST-TEST FRONT VIEW</td>
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<td>POST-TEST REAR VIEW</td>
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<tr>
<td>A-18</td>
<td>TIRE PLACARD</td>
<td>A-20</td>
</tr>
<tr>
<td>A-19</td>
<td>ROLLOVER 90°</td>
<td>A-21</td>
</tr>
<tr>
<td>A-20</td>
<td>ROLLOVER 180°</td>
<td>A-22</td>
</tr>
<tr>
<td>A-21</td>
<td>ROLLOVER 270°</td>
<td>A-23</td>
</tr>
<tr>
<td>A-22</td>
<td>ROLLOVER 360°</td>
<td>A-24</td>
</tr>
</tbody>
</table>