

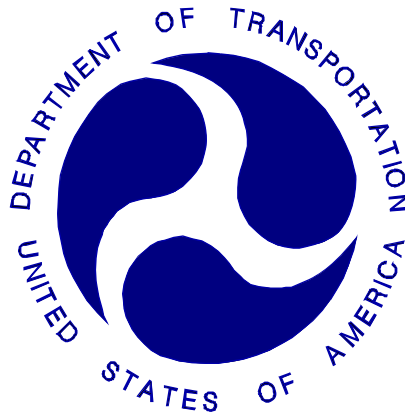
**REPORT NUMBER: 301R-CAL-18-003**

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

**FCA US LLC  
2018 Dodge Ram 1500**

**NHTSA NUMBER: C20180303**

**PREPARED BY:  
CALSPAN CORPORATION  
TRANSPORTATION TEST OPERATIONS  
P.O. BOX 400  
BUFFALO, NEW YORK 14225**



**May 21, 2018**

**FINAL REPORT**

**PREPARED FOR:  
U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration Enforcement  
Office of Vehicle Safety Compliance  
Mail Code: NVS-220  
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. DTNH22-16-D-00032.

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Edward J. Dutton, Test Engineer Director  
Transportation Test Operations

Approval Date: May 21, 2018

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: \_\_\_\_\_

Acceptance  
Date: \_\_\_\_\_

# **TECHNICAL REPORT STANDARD TITLE PAGE**

|                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                            |                                                                                                                                                                                                                                                                                 |                                   |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------|
| <b>1. Report No.</b><br>301R-CAL-18-003                                                                                                                                                                                                                                                                                                                                                                                                       | <b>2. Government Accession No.</b>                         |                                                                                                                                                                                                                                                                                 | <b>3. Recipient's Catalog No.</b> |                  |
| <b>4. Title and Subtitle</b><br>Final Report of FMVSS 301R Compliance Rear Impact Testing of a 2018 Dodge Ram 1500<br>NHTSA No.: C20180303                                                                                                                                                                                                                                                                                                    |                                                            | <b>5. Report Date</b><br>May 21, 2018                                                                                                                                                                                                                                           |                                   |                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                            | <b>6. Performing Organization Code</b><br>CAL                                                                                                                                                                                                                                   |                                   |                  |
| <b>7. Author(s)</b><br>Alexander Rudniski, Engineer Technician<br>Edward Dutton, Senior Test Engineer                                                                                                                                                                                                                                                                                                                                         |                                                            | <b>8. Performing Organization Report No.</b><br>CAL-DOT-2018-003                                                                                                                                                                                                                |                                   |                  |
| <b>9. Performing Organization Name and Address</b><br>Calspan Corporation<br>Transportation Test Operations<br>P.O. Box 400<br>Buffalo, New York 14225                                                                                                                                                                                                                                                                                        |                                                            | <b>10. Work Unit No.</b>                                                                                                                                                                                                                                                        |                                   |                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                            | <b>11. Contract or Grant No.</b><br>DTNH22-16-D-00032                                                                                                                                                                                                                           |                                   |                  |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                            | <b>14. Sponsoring Agency Code</b><br>NVS-220                                                                                                                                                                                                                                    |                                   |                  |
| <b>15. Supplementary Notes</b>                                                                                                                                                                                                                                                                                                                                                                                                                |                                                            |                                                                                                                                                                                                                                                                                 |                                   |                  |
| <b>16. Abstract</b><br><br><p>A compliance test was conducted on a 2018 Dodge Ram 1500 Truck in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301R-02 for the determination of FMVSS 301R compliance. Test failures identified were as follows:</p> <p><b>None - The test vehicle appeared to comply with all requirements of FMVSS 301R "Fuel System Integrity – Rear Impact."</b></p> |                                                            |                                                                                                                                                                                                                                                                                 |                                   |                  |
| <b>17. Key Words</b><br>Compliance Testing<br>Safety Engineering<br>FMVSS 301R                                                                                                                                                                                                                                                                                                                                                                |                                                            | <b>18. Distribution Statement</b><br><u>Copies of this report are available from:</u><br>National Highway Traffic Safety Administration<br>Technical Reference Division (TIS) (NPO-230)<br>1200 New Jersey Avenue, SE<br>Washington, D.C. 20590<br>Telephone No. (202) 366-4946 |                                   |                  |
| <b>19. Security Classification of Report</b><br>UNCLASSIFIED                                                                                                                                                                                                                                                                                                                                                                                  | <b>20. Security Classification of Page</b><br>UNCLASSIFIED |                                                                                                                                                                                                                                                                                 | <b>21. No. of Pages</b><br>39     | <b>22. Price</b> |

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## **SECTION 1**

### **PURPOSE AND TEST PROCEDURE**

This rear impact test is part of the FMVSS 301R Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-16-D-00032. The purpose of this test was to determine if the subject vehicle, a 2018 Dodge Ram 1500 Truck, meets the performance requirements of FMVSS No. 301R "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 2,632 kg 2018 Dodge Ram 1500 Truck was impacted from the rear by a 1357.0 kg moving barrier at a velocity of 79.54 kph (49.42 mph). The test was performed by Calspan Corporation on May 14, 2018.

The test vehicle was equipped with a 98.4 liter fuel tank which was filled to 93 percent capacity with stoddard fluid prior to impact. Additional ballast (135 kg) was secured in the vehicle's rear passenger foot well. Two ballast Part 572E 50th percentile male Anthropomorphic Test Devices (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 can be found on page 3-7 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 and including all portions of the static rollover test. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

## **SECTION 3**

### **SUMMARY OF TEST RESULTS**

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – Test Vehicle Specifications

Data Sheet No. 2 – Pre-Test Data

Data Sheet No. 3 – Moving Deformable Barrier (MDB) Data

Data Sheet No. 4 – High Speed Camera Locations and Data Summary

Data Sheet No. 5 – Post-Test Data

Data Sheet No. 6 – FMVSS No. 301 Static Rollover Test Data

**DATA SHEET NO. 1**  
**TEST VEHICLE SPECIFICATIONS**

Test Vehicle: 2018 Dodge Ram 1500 Truck  
Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20180303  
Test Date: 5/14/2018

**TEST VEHICLE INFORMATION AND OPTIONS**

|                          |                  |
|--------------------------|------------------|
| NHTSA No.                | C20180303        |
| Model Year               | 2018             |
| Make                     | Dodge            |
| Model                    | Ram 1500         |
| Body Style               | Truck            |
| Body Color               | Gray             |
| Odometer Reading (km/mi) | 25 miles         |
| Engine Displacement (L)  | 5.7              |
| Type/No. Cylinders       | V8               |
| Engine Placement         | Inline           |
| Transmission Type        | Automatic        |
| Transmission Speeds      | 8-Speed          |
| Final Drive              | Rear Wheel Drive |

|                                   |     |
|-----------------------------------|-----|
| Overdrive                         | Yes |
| Air Conditioning (AC)             | Yes |
| All-Wheel Drive (AWD)             | No  |
| Anti-Lock Brakes (ABS)            | Yes |
| Automatic Door Locks (ADL)        | Yes |
| Power Brakes                      | Yes |
| Power Seats                       | No  |
| Power Steering                    | Yes |
| Power Windows                     | Yes |
| Stability Control (Auto-Leveling) | No  |
| Sunroof/T-Top                     | No  |
| Tilt Steering Wheel               | Yes |
| Traction Control System (TCS)     | Yes |

**DEALER AND DELIVERY INFORMATION FROM CERTIFICATION LABEL**

|                     |                   |
|---------------------|-------------------|
| Manufactured By     | FCA US LLC        |
| Date of Manufacture | 9-17              |
| VIN                 | 1C6RR6FT6JS119654 |

|                 |      |
|-----------------|------|
| GVWR (kg)       | 3130 |
| GAWR Front (kg) | 1679 |
| GAWR Rear (kg)  | 1770 |

**TIRE PLACARD & SIDEWALL INFORMATION**

Tire Placard Location: Driver's Door Sill

Spare Tire Type: T135/80D17

| Measured Parameter                           | Front       | Rear        |
|----------------------------------------------|-------------|-------------|
| Tire Manufacturer                            | Goodyear    | Goodyear    |
| Tire Name                                    | Wrangler    | Wrangler    |
| Tire Type                                    | All Weather | All Weather |
| Max. Tire Pressure (kPa)                     | 300         | 300         |
| Recommended Tire Size                        | 265/70R17   | 265/70R17   |
| Load Index/Speed Symbol                      | 113R        | 113R        |
| Recommended Cold Tire Pressure (kPa)         | 276         | 276         |
| Tire Size on Vehicle                         | 265/70R17   | 265/70R17   |
| Treadwear/ Traction Grade/ Temperature Grade | 500 / A / B | 500 / A / B |

**VEHICLE CAPACITY DATA**

| Measured Parameter                        | Front  | Rear  | Third | Total  |
|-------------------------------------------|--------|-------|-------|--------|
| Designated Seating Capacity (DSC)         | 3      | 3     | -     | 6      |
| Seat Type (Bench, Bucket, or Split Bench) | Bucket | Bench | -     |        |
| Capacity Weight (VCW) (kg)                |        |       |       | 798    |
| DSC X 68.04 (kg)                          |        |       |       | 408.24 |
| Cargo Weight (RCLW) (kg)                  |        |       |       | 136    |

## DATA SHEET NO. 2 PRE-TEST DATA

Test Vehicle: 2018 Dodge Ram 1500 Truck  
Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20180303  
Test Date: 5/14/2018

### TEST VEHICLE WEIGHTS

|        | Units | As Delivered (UVW) |      |       | As Tested (ATW) |      |       |
|--------|-------|--------------------|------|-------|-----------------|------|-------|
|        |       | Front              | Rear | Total | Front           | Rear | Total |
| Left   | kg    | 672                | 518  |       | 740             | 586  |       |
| Right  | kg    | 662                | 496  |       | 745             | 561  |       |
| Ratio  | %     | 57                 | 43   |       | 56              | 44   |       |
| Totals | kg    | 1334               | 1014 | 2348  | 1485            | 1147 | 2632  |

### TARGET TEST WEIGHT CALCULATION (TTW)

| Measured Parameter                   | Units | Value  |         |
|--------------------------------------|-------|--------|---------|
| Total Unloaded Vehicle Weight (UVW)  | kg    | 2348   | (A)     |
| Rated Cargo/Luggage Weight (RCLW)    | kg    | 136    | (B)     |
| Weight of two P572E ATDS @ 74kg each | kg    | 155.4  | (C)     |
| Target Vehicle Test Weight (TVTWT)   | kg    | 2539.4 | (A+B+C) |

\*As tested Weight = (TVTWT - 10kg) <= ATW < (TVTWT - 5kg); TVTWT = Weight of Test Vehicle with 2 dummies and 136kg of Cargo Weight

### GENERAL TEST VEHICLE DATA

| Measured Parameter                                   | Units | Value          |
|------------------------------------------------------|-------|----------------|
| Vehicle Wheelbase                                    | mm    | 3569           |
| Vehicle Length (at Centerline)                       | mm    | 5826           |
| Vehicle Width (B-Pillar)                             | mm    | 2014           |
| Weight of Ballast Secured in Cargo Area <sup>1</sup> | kg    | 135            |
| Type of Ballast                                      |       | Weight plates  |
| Method of Securing Ballast                           |       | Rear Foot Well |
| Components Removed for Weight Reduction              |       | 0              |
| Vehicle Width at Widest Point                        | mm    | 2017           |
| Vehicle Width at Widest Point Location               |       | A-Pillar       |
| Centerline offset for impact line                    | mm    | 404            |
| Filler neck side (left/right)                        |       | Left           |

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

### TEST VEHICLE ATTITUDE AND CG

|                    | Units | Left  |      | Right |      | CG<br>(aft of front axle) |
|--------------------|-------|-------|------|-------|------|---------------------------|
|                    |       | Front | Rear | Front | Rear |                           |
| As Delivered (UVW) | mm    | 909   | 985  | 910   | 989  | 1541                      |
| As Tested (ATW)    | mm    | 891   | 967  | 888   | 968  | 1555                      |

**DATA SHEET NO. 2 (Continued)**  
**PRE-TEST DATA**

Test Vehicle: 2018 Dodge Ram 1500 Truck  
Test Program: FMVSS 301R Compliance Rear Impact Test

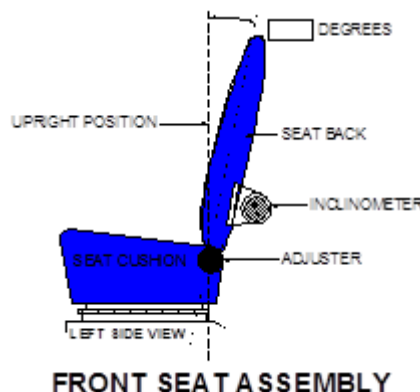
NHTSA No.: C20180303  
Test Date: 5/14/2018

**SEATING**

**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.*

**Driver Seat Instructions:** The driver seat back was positioned according to the Nominal Design Riding position listed in FORM 1.

**Passenger Seat Instructions:** The passenger seat back was positioned to the Nominal Design Riding position listed in FORM 1.



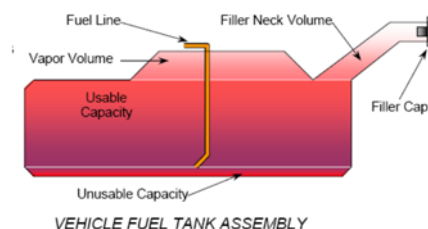
| Measured Parameter        | Deg. |
|---------------------------|------|
| Driver Seat Back Angle    | 7.0  |
| Passenger Seat Back Angle | 7.1  |

**SEAT FORE/AFT POSITIONING**

Driver Seat: Was positioned according to the Nominal Design Riding position listed in FORM1.

Passenger Seat: Was positioned according to the Nominal Design Riding position listed in FORM1.

|                | Total Travel | Test Position |
|----------------|--------------|---------------|
| Driver Seat    | 24 (0-23)    | 12            |
| Passenger Seat | 24 (0-23)    | 12            |



**FUEL TANK CAPACITY DATA**

| Measured Parameter                   | Reference                 | Liters      |
|--------------------------------------|---------------------------|-------------|
| Fuel System Capacity (Standard Tank) | Owner's Manual            | 98.4        |
| COTR Usable Capacity (Standard Tank) | Form No. 1                | 98.4        |
| Test Volume Range                    | 92-94% of Usable Capacity | 90.5 – 92.5 |
| Actual Test Volume (Solvent Used)    | 93% of Usable Capacity    | 91.5        |

**FUEL SYSTEM DATA**

| Measured Parameter                                                      | Value            |
|-------------------------------------------------------------------------|------------------|
| Test Fluid Type                                                         | Stoddard Solvent |
| Test Fluid Specific Gravity                                             | 0.764            |
| Test Fluid Kinematic Viscosity ( centistokes)                           | 0.96             |
| Test Fluid Color                                                        | Purple           |
| Electric Fuel Pump?                                                     | Yes              |
| Can Activate Electric Fuel Pump with Ignition Switch On but Engine Off? | Yes              |

Fuel Pump Comments : None

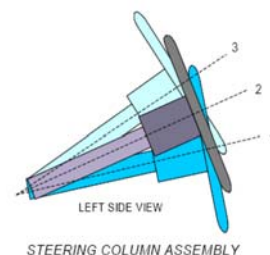
**DATA SHEET NO. 2 (Continued)**  
**PRE-TEST DATA**

Test Vehicle: 2018 Dodge Ram 1500 Truck  
Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20180303  
Test Date: 5/14/2018

**STEERING COLUMN ADJUSTMENT**

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.



Operational Instructions: Tilt wheel was positioned to mid-range at 20.8 degrees.

**SEAT BELT UPPER ANCHORAGE**

Nominal design riding position

Operational Instructions: Anchorage were set to the most upright position.

**COMMENTS:** None

**DATA SHEET NO. 3**  
**MOVING DEFORMABLE BARRIER (MDB) DATA**

Test Vehicle: 2018 Dodge Ram 1500 Truck  
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20180303  
 Test Date: 5/14/2018

MDB Face Manufacturer: Plascore      MDB Face Serial No. A0218295

**MDB SPECIFICATIONS**

| Measurement Description                               | Length (mm) |
|-------------------------------------------------------|-------------|
| Overall Width of Framework Carriage                   | 1250        |
| Overall Length of MDB (incl. honeycomb impactor face) | 4120        |
| Wheelbase of Framework Carriage                       | 2591        |
| Tread of Framework Carriage (Front & Rear)            | 1880        |
| CG Location of Front Axle                             | 1136        |

**MDB WEIGHTS**

|        | Units | Front | Rear  | Total  |
|--------|-------|-------|-------|--------|
| Left   | kg    | 358.0 | 322.0 | 680.0  |
| Right  | kg    | 404.0 | 273.0 | 677.0  |
| Ratio  | %     | 56.2% | 43.8% | 100.0% |
| Totals | kg    | 762.0 | 595.0 | 1357.0 |

**MDB TIRE SIZE & PRESSURES**

|               | Units | Requirement | Left Front | Right Front | Left Rear  | Right Rear |
|---------------|-------|-------------|------------|-------------|------------|------------|
| Tire Size     |       | P205/75R15  | P205/75R15 | P205/75R15  | P205/75R15 | P205/75R15 |
| Tire Pressure | kPa   | 200 ± 21    | 207        | 207         | 207        | 207        |

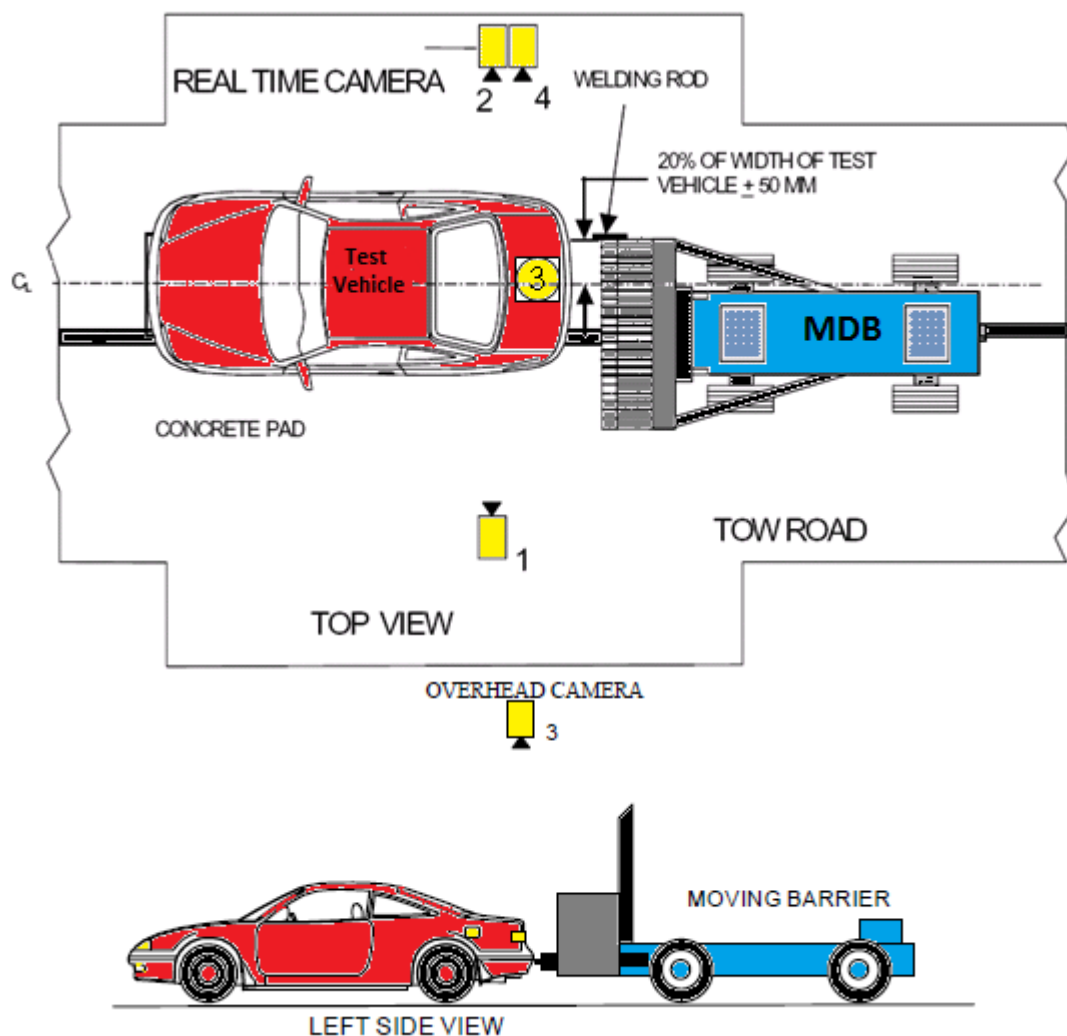
Brake Abort System? (Yes/No): Yes

Date of Last MDB Calibration: May 15, 2010

**DATA SHEET NO. 4**  
**HIGH SPEED CAMERA LOCATIONS AND DATA SUMMARY**

Test Vehicle: 2018 Dodge Ram 1500 Truck  
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20180303  
 Test Date: 5/14/2018



| No. | Camera View      | Coordinates (mm) |        |      | Angle (Deg) | Lens (mm) | Film Speed (fps) |
|-----|------------------|------------------|--------|------|-------------|-----------|------------------|
|     |                  | X*               | Y*     | Z*   |             |           |                  |
| 1   | Left Side View   | 2380             | -11571 | 1377 | 0.5         | 24        | 1000             |
| 2   | Real-Time Camera |                  |        |      |             |           | 60               |
| 3   | Overhead View    | 606              | 0      | 8212 | 90          | 12.5      | 1000             |
| 4   | Right Side View  | 2471             | 11228  | 1379 | 0.6         | 24        | 1000             |

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

X = (Impact Point) + Forward

Y = (Impact Point) + To Right

Z = (Ground Level) + Down

**DATA SHEET NO. 5  
POST-TEST DATA**

Test Vehicle: 2018 Dodge Ram 1500 Truck  
Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20180303  
Test Date: 5/14/2018

VIN: 1C6RR6FT6JS119654

REQUIRED IMPACT VELOCITY RANGE: 78.5 to 80.1 km/h

**ACTUAL IMPACT VELOCITY (WITHIN 1.5 M OF IMPACT PLANE)**

| Measurement Description | Units | Speed |
|-------------------------|-------|-------|
| Trap No. 1              | km/h  | 79.54 |
| Trap No. 2              | km/h  | 79.59 |

**WELDING ROD IMPACT POINT**

| Measurement Description                                | Tolerance | Units | Value |
|--------------------------------------------------------|-----------|-------|-------|
| Vertical distance from target center<br>(+ is above)   | ±40 mm    | mm    | 0     |
| Horizontal distance from target center<br>(+ is right) | ±50 mm    | mm    | -9    |

**STODDARD SOLVENT SPILLAGE MEASUREMENT:**

- A. From impact until vehicle motion ceases:  
(Maximum allowable is 28 grams) 0 grams
- B. For the 5-minute period after motion ceases:  
(Maximum allowable is 28 grams) 0 grams
- C. For the next 25 minutes:  
(Maximum allowable is 28 grams/minute) 0 grams
- D. Spillage Details: No Spillage Occurred

**DATA SHEET NO. 5**  
**POST-TEST DATA (Continued)**

Test Vehicle: 2018 Dodge Ram 1500 Truck  
Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20180303  
Test Date: 5/14/2018

**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     | Reclined             | Reclined             |
| Glazing Damage        | None                 | None                 |

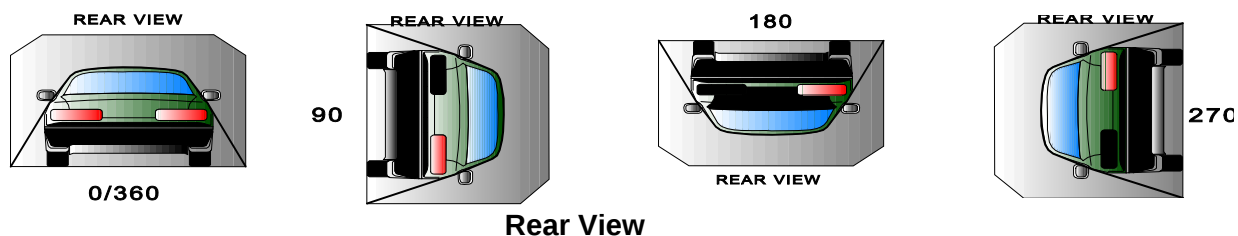
**POST TEST STRUCTURAL OBSERVATIONS**

| Critical Areas of Performance | Observations and Conclusions  |
|-------------------------------|-------------------------------|
| Windshield Damage             | None                          |
| Window Damage                 | None                          |
| Other Notable Effects         | Tailgate fell off of vehicle. |

**DATA SHEET NO. 6**  
**FMVSS NO. 301 STATIC ROLLOVER TEST DATA**

Test Vehicle: 2018 Dodge Ram 1500 Truck  
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20180303  
 Test Date: 5/14/2018



**ROLLOVER SOLVENT COLLECTION TIME TABLE**

| Test Phase   | Rotation Time<br>(spec. 1 -3 min) |         | Hold Time | Total Time |         | Next Whole<br>Minute<br>Interval |
|--------------|-----------------------------------|---------|-----------|------------|---------|----------------------------------|
|              | Minutes                           | Seconds | Minutes   | Minutes    | Seconds | Minutes                          |
| 0° to 90°    | 1                                 | 12      | 5         | 6          | 12      | 7                                |
| 90° to 180°  | 1                                 | 7       | 5         | 6          | 7       | 7                                |
| 180° to 270° | 1                                 | 4       | 5         | 6          | 4       | 7                                |
| 270° to 360° | 1                                 | 7       | 5         | 6          | 7       | 7                                |

**FMVSS 301 REQUIREMENTS TABLE (Maximum allowable solvent spillage)**

| First 5 Minutes<br>(grams) | 6th Minute<br>(grams) | 7th Minute<br>(grams) | 8th Minute<br>(grams) |
|----------------------------|-----------------------|-----------------------|-----------------------|
| 142                        | 28                    | 28                    | 28                    |

**ACTUAL TEST VEHICLE STODDARD SOLVENT SPILLAGE TABLE**

| Test Phase   | First 5 Minutes<br>(grams) | 6th Minute<br>(grams) | 7th Minute<br>(grams) | 8th Minute<br>(grams) |
|--------------|----------------------------|-----------------------|-----------------------|-----------------------|
| 0° to 90°    | 0                          | 0                     | 0                     |                       |
| 90° to 180°  | 0                          | 0                     | 0                     |                       |
| 180° to 270° | 0                          | 0                     | 0                     |                       |
| 270° to 360° | 0                          | 0                     | 0                     |                       |

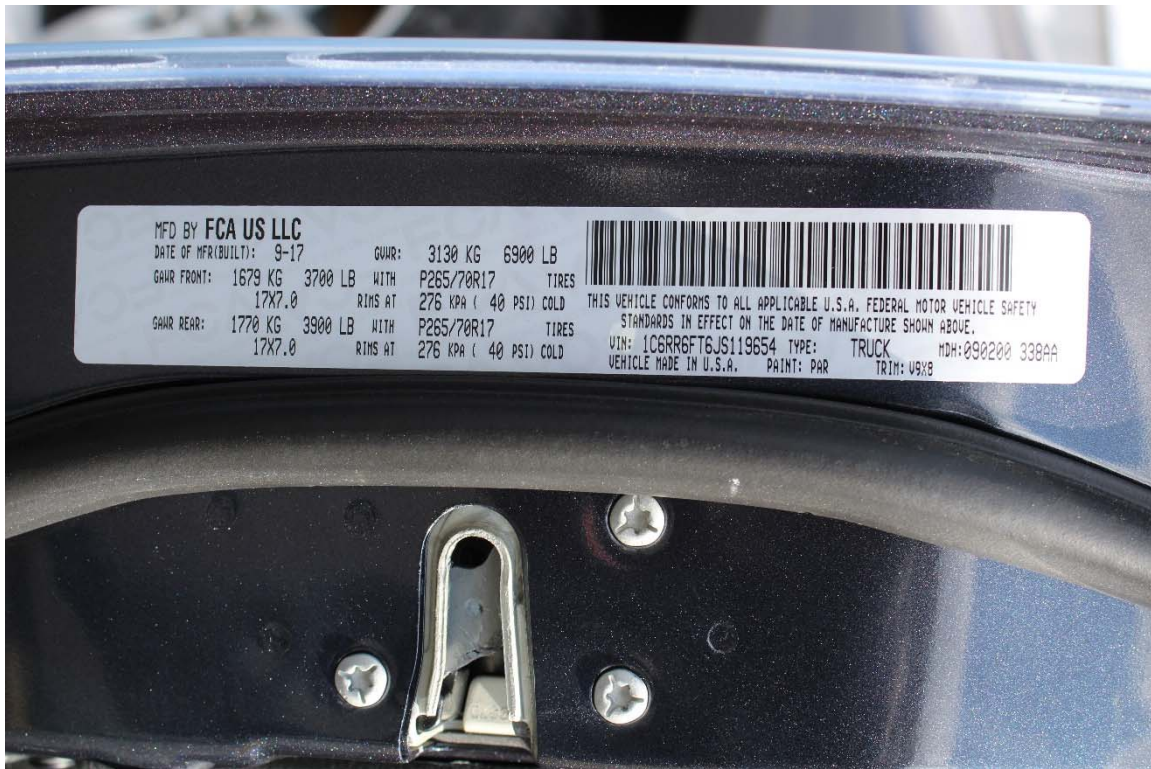
**ROLLOVER STODDARD SOLVENT SPILLAGE LOCATION TABLE**

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

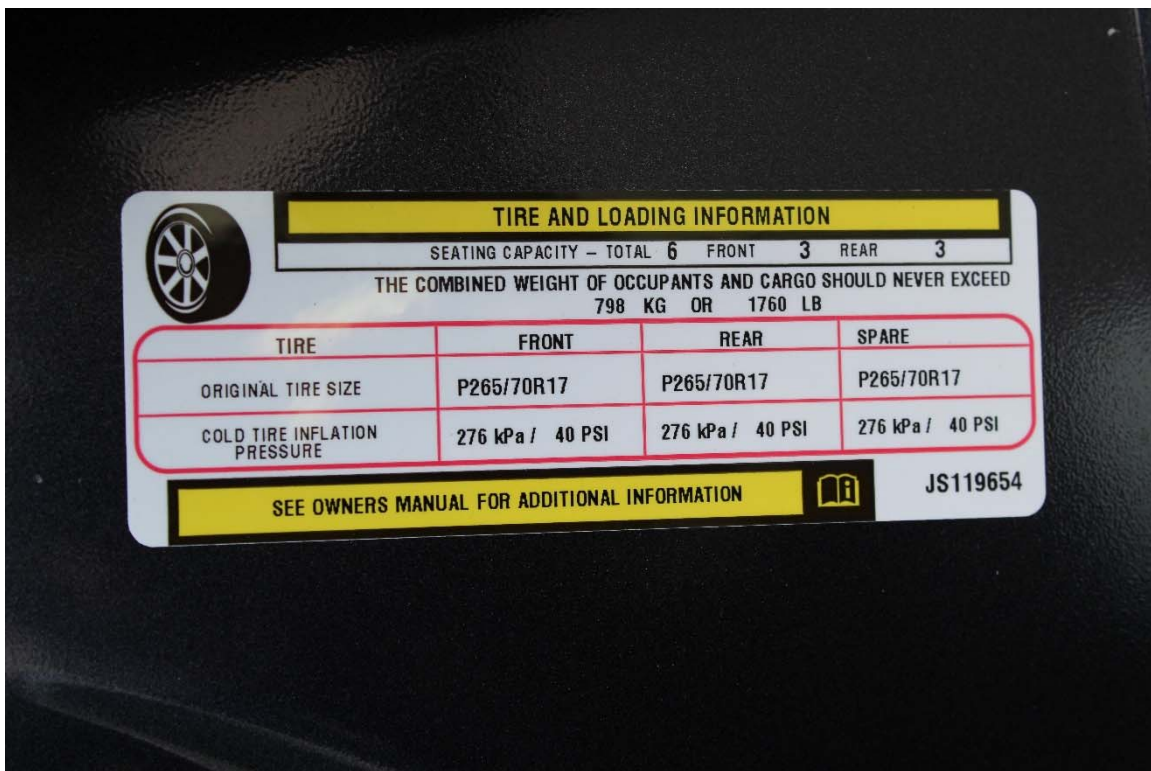
**APPENDIX A**  
**PHOTOGRAPHS**

## TABLE OF PHOTOGRAPHS

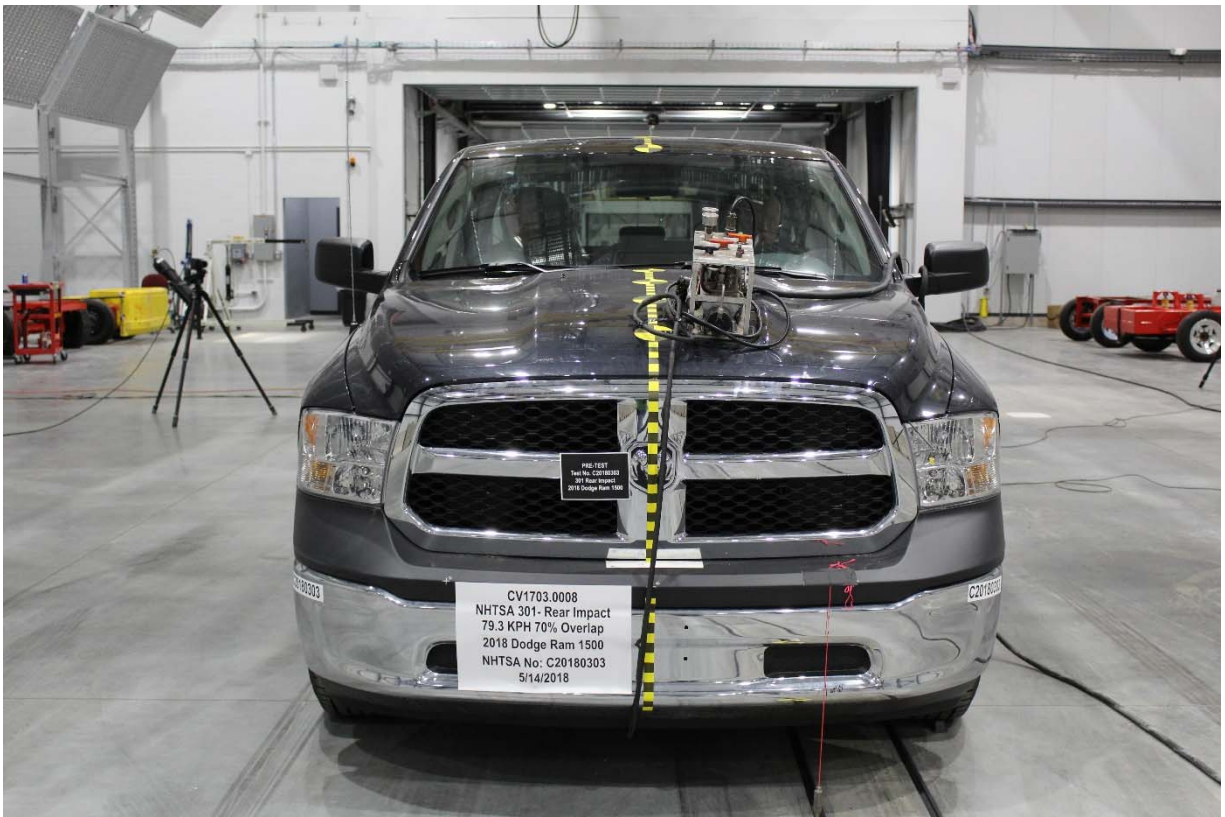
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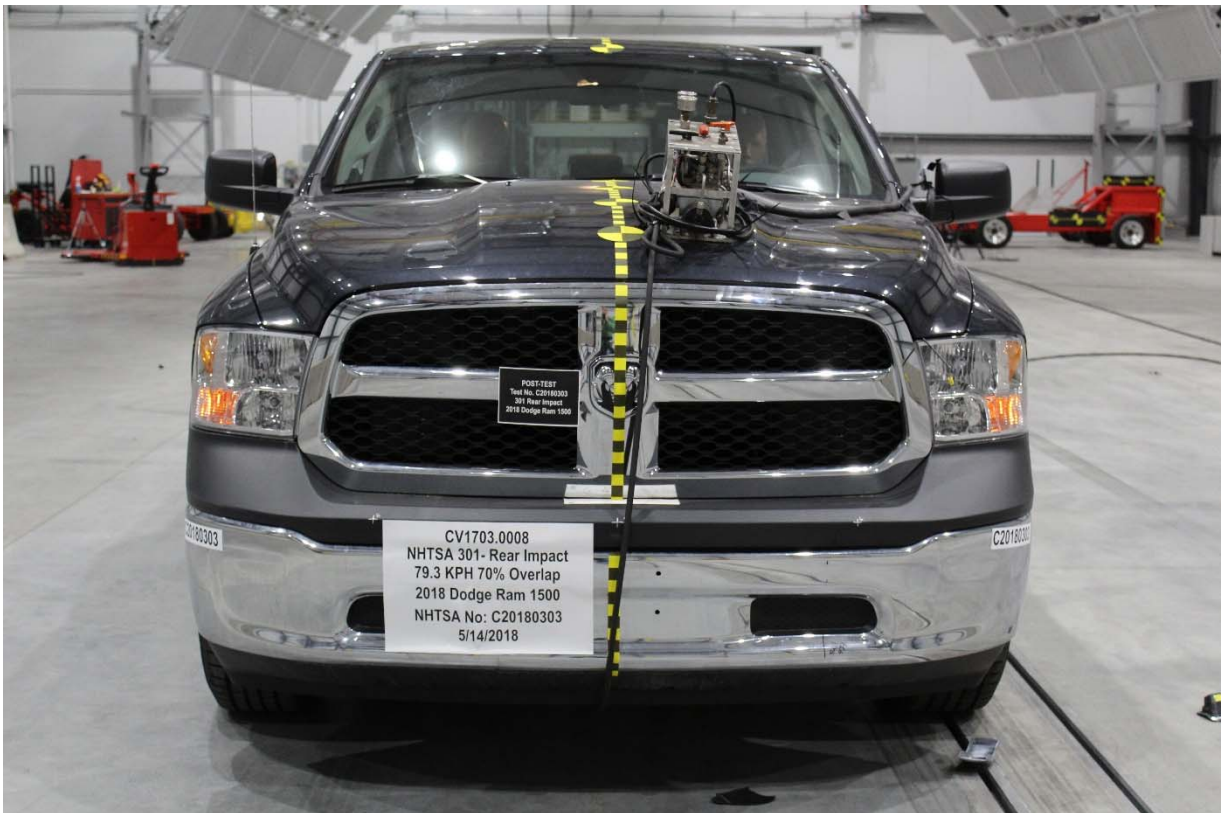
**Figure A-1: Vehicle Certification Placard**



**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**



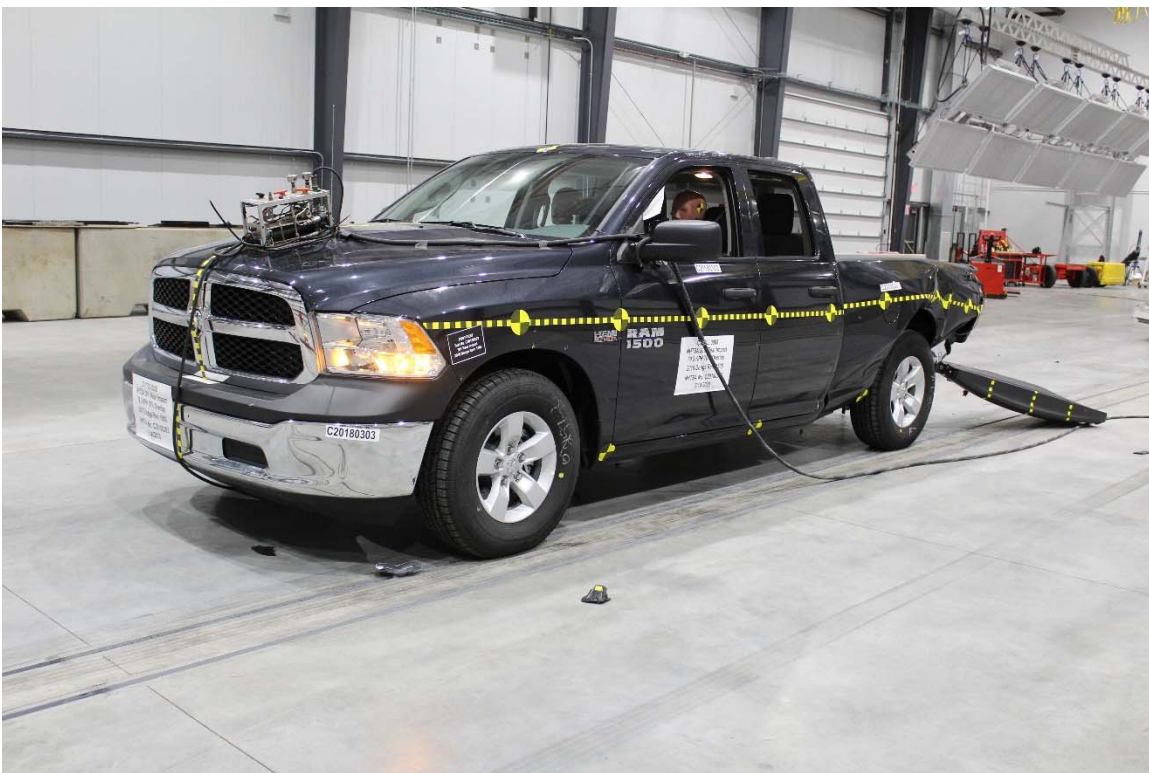
**Figure A-7: Pre-Test Right Side View**



**Figure A-8: Post-Test Right Side View**



**Figure A-9: Pre-Test Left Front 3/4 View**



**Figure A-10: Post-Test Left Front 3/4 View**



**Figure A-11: Pre-Test Right Front 3/4 View**



**Figure A-12: Post-Test Right Front 3/4 View**



**Figure A-13: Pre-Test Left Rear 3/4 View**



**Figure A-14: Post-Test Left Rear 3/4 View**



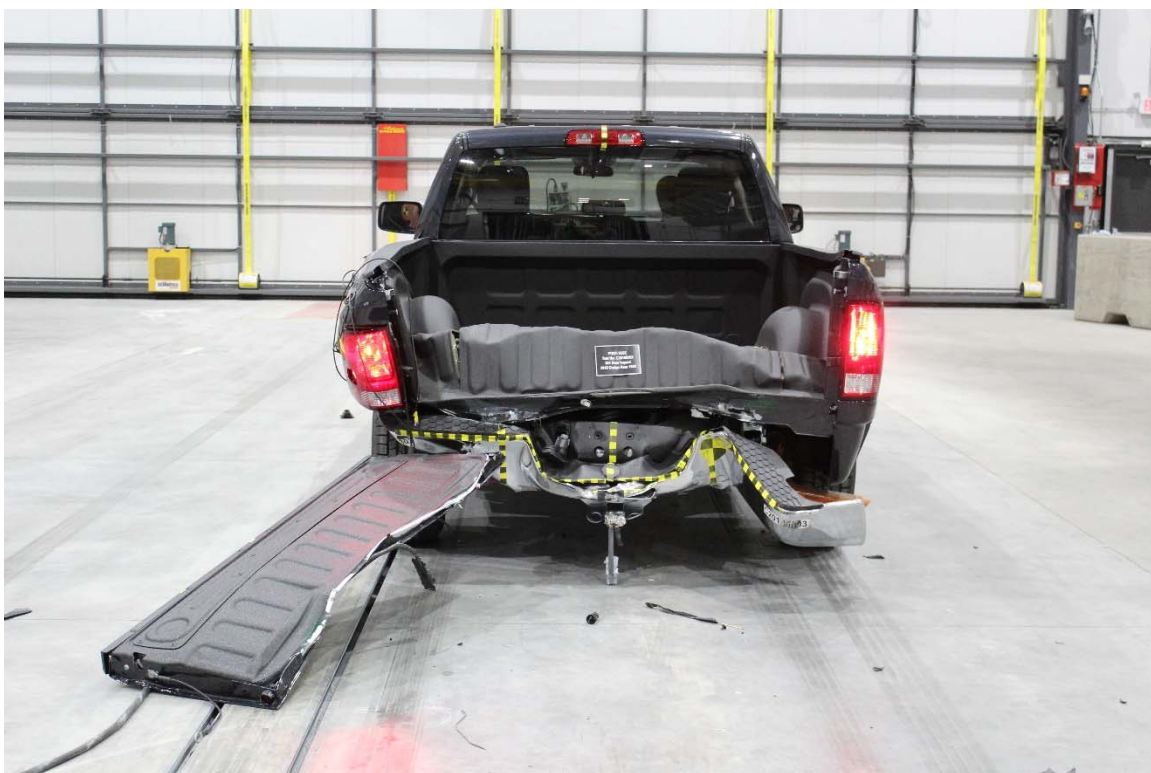
**Figure A-15: Pre-Test Right Rear 3/4 View**



**Figure A-16: Post-Test Right Rear 3/4 View**



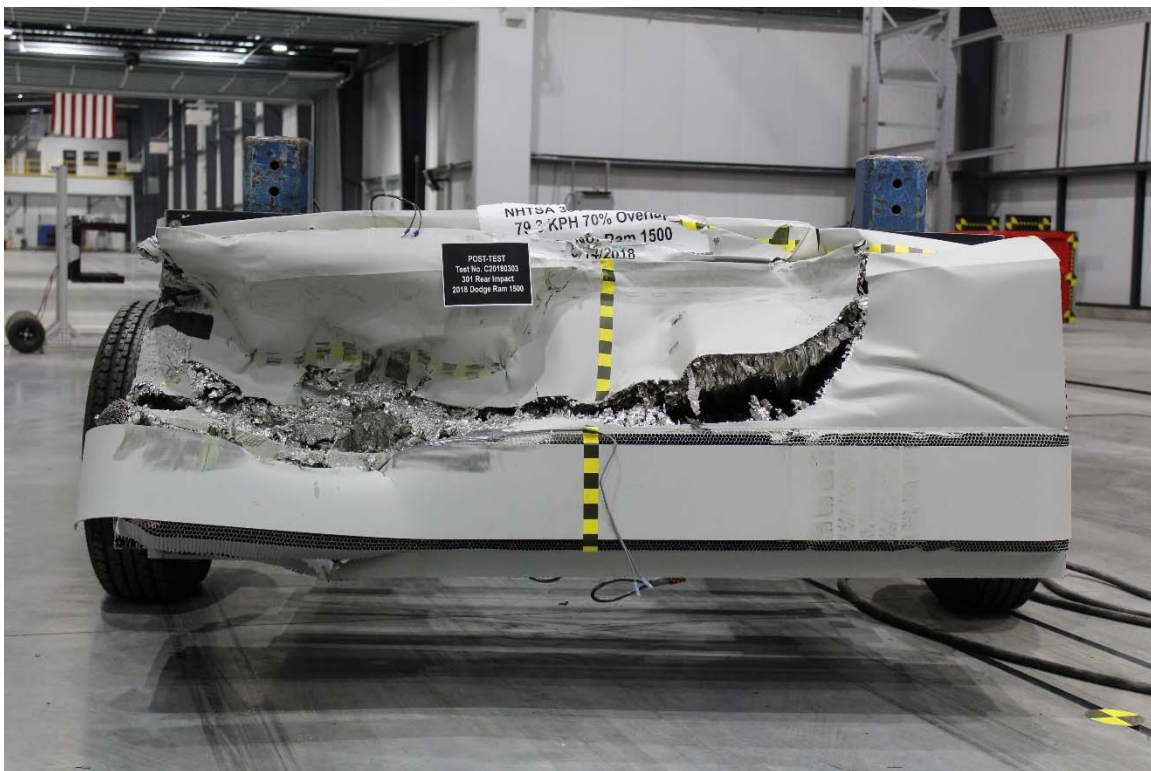
**Figure A-17: Pre-Test Rear View**



**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**



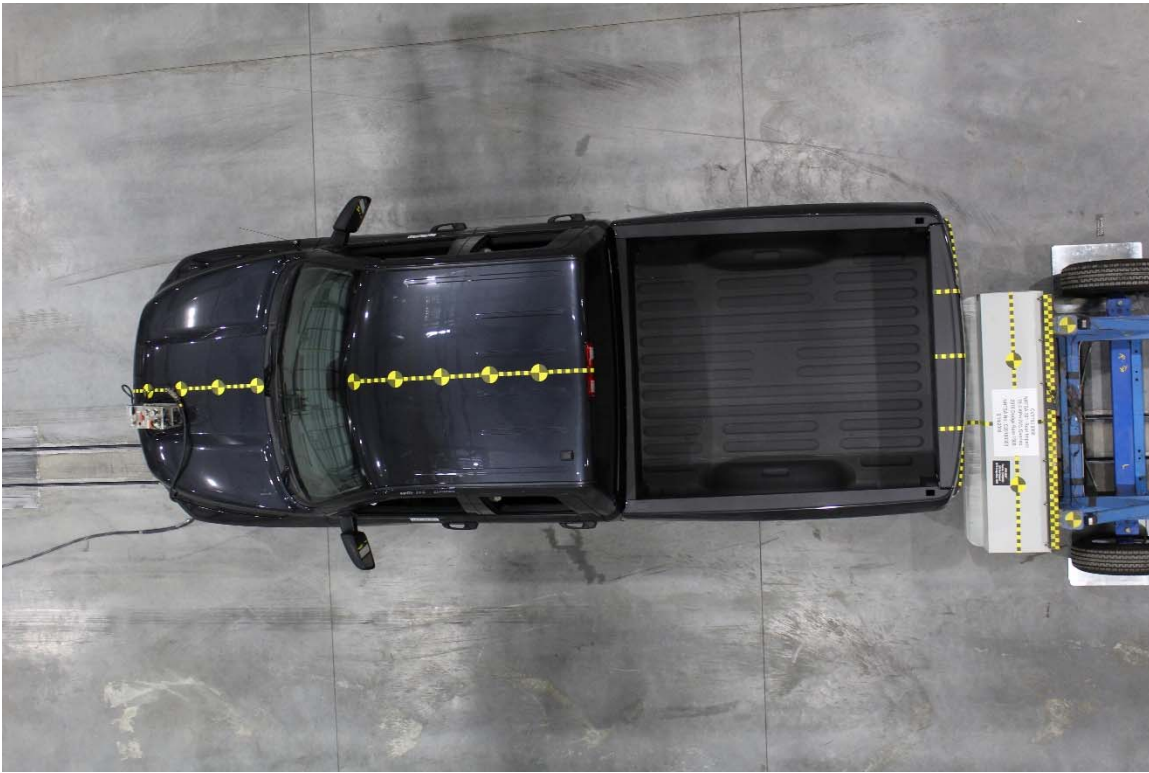
**Figure A-24: Post-Test MDB Right Side View**



**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**



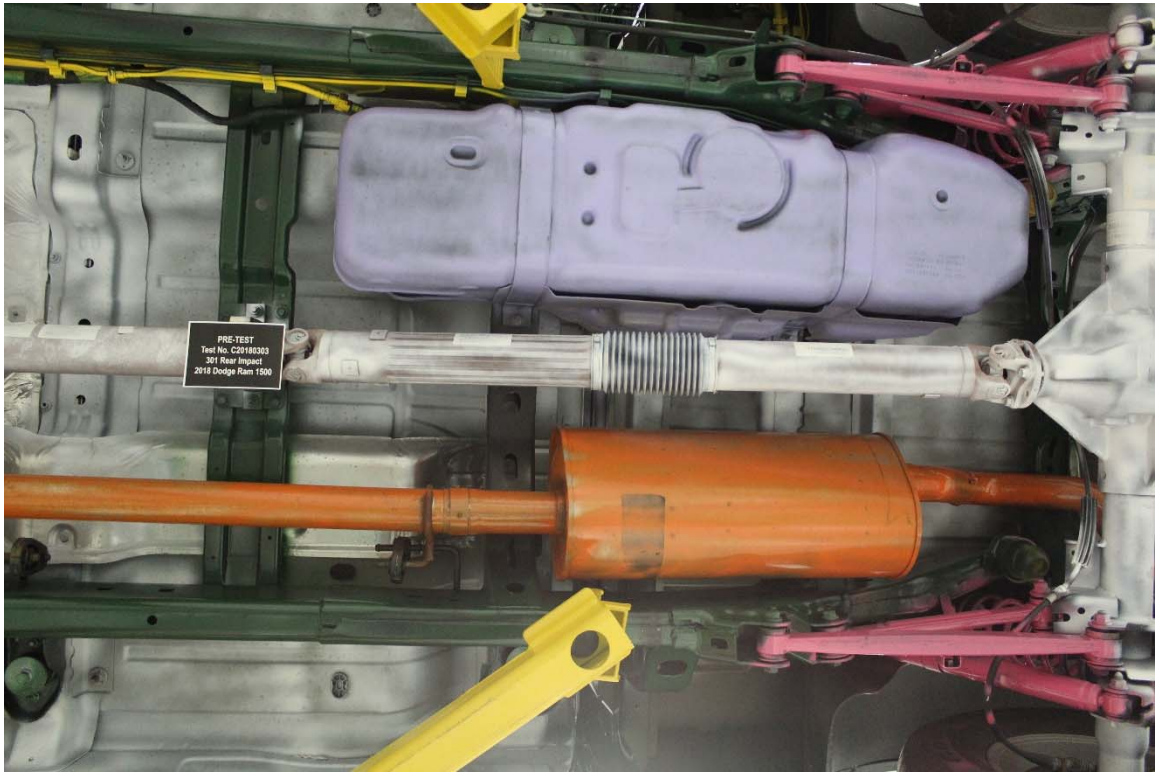
**Figure A-28: Post-Test Impact Target View**



**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**



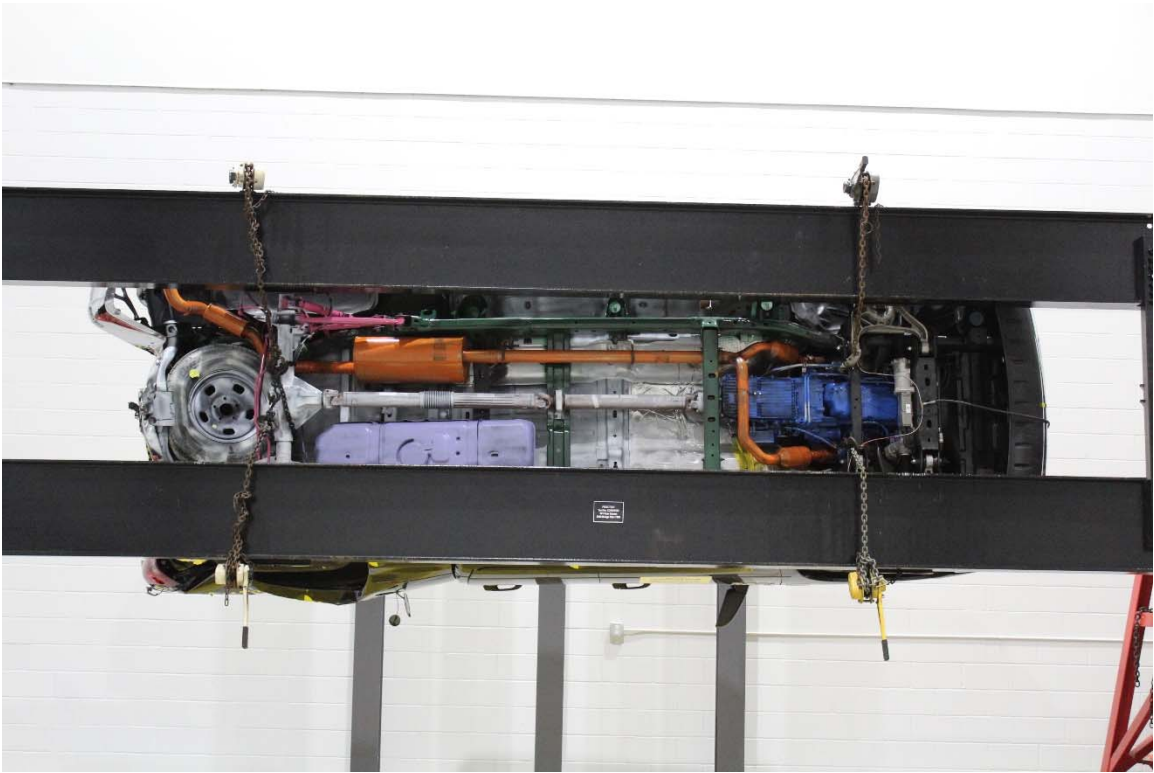
**Figure A-36: Post-Test Fuel Filler Cap View**



Figure A-37: Impact View



Figure A-38: Speed Trap View\*



**Figure A-39: Rollover 90° View**



**Figure A-40: Rollover 180° View**



**Figure A-41: Rollover 270° View**



**Figure A-42: Rollover 360° View**