SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 301L
FUEL SYSTEM INTEGRITY

LANDROVER IN THE UK
2004 LANDROVER FREELANDER, MPV
NHTSA NO. C40602

GENERAL TESTING LABORATORIES, INC.
1623 LEEDSTOWN ROAD
COLONIAL BEACH, VIRGINIA 22443

OCTOBER 4, 2004
FINAL REPORT
PREPARED FOR
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
SAFETY ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW
ROOM 611B (NVS-220)
WASHINGTON, D.C. 20590
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Prepared By: Debbie Mussell
Approved By: [Signature]
Approval Date: 10/04/04

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: [Signature]
Acceptance Date: 10/18/04
### Technical Report Documentation Page

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| 15. Supplementary Notes | |
|------------------------||

### Abstract

Compliance tests were conducted on the subject, 2004 Landrover Freelander MPV in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301-02 for the determination of FMVSS 301 compliance. Test failures identified were as follows:

NONE

### Key Words

Compliance Testing  
Safety Engineering  
FMVSS 301

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SECTION 1

PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2004 Landrover Freelander MPV was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 301 testing to determine if the vehicle was in compliance with the requirements of the standard. The purpose of this standard is to reduce deaths and injuries occurring from fires that result from fuel spillage during and after motor vehicle crashes, and resulting from ingestion of fuels during siphoning.

1.1 The test vehicle was a 2004 Landrover Freelander MPV. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: SALNY22254A

B. NHTSA No.: C40602

C. Manufacturer: LANDROVER IN THE UK

D. Manufacture Date: 01/04

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 301 testing on September 22, 2004.
SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

2.0 TEST RESULTS

All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-301-02 dated 8 November 1994 and General Testing Laboratories, Inc. (GTL) Test Procedure, TP-301-02, "Fuel System Integrity".

Based on the test performed, the 2004 Landrover Freelander MPV appears to meet the lateral impact requirements of FMVSS 301 testing.
SECTION 3

COMPLIANCE TEST DATA

3.0 TEST RESULTS

The following data sheets document the results of testing on the 2004 Landrover Freelander.
SUMMARY OF RESULTS

Vehicle's NHTSA No.: C40602       Test Model: FREELANDER

Test Date.: 09/22/04                Time: 16:45             Temperature 78 °F

Vehicle Model Year, Make, Model and Body Style:
2004 LANDROVER FREELANDER MPV

Vehicle Test Weight: 4108 lbs.; Impact Velocity: 19.7 mph

Type of Front Occupant Restraint System Installed in Test Vehicle:

Driver's DSP: TYPE 2 BELT WITH FRONTAL AIR BAG IN STEERING WHEEL

Right Passenger's DSP: TYPE 2 BELT WITH FRONTAL AIR BAG IN DASH

Stoddard solvent spillage from Vehicle's Fuel System: None

REMARKS:

RECORDED BY: ___________________________ DATE: 09/22/04

APPROVED BY: ___________________________
DATA SHEET 1
TEST VEHICLE SPECIFICATIONS

TEST VEHICLE INFORMATION:

NHTSA No.: C40602
Year/Make/Model/Body Style: 2004 LANDROVER FREELANDER
Engine Data: 2.5 LITER 174 HP 24 VALVE ALUMINUM V6
Transmission Data: 5 SPEED AUTOMATIC
Final Drive Data: ALL WHEEL DRIVE
Major Options: NONE
Date Received: 09/13/04; Odometer Reading: 20 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: LANDROVER IN THE UK
Date of Manufacture: 01/04
VIN: SALNY22254A

GVWR: 2080 kg (4542 lbs.); GAWR Front: 1080 kg (2381 lbs.) GAWR Rear: 1120 kg (2469 lbs.)

DATA FROM VEHICLE'S TIRE PLACARD:

Location of Placard on Vehicle: DRIVER'S "B" PILLAR
Tire Pressure With Maximum Capacity Vehicle Load —
   Front: 30 psi; Rear: 30 psi
Recommended Tire Size: P195/80R15, P215/65R16, P225/55R17, P235/60R16
Recommended Cold Tire Pressure: Front = 207 kPa (30 psi) Rear = 207 kPa (30 psi)
Size of Tires on Test Vehicle: P215/65R16
Type of Spare Tire: FULL SIZE P195/80R15

Vehicle Capacity Data —

Type of Front Seat(s): BUCKET
Number of Occupants: Front = 2; Mid = 0; Rear = 3; Total = 5

A. VEHICLE CAPACITY WEIGHT (VCW) =
B. Number of Occupants x 150 lbs. =
RATED CARGO AND LUGGAGE WEIGHT (RCLW) = A - B =

RECORDED BY: ___________________________  DATE: 09/22/04
APPROVED BY: ___________________________
DATA SHEET 2
PRE-TEST DATA

WEIGHT OF TEST VEHICLE:

A. As Received At Laboratory (Maximum Fluids) —

Right Front = 474 kg (1045 lbs.)  Right Rear = 347 kg (764 lbs.)
Left Front = 462 kg (1018 lbs.)  Left Rear = 347 kg (765 lbs.)
TOTAL FRONT = 936 kg (2063 lbs.) TOTAL REAR = 694 kg (1529 lbs.)
% of TOTAL = 57 %  % of TOTAL = 43 %
TOTAL DELIVERED WEIGHT = 1629 kg (3592 lbs.)

B. Calculation of Target Test Weight —

1. Total Delivered Weight = 1629 kg (3592 lbs.)
2. Rated Cargo & Lugg. Weight (RCLW) = 91 kg (200 lbs.)
3. Weight of 2 Dummies (184 lbs. each) = 149 kg (328 lbs.)
TARGET TEST WEIGHT = 1 + 2 + 3 = 1869 kg (4120 lbs.)

C. Vehicle, Dummies and 91 kg (200 lbs.) of Cargo Weight —

Right Front = 505 kg (1113 lbs)  Right Rear = 430 kg (948 lbs)
Left Front = 493 kg (1087 lbs)  Left Rear = 435 kg (960 lbs)
TOTAL FRONT = 998 kg (2200 lbs) TOTAL REAR = 865 kg (1908 lbs)
% of TOTAL = 54 %  % of TOTAL = 46 %
TOTAL TEST WEIGHT = 1863 kg (4108 lbs)

Weight of Ballast secured in cargo area = 110 kg (243 lbs)
Type of Ballast: SALT BAGS
Method of Securing Ballast: VEHICLE SEAT BELTS
Vehicle Components Removed for Weight Reduction: NONE
TEST VEHICLE ATTITUDE:

As Delivered —
- Right Front: 792 mm (31.2 inches)
- Left Front: 790 mm (31.1 inches)
- Right Rear: 803 mm (31.6 inches)
- Left Rear: 800 mm (31.5 inches)

As Tested —
- Right Front: 785 mm (30.9 inches)
- Left Front: 782 mm (30.8 inches)
- Right Rear: 767 mm (30.2 inches)
- Left Rear: 762 mm (30.0 inches)

Vehicle's Wheelbase = 2557 mm (101 inches)

FUEL SYSTEM DATA:

Fuel System Capacity Listed in Owner’s Manual = 64 liters (16.9 gallons)
Usable Capacity Figure Furnished By COTR = 64 liters (16.9 gallons)

Test Volume Range (91 to 94% of Usable Capacity) —
58 liters (15.4 gallons) TO 60 liters (15.9 gallons)

ACTUAL TEST VOLUME = 59 liters (15.6 gallons) (with entire fuel system filled)

Test Fluid Type: Stoddard solvent
Test Fluid Specific Gravity: .7583
Test Fluid Kinematic Viscosity: 1.7 centistokes at 77°F
Test Fluid Color: BLUE ("red" is preferred)
Type of Vehicle Fuel Pump: ELECTRIC
Electric Fuel Pump Operation with Ignition Switch ON and Engine OFF — YES

Details of Fuel System: HIGH PRESSURE ELECTRIC FUEL PUMP SUPPLY TO FUEL INJECTORS WITH LOW PRESSURE RETURN LINE TO FUEL TANK.

REMARKS:

RECORDED BY: [Signature] DATE: 09/22/04
APPROVED BY: [Signature]
DATA SHEET 3
POST IMPACT DATA

TYPE OF TEST: 301L

TEST DATE: 09/22/04; TIME: 16:45; TEMP.: 78 °F

VEH. NHTSA NO.: C40602; VIN: SALNY22254A

REQUIRED IMPACT VELOCITY RANGE: 18.9 to 19.9 mph

ACTUAL IMPACT VELOCITY: (speed traps located within 5 feet of impact plane)

Trap No. 1 = 19.7 mph
Trap No. 2 = 19.7 mph
Average Impact Speed = 19.7 mph

REMARKS:

RECORDED BY: [Signature]

APPROVED BY: [Signature]

DATE: 09/22/04
DATA SHEET 4
SUMMARY OF FMVSS 301 DATA

TEST VEHICLE NHTSA NO.: C40602 ; TEST DATE: 09/22/04

VEHICLE YEAR/MAKE/MODEL/BODY STYLE:
2004 LANDROVER FREELANDER MPV

TYPE OF IMPACT: 301L

STODDARD SOLVENT SPILLAGE MEASUREMENT:

A. From impact until vehicle motion ceases —
   
   Actual = 0 oz. Maximum Allowable = 1 ounce

B. For 5 minute period after vehicle motion ceases —
   
   Actual = 0 oz. Maximum Allowable = 5 ounces

C. For next 25 minutes —
   
   Actual = 0 oz. Maximum Allowable = 1 oz./minute

D. Provide Spillage Details: NONE

REMARKS:

RECORDED BY: [Signature] DATE: 09/22/04

APPROVED BY: [Signature]
DATA SHEET 5
STATIC ROLLOVER TEST DATA:

A. Test Phase = 0° to 90°

Determination of Stoddard Solvent Collection Time Period:

1. Rollover Fixture 90° Rotation Time = 1 minute, 35 seconds

(Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold Time = 5 minutes, 0 seconds

3. TOTAL = 6 minutes, 35 seconds

4. NEXT WHOLE MINUTE INTERVAL = 7 minutes

Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = 0 oz.
   (5 oz. allowed)

2. 6th minute = 0 oz.
   (1 oz. allowed)

3. 7th minute = 0 oz.
   (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE.
DATA SHEET 5 CONTINUED

B. Test Phase = 90° to 180°

Determination of Stoddard Solvent Collection Time Period:

1. Rollover Fixture 90°
   Rotation Time = 1 minutes, 35 seconds

(Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold
   Time = 5 minutes, 0 seconds

3. TOTAL = 6 minutes, 35 seconds

4. NEXT WHOLE MINUTE INTERVAL = 7 minutes

Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = 0 oz.
   (5 oz. allowed)

2. 6th minute = 0 oz.
   (1 oz. allowed)

3. 7th minute = 0 oz.
   (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE
C. Test Phase = 180° to 270°

Determination of Stoddard Solvent Collection Time Period:

1. Rollover Fixture 90°
   Rotation Time = _1_ minutes, _22_ seconds

   (Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold
   Time = 5 minutes, 0 seconds

3. TOTAL = _6_ minutes, _22_ seconds

4. NEXT WHOLE MINUTE INTERVAL = _7_ minutes

   Actual Test Vehicle Stoddard Solvent Spillage:

   1. First 5 minutes from onset of rotation = _0_ oz.
      (5 oz. allowed)

   2. 6th minute = _0_ oz.
      (1 oz. allowed)

   3. 7th minute = _0_ oz.
      (1 oz. allowed)

   4. 8th minute (if required) = N/A oz. (1 oz. allowed)

   Provide Details of Stoddard Solvent Spillage Locations — NONE
D. Test Phase = 270° to 360°

Determination of Stoddard Solvent Collection Time Period:

1. Rollover Fixture 90°
   Rotation Time = _1_ minutes, _44_ seconds

   (Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold
   Time = 5 minutes, 0 seconds

3. TOTAL = _6_ minutes, _44_ seconds

4. NEXT WHOLE MINUTE INTERVAL = _7_ minutes

Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = _0_ oz.
   (5 oz. allowed)

2. 6th minute = _0_ oz.
   (1 oz. allowed)

3. 7th minute = _0_ oz.
   (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — _NONE_
DATA SHEET 8
CAMERA LOCATION

VEHICLE NHTSA NO.: C40602
TEST DATE: 09/22/04

CAMERA 1 - FRONT SIDE VIEW OF VEHICLE DURING CRASH
CAMERA 2 - REAR SIDE VIEW OF VEHICLE DURING CRASH
CAMERA 3 - OVERHEAD VIEW OF ENTIRE IMPACT
CAMERA 4 - UNDERBODY VIEW OF FUEL TANK LOCATED IN PIT
## SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

### TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

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SECTION 5

PHOTOGRAPHS
2004 LAND ROVER FREELANDER
NHTSA NO. C40602
FMVSS NO. 301

FIGURE 5.20
VEHICLE CERTIFICATION AND TIRE INFORMATION LABEL
2004 LAND ROVER FREELANDER
NHTSA NO. C40802
FMVSS NO. 301L

FIGURE 5.36
UNDERBODY VIEW OF FUEL LINES AT TANK
POST TEST
FIGURE 5.41
UNDERBODY VIEW OF FUEL FILL HOSE POST TEST
FIGURE 5.46
VEHICLE IN ROLLOVER FIXTURE AT 270°
SECTION 6

BARRIER INFORMATION
NOTES:
1. Face Plate 0.50 in. (19mm) thick cold rolled steel
2. All Inner Reinforcements 4.0 x 2.0 x 0.19 in. (102 x 51 x 5mm) Steel Tubing
3. Impact Surface above shown without .75 x 48 x 96 in. Plywood Face attached

DIMENSIONS SHOWN IN TABLE ON NEXT PAGE
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<tr>
<td>E</td>
<td>78.0</td>
<td>198</td>
</tr>
</tbody>
</table>

TEST SET-UP OF COMMON CARRIAGE WITH 60" x 78" FLAT FACE IMPACT SURFACE INSTALLED:

LEFT FRONT WEIGHT 1075
RIGHT FRONT WEIGHT 1075
LEFT REAR WEIGHT 887
RIGHT REAR WEIGHT 887

TOTAL WEIGHT 3924

* EXCLUDING 3/4" PLYWOOD FACE

DIMENSIONS FOR GTL 60" x 78" FLAT FACE IMPACT SURFACE