SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 216
ROOF CRUSH RESISTANCE

LANDROVER IN THE UK
2004 LANDROVER FREELANDER, MPV
NHTSA NO. C40600

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Final Report of FMVSS 216 Compliance Testing of 2004 LANDROVER FREELANDER, MPV
NHTSA No. C40800

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**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-216-05 for the determination of FMVSS 216 compliance. The mounting procedure deviates from Test Procedure No. TP-216-05. Test failures identified were as follows:

**Key Words**
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Safety Engineering
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<td>4</td>
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<td>11</td>
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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. 216 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 due to the crushing of the roof into the occupant compartment in rollover crashes.

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

A. Vehicle Identification Number: SALNY22214A298887

B. NHTSA No.: C40800

C. Manufacturer: LANDROVER IN THE UK

D. Manufacture Date: 10/03

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 216 testing on May 24, 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-216-05 and General Testing Laboratories Procedure, TP-216-05B with the following modifications requested by the COTR:

1) The vehicle was rigidly mounted in the test fixture by welding vertical supports to the vehicle jack points to prevent any vehicle movement. Chains were not used in an effort to reduce and/or eliminate “pre-stressing” of the vehicle due to the tightening of chains.

2) Dial gauges were placed at the vehicle corners and at the passenger door to track overall vehicle motion and the ability of the alternate tie-down procedure to restrict motion of the vehicle.

The data for this portion of the test can be found on Data Sheet 6.

Based on the test performed, the 2004 Landrover Freelander appears to meet the requirements of FMVSS 216.
3.0 TEST RESULTS

The following data sheets document the results of testing on the 2004 Landrover Freelander.
DATA SHEET 1
FMVSS 216
SUMMARY OF RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LANDROVER FREELANDER MPV
VEH. NHTSA NO: C40800; VIN: SALNY22214A298687
VEH. BUILD DATE: 10/03; TEST DATE: MAY 24, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE, AMANDA PRESCOTT

A. VISUAL INSPECTION OF TEST VEHICLE

Upon receipt, inspect vehicle for completeness, function, and discrepancies or damage which might influence the testing.

RESULTS:

B. VEHICLE DATA

(1) Vehicle type as shown on certification label: MPV
(2) Vehicle UVW as recorded on Data Table 2: 1640 kg

C. STATIC LOAD TEST OF DRIVER SIDE OF ROOF

Minimum roof crush resistance required by FMVSS 216 for the vehicle tested:

MCCR as recorded on Data Table 2: 24,108 N

Maximum roof crush resistance measured during test was 27,662 N at 76.8 mm

PASS FAIL

D. POST TEST VISUAL INSPECTION

Driver roof rail pushed down from "C" pillar forward. Roof pushed down/in approximately 2" over top of driver's door. Windshield cracked on driver side.

RESULTS:

REMARKS:

RECORDED BY: DATE: 05/24/04
APPROVED BY: 
DATA SHEET 2
FMVSS 216
RECEIVING INSPECTION

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LANDROVER FREELANDER MPV
VEH. NHTSA NO: C40680; VIN: SALNY22214A298687
VEH. BUILD DATE: 10/03; TEST DATE: MAY 24, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE, AMANDA PRESCOTT

Upon receipt, the vehicle will be examined visually for completeness, function, and damage. The roof and supporting structures such as the doors and windows should be checked for proper operation and any discrepancies which may influence the testing. The vehicle will be weighed and the minimum roof crush resistance determined.

RESULTS:

(1) Unloaded Vehicle Weight (UVW)

<table>
<thead>
<tr>
<th>Location</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Front</td>
<td>468</td>
</tr>
<tr>
<td>Right Front</td>
<td>474</td>
</tr>
<tr>
<td>Front Axle</td>
<td>943</td>
</tr>
<tr>
<td>Left Rear</td>
<td>347</td>
</tr>
<tr>
<td>Right Rear</td>
<td>350</td>
</tr>
<tr>
<td>Rear Axle</td>
<td>697</td>
</tr>
</tbody>
</table>

TOTAL UVW 1640 kg

(2) Vehicle type as shown on vehicle certification label: MPV

(3) Minimum Roof Crush Resistance (MCRR):

Passenger Car:

UVW x 1.5 x 9.8 = N/A N
MCRR = N/A N (UVW x 1.5 x 9.8 or 22,241 N whichever is less)

MPV, Truck or Bus:

MCRR = UVW x 1.5 x 9.8 = 24,108 N

(4) Other Comments:________________________________________

REMARKS:

RECORDED BY: [Signature] DATE: 05/24/04
APPROVED BY: [Signature]
DATA SHEET 3
FMVSS 216
PRE-TEST PREPARATION

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LANDROVER FREELANDER MPV
VEH. NHTSA NO: C40600: VIN: SALNY22214A298687
VEH. BUILD DATE: 10/03; TEST DATE: MAY 24, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE, AMANDA PRESCOTT

Prior to testing, the following will be accomplished:

A. Secure any convertible top, movable or removable roof structure in their weather tight positions __________________________ Removed Driver Side Roof Rack

B. Close all windows ______________ OK

C. Close and lock all doors ______________ OK

D. State Side of Roof Tested ______________ Driver

E. Measure the lateral angle of the test device at sufficient points to determine that it has a 25 degree (plus zero degree, minus one degree) angle __________ 25°

F. Measure the longitudinal angle of the loading device at sufficient points to determine that it has a 5 degree (plus zero minutes, minus 20 minutes) __________ 5°

G. The test device will initially contact the roof at ______ 279 mm aft from top center of windshield

H. If the test device was relocated based on the requirements of Chapter 12.3 paragraph F, describe where the test device will initially contact the roof as relocated ______ N/A

I. Ambient temperature 51 mm from the vehicle roof in the immediate area of the test device: ______ 30 ______ degrees C.

REMARKS:

RECORDED BY: ______________________________ DATE: 05/24/04

APPROVED BY: ______________________________
RESULTS: Plots of load versus displacement and time versus displacement showed that:

(1) The maximum roof crush resistance was 27,662 N at 76.6 mm
(2) The rate of loading was 5.08 mm/sec (.2 in/sec)
(3) The required roof crush resistance of 24,108 N was at 53.8 mm

REMARKS:

RECORDED BY: [Signature]
DATE: 05/24/04

APPROVED BY: [Signature]
DATA SHEET 5
FMVSS 216
POST TEST VISUAL INSPECTION

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LANDROVER FREELANDER MPV
VEH. NHTSA NO: C40900; VIN: SALNY22214A298887
VEH. BUILD DATE: 10/03; TEST DATE: MAY 24, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE, AMANDA PRESCOTT

Upon completion of testing, a detailed visual inspection of the vehicle shall be made. Describe all damage and deformation that occurred during the test.

RESULTS: Driver roof rail pushed down from "C" pillar forward. Roof pushed down/in approximately 2" over top of driver’s door. Windshield cracked on driver side.

RECORDED BY: [Signature] DATE: 05/24/04
APPROVED BY: [Signature]
DATA SHEET 6
FMVSS 216 MODIFIED PORTION POST TEST

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LANDROVER FREELANDER MPV
VEH. NHTSA NO: C40600; VIN: SALNY22214A298687
VEH. BUILD DATE: 10/03; TEST DATE: MAY 24, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE, AMANDA PRESCOTT

Maximum Load Applied = 27,862 N @ 76.6 mm
Maximum Displacement = 91 mm @ 26,500 N

Left Front Dial Indicator Displacement = 3.86 mm
Right Front Dial Indicator Displacement = 1.68 mm
Left Rear Dial Indicator Displacement = 6.90 mm
Right Rear Dial Indicator Displacement = 9.53 mm
Right Door Sill Dial Indicator Displacement = 5.18 mm

NOTES:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

RECORDED BY: ___________________________ DATE: 05/24/04
APPROVED BY: ___________________________
### TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>DESCRIPTION</th>
<th>MODEL/ SERIAL NO.</th>
<th>CAL. DATE</th>
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<td>486D86</td>
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<td>GTL</td>
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<td>N/A</td>
<td>N/A</td>
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<tr>
<td>A/D INTERFACE</td>
<td>METRABYTE</td>
<td>DAS-16(F)</td>
<td>BEFORE USE</td>
<td>BEFORE USE</td>
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<tr>
<td>SIGNAL CONDITIONER</td>
<td>METRABYTE</td>
<td>EXP-RES</td>
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<td>11A4A6</td>
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<td>BEFORE USE</td>
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SECTION 5

PHOTOGRAPHS
NFD BY LANDROVER IN THE UK

DATE: 10/03  GVWR: 2080KG (45620LB)

GVWR FRONT: 1080KG 23915LB
155/65R15 TIRES, 65.0K PSI, AT 207KPA (30PSI) COLD
235/60R17 TIRES, 60.0K PSI, AT 207KPA (30PSI) COLD
225/45R17 TIRES, 45.0K PSI, AT 207KPA (30PSI) COLD
225/50R17 TIRES, 50.0K PSI, AT 207KPA (30PSI) COLD

GVWR REAR: 1120KG 2469LB
155/65R15 TIRES, 65.0K PSI, AT 207KPA (30PSI) COLD
235/60R17 TIRES, 60.0K PSI, AT 207KPA (30PSI) COLD
225/45R17 TIRES, 45.0K PSI, AT 207KPA (30PSI) COLD
225/50R17 TIRES, 50.0K PSI, AT 207KPA (30PSI) COLD

THIS VEHICLE CONFORMS TO ALL APPLICABLE US FEDERAL VEHICLE MOTOR SAFETY AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

SALNY22214A298687

TYPE: FFV  F40F7 737 TRIM: TSV

2004 LAND ROVER FREELANDER NHTSA NO. G400005 FMVSS NO. 216

Figure 5.37 Close-up View of Vehicle's Certification and Tire Information Label
SECTION 6

TEST PLOTS
GTL 5201

216, Roof Crush, Driver Side.

Force in Newtons (Thousands)

Displacement in Millimeters