SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 216
ROOF CRUSH RESISTANCE

FORD MOTOR CO. IN U.S.A.
2004 LINCOLN LS, PASSENGER CAR
NHTSA NO. C40204

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

JUNE 3, 2004
FINAL REPORT
PREPARED FOR
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW
ROOM 9111 (NVS-220)
WASHINGTON, D.C. 20590
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Prepared By: [Signature]
Approved By: [Signature]
Approval Date: 6/3/04

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Accepted By: [Signature]
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<tr>
<td>Grant Farrand, Project Engineer</td>
<td>GTL-DOT-04-216-005</td>
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<tr>
<td>Debbie Messick, Project Manager</td>
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<td>Office of Vehicle Safety Compliance (NVS-220)</td>
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<tr>
<td>400 7th Street, S.W., Room 6111</td>
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16. Abstract
Compliance tests were conducted on the subject, 2004 Lincoln LS Passenger Car 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:

NONE

17. Key Words
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Safety Engineering
FMVSS 216

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Form DOT F 1700.7 (8-72)
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SECTION 1

PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2004 Lincoln LS Passenger Car 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 Lincoln LS Passenger Car. Nomenclature applicable to the test vehicle are:

   A. Vehicle Identification Number: 1LNHM86S34Y630130

   B. NHTSA No.: C40204

   C. Manufacturer: FORD MOTOR CO. IN U.S.A.

   D. Manufacture Date: 11-03

1.2 TEST DATE

   The test vehicle was subjected to FMVSS No. 216 testing on May 25, 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 Lincoln LS appears to meet the requirements of FMVSS 216.
SECTION 3

COMPLIANCE TEST DATA

3.0 TEST RESULTS

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

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR
VEH. NHTSA NO: C40204;  VIN: 1LNHM86S34Y630130
VEH. BUILD DATE: 11-03  TEST DATE: MAY 25, 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: PASSENGER CAR
(2) Vehicle UVW as recorded on Data Table 2: 1663 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: 22,241 N

Maximum roof crush resistance measured during test was 42,042 N at 83.6 mm

PASS FAIL

X

D. POST TEST VISUAL INSPECTION

Driver side roof rail flattened from windshield rearward 43°. Windshield shattered.

RESULTS:

REMARKS:

RECORDED BY: [Signature]  DATE: 06/25/04
APPROVED BY: [Signature]
DATA SHEET 2
FMVSS 216
RECEIVING INSPECTION

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR
VEH. NHTSA NO: C40204; VIN: 1LNHM86S34Y630130
VEH. BUILD DATE: 11-03; TEST DATE: MAY 25, 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>
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<tr>
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<td>Left Front</td>
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<tr>
<td>Right Front</td>
<td>437</td>
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<tr>
<td>Front Axle</td>
<td>664</td>
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<tr>
<td>Left Rear</td>
<td>402</td>
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<tr>
<td>Right Rear</td>
<td>397</td>
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<tr>
<td>Rear Axle</td>
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</table>

TOTAL UVW 1663 kg

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

(3) Minimum Roof Crush Resistance (MCRR):

Passenger Car:

UVW x 1.5 x 9.8 = 24,446 N
MCRR = 22,241 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 = N/A N

(4) Other Comments:

REMARKS:

RECORDED BY: [Signature]  DATE: 05/25/04

APPROVED BY: [Signature]
DATA SHEET 3
FMVSS 216
PRE-TEST PREPARATION

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR
VEH. NHTSA NO: C40204; VIN: 1LNHM86S34Y630130
VEH. BUILD DATE: 11-03; TEST DATE: MAY 25, 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 ______________ OK ______________

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 457 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: [Signature] DATE: 05/25/04

APPROVED BY: [Signature]
DATA SHEET 4
FMVSS 216

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR
VEH. NHTSA NO: C40204; VIN: 1LNHM86S34Y630130
VEH. BUILD DATE: 11-03; TEST DATE: MAY 25, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE, AMANDA PRESCOTT

RESULTS: Plots of load versus displacement and time versus displacement showed that:

(1) The maximum roof crush resistance was 42,042 N at 83.6 mm
(2) The rate of loading was 5.06 mm/sec (.2 in/sec)
(3) The required roof crush resistance of 24,448 N was at 22.6 mm

REMARKS:

RECORDED BY: [Signature] DATE: 05/25/04
APPROVED BY: [Signature]
DATA SHEET 5
FMVSS 216
POST TEST VISUAL INSPECTION

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR

VEH. NHTSA NO: C40204; VIN: 1LNHM86S34Y830130

VEH. BUILD DATE: 11-03; TEST DATE: MAY 25, 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 side roof rail flattened from windshield rearward 43”. Windshield shattered.

RECORDED BY: [Signature]  DATE: 05/26/04

APPROVED BY: [Signature]
DATA SHEET 6
FMVSS 216 MODIFIED PORTION POST TEST

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR
VEH. NHTSA NO: C40204; VIN: 1LNHM86S34Y630130
VEH. BUILD DATE: 11-03; TEST DATE: MAY 25, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE, AMANDA PRESCOTT

Maximum Load Applied = 42,042 N @ 83.6 mm
Maximum Displacement = 93 mm @ 41,000 N

Left Front Dial Indicator Displacement = 0.51 mm
Right Front Dial Indicator Displacement = 0.25 mm
Left Rear Dial Indicator Displacement = 8.41 mm
Right Rear Dial Indicator Displacement = 9.98 mm
Right Door Sill Dial Indicator Displacement = 4.85 mm

NOTES:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

RECORDED BY: [Signature]
DATE: 05/25/04

APPROVED BY: [Signature]
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SECTION 6

TEST PLOTS
GTL 5202

216, Roof Crush, Driver Side.

Force in Newtons (Thousands)

Time in Seconds
GTL 5202

216, Roof Crush, Driver Side.