SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 104
WINDSHIELD WIPING AND WASHING SYSTEMS

TOYOTA MOTOR CORPORATION
2009 LEXUS ES 350, PASSENGER CAR
NHTSA NO. C95104

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

JUNE 30, 2009
FINAL REPORT
PREPARED FOR
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVE., S.E.
WASHINGTON, D.C. 20590
Compliance tests were conducted on the subject 2009 Lexus ES 350 Passenger Car in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-104-08 for the determination of FMVSS 104 compliance. Test failures identified were as follows:
NONE
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1.0 PURPOSE OF COMPLIANCE TEST

A 2009 Lexus ES 350 Passenger Car was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 104 testing to determine if the vehicle was in compliance with the requirements of the standard. All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-104-08 dated 26 June 1996 and General Testing Laboratories, Inc. (GTL) Test Procedure, TP-104-08A dated 4 April 1997.

1.1 The test vehicle was a 2009 Lexus ES 350. Nomenclature applicable to the test vehicle are:

A. **Vehicle Identification Number:** JTHBJ46GX92295416
B. **NHTSA No.:** C95104
C. **Manufacturer:** TOYOTA MOTOR CORPORATION
D. **Manufacture Date:** 10/08
E. **Color:** Smoky Granite Mica

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 104 testing on June 9, 2009.
SECTION 2
COMPLIANCE TEST PROCEDURE AND SUMMARY OF RESULTS

2.0 GENERAL

The 2009 Lexus ES 350 passenger car, NHTSA No. C95104 was subjected to FMVSS No. 104 tests on June 9, 2009. The selected portions of FMVSS No. 104 tests used were as amplified in the following subparagraphs. The test vehicle was positioned in the test system with three water spray nozzles suspended in line with the center of the longitudinal axis of the windshield and horizontal left/right center of the windshield to provide an even distribution of spray to the entire windshield. The height of the nozzles was approximately 22 inches above the glazing surface.

2.1 WIPER FREQUENCY TEST

The wiper frequency test was performed with the engine operating and with a minimum of 50 cubic inches per minute of water from the spray nozzles. The wiper frequency was measured at the low and high wiper speed settings with the engine operating at idle RPM and 2,000 RPM.

2.2 WIPED AREA TEST

The test was conducted with the windshield wiper system operating at the high speed setting, engine at idle RPM and the spray nozzles spraying water at a minimum of 50 cubic inches per minute. The wiper blade wipe pattern was outlined on the glazing surface and then transferred to a windshield pattern. The wiped area was determined for areas A, B and C from the windshield pattern.

2.3 CAPABILITY TEST

The windshield glazing surface was coated with a mixture of water and fine grade test dust. Within 15 seconds following application of the water-dust mixture, the windshield wiper and washing system was activated in the high speed mode for ten complete cycles. The vehicle’s engine was operating at idle RPM. The cleared areas of the windshield were marked on the inside windshield surface. After ten complete cycles the system was deactivated and the wiped area transferred to a windshield pattern.

The glazing surface was cleaned and dried. The water dust mixture was re-applied and the test repeated.

The windshield patterns were used subsequently to determine the cleared area percentages.

2.4 SUMMARY OF RESULTS

Based on the test performed, the test vehicle’s windshield wiping and washing system appears to meet the requirements of FMVSS 104.
SECTION 3
COMPLIANCE TEST DATA

3.0 TEST RESULTS

The following data sheets document the results of testing on the 2009 Lexus ES 350.
SUMMARY OF DATA
FMVSS 104, WINDSHIELD WIPING AND WASHING SYSTEMS

VEH. MOD YR/MAKE/MODEL/BODY: 2009 LEXUS ES 350 PASSENGER CAR
VEH. NHTSA NO: C95104; VIN: JTHBJ46GX92295416
VEH. BUILD DATE: 10/08 TEST DATE: JUNE 9, 2009
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

WIPER TYPE: 2 SPEED ELECTRIC WITH DELAY
WASHER TYPE: HIGH PRESSURE ELECTRIC

WINDSHIELD AREAS: A = 1901 in² B = 779 in² C = 256 in²
MANUFACTURER’S WINDSHIELD PATTERN USED: Yes X No

ACCESSIBILITY:

(1) Washer Control Accessible: Yes X No
(2) Wiper Control Accessible: Yes X No
(3) Washer Reservoir Filler Accessible: Yes X No

DESCRIBE UNUSUAL FEATURES OF WIPING AND WASHING SYSTEMS: NONE

PERFORMANCE:

<table>
<thead>
<tr>
<th>TEST</th>
<th>PASS</th>
<th>FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIPER FREQUENCY</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WIPED AREA</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WASHER CAPABILITY</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

RECORDED BY: G. FARRAND DATE: 06/09/09
APPROVED BY: D. MESSICK
FREQUENCY TEST DATA
FMVSS 104 – WINDSHIELD WIPER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2009 LEXUS ES 350 PASSENGER CAR
VEH. NHTSA NO: C95104; VIN: JTHBJ46GX92295416
VEH. BUILD DATE: 10/08 TEST DATE: JUNE 9, 2009
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Water Hardness: 7.0 grains/gallon (12 max.); Date Certified: 05/09
Water Spray Flow Rate: 75 in³/min. (specified range = 50 to 100 in³/min.)
Ambient Air Temp.: 88 °F (50-100°F); Water Temp.: 81 °F (100°F max.)
Manufacturer’s Recommended Engine Idle Speed: 750 rpm

RUN 1, MAXIMUM WIPER FREQUENCY TEST:

<table>
<thead>
<tr>
<th>TIME</th>
<th>ENGINE SPEED</th>
<th>TOTAL CYCLES</th>
<th>AVG. CYCLES/MIN. (45 MINIMUM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ˢᵗ 3 minutes</td>
<td>750 (idle ± 50 rpm)</td>
<td>217</td>
<td>72.3</td>
</tr>
<tr>
<td>2ⁿᵈ 3 minutes</td>
<td>2000 (2000 rpm ± 50 rpm)</td>
<td>222</td>
<td>74.0</td>
</tr>
</tbody>
</table>

Frequency at least 45 cycles/minute regardless of engine speed: Yes X No __

RUN 2, LOWER WIPER FREQUENCY TEST:

<table>
<thead>
<tr>
<th>TIME</th>
<th>ENGINE SPEED</th>
<th>TOTAL CYCLES</th>
<th>AVG. CYCLES/MIN. (20 MINIMUM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ˢᵗ 3 minutes</td>
<td>750 (idle ± 50 rpm)</td>
<td>150</td>
<td>50</td>
</tr>
<tr>
<td>2ⁿᵈ 3 minutes</td>
<td>2000 (2000 rpm ± 50 rpm)</td>
<td>150</td>
<td>50</td>
</tr>
</tbody>
</table>

Highest and lower frequency differ by at least 15 cycles/minute, and lower frequency is at least 20 cycles/minute regardless of engine speed: Yes X No __

REMARKS:

RECORDED BY: G. FARRAND DATE: 06/09/09
APPROVED BY: D. MESSICK
VEH. MOD YR/MAKE/MODEL/BODY: 2009 LEXUS ES 350 PASSENGER CAR
VEH. NHTSA NO: C95104; VIN: JTHBJ46GX92295416
VEH. BUILD DATE: 10/08; TEST DATE: JUNE 9, 2009
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 88°F (specified range of 50 to 100°F)

Air Velocity at windshield = .5 mph (specified range of 0 to 1 mph)

Engine speed = 750 rpm (manufacturer’s recommended idle ± 50 rpm)

Temperature of water spray = 80°F (100°F maximum)

Water spray flow rate = 75 in³/min. (specified range of 50 to 100 in³/min.)

Windshield wiper frequency = 50 cycles/min. (45 cpm minimum)

TEST RESULTS:

<table>
<thead>
<tr>
<th>WINDSHIELD AREA</th>
<th>ACTUAL</th>
<th>REQUIRED</th>
<th>PASS</th>
<th>FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>95.84%</td>
<td>80%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>96.83%</td>
<td>94%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>100%</td>
<td>99%</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

REMARKS:

RECORDED BY: G. FARRAND DATE: 06/09/09
APPROVED BY: D. MESSICK
CAPABILITY TEST DATA
FMVSS 104 – WINDSHIELD WASHER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2009 LEXUS ES 350 PASSENGER CAR
VEH. NHTSA NO: C95104; VIN: JTHBJ46GX92295416
VEH. BUILD DATE: 10/08; TEST DATE: JUNE 9, 2009
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 88 ºF (specified range of 70 to 80ºF)
Washer reservoir fluid temperature = 78 ºF (specified range of 70 to 80ºF)
Air Velocity at windshield = .5 mph (specified range of 0 to 1 mph)
Engine speed = 750 rpm (manufacturer’s recommended idle ± 50 rpm)
Number of windshield washer nozzles on the vehicle = 2

Windshield washer system activation coordinated with components of the wiper system:
Yes X No

TEST RESULTS:

<table>
<thead>
<tr>
<th>WINDSHIELD AREA</th>
<th>TEST 1</th>
<th>TEST 2</th>
<th>AVG</th>
<th>REQ'D*</th>
<th>PASS</th>
<th>FAIL</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>97.4</td>
<td>97.4</td>
<td>97.4</td>
<td>75%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>97.9</td>
<td>97.9</td>
<td>97.9</td>
<td>75%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>75%</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*NOTE FOR REFERENCE ONLY: SAE 942b, revised Jul72, recommends capability to clear 80% of the total wash area and 90% of the wash area included in AREA C.

REMARKS:

RECORDED BY: G. FARRAND DATE: 06/09/09
APPROVED BY: D MESSICK
## TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>DESCRIPTION</th>
<th>MODEL/ SERIAL NO.</th>
<th>CAL. DATE</th>
<th>NEXT CAL. DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIMER</td>
<td>ACCU-SPLIT</td>
<td>ACT1</td>
<td>05/09</td>
<td>05/10</td>
</tr>
<tr>
<td>TEMPERATURE READOUT</td>
<td>FLUKE</td>
<td>7471026</td>
<td>10/08</td>
<td>10/09</td>
</tr>
<tr>
<td>TEMPERATURE RECORDER</td>
<td>FLUKE</td>
<td>7471026</td>
<td>10/08</td>
<td>10/09</td>
</tr>
<tr>
<td>SPRAY SYSTEM</td>
<td>GTL</td>
<td>N/A</td>
<td>BEFORE USE</td>
<td>BEFORE USE</td>
</tr>
<tr>
<td>ANEMOMETER</td>
<td>OMEGA</td>
<td>19353-56</td>
<td>06/08</td>
<td>06/09</td>
</tr>
<tr>
<td>CYCLE COUNTER</td>
<td>GTL</td>
<td>GTL</td>
<td>BEFORE USE</td>
<td>BEFORE USE</td>
</tr>
<tr>
<td>SOFT WATER</td>
<td>N/A</td>
<td>N/A</td>
<td>05/09</td>
<td>05/10</td>
</tr>
<tr>
<td>TACHOMETER</td>
<td>MONARCH</td>
<td>ACT-3</td>
<td>05/09</td>
<td>05/10</td>
</tr>
<tr>
<td>TEST DUST</td>
<td>AC</td>
<td>GM FINE</td>
<td>CALIBRATED DUST</td>
<td>CALIBRATED BY VENDOR*</td>
</tr>
</tbody>
</table>

*AC Inspection #503, Batch #1943, Measured with particle size roller analyzer.
SECTION 5
PHOTOGRAPHS
2009 LEXUS ES 350
NHTSA NO. C95104
FMVSS NO. 104

FIGURE 5.3
¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE
MFD. BY: TOYOTA MOTOR CORPORATION 10/08
GVWR 4680LB GAWR FR 2668LB RR 2359LB
THIS VEHICLE CONFORMS TO ALL APPLICABLE
FEDERAL MOTOR VEHICLE SAFETY, BUMPER, AND
THEFT PREVENTION STANDARDS IN EFFECT ON
THE DATE OF MANUFACTURE SHOWN ABOVE.
JTHBJ46GX92295416 PASS. CAR

C/TR: 1G0/LA25 GSV40L-BETGKA
A/TM: -01A/U660E MADE IN JAPAN 122A

2009 LEXUS ES 350
NHTSA NO. C95104
FMVSS NO. 104
FIGURE 5.5
VEHICLE CERTIFICATION LABEL
<table>
<thead>
<tr>
<th>TIRE</th>
<th>SIZE</th>
<th>COLD TIRE PRESSURE</th>
<th>PNEUS</th>
<th>DIMENSION</th>
<th>PRESSION DE GONFLAGE À FROID</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRONT</td>
<td>P215/55R17</td>
<td>210kPa, 30PSI</td>
<td>AVANT</td>
<td>P215/55R17</td>
<td>210kPa, 30PSI</td>
</tr>
<tr>
<td>REAR</td>
<td>P215/55R17</td>
<td>210kPa, 30PSI</td>
<td>ARRIÈRE</td>
<td>P215/55R17</td>
<td>210kPa, 30PSI</td>
</tr>
<tr>
<td>SPARE</td>
<td>P215/55R17</td>
<td>210kPa, 30PSI</td>
<td>SECOURS</td>
<td>P215/55R17</td>
<td>210kPa, 30PSI</td>
</tr>
</tbody>
</table>

See owner’s manual for additional information.

Pour de plus amples informations, voir le manuel du propriétaire.
2009 LEXUS ES 350
NHTSA NO. C95104
FMVSS NO. 104

FIGURE 5.7
INSTRUMENTATION AND EQUIPMENT SET-UP
FIGURE 5.9
WIPED AREA TEST PATTERN
FIGURE 5.10
CAPABILITY TEST #1 PRE-COATED WINDSHIELD
2009 LEXUS ES 350
NHTSA NO. C95104
FMVSS NO. 104

FIGURE 5.14
CAPABILITY TEST #1 AND #2 PATTERN
2-3. Operating the lights and windshield wiper

Windshield wiper and washer

- Intermittent wiper with interval adjuster (if equipped)
  When intermittent wiper operation is selected, wiper intervals can be adjusted.

1. Intermittent windshield wiper operation
2. Low speed windshield wiper operation
3. High speed windshield wiper operation
4. Temporary operation

5. Increases the intermittent windshield wiper frequency
6. Decreases the intermittent windshield wiper frequency
Rain-sensing windshield wipers (if equipped)

With AUTO selected, the wipers will operate automatically when the sensor detects falling rain. The system automatically adjusts wiper timing in accordance with rain volume and vehicle speed.

1. Rain-sensing windshield wiper operation
2. Low speed windshield wiper operation
3. High speed windshield wiper operation
4. Temporary operation
5 Sensor sensitivity (high)
6 Sensor sensitivity (low)

7 Wash/wipe operation
Wipers operate automatically. (With AUTO selected, after operating several times, the wipers operate one more time after a short delay to prevent dripping.)

The windshield wiper and washer can be operated when
The "ENGINE START STOP" switch is in IGNITION ON mode.

Rain drop sensor (vehicles equipped with the rain-sensing windshield wipers)
The sensor judges the amount of raindrops.

AUTO mode
If the wiper switch is turned to AUTO position while the "ENGINE START STOP" switch is in IGNITION ON mode, the wiper will operate once to show that AUTO mode is activated.
If no windshield washer fluid sprays

Check that the washer nozzles are not blocked if there is washer fluid in the windshield washer fluid reservoir.

**CAUTION**

- Caution regarding the use of windshield wipers in AUTO mode (vehicles equipped with the rain-sensing windshield wipers)
  
The windshield wipers may operate unexpectedly if the sensor is touched or the windshield is subject to vibration in AUTO mode. Take care that your fingers or anything else do not become caught in the windshield wipers.

**NOTICE**

- When the windshield is dry
  
  Do not use the wipers, as they may damage the windshield.

- When there is no washer fluid spray from the nozzle
  
  Damage to the washer fluid pump may be caused if the lever is pulled toward you and held continually.