

DRAFT TEST METHOD

Measurement of body voltage getting out of a car

1. PURPOSE:

To measure the voltages generated on a person getting out of a car to assess suitability of seat materials to avoid risks from static electricity.

2. TEST EQUIPMENT:

2.1 Electrostatic voltmeter

- analogue and/or serial data output
- ability to measure voltages to at least 20kV with a resolution of 50V or better
- leakage resistance 10^{14} ohms, or greater, at voltages over 10kV
- internal capacitance less than 10pF
- response time below 0.1s.

2.2 Signal recording equipment (analogue or digital) capable of storing data with time resolution of 0.1s or better for test periods lasting at least 20 seconds. It is convenient to be able to review observations immediately after a test to check that conduct of the test was satisfactory and to note numerical values for peak and plateau voltages achieved.

2.3 Insulated HV lead about 2m long to connect the electrostatic voltmeter to the body of the test operator. The lead is connected to the person at a 'wrist strap' or by connection to a metal watch strap. The lead must provide no noticeable impediment to movement in getting out of the car and must not drag over surfaces or risk snagging on car features during such actions. Its insulation must provide a leakage resistance 10^{14} ohms, or better, at 10kV.

2.4 The electrostatic voltmeter is conveniently supported on the front passenger seat of the car and linked to the wrist of the test operator on that side (to the left hand wrist for a right hand drive car, and vice versa).

2.5 A sheet of good quality insulation is placed on the ground at the point of contact of the feet with the ground and for standing after getting out of the car. The sheet needs to be about 1m^2 and 3-5mm thick. It needs to provide 10^{14} ohms isolation resistance at voltages up to 20kV.

2.6 If high body voltages (over 5kV) are likely to occur then provision of a piece of wood on an earthed mounting will provide a way for the operator to dissipate body charge without experiencing a shock.

3. ENVIRONMENTAL CONDITIONS

The temperature and humidity in the car and outside at the time of testing are to be measured - for example using a Whirling Hygrometer. The electrostatic characteristics of materials can be strongly influenced by absorbed moisture. Hence, the car and any alternative test seating materials and all test clothing worn shall be exposed to the test conditions for several hours before the start of testing.

For standardised studies measurements are to be made at 23C 50%RH and at 23C 12%RH. The test garments and the car shall be under these conditions for 24 hours before starting tests.

4. TEST PROCEDURE

4.1 Place the electrostatic voltmeter on the front passenger seat and link it to the signal recording equipment. Bond the earth connection of the voltmeter to the metal bodywork of the car.

4.2 Place the sheet of good quality insulation on the ground at the point of contact and covering the position of standing after getting out of the car.

4.3 Link the HV connection lead from the electrostatic voltmeter to the tester - for example to a wristband or metal watch strap.

4.4 Perform a test action of getting out of the car to check that the HV connection lead moves freely and does not impede activity or snag on any car structure or fittings. Check that no part of the clothing remains in contact with the car or with earth after leaving the car. Check the sheet of insulation on the ground is stable and will not skid away.

4.5 Switch on the electrostatic voltmeter and the signal recording equipment and check operating satisfactorily. Earth the operator body and check zero level of displayed and recorded readings. Record relevant test parameters and the date and time.

4.6 Perform at least 5 actions of getting out of the car in a normal manner from the selected seat for each set of test conditions. Leave the car without the body or clothing touching the metal bodywork and with the feet impacting squarely on the layer of insulation on the ground. Avoid any sliding or scuffing action of the feet on the insulation. After leaving the car stand still on the insulation for at least 10s to allow recording of the natural rate of voltage decay.

4.7 Typically, on getting out of a car the body voltage rises to a peak value in a time of 1-2 seconds. Depending on body action the voltage may either remain at the peak or may quickly drop to a somewhat lower value at which it remains constant. The peak and plateau values of voltage are to be noted.

4.8 For each set of observation calculate the average value and the standard deviation

4.9 Where studies are made on a number of different seat fabrics and/or wearing various clothing the sequence of tests shall preferably start and finish with standard or reference combinations of materials. In tests likely to extend over many hours it is desirable to perform additional tests from time to time with the reference materials to if observations are stable or if the changes are due to changes in environmental conditions, transfer of fabric finish or other factors.

5. TEST REPORT:

The following information shall be reported:

- description of the make and model of the car and the seat used for testing
- the seat material
- the type and fabric of clothing worn (including component fibres and weave if possible)
- the temperature and humidity in the vehicle.
- peak values and plateau values of body voltages observed shall be listed with average values and standard deviations for each set of tests under particular conditions.
- description (and serial numbers) of the instrumentation and the data recording equipment used together with the source and date of most recent calibration.

John Chubb - John Chubb Instrumentation - 30 April, 2000