

Annex 4

FRONTAL-IMPACT TEST AGAINST A BARRIER\*

1. INSTALLATIONS, PROCEDURE AND MEASURING INSTRUMENTS

1.1. Testing ground

The test area shall be large enough to accommodate the run-up track, barrier and technical installations necessary for the test. The last part of the track, for at least 5 m before the barrier, must be horizontal, flat and smooth.

1.2. Barrier

The barrier consists of a block of reinforced concrete not less than 3 m wide in front and not less than 1.5 m high. The barrier must be of such thickness that it weighs at least 70 tons. The front face must be vertical, perpendicular to the axis of the run-up track, and covered with plywood boards 2 cm thick in good condition. The barrier shall be either anchored in the ground or placed on the ground with, if necessary, additional arresting devices to limit its displacement. A barrier with different characteristics, but giving results at least equally conclusive, may likewise be used.

1.3. Propulsion of vehicle

At the moment of impact the vehicle must no longer be subject to the action of any additional steering or propelling device. It must reach the obstacle on a course perpendicular to the collision wall; the maximum lateral disalignment tolerated between the vertical median line of the front of the vehicle and the vertical median line of the collision wall is  $\pm 30$  cm.

1.4. State of vehicle

1.4.1. The vehicle under test must either be fitted with all the normal components and equipment included in its unladen kerb weight or be in such a condition as to fulfil this requirement so far as the components and equipment of concern to the passenger compartment and the distribution of the weight of the vehicle as a whole, in running order, are concerned.

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\* This method is not applicable to vehicles weighing more than 3.5 metric tons.

- 1.4.2. If the vehicle is driven by external means, the fuel installation must be filled to at least 90% of its capacity either with fuel or with a non-inflammable liquid having a density and a viscosity close to those of the fuel normally used. All other systems (brake-fluid header tanks, radiator, etc.) may be empty.
- 1.4.3. If the vehicle is driven by its own engine, the fuel tank must be at least 90% full. All other liquid-holding tanks may be filled to capacity.
- 1.4.4. If the manufacturer so requests, the technical service responsible for conducting the tests may allow the same vehicle as is used for tests prescribed by other Regulations (including tests capable of affecting its structure) to be used also for the tests prescribed by this Regulation.

1.5. Velocity on impact

The velocity on impact must be between 48.3 km/h and 53.1 km/h. However, if the test has been carried out at a higher impact velocity and the vehicle has satisfied the conditions prescribed, the test is considered satisfactory.

1.6. Measuring instruments

The instrument used to record the speed referred to in paragraph 1.5. above shall be accurate to within 1%.

2. RESULTS

Before and after impact, the dimensions specified in paragraph 5. of this Regulation shall be measured and recorded.

3. CORRECTION FACTORS

3.1. Notation

- V Recorded speed in km/h;
- $m_0$  Weight mass of prototype in state defined in paragraph 1.4. of this annex;
- m Weight mass of prototype with testing apparatus;
- $D_0$  Residual dimensions measured after the impact, as defined in paragraph 5. of this Regulation;
- $D_1$  Corrected residual dimensions used to determine results of test;

$K_1$  = the greater of  $(\frac{48.3}{V})^2$  and 0.83;

$K_2$  = the greater of  $\frac{m_0}{m}$  and 0.8.

- 3.2. The corrected dimensions  $D_1$  used to check the conformity of the prototype with the requirements of this Regulation shall be calculated by the following formula:

$$D_1 = D_0 \cdot K_1 \cdot K_2$$

- 3.3. A front impact test against a barrier is not needed in the case of a vehicle which is identical to the prototype considered as regards the characteristics specified in paragraph 2.2.2.1. of this Regulation but whose weight (mass)  $m_1$  is greater than  $m_0$ , if  $m_1$  is not more than 1.25  $m_0$  and if the corrected dimension  $D_2$  obtained from the dimensions  $D_1$  by the formula  $D_2 = \frac{m_0}{m_1} \cdot D_1$  are such as to show that the new vehicle still meets the requirements of paragraph 5. of this Regulation.

#### 4. EQUIVALENT TEST METHODS

- 4.1. Equivalent test methods are permitted provided that the conditions referred to in this Regulation can be observed either entirely by means of the substitute test or by calculation from the results of the substitute test.
- 4.2. If a method other than that described in paragraph 1. above is used its equivalence must be demonstrated.

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