

## Attachment 86 Rear-end collision for prevention of fuel tank fire risks

Refer to: UN R34 03-S1, R153 00 Series

### 86.1 Effective date and Scope:

86.1.1 Effective date from 2023/1/1, the new vehicle variant of category symbols M1 and N1 that total permissible mass not exceeding to 2.8 tons, and from 2025/1/1 all vehicle variant of category symbols M1 and N1 that total permissible mass not exceeding to 2.8 tons, the rear-end collision for prevention of fuel tank fire risks shall comply with this regulation.

86.1.2 Except for child-only vehicle, application for low volume or vehicle-by-vehicle safety approval may be exempt from this regulation.

86.1.3 Technical Service can carry out test according to UN Regulations that this direction harmonized with: UN R34 03 Series of amendments 、 R153 00 Series of amendments and following amendments of above-mentioned regulations.

### 86.2 Definitions:

86.2.1 "Transverse plane" means the vertical transverse plane perpendicular to the median longitudinal plane of the vehicle;

86.2.2 "Unladen mass" means the mass of the vehicle in running order, unoccupied and unladen but complete with fuel, coolant, lubricants, tools and a spare wheel (if provided as standard equipment by the vehicle manufacturer);

86.3 Rear-end collision for prevention of fuel tank fire risks shall according to suitable type and range of principle : .

86.3.1 The same brand.

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- 86.3.2 The same structure, shape, dimensions and materials (metal/plastic) of the tank(s).
- 86.3.3 The same in vehicles of category M1 the position of the tank(s) in the vehicle in so far as it has a negative effect on tanks, which has protruding parts, sharp edges, etc. near the tank.
- 86.3.4 The same characteristics and siting of the fuel feed system (pump, filters, etc.).
- 86.3.5 The same characteristics and siting of the electrical installation in so far as they have an effect on the results of the collision tests prescribed in this Regulation.
- 86.3.6 If use chassis vehicle instead of completed vehicle for entire or partial testing, which shall according to suitable variants and range of principle are as below :
- 86.3.6.1 The same brand.
- 86.3.6.2 The same structure, shape, dimensions and materials (metal/plastic) of the tank(s).
- 86.3.6.3 The same in vehicles of category M1 the position of the tank(s) in the vehicle in so far as it has a negative effect on tanks, which has protruding parts, sharp edges, etc. near the tank.
- 86.3.6.4 The same characteristics and siting of the fuel feed system (pump, filters, etc.).
- 86.3.6.5 The same characteristics and siting of the electrical installation in so far as they have an effect on the results of the collision tests prescribed in this Regulation.

#### 86.4 General requirements

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86.4.1 Applicants apply for certification test shall provide at least one representative vehicle (or the essential part of vehicle for test) and submit the documents as below:

86.4.1.1 Vehicle specification documents, drawings and/or photographs described in paragraph 86.3.

86.4.1.2 A detailed description of the numbers and/or symbols identifying the engine type and the vehicle type shall be specified;

86.4.1.3 Drawing(s) showing the characteristics and material of the fuel tank;

86.4.1.4 A diagram of the entire fuel feed systems, showing the site of each component on the vehicle; and

86.4.1.5 A diagram of the electrical installation showing its siting and its mode of attachment to the vehicle.

86.4.1.6 Required documents for carry out the test of this regulation

86.4.2 Requirements for the installation of liquid fuel tanks

If technical service could not carry out the following testing items in reality, then technical service could refer to design and

related documents to check the test instead.

86.4.2.1 Fuel feed systems installation

86.4.2.1.1 The vehicles shall be approved according to “Installation of fuel tank” of VSTD (or provide the test reports that issued by technical service).

86.4.2.1.2 The components of the fuel installation shall be adequately protected by parts of the frame or bodywork

against contact with possible obstacles on the ground. Such protection shall not be required if the components beneath the vehicle are further from the ground than the part of the frame or bodywork in front of them.

86.4.2.1.3 The pipes and all other parts of the fuel installation shall be accommodated on the vehicle at sites protected to the fullest possible extent. Twisting and bending movements, and vibrations of the vehicle's structure or drive unit, shall not subject the components of the fuel installation to friction, compression or any other abnormal stress.

86.4.2.1.4 The connections of pliable or flexible pipes with rigid parts of components of the fuel installation shall be so designed and constructed as to remain leak-proof under the various conditions of use of the vehicle, despite twisting and bending movements and despite vibrations of the vehicle's structure or drive unit.

86.4.2.1.5 If the filler hole is situated on the side of the vehicle, the filler cap shall not, when closed, project beyond the adjacent surfaces of the bodywork.

### 86.4.3 Electrical installation

If technical service could not carry out the following testing items in reality, then technical service could refer to design and related documents to check the test instead.

86.4.3.1 Electric wires other than wires accommodated in hollow components shall be attached to the vehicle's structure

or walls or partitions near which they lead. The points at which they pass through walls or partitions shall be satisfactorily protected to prevent cutting of the insulation.

86.4.3.2 The electrical installation shall be so designed, constructed and fitted that its components are able to resist the corrosion phenomena to which they are exposed.

## 86.5 Collision tests on the vehicle

In the rear-end impact test carried out by the procedure specified in paragraph 86.6.

86.5.1 No more than a slight leakage of liquid in the fuel installation shall occur on collision;

86.5.2 If there is continuous leakage in the fuel installation after the collision, the rate-of leakage shall not exceed 30 g/min; if the liquid from the fuel installation mixes with liquids from the other systems, and if the several liquids cannot be easily separated and identified, the continuous leakage shall be evaluated from all the fluids collected;

86.5.3 No fire maintained by the fuel shall occur.

86.5.4 During and after the rear-end impact test carried out by the procedure specified in paragraph 86.6., the battery shall be kept in position by its securing device.

## 86.6 Procedure for rear-end collision test

86.6.1 Purpose and scope

86.6.1.1 The purpose of the test is to simulate the conditions of rear-end collision by another vehicle in motion.

86.6.2 Installations, procedures and measures instrument

#### 86.6.2.1 Testing ground

The test area shall be large enough to accommodate the impactor (striker) propulsion system and to permit after-collision displacement of the vehicle struck and installation of the test equipment. The part in which vehicle collision and displacement occur shall be horizontal, flat and uncontaminated, and representative of a normal, dry, uncontaminated road surface.

#### 86.6.2.2 Impactor (striker)

86.6.2.2.1 The impactor shall be of steel and of rigid construction.

86.6.2.2.2 The impacting surface shall be flat, not less than 2,500 mm wide, and 800 mm high, and its edges shall be rounded to a radius of curvature of between 40 and 50 mm. It shall be clad with a layer of plywood 20 +/- 2 mm thick, in good condition.

86.6.2.2.3 At the moment of collision the following requirements shall be met:

86.6.2.2.3.1 The impacting surface shall be vertical and perpendicular to the median longitudinal plane of the vehicle struck;

86.6.2.2.3.2 The direction of movement of the impactor shall be substantially horizontal and parallel to the median longitudinal plane of the vehicle struck;

86.6.2.2.3.3 The maximum lateral deviation tolerated between the median vertical line of the surface of the impactor and the median longitudinal plane of the vehicle struck shall be 300 mm. In addition, the

impacting surface shall extend over the entire width of the vehicle struck;

86.6.2.2.3.4 The ground clearance of the lower edge of the impacting surface shall be 175 +/- 25 mm.

#### 86.6.2.3 Propulsion of the impactor

The impactor may either be secured to a carriage (moving barrier) or form part of a pendulum.

#### 86.6.2.4 Special provisions applicable where a moving barrier is used

86.6.2.4.1 If the impactor is secured to a carriage (moving barrier) by a restraining element, the latter shall be rigid and be incapable of being deformed by the collision; the carriage shall at the moment of collision be capable of moving freely and no longer be subject to the action of the propelling device.

86.6.2.4.2 The velocity of collision shall be between 48 km/h and 52 km/h.

86.6.2.4.3 The aggregate weight (mass) of carriage and impactor shall be 1,100 +/- 20 kg.

#### 86.6.2.5 Special provisions applicable where a pendulum is used

86.6.2.5.1 The distance between the centre of the impacting face and the axis of rotation of the pendulum shall be not less than 5 m.

86.6.2.5.2 The impactor shall be freely suspended by rigid arms rigidly secured to it. The pendulum so constituted shall be substantially incapable of being deformed by the collision.

86.6.2.5.3 Arresting gear shall be incorporated in the pendulum to prevent any secondary collision by the impactor on the test vehicle.

86.6.2.5.4 At the moment of collision the velocity of the centre of percussion of the pendulum should be between 48 and 52 km/h.

86.6.2.5.5 The reduced mass " $m_r$ " at the centre of percussion of the pendulum is defined as a function of the total mass " $m$ ", of the distance " $a$ "<sup>1</sup> between the centre of percussion and the axis of rotation, and of the distance " $l$ " between the centre of gravity and the axis of rotation, by the following equation:

$$m_r = m (l/a)$$

<sup>1</sup> It is recalled that the distance " $a$ " is equal to the length of the synchronous pendulum under consideration.

86.6.2.5.6 The reduced mass  $m_r$  shall be 1,100 +/- 20 kg.

#### 86.6.2.6 General provisions relating to the mass and velocity of the impactor

If the test has been conducted at a collision velocity higher than those prescribed in paragraphs 86.6.2.4.2. and 86.6.2.5.4. and/or with a mass greater than those prescribed in paragraphs 86.6.2.4.3. and 86.6.2.5.6., and the vehicle has met the requirements prescribed, the test shall be considered satisfactory.

#### 86.6.2.7 State of vehicle under test

86.6.2.7.1 The vehicle under test shall either be fitted with all the normal components and equipment included in its unladen kerb weight or be in such condition as to fulfil this requirement so far as the components and equipment affecting fire risks are concerned.

86.6.2.7.2 The fuel tank shall be filled to at least 90 per cent 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.

86.6.2.7.3 A gear may be engaged and the brakes may be applied.

86.6.2.7.4 If the manufacturer so requests, the following derogation shall be permitted:

86.6.2.7.4.1 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; and

86.6.2.7.4.2 The vehicle may be weighted to an extent not exceeding 10 per cent of its unladen kerb weight with additional weights rigidly secured to the structure in such a way as not to affect the behaviour of the structure of the passenger compartment during the test.

#### 86.6.2.8 Measuring instruments

The instruments used to record the speed referred to in paragraphs 86.6.2.4.2. and 86.6.2.5.4. above shall be accurate to within one per cent.

#### 86.6.3 Equivalent test methods

86.6.3.1 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.

86.6.3.2 If a method other than that described in paragraph 86.6.2. above is used, its equivalence shall be demonstrated.