

Proposal for Supplements to the 03 and 04 series of amendments to UN Regulation No. 79

Proposal for a Supplement to the 03 and 04 series of amendments to UN Regulation No. 79 (Steering equipment). This document proposes amendments to provisions on full power steering. The changes to the current text of the regulation are indicated in ~~strike through~~ for deleted and **bold** for new text.

I. Proposal

5.3. Failure provisions and performance

5.3.1. General

Paragraph 5.3.1.1., amend to read:

5.3.1.1. For the purposes of this Regulation the steered wheels, the steering control and all mechanical parts of the steering transmission shall not be regarded as liable to breakage if they are amply dimensioned, are readily accessible for maintenance, and exhibit safety features at least equal to those prescribed for other essential components (such as the braking system) of the vehicle. Where the failure of any such part would be likely to result in loss of control of the vehicle, that part shall be made of metal or of a material with equivalent characteristics (**e.g. similar strength and fatigue life attributes**) and shall not be subject to significant distortion in normal operation of the steering system.

Paragraphs 5.3.3.x., amend to read:

5.3.3. Full power steering systems

5.3.3.1. The system shall be designed such that the vehicle cannot be driven indefinitely at speeds above 10 km/h where there is any fault which requires operation of the warning signal referred to in paragraph 5.4.2.1.1.

5.3.3.2. In case of a failure within the control transmission, with the exception of those parts listed in paragraph 5.1.4., it shall still be possible to steer with the performance laid down in paragraph 6. for the intact steering system.

5.3.3.3. In the event of a failure of the energy source of the control transmission, it shall be possible to carry out at least 24 "figure of eight" manoeuvres, where each loop of the figure is 40m diameter at 10km/h speed and at the performance level given for an intact system in Paragraph 6. ~~The test manoeuvres shall begin at an energy storage level given in Paragraph 5.3.3.5.~~ **An alternative to this requirement is specified in paragraph 5.3.3.6.**

5.3.3.4. In the event of a failure within the energy transmission, with the exception of those parts listed in paragraph 5.3.1.1., there shall not be any immediate changes in steering angle. ~~As long as the vehicle is capable of being driven at a speed greater than 10 km/h the requirements of paragraph 6. for the system with a failure shall be met after the completion of at least 25 "figure of eight" manoeuvres at 10 km/h minimum speed, where each loop of the figure is 40 m diameter.~~

The requirements of paragraph 6. for the system with a failure shall be met

- **either after the completion of at least 25 "figure of eight" manoeuvres at 10 km/h minimum speed, where each loop of the figure is 40 m**

diameter, when the vehicle is intended of being driven at a speed greater than 10 km/h, or

- until the vehicle speed is reduced and then limited to 10 km/h or below with a deceleration demand not exceeding 4 m/s². The manufacturer shall provide information on how the reduction and limitation to 10 km/h is ensured.

~~The test manoeuvres shall begin at an energy storage level given in paragraph 5.3.3.5.~~

- 5.3.3.5. The energy level to be used for the tests referred to in paragraphs 5.3.3.3. and, 5.3.3.4. and 5.3.3.6. shall be the energy storage level at which a failure is indicated to the driver.

In the case of electrically powered systems subject to Annex 6, this level shall be the worst case situation outlined by the manufacturer in the documentation submitted in connection with Annex 6 and shall take into account the effects of e.g. temperature and ageing on battery performance.

Insert a new paragraph 5.3.3.6. to read:

5.3.3.6. Alternative requirements to paragraph 5.3.3.3.

In the event of a failure of the energy source of the control transmission, the requirements of paragraph 6 for an intact system shall be satisfied until the vehicle has reached a safe state as below:

- a speed below or equal 10 km/h or standstill, in case of independent energy sources for the braking and the steering system, or
- standstill, in case of a shared energy source for the braking and the steering system.

It shall be ensured that the safe state is reached

- at the earliest 60s after the failure occurs, provided propulsion is still available, and
- at the latest before the energy level is down to an amount not allowing for a further lane change as specified below.

The maximum deceleration demand to reach a safe state shall not exceed 4m/s². It should be understood that the driver still has the possibility to stop the vehicle earlier.

Sufficient energy shall be available to perform subsequent lane changes between the time when the failure occurs and the time when the safe state is reached. For the purpose of the test, subsequent lane change manoeuvres shall be carried out with a vehicle speed of 20 km/h (+/- 2km/h) whereby each lane change manoeuvres shall be of a duration of not more than 5 seconds for vehicles of categories M₁ and N₁, and not more than 10 seconds for vehicles of categories M₂, M₃, N₂ and N₃.

Upon reaching standstill the vehicle shall be prevented from rolling away either automatically or by requiring an action by the driver.

The means by which the system monitors the energy storage level and its ability to perform the subsequent lane changes shall be assessed by the Technical Service as per Annex 6 to this Regulation. The vehicle manufacturer shall provide details of the operation of this monitoring means, and the input variables (including the sensitivity, to those variables, of the performance of the energy storage device). This information shall be part of the documentation required by Annex 6.

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- 5.4.2. Special provisions for full-power steering equipment
 - 5.4.2.1. Power-driven vehicles shall be capable of providing steering failure and defect warning signals, as follows:

Paragraph 5.4.2.1.1., amend to read:

- 5.4.2.1.1. A red warning signal, indicating failures defined in paragraph 5.3.1.3. within the main steering equipment, **if a single additional failure could result in a complete loss of steering function.** [The red warning signal may also be used for other types of failures.]

II. JUSTIFICATION:

The modifications suggested in this document intend to clarify the provisions for full power steering systems such as steer by wire systems.

The detailed justifications for the modified paragraphs above are:

- 5.3.1.1. Just for clarification what “equivalent characteristics” means the example of “(e.g. **similar strength and fatigue life attributes**)” is suggested to be added.
- 5.3.3.3. The reference to the energy storage level is already given in 5.3.3.5. The deletion is suggested to avoid confusion.
- 5.3.3.4. The current wording “*As long as the vehicle is capable of being driven at a speed greater than 10 km/h ...*” is somewhat unclear in its meaning, e.g. when the vehicle speed is automatically reduced and limited to a speed of 10 km/h maximum.

The proposed modification seeks clarifying this by linking the requirements to the intention as to whether the vehicle is expected to be operational at speeds greater than 10 km/h or not. If not, a threshold is added (4m/s² inspired from RMF in this regulation and MRM from Reg 157 on ALKS) with which the vehicle is allowed to be decelerated to a velocity below 10 km/h in case of a failure.

- 5.3.3.5. Reference added to the suggested new paragraph 5.3.3.6.
- 5.3.3.6. This new paragraph defines an alternative manoeuvre for a transition to a safe state in case of a failure of the energy source which is not included in detail in the current wording of paragraph 5.3.3.3.

Especially in battery electric vehicles which usually share the energy source with the propulsion the original test described in paragraph 5.3.3.3. seems inappropriate.

The requirements to the means by which the system monitors the energy storage level should be aligned on those currently being drafted by the experts of the Electric Braking Special Interest Group (EBSIG) for UN-Regulations 13 and 13-H.

- 5.4.2.1.1. Only those failures which would result in a complete loss of steering function should be required to be shown in red. For safer designs providing more redundancy a yellow warning as described in paragraph 5.4.2.1.2 is sufficient. Additional clarification is added, that the red warning signal may also be used to indicate other failures, e.g. those for which the consultation of a service facility is needed.