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PROPOSAL FOR DRAFT 02 SERIES OF AMENDMENTS TO REGULATION No. 79
(Steering Equipment)

Revision 1 - Addendum 1

Transmitted by the expert from Germany

Note: The text reproduced below was prepared by the experts of the ad hoc GRRF Informal Group "Electronic Steering" (EST) in order to add technical requirements of electronic steering systems to Regulation No. 79. It contains amendments and editorial modifications of the United Kingdom.

Compared with Revision 1, all relations to type approval on a national basis were crossed out. In order to address some concerns raised by Germany, the proposal only allows the approval of systems that incorporate an "Automatically Commanded Steering Function" at low speed manoeuvring or parking operations up to a maximum speed of 10 km/h.

Additionally, paragraph 5.5.1. (provisions for Periodical Technical Inspections) was amended to follow the current prescriptions of Regulation No. 13.

Note: This document is distributed to the Experts on Brakes and Running Gear only.

Paragraph 0., amend to read:

"0. INTRODUCTION

The intention of the Regulation is to establish uniform provisions for the layout and performance of steering systems fitted to vehicles used on the road. Traditionally, the major requirement has been that the main steering system *contains* a positive mechanical link between the steering control, normally the steering wheel, and the road wheels in order to determine the path of the vehicle. The mechanical link, if amply dimensioned, has been regarded as not being liable to failure.

Advancing technology, coupled with the wish to improve occupant safety by elimination of the mechanical steering column and the production advantages associated with easier transfer of the steering control between left and right hand drive vehicles, has led to a review of the traditional approach and the Regulation is now amended to take account of the new technologies. Accordingly it will now be possible to have steering systems in which there is not any positive mechanical connection between the steering control and the road wheels.

The technology will also allow steering to be influenced or controlled by sensors and signals generated either on or off-board the vehicle and this has led to concerns regarding *responsibility for the primary control of the vehicle and* the absence of any internationally agreed data transmission protocols with respect to off-board or external control of steering. The Regulation addresses these concerns *as follows*:

a) *it prohibits* the general approval of systems that incorporate functions by which the steering can be controlled by external signals, for example, transmitted from roadside beacons or active devices embedded into the road surface. Such systems, which may not even require the presence of a driver, have been defined as "Autonomous Steering Systems" and may be *implemented* only on a national basis.

~~—Where a nationally approved "Autonomous Steering System" consists of control systems that are added to an otherwise basic main steering system, the main steering system can be type approved in accordance with this Regulation provided that the effects of the additional systems are taken into account in so far as they interface with the main steering system and comply with the requirements for safety aspects of complex electronic vehicle control systems as outlined in this Regulation.~~

b) *it defines* systems *in which* the driver remains in primary control of the vehicle but may be helped by the steering system being influenced by signals initiated on-board the vehicle. These systems are defined as "Advanced Driver Assistance Steering Systems". *Such Systems* may incorporate an "Automatically Commanded Steering Function", for example, using passive infrastructure *devices* to assist the driver in keeping the vehicle on an ideal path (Lane Guidance, Lane Keeping or Heading Control), to assist the driver in

manoeuvring the vehicle at low speed in confined spaces or to assist the driver in coming to rest at a pre-defined point (Bus Stop Guidance). *Advanced Driver Assistance Steering Systems* may *also* incorporate a "Corrective Steering Function" that, for example, warns the driver of any deviation from *the chosen lane* (Lane Departure Warning), *corrects the steering angle to prevent departure from the chosen lane (Lane Departure Avoidance)* or corrects the steering angle of one or more wheels to improve the *vehicle's* dynamic behaviour or stability. ~~of the vehicle to assist in maintaining the desired line.~~

In the case of any Advanced Driver Assistance Steering System, the driver can, at all times, choose to override the assistance function by deliberate action, for example, to avoid an unforeseen object in the road.

In addition, positive steering of trailers using energy supply and electrical control from the towing vehicle is currently not able to be type approved to this Regulation at present as there are not any standards applicable to energy supply connectors or to control transmission digital information interchange. It is expected that at some time in the future, the International Standards Organization (ISO) Standard, ISO11992, will be amended to take account of transmission of steering control data."

Paragraph 1., amend to read:

"1. SCOPE

1.1. *This Regulation applies to the steering equipment of vehicles of categories M, N and O 1/*

1/ *As defined in annex 7 of the Consolidated Resolution on the Construction of Vehicles (R.E.3) (TRANS/ WP.29/78/Rev.1).*

1.2. *This Regulation does not apply to:*

1.2.1. *Steering equipment with a purely pneumatic transmission;*

1.2.2. *Autonomous Steering Systems as defined in paragraph 2.3.3;*

1.2.3. *Steering systems that incorporate an Automatically Commanded Steering Function as defined in paragraph 2.3.4.1 except low speed manoeuvring or parking up to a maximum speed of 10 km/h, where the driver controls the vehicle speed by deliberate actuation from the drivers seat;*

1.2.4. *Full power steering systems fitted to trailers where the energy necessary for operation is transmitted from the towing vehicle;*

1.2.5. *The electrical control of full power steering systems fitted to trailers, other than additional steering equipment as defined in paragraph 2.5.2.4.*

- ~~1.3. The Regulation does not cover autonomous steering systems. Until such time as harmonized provisions concerning data transmission protocols are incorporated into the Regulation, Contracting Parties may approve such systems for national use according to national or other international requirements or standards and by applying the requirements of paragraph 5.1. and the principles of annex 6 to this Regulation.~~
- ~~1.4. Automatically commanded steering systems may only be approved for use in traffic situations below a maximum speed of 50 km/h or for manoeuvring or parking operations.~~
- ~~1.5. Automatically commanded and corrective steering systems may only be approved where the driver retains overall control of the vehicle and is required to remain alert to, or aware of, its direction and path.~~
- ~~1.6 1.4. Full power steering systems fitted to trailers in which the energy is transmitted from the towing vehicle are not covered by this Regulation until standards for the energy media connectors have been agreed.~~
- ~~1.7 1.5. Electric control of full power steering systems fitted to trailers, other than additional steering systems, is not covered by this Regulation until ISO 11992 has been amended to include requirements for steering control functions(s). (see paragraph 5.2.3.1.)"~~

Paragraphs 2.3.4.1. and 2.3.4.2., amend to read:

"2.3.4.1. "Automatically commanded steering function" means the function within a complex electronic control system where actuation of the steering system may result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure devices, to generate continuous control action in order to assist the driver in following a particular path, or in low speed manoeuvring or parking operations.

2.3.4.2. "Corrective steering function" means the discontinuous control function within a complex electronic control system whereby, for a limited duration, changes to the steering angle of one or more wheels may result from the automatic evaluation of signals initiated on-board the vehicle, in order to maintain the basic desired path of the vehicle or to influence the vehicle's dynamic behaviour.

Systems that do not themselves positively actuate the steering system but that, possibly in conjunction with passive infrastructure devices, simply warn the driver of a deviation from the ideal path of the vehicle, or of an unseen hazard, by means of a tactile warning transmitted through the steering control, are also considered to be corrective steering."

Paragraph 2.3.6., the reference to "paragraph 5.3.2.1." should read to "paragraph 5.3.2.1."

Paragraph 5.1., should be deleted.

Paragraphs 5.2 to 5.2.2. (former), renumber as paragraphs 5.1. to 5.1.2.

Paragraph 5.2.3. (former), renumber as paragraph 5.1.3., and amend to read:

"5.1.3. The direction of operation of the steering control shall correspond to the intended change of direction of the vehicle and there shall be a continuous relationship between the steering control deflection and the steering angle. These requirements do not apply to systems that incorporate an automatically commanded or corrective steering function, or to auxiliary steering equipment.

These requirements may also not *necessarily* apply in the case of full power steering when the vehicle is stationary and when the system is not energised."

Paragraphs 5.2.4. and 5.2.5. (former), renumber as paragraphs 5.1.4. and 5.1.5.

Paragraph 5.2.6. (former), renumber as paragraph 5.1.6., and amend to read:

"5.1.6. *Advanced driver assistance steering systems shall only be approved in accordance with this Regulation where the function does not cause any deterioration in the performance of the basic steering system. In addition they shall be designed such that the driver may, at any time and by deliberate action, override the function.*"

Paragraphs 5.2.7. to 5.2.8. (former), renumber as paragraphs 5.1.7. to 5.1.8.

Paragraph 5.2.9. (former), renumber as paragraph 5.1.9., and amend the reference to "paragraph 5.4." to read "paragraph 5.3."

Paragraph 5.2.10. (former), renumber as paragraph 5.1.10., and amend to read:

"5.1.10. Control systems

The requirements of annex 6 shall be applied to the safety aspects of electronic vehicle control systems that provide or form part of the control transmission of the steering function including ~~automatically commanded steering or corrective steering functions~~ *advanced driver assistance steering systems*. However, systems or functions, that use the steering system as the means of achieving a higher-level objective, are subject to annex 6 only insofar as they have a direct effect on the steering system. If such systems are provided, they shall not be deactivated during type approval testing of the steering system."

Paragraphs 5.3. to 5.4.1.1. (former), renumber as paragraphs 5.2. to 5.3.1.1.

Paragraph 5.4.1.2. (former), renumber as paragraph 5.3.1.2., and amend the references to "paragraphs 5.2.2. and 5.2.3." (twice) to read "paragraphs 5.1.2. and 5.1.3." (twice).

Paragraph 5.4.1.3. (former), renumber as paragraph 5.3.1.3., and amend the references to "paragraphs 5.5. and, 6.2.5.2." to read "paragraphs 5.4. and 6.2.6."

Paragraph 5.4.1.4. (former), renumber as paragraph 5.3.1.4., and amend the references to "paragraphs 5.4.2. and 5.4.3." to read "paragraphs 5.3.2. and 5.3.3."

Paragraph 5.4.1.5. (former), renumber as paragraph 5.3.1.5., and amend the references to "paragraphs 5.4.2. and 5.4.3." to read "paragraphs 5.3.2. and 5.3.3."

Paragraph 5.4.1.6. (former), renumber as paragraph 5.3.1.6., and amend the reference to "paragraph 5.3.2." to read "paragraph 5.2.2."

Paragraph 5.4.2. (former), renumber as paragraph 5.3.2.

Paragraph 5.4.2.1. (former), renumber as paragraph 5.3.2.1., and amend the reference to "paragraph 5.4.1.1." to read "paragraph 5.3.1.1."

Paragraph 5.4.3. (former), renumber as paragraph 5.3.3.

Paragraph 5.4.3.1. (former), renumber as paragraph 5.3.3.1., and amend the reference to "paragraph 5.5.2.1.1." to read "paragraph 5.4.2.1.1."

Paragraph 5.4.3.2. (former), renumber as paragraph 5.3.3.2., and amend the reference to "paragraph 5.2.4." to read "paragraph 5.1.4."

Paragraph 5.4.3.3. (former), renumber as paragraph 5.3.3.3., and amend the reference to "paragraph 5.4.3.5." to read "paragraph 5.3.3.5."

Paragraph 5.4.3.4. (former), renumber as paragraph 5.3.3.4., and amend the references to "paragraphs 5.4.1.1. and 5.4.3.5." to read "paragraphs 5.3.1.1. and 5.3.3.5."

Paragraph 5.4.3.5. (former), renumber as paragraph 5.3.3.5., and amend the reference to "paragraphs 5.4.3.3. and 5.4.3.4." to read "paragraphs 5.3.3.3. and 5.3.3.4."

Paragraphs 5.5. and 5.5.1. (former), renumber as paragraphs 5.4. and 5.4.1.

Paragraph 5.5.1.1. (former), renumber as paragraph 5.4.1.1., and amend the reference to "paragraph 5.2.2." to read "paragraph 5.1.2."

Paragraphs 5.5.1.2. to 5.5.2.1. (former), renumber as paragraphs 5.4.1.2. to 5.4.2.1.

Paragraph 5.5.2.1.1. (former), renumber as paragraph 5.4.2.1.1., and amend the reference to "paragraph 5.4.1.3." to read "paragraph 5.3.1.3."

Paragraph 5.5.2.1.2. (former), renumber as paragraph 5.4.2.1.2.

Paragraph 5.5.2.1.3. (former), renumber as paragraph 5.4.2.1.3., and delete the words "the relevant".

Paragraphs 5.5.2.1.4 to 5.6. (former), renumber as paragraphs 5.4.2.1.4. to 5.5.

Paragraph 5.6.1. (former), renumber as paragraph 5.5.1., and amend to read:

"5.5.1. ~~As far as is practicable~~ **It shall be possible to assess the wear condition of the steering equipment that are subject to wear.** It shall be so designed that **from the outside or underside of the vehicle** without disassembly **this wear** can be checked with, if necessary, commonly used measuring instruments, methods or test devices. **For instance also by the provision of appropriate inspection holes or by some other means.**"

Paragraphs 5.6.2. and 5.6.2.1. (former), renumber as paragraphs 5.5.2. and 5.5.2.1.

Annex 4,

Paragraphs 2.1.1., 2.2.1. and 2.3.1., amend the reference to "paragraph 5.4.1.1." to read "paragraph 5.3.1.1."
