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Collective amendments – Regulations Nos. 48 and 123

Proposal for Supplement 7 to the 04 series of amendments to Regulation No. 48 (Installation of lighting and light-signalling devices)

Submitted by the experts from the Working Party “Brussels 1952”*

The text reproduced below was prepared by the expert from the Working Party “Brussels 1952” (GTB) in order to introduce provisions for the automatic adaptation of the main beam. The modifications to the existing text of the Regulation, including Supplement 6 to the 04 series of amendments, are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2006–2010 (ECE/TRANS/166/Add.1, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

Paragraph 2.7.28.6., amend to read:

“2.7.28.6. “Neutral state” means the state of the AFS when a defined mode of the class C passing beam (“basic passing beam”) or of the main beam **in the maximum position of activation**, if any, is produced, and no AFS control signal applies.”

Insert a new paragraph 2.7.28.7., to read:

“2.7.28.7. “**Adaptive main-beam**” means a main-beam of the AFS that adapts its beam pattern to the presence of oncoming and preceding vehicles in order to improve the long-range visibility for the driver without causing discomfort, distraction or glare to other road users.”

Paragraph 6.22.7.1., amend to read:

“6.22.7.1. Main-beam lighting (if provided by the AFS)

6.22.7.1.1. The lighting units for the main-beam may be activated either simultaneously or in pairs. For changing over from the dipped-beam to the main-beam at least one pair of lighting units for the main-beam shall be activated. For changing over from the main-beam to the dipped-beam all lighting units for the main-beam shall be de-activated simultaneously.

6.22.7.1.2. **The main-beam may be designed to be adaptive, subject to the provisions in paragraph 6.22.9.3., the control signals being produced by a sensor system which is capable of detecting and reacting to each of the following inputs:**

- (a) **ambient lighting conditions ;**
- (b) **the light emitted by the front lighting devices and front light-signalling devices of oncoming vehicles;**
- (c) **the light reflected from front retro-reflecting device of oncoming vehicles;**
- (d) **the light emitted by the rear light-signalling of preceding vehicles;**
- (e) **the light reflected from rear retro-reflecting devices of preceding vehicles.**

Additional sensor functions to improve performance are allowed.

For the purpose of this paragraph, “vehicles” means vehicles of categories L, M, N, O, T, as well as bicycles, such vehicles being equipped with retro-reflectors, with lighting and light-signalling devices, which are switched ON.

6.22.7.1.3. **It shall always be possible to switch the main-beam headlamps, adaptive or non adaptive, ON and OFF manually and to manually switch off the automatic control.**

6.22.7.1.4. The dipped-beams may remain switched ON at the same time as the main beams.

6.22.7.1.5. Where four concealable lighting units are fitted their raised position must prevent the simultaneous operation of any additional headlamps fitted, if

these are intended to provide light signals consisting of intermittent illumination at short intervals (see paragraph 5.12.) in daylight.”

Paragraph 6.22.7.4., amend to read:

“6.22.7.4. Automatic operation of the AFS

The changes within and between the provided classes and their modes of the AFS lighting functions as specified below, shall be performed automatically **without causing discomfort, distraction or glare**, neither for the driver nor for other road users.

The following conditions apply for the activation of the classes and their modes of the passing beam and, where applicable, of the main-beam **and/or the adaptation of the main-beam.**”

Insert a new paragraph 6.22.8.3., to read:

“6.22.8.3. **If the main-beam is adaptive, a visual tell-tale shall be provided to indicate to the driver that the adaptation of the main beam is activated. This information shall remain displayed as long as the adaptation is activated.**”

Paragraph 6.22.8.3. (*former*), renumber as paragraph 6.22.8.4.

Paragraph 6.22.9.2.2., amend to read:

“6.22.9.2.2. To verify, whether, according to the paragraph 6.22.7.4., the AFS automatic operation **of the passing beam functions** does not cause any discomfort, the technical service shall perform a test drive which comprises any situation relevant to the system control on the basis of the applicants description; it shall be notified whether all modes are activated, performing and de-activated according to the applicant's description; obvious malfunctioning, if any, **shall** be contested (e.g. excessive angular movement or flicker). ”

Insert new paragraphs 6.22.9.2.3. and 6.22.9.2.4., to read:

“6.22.9.2.3. **The overall performance of the automatic control shall be demonstrated by the applicant by documentation or by other means accepted by the authority responsible for type approval. Furthermore the manufacturer shall provide a documentation package which gives access to the design of “the safety concept” of the system. This “safety concept” is a description of the measures designed into the system, for example within the electronic units, so as to address system integrity and thereby ensure safe operation even in the event of mechanical or electrical failure which could cause any discomfort, distraction or glare, either to the driver or to oncoming and preceding vehicles. This description shall also give a simple explanation of all the control functions of the “system” and the methods employed to achieve the objectives, including a statement of the mechanism(s) by which control is exercised.**

A list of all input and sensed variables shall be provided and the working range of these shall be defined. The possibility of a fall-back to the basic passing beam (class C) function shall be a part of the safety concept.

The functions of the system and the safety concept, as laid down by the manufacturer, shall be explained. The documentation shall be brief, yet provide evidence that the design and development has had the benefit of expertise from all the system fields which are involved.

For periodic technical inspections, the documentation shall describe how the current operational status of the “system” can be checked.

For Type Approval purposes this documentation shall be taken as the basic reference for the verification process.

- 6.22.9.2.4. To verify, that the adaptation of the main-beam does not cause any discomfort, distraction or glare, neither to the driver nor to oncoming and preceding vehicles, the technical service shall perform a test drive according to paragraph 2 in Annex 13. This shall include any situation relevant to the system control on the basis of the applicant’s description. The performance of the adaptation of the main-beam shall be documented and checked against the applicant’s description. Any obvious malfunctioning shall be contested (e.g. excessive angular movement or flicker).

Insert new paragraphs 6.22.9.3. to 6.22.9.3.1.3., to read:

“6.22.9.3. Adaptation of the main-beam

- 6.22.9.3.1. The sensor system used to control the adaptation of the main-beam, as described in paragraph 6.22.7.1.2., shall comply with the following requirements:

6.22.9.3.1.1. The boundaries of the minimum fields in which the sensor is able to detect light emitted or retro-reflected from other vehicles as defined in paragraph 6.22.7.1.2. are given by the angles indicated in paragraph 6.1.9.3.1.1. to this Regulation.

6.22.9.3.1.2. The sensor system sensitivity shall comply with the requirements in Paragraph 6.1.9.3.1.2. to this Regulation.

6.22.9.3.1.3. The adaptive main-beam shall be switched off when the illuminance produced by ambient lighting conditions exceeds 7000 lx.

Compliance with this requirement shall be demonstrated by the applicant, using simulation or other means of verification accepted by the authority responsible for type approval. If necessary the illuminance shall be measured on a horizontal surface, with a cosine corrected sensor on the same height as the mounting position of the sensor on the vehicle. This may be demonstrated by the manufacturer by sufficient documentation or by other means accepted by the authority responsible for type approval.”

Paragraphs 6.22.9.3. and 6.22.9.4.(former), renumber as paragraphs 6.22.9.4. and 6.22.9.5.

Insert a new Annex 12, to read:

“Annex 12

Test Drive

2. Test drive specifications for adaptive main-beam headlamps

- 2.1. The test drive shall be carried out in clear atmosphere ² and with clean head-lamps.
- 2.2. The test course shall comprise test sections with traffic conditions, at speed corresponding to the relevant type of road, as described in table 2 below:

Table 2

Test Section	Traffic conditions	Road type		
		Urban areas	Multi lane road, e.g. Motorway	Country road
	Speed	50 ± 10km/h	100 ± 20km/h	80 ± 20km/h
	Average percentage of the full test course length	10 per cent	20 per cent	70 per cent
A	Single oncoming vehicle or single preceding vehicle in a frequency so that the adaptive main beam will react to demonstrate the adaptation process.		X	X
B	Combined oncoming and preceding traffic situations. in a frequency so that the adaptive main beam will react to demonstrate the adaptation process.		X	X
C	Active and passive overtaking manoeuvres, in a frequency so that the adaptive main beam will react to demonstrate the adaptation process.		X	X
D	Oncoming bicycle, as described in paragraph 6.22.9.3.1.2.			X
E	Combined oncoming and preceding traffic situations	X		

- 2.3. Urban areas shall comprise roads with and without illumination.
- 2.4. Country roads shall comprise sections having two lanes and sections having four or more lanes and shall include junctions, hills and/or slopes, dips and winding roads.

² Good visibility (meteorological optical range MOR > 2,000 m defined according to WMO, Guide to Meteorological Instruments and Methods of Observation, Sixth Edition, ISBN: 92-63-16008-2, pp 1. 9. 1/ 1. 9. 11, Geneva 1996)

- 2.5. **Multi lane roads (e.g. motorways) and country roads shall comprise sections having straight level parts with a length of more than 600m. Additionally they shall comprise of sections having curves to the left and to the right.**
- 2.6. **Dense traffic situations shall be taken into account**
- 2.7. **For the test sections A and B in the table above the engineers conducting the tests shall evaluate and record the acceptability of the performance of the adaptation process in relation to oncoming and preceding road users. This means that the test engineers shall be seated in the vehicle being tested and additionally be seated in the oncoming and preceding vehicles.”**

II. Justification

- 1. Systems capable of automatically adapting the main beam using sensors to detect the presence of other vehicles have been developed to assist the driver. These proposed amendments have been developed to introduce objective requirements that are not dedicated to specific technologies and can be applied to the type approval process of Regulation No. 48.
 - 2. A detailed review of the work undertaken by GTB in collaboration with Working Party on Lighting and Light-Signalling (GRE) experts to develop suitable provisions for these new systems is available as Informal document GRE-64-01.
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