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### Inland Transport Committee

### World Forum for Harmonization of Vehicle Regulations

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Item 4.7.5 of the provisional agenda

#### **1958 Agreement – Consideration of draft amendments to existing Regulations submitted by GRE**

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

#### **Submitted by the Working Party on Lighting and Light-Signalling (GRE)\***

The text reproduced below was adopted by the Working Party on Lighting and Light-Signalling (GRE) at its sixty-fourth session. It is based on ECE/TRANS/WP.29/GRE/2010/37 as amended by Annex III to the report, on ECE/TRANS/WP.29/GRE/2010/52, not amended, and on ECE/TRANS/WP.29/GRE/2010/40 and ECE/TRANS/WP.29/GRE/2010/41, both amended by Annex IV to the report. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee (AC.1) for consideration (ECE/TRANS/WP.29/GRE/64, paras. 10 and 19).

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\* 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.

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 condition 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."

Insert a new paragraph 6.1.7.1. to 6.1.7.2., to read:

"6.1.7.1. The control of the main-beam headlamps may be automatic regarding their activation and deactivation, 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 emitted by the rear light-signalling 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.

6.1.7.2. It shall always be possible to switch the main-beam headlamps ON and OFF manually and to manually switch off the automatic control of the main beam head lamps."

Paragraphs 6.1.7.1. to 6.1.7.4. (former), renumbered as paragraphs 6.1.7.3. to 6.1.7.6.

Insert new paragraph 6.1.8.1., to read:

"6.1.8.1. If the control of the main-beam headlamps is automatic as described in paragraph 6.1.7.1. above an indication shall be provided to the driver that the automatic control of the main-beam function is activated. This information shall remain displayed as long as the automatic operation is activated."

Insert new paragraphs 6.1.9.3. to 6.1.9.3.5., to read:

"6.1.9.3. Automatic activation and deactivation of the main-beam headlamps:

6.1.9.3.1. The sensor system used to control the automatic activation and deactivation of the main-beam headlamps, as described in paragraph 6.1.7.1., shall comply with the following requirements:

6.1.9.3.1.1. The boundaries of the minimum fields in which the sensor is able to detect light emitted or retro reflected from other vehicles defined in paragraph 6.1.7.1. are defined by the angles indicated below.

6.1.9.3.1.1.1. Horizontal angles: 15° to the left and 15° to the right.

Vertical angles:

Upward angle	5°		
Mounting height of the sensor (centre of sensor aperture above the ground)	Less than 2 m	Between 1.5 m and 2.5 m	Greater than 2.0 m
Downward angle	2°	2° to 5°	5°

These angles are measured from the centre of the sensor aperture relative to a horizontal straight line through its centre and parallel to the longitudinal median plane of the vehicle.

6.1.9.3.1.2. The sensor system shall be able to detect on a straight level road:

- (a) an oncoming power driven vehicle at a distance extending to at least 400 m;
- (b) a preceding power driven vehicle or a vehicle-trailers combination at a distance extending to at least 100 m;
- (c) an oncoming bicycle at a distance extending to at least 75 m, its illumination represented by a white lamp with a luminous intensity of 150 cd with a light emitting area of 10cm<sup>2</sup> +/- 3cm<sup>2</sup> and a height above a ground of 0.8 m.

6.1.9.3.2. The transition from main-beam to dipped-beam and vice versa according to the conditions indicated in paragraph 6.1.7.1. above may be performed automatically and shall not cause discomfort, distraction or glare.

6.1.9.3.3. The overall performance of the automatic control shall be verified by:

6.1.9.3.3.1. means of simulation or other means of verification accepted by the authority responsible for type approval testing, as provided by the applicant.

6.1.9.3.3.2. a test drive according to paragraph 1 in Annex 13. The performance of the automatic control shall be documented and checked against the applicant's description. Any obvious malfunctioning shall be contested (e. g. excessive angular movement or flicker).

6.1.9.3.4. The control of the main-beam headlamps may be such that the main-beam headlamps are switched ON automatically only when:

- (a) no vehicles, as mentioned in paragraph 6.1.7.1. above, are detected within the fields and distances according to paragraphs 6.1.9.3.1.1. and 6.1.9.3.1.2.;
- and
- (b) the detected ambient lighting levels are as prescribed in paragraph 6.1.9.3.5. below.

6.1.9.3.5. In the case where main-beam headlamps are switched ON automatically, they shall be switched OFF automatically when oncoming or preceding vehicles, as mentioned in paragraph 6.1.7.1. above, are detected within the fields and distances according to paragraphs 6.1.9.3.1.1. and 6.1.9.3.1.2.

Moreover, they shall be switched OFF automatically when the illuminance produced by ambient lighting conditions exceeds 7000 lx.

Compliance with 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."

Paragraph 6.2.9., amend to read:

"6.2.9. *Other requirements*

...

In the case of filament lamps for which more than one test voltage is specified, the objective luminous flux which produces the principal dipped beam, as indicated in the communication form for the type approval of the device, is applied.

Only dipped-beam headlamps according to Regulations Nos. 98 or 112 may be used to produce bend lighting.

..."

Paragraph 6.3.6. to 6.3.6.2.5., amend to read:

"6.3.6. *Orientation*

toward the front.

6.3.6.1. Vertical orientation.

6.3.6.1.1. In the case of class "B" front fog lamps the vertical inclination of the cut-off to be set in the unladen vehicle state with one person in the driver's seat shall be -1.5 per cent or lower.<sup>15</sup>

6.3.6.1.2. In the case of class "F3" front fog lamps:

6.3.6.1.2.1. When the total objective luminous flux of the light source does not exceed 2,000 lumens:

6.3.6.1.2.1.1. The vertical inclination of the cut-off to be set in the unladen vehicle state with one person in the driver's seat shall be - 1.0 per cent or lower

6.3.6.1.2.2. When the total objective luminous flux of the light source exceeds 2,000 lumens:

6.3.6.1.2.2.1. Depending on the mounting height in metres (h) of the lower edge of the apparent surface in the direction of the reference axis of the front fog lamp, measured on the unladen vehicles, the vertical inclination of the cut-off shall under all the static conditions of Annex 5 automatically remain between the following values:

$h \leq 0.8$

Limits: between -1.0 per cent and - 3.0 per cent

Initial aiming: between -1.5 per cent and -2.0 per cent

$h > 0.8$

Limits: between -1.5 per cent and - 3.5 per cent

Initial aiming: between -2.0 per cent and -2.5 per cent

- 6.3.6.1.2.2.2. The initial downward inclination of the cut-off to be set in the unladen vehicle state with one person in the driver's seat shall be specified within an accuracy of one decimal place by the manufacturer and indicated in a clearly legible and indelible manner on each vehicle close to either the front fog lamp or the manufacturer's plate or in combination with the indication referred to in paragraph 6.2.6.1.1. by the symbol shown in Annex 7 to this Regulation. The value of this indicated downward inclination shall be defined in accordance with paragraph 6.3.6.1.2.2.1.
- 6.3.6.2. Front fog lamp levelling device.
- 6.3.6.2.1. Where a levelling device is fitted for a front fog lamp, independent or grouped with other front lighting and light signalling functions, it shall be such that the vertical inclination, under all the static loading conditions of Annex 5 of this Regulation, shall remain between the limits prescribed in paragraph 6.3.6.1.2.1.
- 6.3.6.2.2. In the case where the front fog lamp of category "F3" is part of the dipped beam headlamp or is part of an AFS system, the requirements of paragraph 6.2.6. shall be applied during the use of the front fog beam as part of the dipped beam.
- In this case the levelling limits defined in paragraph 6.2.6. may be applied also when this front fog lamp is used as such.
- 6.3.6.2.3. The levelling device may also be used to automatically adapt the inclination of the front fog beam in relation to the prevailing ambient conditions, provided that the limits for the downward inclination specified in paragraph 6.3.6.1.2.1. are not exceeded.
- 6.3.6.2.4. In the case of a failure of the levelling device, the front fog beam shall not assume a position in which the cut off is less inclined than it was at the time when the failure of the device occurred."

*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 emitted by the rear light-signalling 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), renumbered 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****Test drive specifications for the automatic control of the main-beam headlamps**

- 1.1. The test drive shall be carried out in clear atmosphere <sup>1</sup> and with clean headlamps
- 1.2. The test course shall comprise test sections with traffic conditions, at speed corresponding to the relevant type of road, as described in table 1 below:

Table 1

<i>Test Section</i>	<i>Traffic conditions</i>	<i>Road type</i>		
		<i>Urban areas</i>	<i>Multi lane road, e.g. Motorway</i>	<i>Country road</i>
	Speed	50 ± 10 km/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 main beam will switch ON and OFF.		X	X
B	Combined oncoming and preceding traffic situations, in a frequency so that the main beam will switch ON and OFF.		X	X
C	Active and passive overtaking manoeuvres, in a frequency so that the main beam will switch ON and OFF.		X	X
D	Oncoming bicycle, as described in paragraph 6.1.9.3.1.2.			X
E	Combined oncoming and preceding traffic situations	X		

- 1.3. Urban areas shall comprise roads with and without illumination.
- 1.4. 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.

<sup>1</sup> 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).



- 1.5. Multi-lane roads (e.g. motorways) and country roads shall comprise sections having straight level parts with a length of more than 600 m. Additionally they shall comprise sections having curves to the left and to the right.
- 1.6. Dense traffic situations shall be taken into account."
2. Test drive specifications for adaptive main-beam headlamps
- 2.1. The test drive shall be carried out in clear atmosphere <sup>2</sup> and with clean headlamps.
- 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.

<sup>2</sup> 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)

- 2.4. 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.
  - 2.5. 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."
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