Comparison of ADB provisions between current R48 and R53 proposal

<table>
<thead>
<tr>
<th>UN Regulation No. 48</th>
<th>Proposed amendments to UN Regulation No. 53 (GRE-82-13)</th>
</tr>
</thead>
</table>

2.7.28. “Adaptive front lighting system” (or "AFS") means a lighting device type-approved according to Regulation No. 123, providing beams with differing characteristics for automatic adaptation to varying conditions of use of the dipped-beam (passing beam) and, if it applies, the main-beam (driving beam).

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.

3.2.6.6. The lamps that are grouped or combined with or reciprocally incorporated in the AFS;

6.1.8.1. If the control of the main-beam headlamps is automatic as described in paragraph 6.1.7.1., shall comply with the following requirements:

6.1.8.2. The control of the driving-beam headlamp(s) may be automatic according to the 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 preceding vehicles;
(c) The light emitted by the rear light-signalling devices of preceding vehicles. Additional sensor functions to improve performance are allowed.

7.2.5. Where an ADB is fitted, it shall be considered equivalent to a pair of main-beam headlamps and, if it provides main-beam function(s), it shall be considered equivalent to a pair of main-beam headlamps.

8.2.10. Adaptive Driving Beam (or "ADB") means one of the systems of AFS type-approved according to UN Regulation No. 149, which is a driving-beam system 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.

8.2.20. ADB neutral state means the state of the ADB when the driving-beam is in the maximum condition of activation.

8.2.20.2. ADB control signal means the input signal to the ADB in accordance with the paragraph 6.17.7.2. of this Regulation.

8.2.20.3. The lamps that are grouped or combined with or reciprocally incorporated in the ADB.
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 Type Approval Authority, as provided by the applicant.

6.1.9.3.3.2. A test drive according to paragraph 1 in Annex 12. 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 this requirement shall be demonstrated by the applicant, using simulation or other means of verification accepted by the Type Approval Authority. 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 Type Approval Authority.

6.2.2. Adaptive front lighting system (AFS) (Regulation No. 123)

6.15. Adaptive Driving Beam (ADB) (UN Regulation No. [149])

Where not otherwise specified below, the requirements for main-beam headlamps (paragraph 6.1.) and for dipped-beam headlamps (paragraph 6.2.) of this Regulation apply to the relevant part of the AFS.

6.22.1. Presence

Optional on motor vehicles. Prohibited on trailers.

6.22.2. Number

6.15.1. Number

6.15.1.1. One.

6.15.1.2. Number of lighting unit shall be one or two.

6.22.3. Arrangement

6.15.2. Arrangement

No special requirements.

6.22.4. Position

6.15.3. Position

The AFS shall, prior to the subsequent test procedures, be set to the neutral state:

The ADB shall, prior to the subsequent test procedures, be set to the neutral state:

6.22.4.1. In width and height:

6.15.3.1. In width and height:

For a given lighting function or mode the requirements indicated in the paragraphs 6.22.4.1.1. through 6.22.4.1.4. below shall be fulfilled by those lighting units which are energized simultaneously for that lighting function or mode of a function, according to the applicant’s description. All dimensions refer to the nearest edge of the apparent surface(s) observed in the direction of the reference axis, of the lighting unit(s).

6.15.3.1.1. An independent ADB lighting unit may be fitted above or below or to one side of another front lamp: if these lamps are on top of the other the reference centre of the ADB lighting unit must be located within the medium longitudinal plane of the vehicle; if these lamps are side by side their reference centre must be symmetrical in relation to the median longitudinal plane of the vehicle.

6.15.3.1.2. An ADB lighting unit, that is reciprocity incorporated with another front lamp, must be fitted in such a way that its reference centre lies within the median longitudinal plane of the vehicle. However, when the vehicle is also fitted with an independent principal passing-beam headlamp, or a principal passing-beam headlamp that is reciprocity incorporated with a front position lamp alongside the ADB lighting unit, their reference centres must be symmetrical in relation to the median longitudinal plane of the vehicle.

6.15.3.1.3. Two ADB lighting units of which either one or both are reciprocity incorporated with another front lamp must be fitted in such a way that their reference centres are symmetrical in relation to the median longitudinal plane of the vehicle.

6.22.4.2. In length:

6.15.3.2. In length:

All lighting units of an AFS shall be mounted at the front. This requirement is deemed to be satisfied if the light emitted does not cause discomfort to the driver either directly or indirectly through the devices for indirect vision and/or other reflecting surfaces of the vehicle.

All lighting units of an ADB shall be mounted at the front. This requirement is regarded as satisfied if the light emitted does not cause discomfort to the driver either directly or indirectly by means of the rear-view mirrors and/or reflective surfaces on the vehicle.

6.22.5. Geometric visibility

6.15.4. Geometric visibility

On each side of the vehicle, for each lighting function and mode provided: the angles of geometric visibility prescribed for the respective lighting functions according to paragraphs 6.1.5. and 6.2.5. of this Regulation, shall be met by at least one of the lighting units that are simultaneously energized to perform said function and mode(s), according to the description of the applicant. Individual lighting units may be used to comply with the requirements for different angles.

The angles of geometric visibility specified in paragraph 6.1.4. of this Regulation, shall be met by at least one of the lighting units said function, according to the description of the applicant. Individual lighting units may be used to comply with the requirements for different angles.

6.22.6. Orientation

6.15.5. Orientation

Towards the front. The AFS shall, prior to the subsequent test procedures, be set to the neutral state, emitting the basic passing-beam.

Towards the front.

6.22.7. Electrical connections

6.15.6. Electrical connections

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 to 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.

6.15.6.1. For changing over from the ADB to the passing beam all lighting units for the driving-beam shall be de-activated simultaneously.
6.22.8.2. The main-beam may be designed to be adaptive, subject to the provisions in paragraph 6.22.8.3. The control should be 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;
(d) 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.

6.22.8.3. If the main-beam is adaptive, a visual tell-tale shall be provided to indicate to the driver that the adaptation of the driving beam is active.

6.22.9. Other requirements

6.15.8.3. The aggregate maximum intensity of the lighting units that can be energized simultaneously to provide the main-beam lighting or its modes, if any, shall not exceed 430,000 cd, which corresponds to a reference value of 100.

6.15.8.4. The aggregate maximum intensity of the lighting units that can be energized simultaneously to provide the main-beam lighting or its modes, if any, shall not exceed 430,000 cd, which corresponds to a reference value of 100.

6.15.8.5. The aggregate maximum intensity of the lighting units that can be energized simultaneously to provide the main-beam lighting or its modes, if any, shall not exceed 430,000 cd, which corresponds to a reference value of 100.
1. Test drive specifications for the automatic control of the driving-beam headlamp(s).

1.1. The test drive shall be carried out in clear atmosphere and with clean headlamp(s).

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>
<thead>
<tr>
<th>Test Section</th>
<th>Traffic conditions</th>
<th>Urban areas</th>
<th>Multilane roads, e.g., motorways</th>
<th>Country roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>Average percentage of the full test course length</td>
<td>60% per cent</td>
<td>50% per cent</td>
<td>50% per cent</td>
</tr>
<tr>
<td>A</td>
<td>Single following vehicle or single preceding vehicle in a frequency so that the driving beam will switch OFF and ON.</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>B</td>
<td>Combined following and preceding traffic situations, in a frequency so that the driving beam will switch OFF and ON.</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>C</td>
<td>Single following vehicle or single preceding vehicle in a frequency so that the driving beam will switch OFF and ON.</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>D</td>
<td>Combined following and preceding traffic situations, as described in paragraph 1A(1)).</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>E</td>
<td>Combined following and preceding traffic situations, as described in paragraph 1A(1)).</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

2. Test drive specifications for adaptive driving-beam headlamp(s).

2.1. The test drive shall be carried out in clear atmosphere and with clean headlamp(s).

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>
<thead>
<tr>
<th>Test Section</th>
<th>Traffic conditions</th>
<th>Urban areas</th>
<th>Multilane roads, e.g., motorways</th>
<th>Country roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>Average percentage of the full test course length</td>
<td>60% per cent</td>
<td>50% per cent</td>
<td>50% per cent</td>
</tr>
<tr>
<td>A</td>
<td>Single following vehicle or single preceding vehicle in a frequency so that the adaptive driving beam will switch OFF or ON, or demonstrate the adaptation process.</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>B</td>
<td>Combined following and preceding traffic situations, in a frequency so that the adaptive driving beam will switch OFF or ON, or demonstrate the adaptation process.</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>C</td>
<td>Single following vehicle or single preceding vehicle in a frequency so that the adaptive driving beam will switch OFF or ON, or demonstrate the adaptation process.</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>D</td>
<td>Combined following and preceding traffic situations, as described in paragraph 2A(1)).</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>E</td>
<td>Combined following and preceding traffic situations, as described in paragraph 2A(1)).</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

3. Urban areas shall comprise roads with and without illumination.

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.

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.

6. Dense traffic situations shall be taken into account.

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.

8. For the tests on sections C and D 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 operate the vehicle being tested and additionally operate the oncoming and preceding vehicles. This may be demonstrated by the manufacturer using other means accepted by the Type Approval Authority.