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**REGULATION No. 46
(Devices for indirect vision)**

Proposal for draft amendments to Regulation No. 46

Submitted by the expert from the European Commission (EC) */

The text reproduced below was prepared by the expert from European Commission in order to introduce corrections to the coordinates of the ocular points when the driver's seat has a fixed seat-back angle different from 25° or when the same seat-back angle cannot be set at 25°. It is based on informal document No. GRSG-94-28 distributed during the ninety-fourth session of the Working Party on General Safety Provisions (GRSG) (ECE/TRANS/WP.29/GRSG/73, para. 26). The modifications to the current text of the Regulation are marked in bold 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 performance of vehicles. The present document is submitted in conformity with that mandate.

A. PROPOSAL

Paragraph 12.1., amend to read:

"12.1. "The driver's ocular points" means as defined in Annex 8. In cases where ~~of a seat with~~ **the driver's seat cannot be adjusted for a design torso line of 25° or has a fixed seat-back angle for which the design torso line differs from 25°**, the location of the ocular points **in relation to the 'R' point** shall be adjusted in accordance with the provisions of Annex 11 to this Regulation. The straight line

Insert a new Annex 11, to read:

"Annex 11

CORRECTIONS TO THE POSITION OF THE OCULAR POINTS
(See paragraph 12.1.)

The table below indicates the corrections to be made to the coordinates of the ocular points when the seat-back angle does not allow the design torso line to be set at 25°.

Seat-back angle (in degrees)	Vertical coordinates ΔZ (in mm)	Seat-back angle (in degrees)	Vertical coordinates ΔZ (in mm)
5°	40.6	23°	6.4
6°	39.9	24°	3.3
7°	39.0	25°	0.0
8°	38.0	26°	-3.4
9°	36.8	27°	-6.9
10°	35.5	28°	-10.6
11°	34.1	29°	-14.3
12°	32.5	30°	-18.2
13°	30.8	31°	-22.2
14°	28.9	32°	-26.3
15°	27.0	33°	-30.6
16°	24.8	34°	-34.9
17°	22.6	35°	-39.4
18°	20.2	36°	-44.0
19°	17.7	37°	-48.7
20°	15.1	38°	-53.5
21°	12.3	39°	-58.4
22°	9.4	40°	-63.4

B. JUSTIFICATION

Aim of the proposal: This draft amendment for a new Annex 11 aims at proposing corrections to the coordinates ΔZ of the ocular points used to check compliance with the provisions related to the required field of vision provided by the rear-view mirrors.

The driver's ocular points OD and OE have been defined taking into account that a design seat back angle of 25° can be achieved easily. In most cases the driver's seat is inclinable and an inclination of 25° to the vertical is representative of the most common driving condition.

Based on this assumption, the ocular points are included in a horizontal plane situated in height at 635 mm above the driver's seat reference point ('R' point). For the measurement of the rearward field of vision, it is sufficient that the measuring device is located at the prescribed position (i.e. 635 mm above the vertical passing by the 'R' point).

As there were some confusion at the time documents ECE/TRANS/WP.29/GRSG/2006/13 and GRSG-91-5 were submitted to GRSG on how to address this issue, it was necessary to assess whether it would be useful to use the corrections for the 'V' and 'P' points defined in Regulation No. 125 relating to the driver's front field of vision or strive for a specific approach.

The European Commission is of the opinion that the second option is the only one possible as the approaches for defining the technical requirements for the forward field of vision are different from those referred to for the rearward field of vision.

Consequently, it proposed to alter the position of the ocular points by referring to the test method described in Regulation No 46. Corrections should only take into account the real vertical motion of the eyes of the driver when the body rotates around the 'R' point.

ADDITIONAL TECHNICAL INFORMATION

In a first attempt, the European Commission made a computation based on simplified assumptions concerning the position of the head rested on the head-restraint during the rotation of the seat back.

GRSG concluded however that some additional research work would be necessary in order to describe more accurately the actual motion of the driver's eyes. A Hybrid III 50th Percentile male has been found to be relevant for such purposes and specific data relating to dummies have been sought.

The computation method refers to ISO 4513 : 1978 (Road vehicle – visibility – method for establishment of 'eyellipses'² for driver's eye location) in combination with the provisions of Regulation No 46. Also the back angle-front (ISO-L40) was applied along with the vertical dimension of 635 mm above the 'R' point ranging from 5° to 40°.

² "Eyellipse": contraction of the words 'eye' and 'ellipse', describing the elliptical shape of the driver's eye range.

It has been assumed that the head remains always parallel to Axle Z for the full range of the rotation angle. The torso, head dimensions and eyes position were computed from data taken from Hybrid III dummy³.

The computational part is straight forward. Applied mathematics and simple trigonometry were used to obtain the corrected vertical displacement of the ocular points from 5° to 40° seat angle shown in Table 1.

³ Source: Manufacturer's user manual of a 50th Percentile Male Hybrid III test Dummy (June 1998, page 24) R. Denton Inc.