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Item 4.15. of the provisional agenda

REGULATION No. 48
(Installation of lighting and light-signalling devices)

Requirements for headlamps

Proposal for draft amendments to Regulation No. 48

Submitted by the expert from Japan

The text reproduced below was prepared by the expert from Japan and is aimed at reducing the glare of high-intensity discharge (HID) headlamps by lowering the maximum installation height of such headlamps. The modifications to the current text of the Regulation (up to Supplement 1 to the 03 series of amendments) are marked in **bold** characters.

Note: This document is distributed to the Experts of the Working Party on Lighting and Light-Signalling (GRE) only.

A. PROPOSAL

Paragraph 6.2.4.2., amend to read:

"**6.2.4.2.** In height: not less than 500 mm and not more than 1,200 mm above the ground. For category N₃G (off-road) vehicles 7/, the maximum height may be increased to 1,500 mm. **For motor vehicles with light sources having an objective luminous flux exceeding 2,000 lumen each, the maximum height shall be not more than 950 mm.**"

B. JUSTIFICATION

The glare produced by headlamps with objective luminous flux exceeding 2,000 lm has become a social problem in Japan. Therefore, Japan suggests reducing the maximum installation height of such headlamps to 950 mm.

The study described below addresses safety issues related with the installation height of HID headlamps. According to this study, the recommended mounting height is 875 mm, which was measured from the bulb center to the ground. In the Japanese proposal, however, this height has been converted to 950 mm, which is the distance measured from the height of the apparent surface in the direction of the reference axis.

C. STUDY OF PASSING HID HEADLAMP HEIGHT CONCERNING GLARE

1. Objective

To evaluate the effect of the mounting height of passing HID headlamps on (discomfort) glare impaired to preceding vehicles.

2. Test method

2.1. Headlamp

The luminous intensity distribution of the headlamps used in the tests had a left rising (15°) pattern. The following vehicle headlamps were aimed so that they were 1.5 per cent below the horizontal cut-off line of the driver's viewing range. The distance between headlamps was 2 m from the bulb center to the bulb center, envisioning the headlamps of a large vehicle.

2.2. Leading vehicle (glare observation vehicle)

The leading vehicle was a typical sedan-type passenger car with a low rear-view mirror mounting height (the height of the mirror center above the ground was 930 mm). During the tests, the glare was observed in the leading vehicle with its headlamps (halogen headlamps) turned on and set to the passing beam.

2.3. Following vehicle

A hand lifter, with the following vehicle headlamps mounted on it, was used to simulate the following vehicle, and it was positioned behind the leading vehicle at distances of 3 m and 5 m from it (Figures 1 and 2). (The scenario envisioned was a vehicle followed closely by another). The following headlamp mounting heights were used: 800 mm, 850 mm, 875 mm, 900 mm, 950 mm, and 1,000 mm.

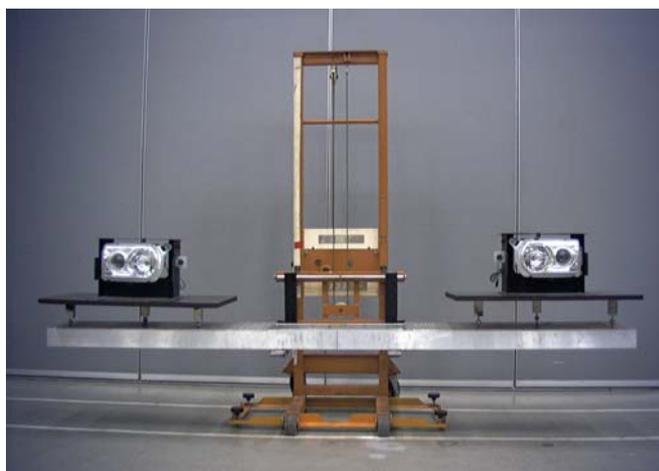


Figure 1 Headlamps and hand lifter

2.4. Test layout

The tests were conducted on the noise and vibration test track belonging to the Japan Automobile Research Institute. As a reference for glare evaluation, a small object (200 mm H x 200 mm W, 5 per cent reflectance) was placed on the test track at a point 20 m ahead of the observer's eye (Figure 2).

2.5. Test subjects

The test subjects were 16 men between 27 and 49 years of age who had correct eyesight of at least 0.7 and were licensed to drive regular vehicles.

2.6. Glare evaluation

The De Boer's 9-point scale, widely used to evaluate discomfort glare, was used to evaluate the glare. Each test subject was placed in the glare observation vehicle while it was stationary and was instructed to evaluate the glare without looking directly into the rear-view mirror (Table 1).

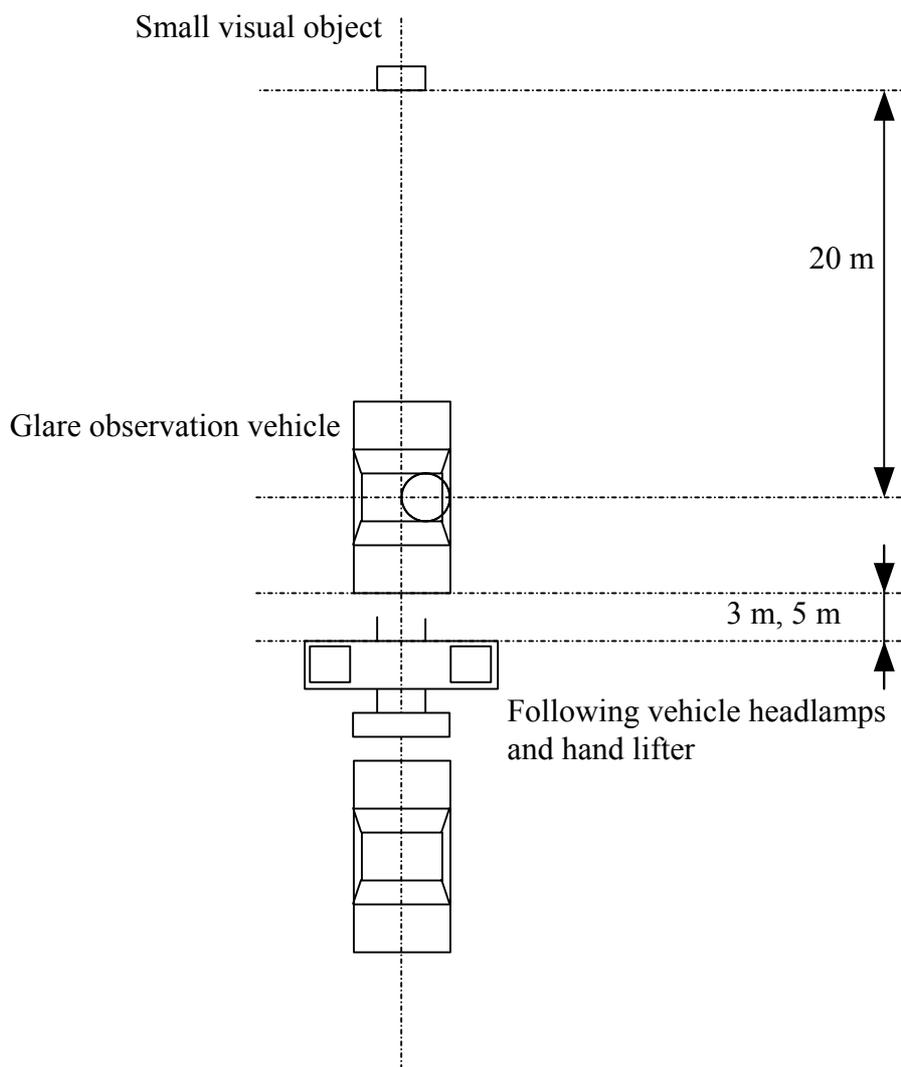


Figure 2 Test layout (test in motionless state)

9	Unnoticeable
8	
7	Satisfactory
6	
5	Just acceptable
4	
3	Disturbing
2	
1	Unbearable

Table 1 De Boer's 9-point rating scale for evaluation of discomfort glare

3. Test results

The median value of glare evaluated by 16 test subjects using the De Boer's 9-point scale was determined. The allowable limit of the glare was set at 5, with the numbers below indicating the discomfort glare outside the allowable limit.

3.1. When the distance between vehicles was 3 m

With the mounting heights of 900 mm or more, the glare was outside the allowable limit when the rear-view mirror night position was not used. However, when the night position was used, the glare was within the allowable limits with mounting heights up to and including 900 mm (Figure 3).

3.2. When the distance between vehicles was 5 m

With the mounting heights of 900 mm or more, the glare was outside the allowable limit when the rear-view mirror night position was not used. However, when the night position was used, the glare was within the allowable limits with mounting heights up to and including 950 mm (Figure 4).

4. Discussion

By using the rear-view mirror night position, the driver of the leading vehicle can avoid glare problems, provided that the following vehicle headlamp mounting height is 900 mm or less. However, a headlamp mounting height, not greater than 875 mm, is recommended to keep the glare within the allowable limit even when the rear-view mirror night position is not used.

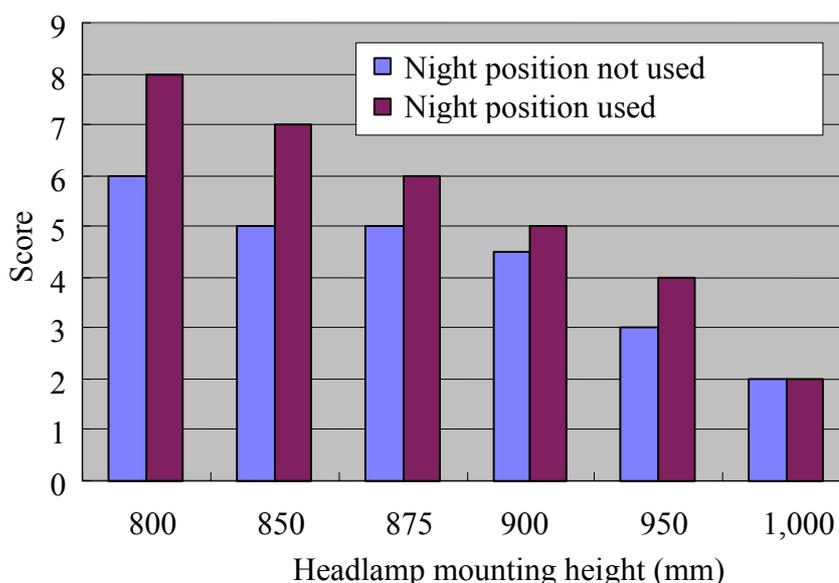


Figure 3 Glare from the following vehicle (the distance between vehicles: 3 m)

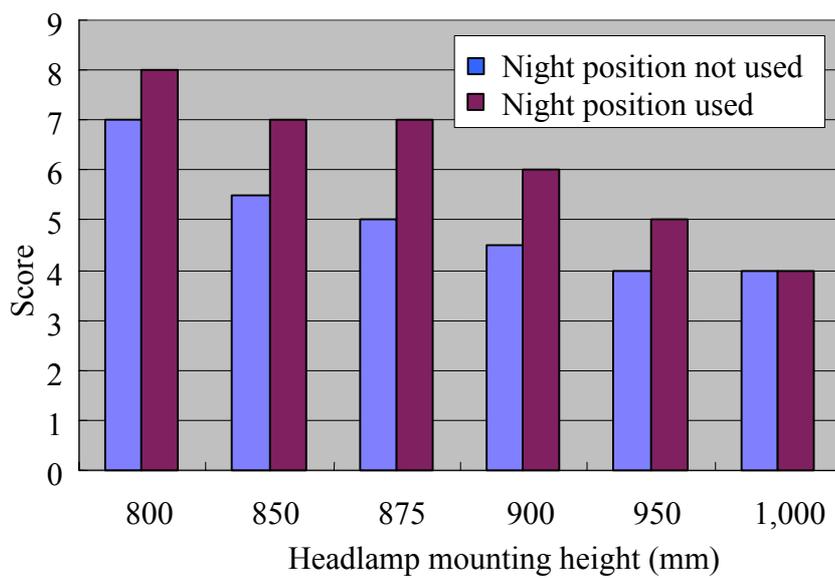


Figure 4 Glare from the following vehicle (the distance between vehicles: 5 m)
