

Evaluation of Discomfort Glare of Passing HID Headlamps

Transmitted by expert from Japan

1. Objective

To evaluate the effect of the mounting height of Passing HID Headlamps on (discomfort) glare imparted 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% below the horizontal cutoff line of the driver's viewing range. The distance between headlamps was 2m from bulb center to 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 rearview mirror mounting height (height of mirror center above ground: 930mm). During the tests, glare was observed in the leading vehicle with its headlamps (halogen headlamps) turned on and set to passing beam.

2.3 Following vehicle

A hand lifter with following vehicle headlamps mounted on it was used as the following vehicle, and it was positioned behind the leading vehicle at distances of 3m and 5m from it (Figures 1 and 2). (The scenario envisioned was a vehicle followed closely by another.) The following headlamp mounting heights were used: 800mm, 850mm, 875mm, 900mm, 950mm, and 1000mm.

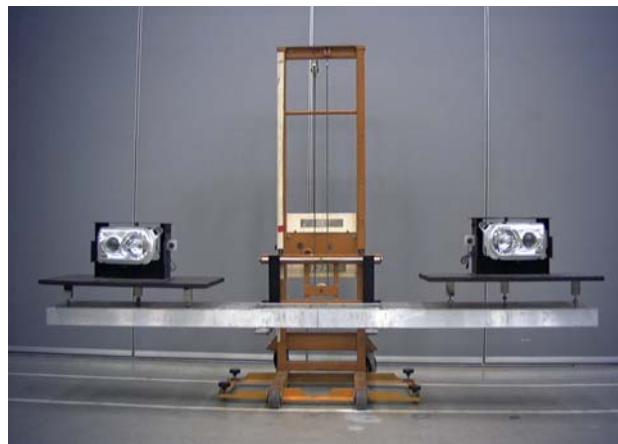


Figure 1 Headlamps and Hand Lifter

2.4 Course layout

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

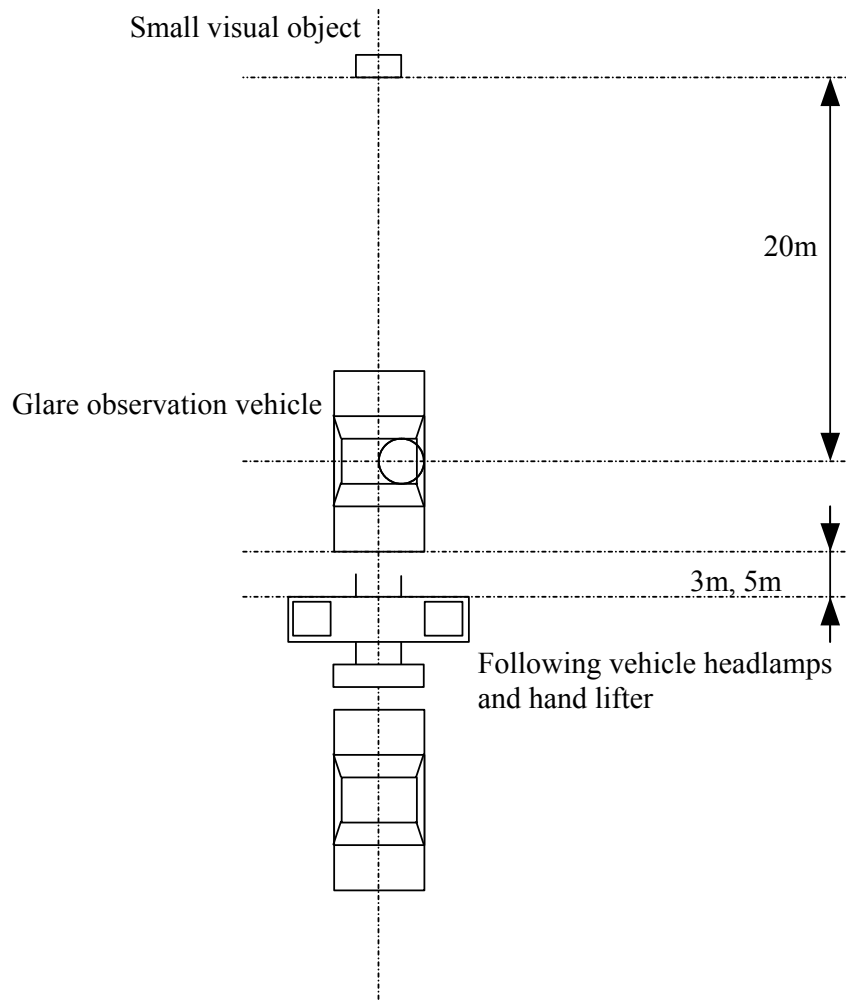


Figure 2 Course Layout (Test in Motionless State)

2.5 Test subjects

The test subjects were 16 men between 27 and 49 years of age who had corrected 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 glare. Each test subject was placed in the glare observation vehicle while it was stationary and instructed to evaluate glare without looking directly into the rearview mirror (Table 1).

Table 1 De boer's 9-Point Scale
De Boer's Rating Scale for Evaluation of Discomfort Glare

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

3. Test results

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

3.1 When distance between vehicles was 3m

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

3.2 When distance between vehicles was 5m

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

4. Discussion

By using the rearview mirror night position, the driver of the leading vehicle can avoid glare problems, provided that the following vehicle headlamp mounting height is 900mm or less. However, a headlamp mounting height no greater than 875mm is recommended to bring glare within the allowable limit even when the rearview mirror night position is not used.

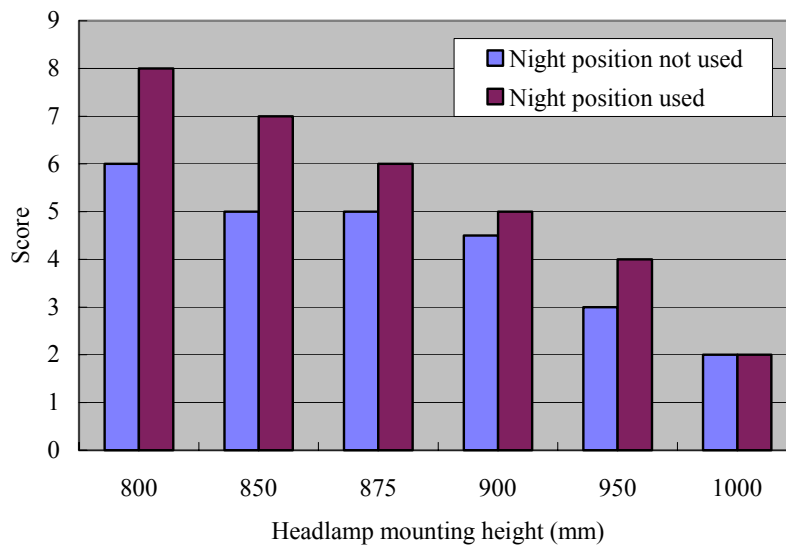


Figure 3 Glare from Following Vehicle (Distance between Vehicles: 3m)

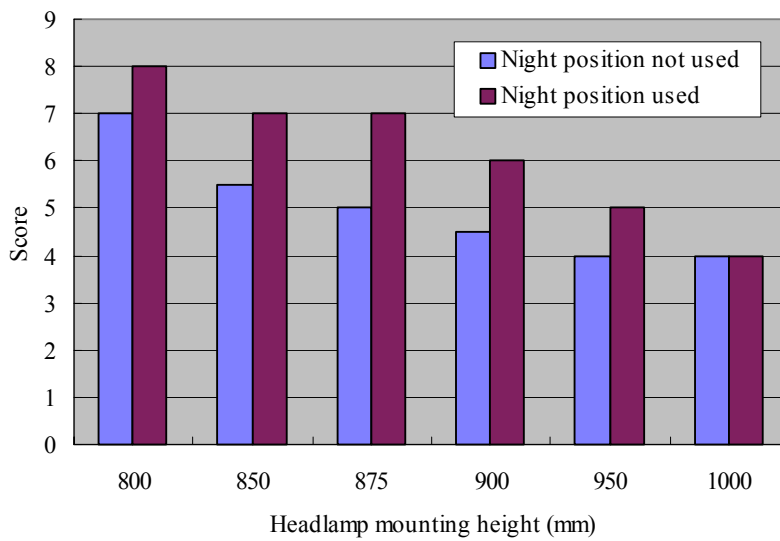


Figure 4 Glare from Following Vehicle (Distance between Vehicles: 5m)
