Transmitted by the expert from IMMA

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Evaluation of the visibility of direction indicators for motorcycles

The text reproduced below was prepared by the expert from the International Motorcycle Manufacturers Association (IMMA) to provide supporting information on the effectiveness of APL, in support of ECE/TRANS/WP.29/GRE/2009/67 and ECE/TRANS/WP.29/GRE/2009/68 as requested by GRE.

1. Introduction

Currently, to harmonize international standards, the standardization of amber position lamps ("amber position lamps" are defined here as those position lamps reciprocally incorporated in the front direction indicators that are used for improving the visibility of motorcycles) has been proposed as in the revised issues of ECE Reg.50 (R50) and ECE Reg.53 (R53). The proposal specifies the adoption of an amber position lamp and the electrical wiring conditions for operating the direction indicator.

The effects of the amber position lamp on visibility are reported by Mr. Morita et al., the Traffic Safety and Nuisance Research Institute, Ministry of Transport(1)(2).

There are two alternative types of electrical wiring when the amber colored position lamp is used. One is the system where the same side of amber position lamp turns off while the direction indicator is operating (here referred to as the "turn-off type"), and the other is the system where the amber position lamp remains lit while the direction indicator is operating (here referred to as the "remain-on type").

In this study, the visibility of the two systems of direction indicator proposed (turn-off type and remain-on type) is evaluated by comparing them.

2. Conspicuity of Direction Indicators

2.1. Test Methods

2.1.1. Position Lamps

Two types of motorcycle direction indicators with an amber position lamp were tested. The direction indicator and amber position lamp were firmly mounted on the headlamp fitting. The mounting height was chosen so that the centers of the direction indicator and amber position lamp were 850mm above the ground and the distance from the outer edge of the headlamp to the edge of the direction indicator was 75mm.

The light intensity of the direction indicator was set to approximately 90cd (in compliance with ECE R50); the light intensity was set by adjusting the terminal voltage of the bulb.

The light intensity of the amber position lamp was set to approximately 1/5 that of the direction indicator by adjusting the terminal voltage of the bulb.

The light flashing frequency of the direction indicator was set to 1.5Hz using a timer-type relay, and the duty factor was 50%.

2.1.2. Motorcycle Headlamp

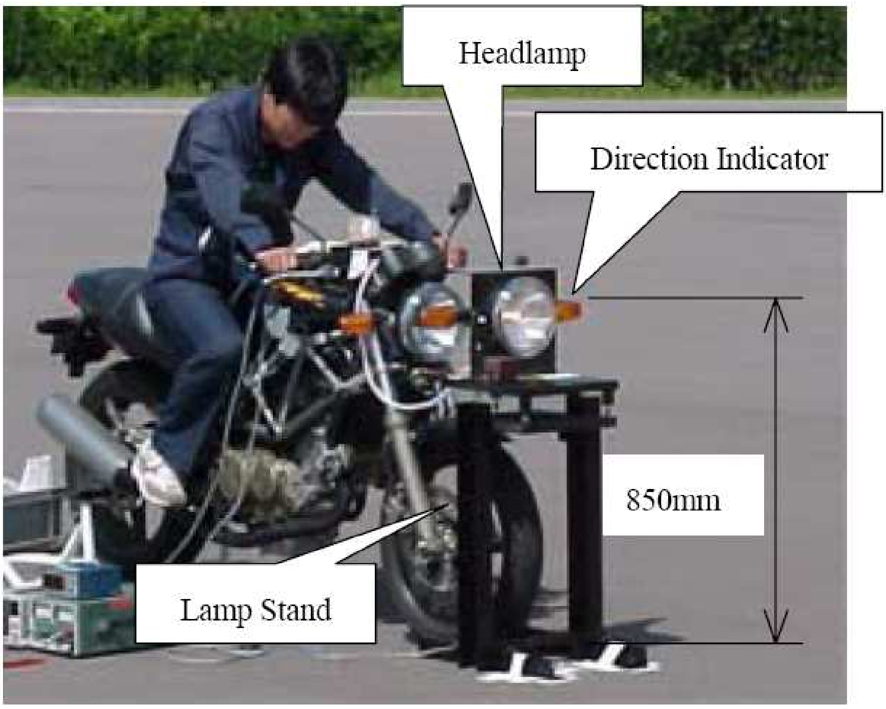
A conventional round lamp with a diameter of 170 mm (H4) was adopted as the headlamp for the motorcycles in the test. Each headlamp was mounted on a dedicated fitting, which was installed on the lamp stand.

Passing beams remained lit regardless of whether the test was in the daytime, twilight, or nighttime. The headlamp aim was adjusted so that the maximum light intensity point of the driving beam was 0.4 D-V, and the terminal voltage of the bulb for the headlamp was set to 12.8V using a DC stabilized regulator.

2.1.3. Motorcycle

During the test, the motorcycle used as the test vehicle was installed behind the lamp stand with rider seated on it to simulate actual riding (see Figure 1).

Figure 1
Motorcycle (Test Vehicle)



2.1.4. Observing Vehicle

The observing vehicle was a car fitted with halogen headlamps.

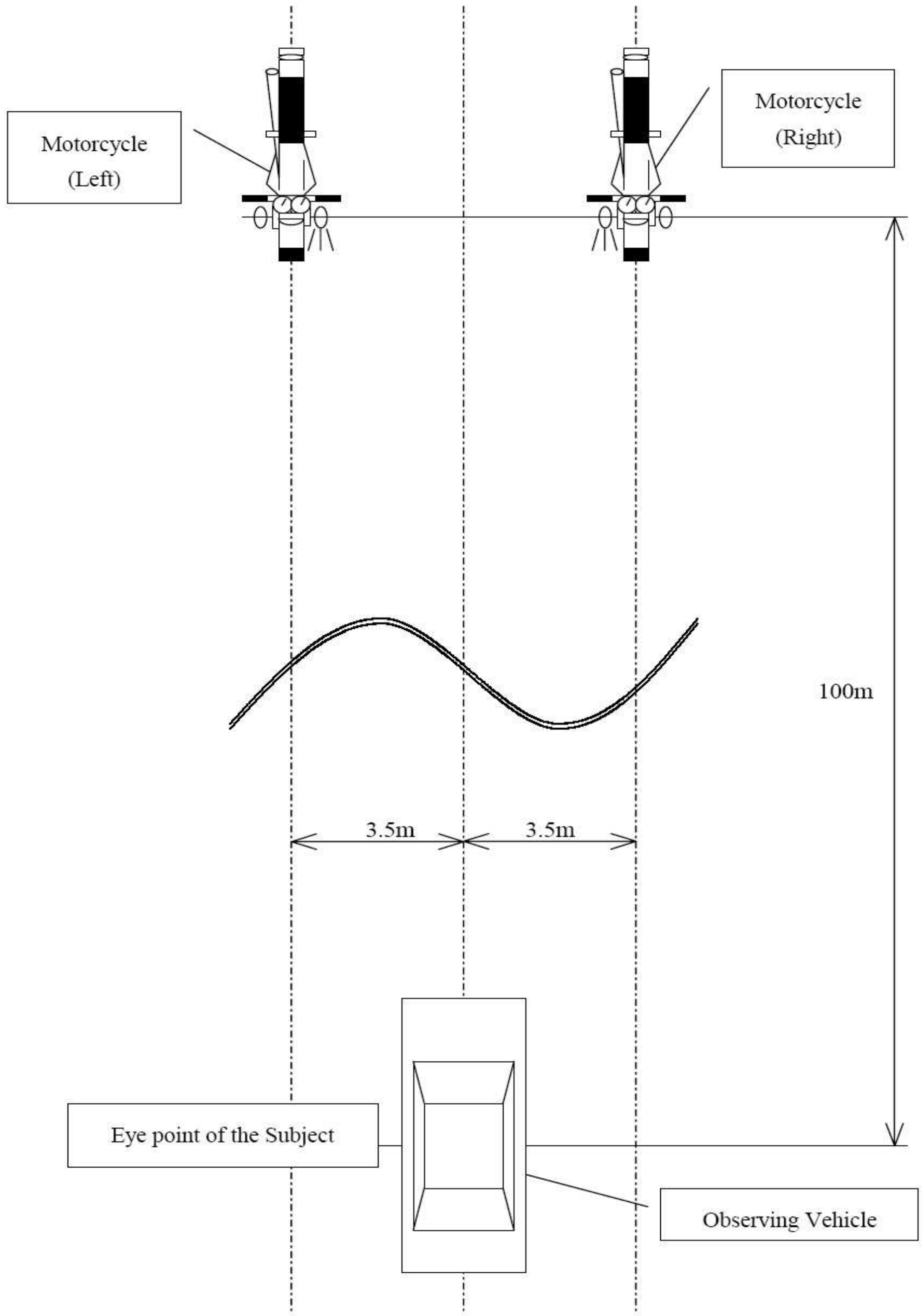
2.1.5. Subjects

The subjects were 10 males, each having a driver’s license, who were aged between 35 and 48 years and who had corrected eyesight of 0.7 or higher.

2.1.6. Course Layout

Tests were performed at a test course of the Japan Automobile Research Institute, Inc. A road with a lane width of 3.5m was set as the testing course (see Figure 2). The observing vehicle and motorcycles were placed at the center of each lane. The distance for observation (the distance from the headlamp of the motorcycle to the eye point of the subject) was set to 100m.

Figure 2
Course Layout (for Evaluation of Conspicuity)



2.1.7. Method for Evaluating Conspicuity

The subject was seated in the driver's seat of the observing vehicle and evaluated the conspicuity of the direction indicator of motorcycle, put on 100m ahead. Fifteen second of observation time were used per test condition, and the direction indicators of the two motorcycles installed on the right and left were lit simultaneously.

Visibility was evaluated on the scale shown in Figure 3. The observations were performed in the daytime, twilight and nighttime. Table 1 shows the lamps used for each observation.

(5) The left is more conspicuous.

(4) The left is slightly more conspicuous.

(3) The left and right are equally conspicuous.

(2) The right is slightly more conspicuous.

(1) The right is more conspicuous.

Figure 3
Scale for Evaluating Visibility

	Left	Right
Daytime	R50 Turn-Off Type	R50 Remain-On Type
Twilight	R50 Turn-Off Type	R50 Remain-On Type
Nighttime	R50 Turn-Off Type	R50 Remain-On Type

2.2. Test Results

The observation marks of visibility obtained from the test are shown in Table 2. Results for each condition are described below.

2.2.1. Visibility in the daytime

The turn-off type was "slightly more conspicuous" than the remain-on type.

2.2.2. Visibility at twilight

The turn-off type and remain-on type were "equally conspicuous."

2.2.3. Visibility nighttime

The turn-off type and remain-on type were "almost equally conspicuous."

Table 2
Evaluation Marks

Condition		Daytime	Twilight	Nighttime
Left	Right			
R50 Turn-Off Type	R50 Remain-On Type	3.9	3	2.7

Refer to Figure 3 for Scoring

3. The Seeing Distance of the Direction Indicator

3.1. Test Methods

3.1.1. Position lamps

The same lamps as described in "2.1.1 Position Lamps" were used for the direction indicator and amber position lamp of the motorcycle.

3.1.2. Motorcycle Headlamp

The same lamp as described in "2.1.2 Motorcycle Headlamp " was used for the motorcycle headlamp.

3.1.3. Motorcycle

The same motorcycle as described in "2.1.3 Motorcycle" was used.

3.1.4. Observing vehicle

The same observing vehicle as described in "2.1.4 Observing Vehicle" was used.

3.1.5. Subjects

The same 10 males as described in "2.1.5 Subjects" participated.

3.1.6. Course layout

Tests were performed at a test course of the Japan Automobile Research Institute, Inc. A road with a lane width of 3.5 m was set as the testing course (see Figure 4). The motorcycle (facing the observing vehicle) was placed at the center of the opposite lane.

3.1.7. Measurement of seeing distance

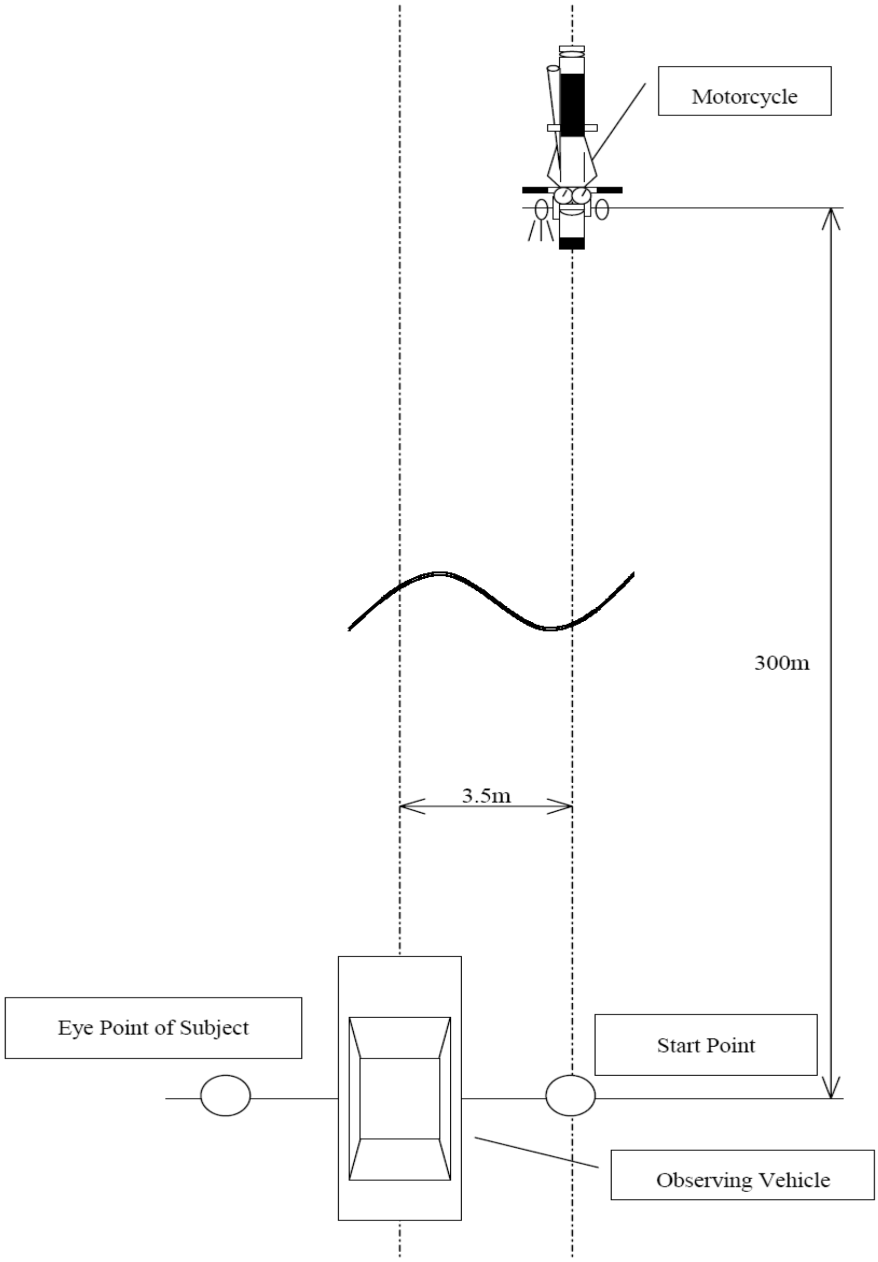
We defined the visible range as the distance at which the subject actually driving the vehicle can detect the flashing of the direction indicator of the opposing motorcycle.

The subject started driving at a distance of 300m from the direction indicator of the opposite motorcycle, accelerated to 30 km/h, and then traveled at a constant speed.

Each subject was required to press a switch near his hand as soon as the operation of the direction indicator became visible.

Information from the speedometer of the observing vehicle was fed to a counter to measure the seeing distance. This enabled us to measure the distance from the start point to the point where the subject pressed the button to register having detected the flashing direction indicator. Measurement was performed three times per condition, and the visible range was obtained by deducting the measured value from the distance of 300 m between the direction indicator of the motorcycle and the start point. The median of the measured values of the 10 subjects was taken as the visible range.

Figure 4
Course of Layout (for measuring Seeing Distance)



3.2. Test Results

3.2.1. Seeing Distance in the daytime

The seeing distance in the daytime was 206 m with the turn-off type and 209 m with the remain-on type, so there was little difference between the turn-off type and the remain-on type (see Table 3 and Figure 5).

3.2.2. Seeing Distance at nighttime

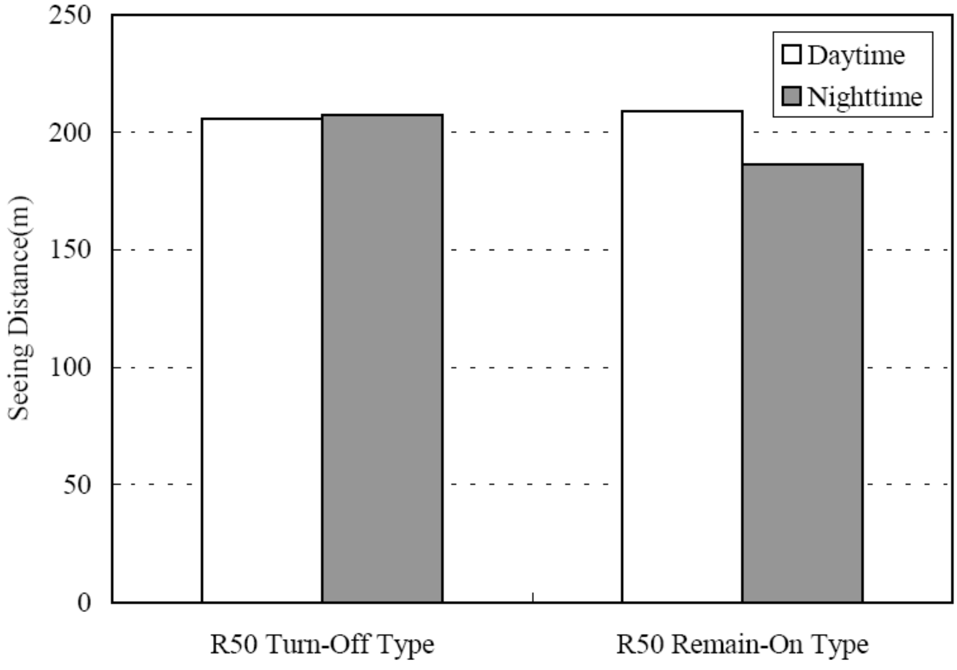
The seeing distance at nighttime was 208 m with the turn-off type and 187m with the remain-on type, so there was little difference between the turn-off type and the remain-on type (see Table 3 and Figure 5).

Table 3
Seeing Distance of the Direction Indicator for Motorcycles

Condition	Daytime	Nighttime
R50 Turn-Off Type	206	208
R50 Remain-On Type	209	187

Unit: m

Figure 5
Seeing distance of the Direction Indicator for Motorcycles



4. Conclusion

We compared two types of direction indicator: the turn-off type and the remain-on type which are proposed for harmonizing international standards.

Results obtained are presented below.

(1) The daylight conspicuity of the turn-off type of direction indicator is slightly superior to that of the remain-on type of direction indicator. However, these two types of direction indicators have equal conspicuity at twilight and nighttime. Conspicuity of both types of direction indicator was almost same.

(2) Though the turn-off type and remain-on type have equal seeing distance in the daytime, the seeing distance of the remain-on type is less at nighttime. There was little difference between the turn-off type and the remain-on type.

Therefore, we found no great difference between the turn-off type and the remain-on type with regard to visibility and seeing distance.

References

(1) Morita et al., Influences of the Secondary Task on Comparative Conspicuousness of the Motorcycle, Society of Automotive Engineers of Japan, Inc., Proceedings of 1993 JSAE Autumn Convention, 935, Oct. 1993.

(2) Morita et al., Influence of the Lighting Condition and the Subsidiary Task on Comparative Conspicuousness of Motorcycle, Transaction of Society of Automotive Engineering of Japan, Vol. 26, No. 4, Oct. 1995.