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World Forum for Harmonization of Vehicle Regulations

Working Party on Lighting and Light-Signalling

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Geneva, 1-5 October 2007
Item 4(d) of the provisional agenda

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

Requirements for light-signalling lamps

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 proposing to allow automatic switching of the rear-end collision alert signal under certain circumstances. The modifications to the current text of the Regulation are marked in **bold** characters.

A. PROPOSAL

Insert a new paragraph 2.28., to read:

"**2.28.** "**Rear-end collision alert signal" means a signal to indicate to other road users to the rear of the vehicle that a rear-end collision is unavoidable.**"

Paragraph 5. 9.1., amend to read:

"5. 9.1. Direction-indicator lamps, the vehicle-hazard warning signal, amber side-marker lamps complying with paragraph 6.18.7. below, the emergency stop signal **and the rear-end collision alert signal** shall be flashing lamps."

Paragraph 5.15., amend to read:

"5.15. The colours of the light emitted by the lamps are the following:

….

emergency stop signal :	amber or red
rear-end collision alert signal: red	**[or amber]**
rear registration plate lamp:	white

….

[Emergency stop signal and rear-end collision alert signal shall display same colour.]"

Insert new paragraphs 6.23. to 6.23.8., to read:

"**6.23. REAR-END COLLISION ALERT SIGNAL**

6.23.1. Presence
Optional

The rear-end collision alert signal shall be given by the simultaneous operation of all the stop lamps fitted as described in paragraph 6.23.7.
[The rear-end collision alert signal shall be given by the simultaneous operation of all the stop lamps or direction indicator lamps fitted as described in paragraph 6.23.7.]

6.23.2. Number
As specified in paragraph 6.7.2. [6.5.2 or 6.7.2]

6.23.3. Arrangement
As specified in paragraph 6.7.3. [6.5.3 or 6.7.3]

6.23.4. Position
As specified in paragraph 6.7.4. [6.5.4 or 6.7.4]

6.23.5. Geometric visibility
As specified in paragraph 6.7.5. [6.5.5 or 6.7.5]

6.23.6. Orientation
As specified in paragraph 6.7.6. [6.5.6 or 6.7.6]

6.23.7. Electrical connections

6.23.7.1. All the lamps of the rear-end collision alert signal shall flash in phase at a frequency of 4.0 ± 1.0 Hz.

6.23.7.1.1. However, if any of the lamps of the rear end collision alert signal to the rear of the vehicle use filament light sources the frequency shall be 4.0 +0.0/-1.0 Hz.

6.23.7.2. The rear-end collision alert signal shall operate independently of other lamps.

6.23.7.3. The rear-end collision alert signal shall not be activated during the ESS activation.

6.23.7.4. The rear-end collision alert signal shall be activated if the system judges, based on relative speed and relative distance between leading and following vehicle, that a rear-end collision is unavoidable and if activation / deactivation criteria are fulfilled. 11/

6.23.8. Tell-tale
Optional"

Note by the secretariat: The reference(s) to further footnote(s) will be renumbered accordingly.

11/ Until uniform test procedures have been agreed, the manufacturer shall provide to the Technical Service with the methodology of the rear-end collision alert signal system. The methodology shall be subject to discussion and agreement between the Technical Service and the vehicle manufacturer and shall be stated in a test report.
[Methodology: for example,
(a) Explanation regarding composition and function of system
(b) Explanation regarding activation area (On/Off) of system and content of control
(by means; such as calculation, simulation, or Demonstration etc.)]

B. JUSTIFICATION

Background:
During the fifty-fifth and fifty-sixth GRE session, Japan submitted ECE/TRANS/WP.29/GRE/2006/23 and ECE/TRANS/WP.29/GRE/2006/57 proposing conditions for automatic activation of hazard warning signal.
ECE/TRANS/WP.29/GRE/2006/23 is superseded by ECE/TRANS/WP.29/GRE/2006/57.

The reason why Japan has proposed to permit the alert signal for rear end collision using automatic hazard warning signal by ECE/TRANS/WP.29/GRE/2006/23 and ECE/TRANS/WP.29/GRE/2006/57 was that the hazard warning signal has been the most suitable under the current UNECE Regulation No. 48. Japan believes this device would contribute to road safety. However, Japan has investigated each effect on the color between red and amber. As a result, there was little difference between red and amber during daytime, regardless of the operating state of normal stop lamp (on/off) prior to its operation. However red color is slightly more effective than amber under a variety of road traffic situations.

As a result, Japan reconsidered the proposed text and in order to simplify to understand and, for a better understanding, proposed the additional definition of the "alert signal", i.e. a device that provides alert to the driver of the following vehicle when there is a possibility that the following vehicle will collide with the leading vehicle.

Thus, Japan would like to submit this proposal to supersede ECE/TRANS/WP.29/GRE/2006/57.

General:
Japan believes that it is important to update UNECE Regulations in order to reflect new vehicle safety technologies available. In Japan, a large number of accidents occur when the driver of the following vehicle is preoccupied and thus fails to check the timely status of the leading vehicle (including when the leading vehicle is stopped at an intersection) resulting in a rear-end collision with the leading vehicle. There are many similar accidents in Europe, too. If the following vehicle is detected and the rear-end collision alert signal automatically activated in advance, then the driver of the following vehicle will be less likely to fail to recognize the leading vehicle and thus the number of rear-end collisions or the degree of injury may be reduced.

Japan has estimated the actual effect of this alert signal based on the number of whiplash injuries on vehicle suffering from rear-end collision. (1,000,000 / EU 15 member states at 2001)

As a result of this simulation, it was established that, thanks to the rear end collision alert signal, at least approx. 20,000 of all whiplash injuries can be avoided, i.e. the equivalent to the expected effects of 23 per cent of the drivers who are looking ahead but are not concentrated.

This simulation was conducted narrow under the conditions mentioned below.
(a) The leading vehicle is stationary;
(b) The the following vehicle directly behind collided with the leading vehicle;
(c) The driver in the following vehicle who is looking ahead, but is not concentrated.

Estimated effects of Rear-end Collision Alert Signal

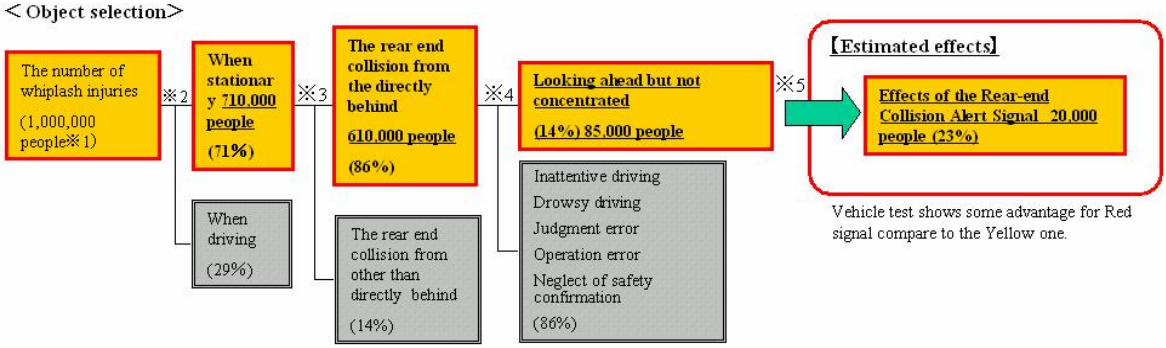
Estimation of expected number of no whiplash injuries against the total numbers of whiplash injuries in the rear-end collision.

＜Estimated result＞

Expected number of no whiplash injuries:

Aprox. 20,000 people

＜Object selection＞



※1 Number of whiplash injuries per year in EU15 due to rear-end collision. (source: EC Brite / Euram Project Wiplash I,2001)
※2 Rear-end collision patterns according to speed of the struck vehicle. Even if struck vehicle is moving, the signal is effective but there might be overlap with struck cars that have ESS activated. (source: FARS – NASS – GES, 2000)
※3 Impact angle rear-end collisions. Even if impact angle is > 5° , the signal is effective but the injury risk curves that are used for 'step ※5' are based on accidents in full lap condition. (source: K. Langwieder & W. Hell, Institute for Vehicle Safety & GDV German Insurance Assosiation, Germany: Proposal international dynamic test standard for seats / head restraints)
※4 Cause of rear-end collision casualties. Target group: drivers looking ahead but not concentrated. However, also in the other conditions the signal is effective but our policy is to estimate the absolute minimum effect. (source: Institute for Traffic Accident and Data Analysis (ITARDA), Japan, 2002)

Vehicle test of Rear-end Collision Alert Signal

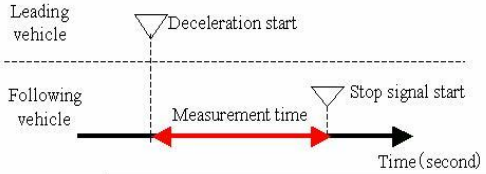
[Test method]

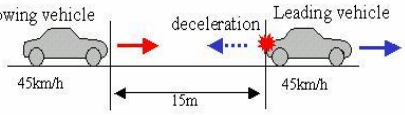
▶ Outline

Measuring the time delay between deceleration timing of leading vehicle and stop signal start time of following vehicle.

①Stop lamp ON (In night time = tail lamp ON , In all time = stop lamp ON)

②Stop lamp OFF (In night time = tail lamp ON)





Test pattern
Deceleration by engine braking (without stop lamp lighting)
Deceleration by engine braking +4Hz Stop lamp
Deceleration by engine braking +4Hz Hazard lamp
Deceleration by engine braking +2Hz Hazard lamp

▶ Driver's condition of following vehicle

- To simulate a drivers who are looking ahead but are not concentrated, the following vehicle's driver reads out the random number which is displayed in center cluster area.

▶ Number of test

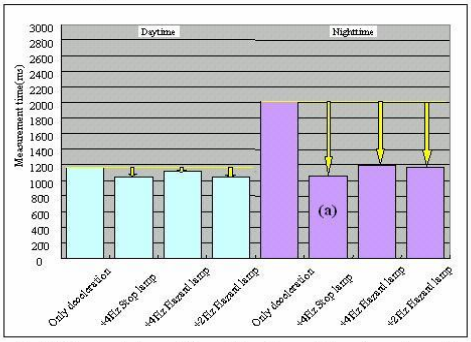
384 times=8(persons) ×4(test pattern) ×3(times/each pattern) ×2(daytime & nighttime) ×2(stop lamp ON and OFF)

*All test patterns were conducted in random condition to avoid the expected condition.

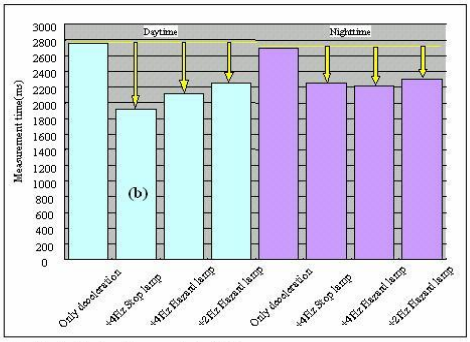
*All tests are conducted on the same day(Order:Daytime ⇒Nighttime).

[Test Result]

①Stop lamp On



②Stop lamp Off



- Big Difference between ① and ② = Normal Stop lamp shows big effect in both day time and night time.
- In (a) and (b) condition, Red flashing Stop lamp(4Hz) shows advantage compare to the Hazard lamp(=Yellow)

Brake stepping time		Slow	<		>		fast
Stop lamp On	Daytime	Only deceleration	<-100ms->	4Hz Hazard	<-80ms->	4Hz Stop	<-10ms-> 2Hz Hazard
	Nighttime	Only deceleration	<-800ms->	4Hz Hazard	<-10ms->	2Hz Hazard	**<-100ms->** 4Hz Stop **(a)**
Stop lamp Off	Daytime	Only deceleration	<-500ms->	2Hz Hazard	<-100ms->	4Hz Hazard	**<-200ms->** 4Hz Stop **(b)**
	Nighttime	Only deceleration	<-400ms->	2Hz Hazard	<-50ms->	4Hz Stop	<-50ms-> 4Hz Hazard

Japan has found that the color of the lamp does not contribute to make the driver of the following vehicles, who is preoccupied, recognize the danger. Rather following this estimation, unexpected high frequency flashing of rear lamps (same frequency as emergency stop signal (ESS); 4Hz) is more effective than 2Hz.

Finally, Japan's new definition of an "alert signal", is a device which provides alert to the driver in the following vehicle, that a rear-end collision is unavoidable.

On the other hand, we believe this alert signal has the same purpose as ESS, namely to prevent a rear-end collision in an emergency case. Therefore, the requirement regarding the rear-end collision alert signal was made in accordance with the ESS requirements.

Specification:
Para. 5.15.
As stated above, according to our simulation, there is minor difference between red and amber during daytime, regardless of the operating state of normal stop lamp (on/off) prior to its operation. But red color is slightly more effective than amber under a variety of road traffic situations (night time, daytime, normal stop lamp on/off).

[Despite the signal color, we believe this alert signal for the following driver can contribute to decrease the number of whiplash injuries in traffic accidents. But in these cases, the rear-end collision alert signal color should be the same as ESS color to avoid confusion among other road users.]

Para. 6.23.7.4.
In the future, the alert signal with more advanced system logic may be available. Therefore, the uniform requirement of the methodology of the system is difficult to be established now. In the case of UNECE Regulations Nos. 13 and 13-H, the footnote has been added to request the information of the service braking system with the electric control transmission because the uniform test procedure can not be established for the electric control transmission systems which are evolving every day.

Japan believes that the request of the technical data of the new system is the most reasonable solution until a uniform test procedure is established. Thus, Japan would like to propose that the footnote, like that one provided in UNECE Regulations Nos. 13 and 13-H, would be inserted into UNECE Regulation No. 48.

[Regarding the supplementary footnote in square bracket, we believe that the documents to be provided to the technical service are unclear. Some examples are needed. These methodology materials would be helpful to evaluate the system.]

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