ASEAN NCAP
www.aseancap.org

ASEAN NCAP PROTOCOL

2021
2025

TEST PROTOCOL – ADVANCED REAR VISUALIZATION

Version 1.1
February 2020

Preface

Where text is contained within square brackets, this denotes that the procedure being discussed is currently being trialled in ASEAN NCAP. Its incorporation in the Test Protocol will be reviewed at a later date.

During the test preparation, vehicle manufacturers are encouraged to liaise with the laboratory and to check that they are satisfied with the way cars are set up for testing. Where a manufacturer feels that a particular item should be altered, they should ask the laboratory staff to make any necessary changes. Manufacturers are forbidden from making changes to any parameter that will influence the test, such as dummy positioning, vehicle setting, laboratory environment etc.

It is the responsibility of the test laboratory to ensure that any requested changes satisfy the requirements of ASEAN NCAP. Where a disagreement exists between the laboratory and manufacturer, the ASEAN NCAP secretariat should be informed immediately to pass final judgement. Where the laboratory staff suspect that a manufacturer has interfered with any of the setup, the manufacturer's representatives should be warned that they are not allowed to do so themselves. They should also be informed that if another incident occurs, they will be asked to leave the test site.

Where there is a recurrence of the problem, the manufacturer’s representatives will be told to leave the test site and the Secretariat should be immediately informed.

Any such incident may be reported by the Secretariat to the manufacturer and the persons concerned may not be allowed to attend further ASEAN NCAP tests.

DISCLAIMER: ASEAN NCAP has taken all reasonable care to ensure that the information published in this protocol is accurate and reflects the technical decisions taken by the organisation. In the unlikely event that this protocol contains a typographical error or any other inaccuracy, ASEAN NCAP reserves the right to make corrections and determine the assessment and subsequent result of the affected requirement(s).

In addition to the settings specified in this protocol, the following information will be required from the manufacturer of the car being tested in order to facilitate the vehicle preparation. A vehicle handbook should be provided to the test laboratory prior to preparation.

TEST PROTOCOL –
ADVANCED REAR VISUALIZATION

Table of Contents

1 INTRODUCTION 2
2 DEFINITIONS 3
3 TEST OBJECTS 4
4 TEST OBJECT LOCATION 6
5 TEST PROCEDURES 7
ANNEX A……. 13

NEW CAR ASSESSMENT PROGRAM FOR SOUTHEAST ASIAN COUNTRIES (ASEAN NCAP)

TEST PROTOCOL – ADVANCED REAR VISUALIZATION

1 INTRODUCTION

ASEAN NCAP believes that collision with motorcyclists can be avoided if a car driver is more alert of his surroundings within a 30-meter radius. Hence, Advanced Rear Visualization will provide an advantage to detect the presence of nearby motorcycles and other small vehicles.

Currently, with the increasing popularity of MPVs and SUVs in ASEAN countries, it has become a norm to see large families travelling together in a car with their luggage packed to the brim. In such a situation, the use of the rear-view mirror will not be helpful as the driver's view is blocked by the rear passengers. Such a scenario can be avoided with the use of Advanced Rear Visualization which will aid and improve the driver's view, as a tiny camera is placed at the rear end (on top of the rear mirror) of the car.

It is typical to see a car maneuvers into the path of an approaching motorcycle and violating the motorcycle's right of way. According to established studies, lack of motorcycle conspicuity and misjudgement of speed or distance are the two main causes of such a collision. Because of that, numerous efforts to enhance the

conspicuity of motorcycles and motorcyclists to the views of other motorists have been introduced and legalized.

In the ASEAN region, a number of motorcycles run not only on the same lane as the preceding vehicle but also on the left and right lanes, and freely move into the lane or overtake a vehicle. Therefore, it is important to always be aware the position of motorcycles around the vehicle especially when changing lanes and turning left or right.

During the lane change maneuver, the driver is expected to check the surrounding of his vehicle using the rear-view mirror, before deciding to change lane or not.

The benefit of Advanced Rear Visualization (ARV) is to increase situation awareness during driving to recognize the presence of motorcyclists not only behind the vehicle but also around it such on rear-side lanes. The effectiveness of ARV will be experienced during the phase of "before making lane change decision". On the other hand, BST is more useful during the phase of "lane change maneuvers".

2 DEFINITIONS

2.1 General definition

A system designed to provide enhanced live rear view which displays the view images created from the rearward camera. When the system is in the built-in monitor combined in the traditional inside rear-view mirror, it is switchable from the traditional rear-view mirror to rear

view image from the camera or vice versa, by the driver's single action.

2.1.1 Additional features

2.1.1.1 Night adaptation
An image processing with night exposure adjustment for increasing rearward visibility.

2.1.1.2 Glare adaptation
An image processing of image glare due to sunlight by increasing rearward visibility.

2.1.1.3 Weather adaptation
Wiping function or other function for making camera-view to clear, or camera location inside the rear wiping range or equivalent location that can be treated as not affected by weather conditions for increasing rearward visibility of rearward in the bad weather conditions such as raining.

3 TEST OBJECTS

3.1 Test object

A pole is used as the test object. The dimension of pole is 300mm diameter, 1500mm height. Regarding visibility, pole should be coloured in bright colour.

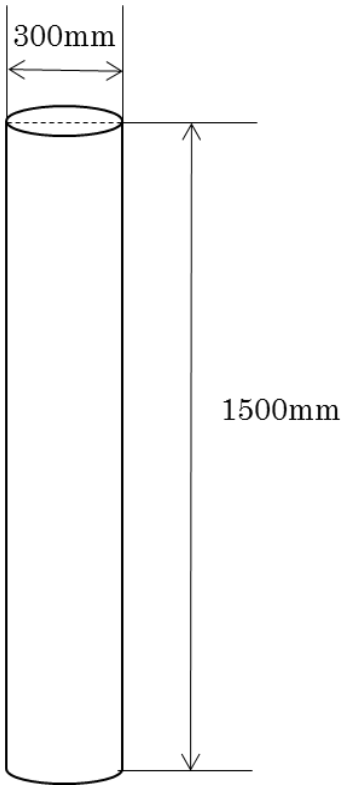


Figure 1: Test object (pole)

4 TEST OBJECT LOCATION

4.1 Pole location origin

Location of poles is defined at pole center.

4.2 Pole location of longitudinal (fore-aft) position

First row of poles is located 1.5m from vehicle rear-end position.
Second, third and fourth rows are located 10m, 20m, 30m.

4.3 Pole location of horizontal (left and right) position

Center pole located at vehicle's longitudinal center line. The poles located at 30cm pitch from the center pole until 5.25m.

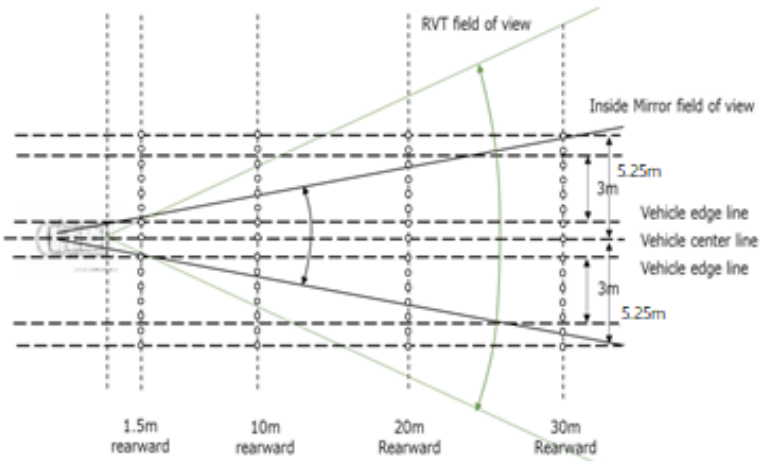


Figure 2: Global locations of poles

5 TEST PROCEDURES

5.1 Pole visibility

5.1.1 Test conditions

The ambient illumination conditions in which testing is conducted comprises light that is evenly distributed from above and is at an intensity between 7,000 lux and 10,000 lux, as measured at the center of the exterior surface of the vehicle's roof.

5.1.2 Rear headrest position

In order to imitate full occupied condition, rear headrest position to be set at highest position.

5.1.3 Actual movement in the test

In the actual test, poles located on the one row. Then, vehicle position of distance from poles can be changed by moving forward.

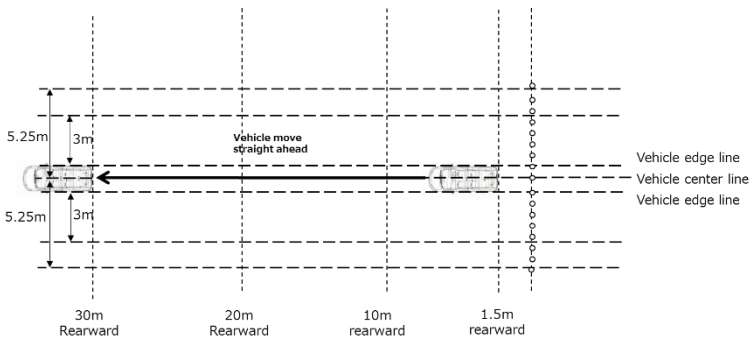


Figure 3: Actual movement of vehicle in the test

5.1.4 Count number of poles

In each row, the number of poles that can be seen is counted. Any part of the pole that can be seen is acceptable. Poles to be counted by using inside mirror and advanced rear visualization.

5.1.5 Criteria

5.1.5.1 Proximity Score

If the number of poles counted at 1.5m rearward position using advanced rear visualization is greater than the number of poles counted using inside mirror, the proximity visibility scores point as indicated in the assessment protocol (0.5 point).

5.1.5.2 Field of view score

If the number of poles counted at 10m rearward position using advanced rear visualization is greater than the number of poles counted using inside mirror, the field of view expansion get the point (full points: 0.5 point).

If the poles seen over 3.0m, 0.5 point is given.

If the poles seen below 3.0m, but field of view expanded by advanced rear visualization, 0.3 point is given.

If the field of view not expanded by advanced rear visualization, no point is given.

5.1.5.3 Long distance visibility

If the poles using advanced rear visualization can be seen clearly compared to using inside mirror, long distance

visibility (20m or 30m) get the points based on the field of view for surrounding lanes (full points: 0.5 point).

If the poles are seen over 5.25m on each side, 0.5 point is given.
If the poles are seen over 3.5m on each side, 0.4 point is given.
If the poles are seen over 1.75m on each side, 0.3 point is given.
If the poles are seen below 1.75m on each side, 0 point is given.

5.2 Night adaptation

If the system has night adaptation function, the function is to be tested. The poles should be visible better than by using inside mirror when the function activated according to the criteria defined in 5.2.3 in this protocol.

5.2.1 Test conditions
The ambient light condition is set above [15 lux].

5.2.2 Test methods
Image luminance measurement of pole surface located at 10m in the mirror and camera view using luminance colour meter that can measure focused point luminance.
Rear seat headrest shall be set at lower position in order to avoid the obstruction for mirror view of poles.
If the system has image quality adjust function (contrast, brightness etc.), camera image can adjust to fine view as much as possible.

5.2.3 Criteria

If the measurement results of the luminance of pole located at 10m by camera view is 15 cd/m^2 larger than the results by mirror view, the index 0.5 is given.

Or, if the camera system satisfies UN R-46 Class I specification of image quality, the index 0.5 is given.

Note: Human contrast perception threshold in dark environment is 5 cd/m^2. Regarding clear difference of night adaptation, difference to be over three times.

The test shall be done by MIROS measurement, OEM in house measurement with witness by MIROS or OEM test report submission.

5.3 Glare adaptation

If the system has glare adaptation function, the function is to be tested. The poles should be visible better than by using inside mirror when the function activated.

5.3.1 Test Condition

The test vehicle shall be hit by a (simulated sun) light of 40k lux at camera surface from the behind or equivalent condition of hit by natural sunlight from behind the vehicle.

5.3.2 Test method

Image luminance measurement of the brightest point of sun light and other six points on the mirror and monitor using luminance colour meter that can measure focused point luminance.

Six points shall be selected at the location from the 10% and 40% of the mirror or monitor surface edges for longitudinal and horizontal direction shown in Figure 4.

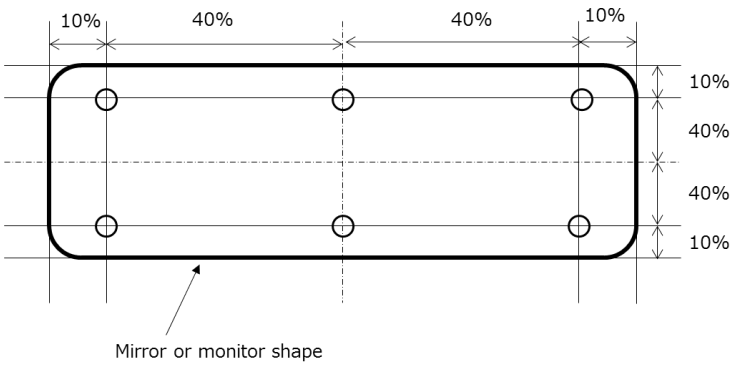


Figure 4: Measurement points location of mirror or monitor surface

If the point defined above included in the brightest area, the point shall be selected from the other near area not affected by brightest area.
If the system has image quality adjust function (contrast, brightness etc.), camera image can adjust to fine view as much as possible.

Six points shall be widely selected from around average luminance and the darkest area in the mirror or camera image excluding the brightest area.

5.3.3 Criteria

$$\text{Luminance ratio} = \frac{Brightest\ area\ luminace}{Average\ of\ 6\ points\ in\ the\ image}$$

If the luminance ratio of camera view is over 50% smaller than the ratio of mirror view, 0.5 point is given.
Or, if the camera system satisfies UN R-46 Class I specification of image quality, 0.5 point is given.

The test shall be done by MIROS measurement, OEM in house measurement with witness by MIROS or OEM test report submission.

5.4 Weather adaptation

If the system has weather adaptation function, the function is to be tested. The poles should be clearly visible than using inside mirror when the function is activated.

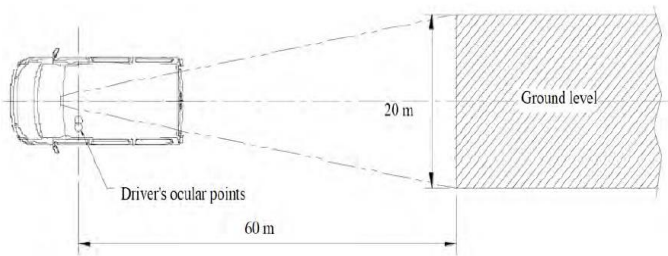
5.4.1 Criteria

If the camera located within the rear wiping range or equivalent location that is not affected by weather conditions such as raining, 0.5 point is given. If different function for making camera-view to clear, it is acceptable with demonstration of functions.

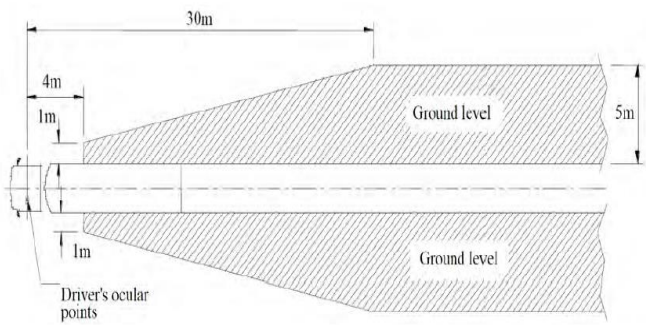
ANNEX A

UN R46 (Indirect vision, mirror or camera monitor systems)

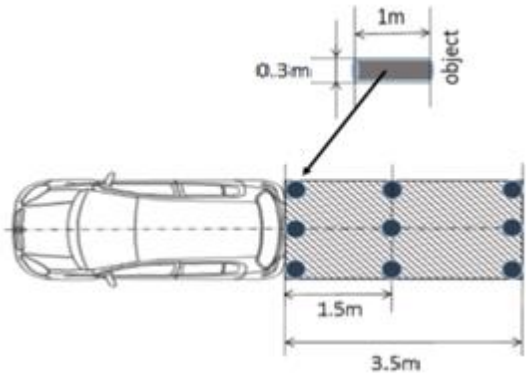
Class I (Inside mirror) field of view



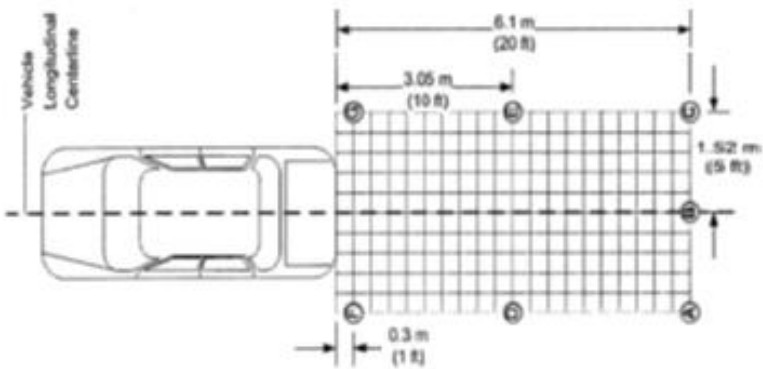
Class II (Outside mirror) field of view



New regulation for reversing motion (Rear indirect vision, rear view camera)



FMVSS 111 (Rear-view Camera)



ACKNOWLEDGEMENT

Editors

Ir. Dr. Khairil Anwar Abu Kassim (Adjunct. Prof)
Malaysian Institute of Road Safety Research (MIROS)

Yahaya Ahmad
Malaysian Institute of Road Safety Research (MIROS)

Mohd Hafiz Johari
Malaysian Institute of Road Safety Research (MIROS)

Salina Mustaffa
Malaysian Institute of Road Safety Research (MIROS)

Assoc. Prof. Dr. Saiprasit Koetniyom
The Sirindhorn International Thai German Graduate School of Engineering (TGGS)

ASEAN NCAP PROTOCOL

2021 - 2025

ASEAN NCAP
Ground Floor, Lot 127,
Jalan TKS 1,
Taman Kajang Sentral,
43000 Kajang,
Selangor, Malaysia.

+603-8924 9200 (ext. 425)

+603-8733 2005

enquiries@aseancap.org

www.aseancap.org

https://www.facebook/AseanNcap

https://twitter.com/aseancap

https://youtube.com/ (Search: ASEAN NCAP)

https://www.flickr.com/photos/aseancap/

ASEAN NCAP
www.aseancap.org