ASEAN NCAP
www.aseancap.org

2021
2025

ASSESSMENT PROTOCOL – MOTORCYCLIST SAFETY

Version 1.0
November 2019

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 the necessary steps 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 the assessment.

ASSESSMENT PROTOCOL – MOTORCYCLIST SAFETY

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

ASSESSMENT PROTOCOL – MOTORCYCLIST SAFETY

1 INTRODUCTION

ASEAN NCAP is committed to ensure the safety of motorcyclists in Southeast Asia. It is a known fact that motorcyclists make up the largest group and represent 80 percent of the total number of road users in ASEAN countries. Unfortunately, the region has also witnessed a significant rise in terms of motorcyclist fatalities, hence the issue of powered two-wheelers safety must not be overlooked. Thailand has already taken the lead in championing this cause and at the same time, ASEAN NCAP will follow suit by putting motorcyclist safety at the forefront of its road safety agenda. Individual documents are released for the four main areas of assessment, namely:

- Assessment Protocol – Adult Occupant Protection;
- Assessment Protocol – Child Occupant Protection;
- Assessment Protocol – Safety Assist;
- Assessment Protocol – **Motorcyclist Safety;**

The Motorcycle Safety Pillar contributes 20% to the overall rating with a maximum of 16 points focusing on four aspects, which are Blind Spot Technology (BST), Advanced Rear Visualization (ARV), Auto High Beam

(AHB), Pedestrian Protection (PP) and Advanced Motorcyclist Safety Technology (MST). The score calculation for specific elements in each domain is based on the Fitment Rating System (FRS). Moreover, Advanced MST will reward an additional 2 points to a maximum of 16 points for any two technologies that could help reduce the possibility of motorcycle collision.

The following protocol deals with the assessments in the areas of Motorcyclist Safety pillar; BST comprising Blind Spot Detection (BSD) and Blind Spot Visualization (BSV), Advanced Rear Visualization (ARV), Pedestrian Protection and Auto High Beam (AHB).

2 METHOD OF ASSESSMENT

Unlike the assessment for protection offered in the event of a crash, assessment of Motorcycle Safety pillar functions does not require destructive testing of a vehicle. Assessment of Motorcyclist Safety pillar can be based both on fitment and performance requirements verified by ASEAN NCAP. However, in the case of pedestrian protection, ASEAN NCAP only require a certificate for the assessment. The intention is to promote standard fitment across the car variants in the ASEAN region combined with good functionality for these systems, where this is possible.

For the performance assessment of BST, ARV and AHB systems, a car is subjected to a number of trial sequences designed to highlight the effectiveness of the systems. The car performance is measured using observations conducted by the Inspector, driver and rider during the assessment. In addition to the basic ASEAN NCAP assessment, additional information may be recorded that may add to the ASEAN NCAP assessment in future.

3 ASSESSMENT OF BLIND SPOT DETECTION OR VISUALIZATION

3.1 Introduction

It is common to see a car maneuvering into the path of an approaching motorcycle and violating the motorcycle's right of way. According to established studies, the lack of motorcycle conspicuity and misjudgment of speed or distance are the two main causes of road collisions. As such, numerous efforts to enhance the conspicuity of motorcycles and motorcyclists to other motorists have been introduced and legalized.

In the vehicle safety perspective, certain manufacturers have incorporated emerging technologies into their cars capable of detecting other vehicles in the blind spot zones, especially smaller ones such as motorcycles and bicycles. This is to compensate for car drivers' expected errors in noticing motorcyclists in the blind spot zones, particularly during lane changing action. It is commonly referred to as Blind Spot Technology (BST).

With the mission to save motorcyclists through fitment of crash avoidance technology in cars, ASEAN NCAP has introduced BST into its rating starting from 2017. Hopefully, with its extensive usage in the future, collisions between cars and motorcycles due to blind spot issues can be potentially minimized. In general, BST can be categorized into two types; namely detection and non-detection.

3.2 Functional Definitions

3.2.1 The detection type, termed by ISO 17387 as Lane Change Decision Aid Systems (LCDAS), is fundamentally intended to "warn the driver of the subject vehicle against potential collision with vehicles to the side and/or rear of the subject vehicle, and moving in the same direction as the subject vehicle during lane change manoeuvres".

3.2.2 As for non-detection type (visualization), the system shall be able to provide a live visual of the vehicles static in the same direction, and on the side and/or rear of the subject vehicle which can be activated manually or via a turn signal action. The system must be able to perform well during the day and at night.

3.3 Requirements for BST

3.3.1 As to encourage manufacturers to fit these systems more broadly, ASEAN NCAP rewards both detection and non-detection types equally with maximum 8 points.

3.3.2 ASEAN NCAP assesses the compliance based on the "Functional Definitions" as described in Section 3.2.

3.4 Scoring

3.4.1 Vehicles of which BST system meet all the requirements, as defined in paragraph 3.2, will be eligible for a maximum score of 8 points. Refer to ASEAN NCAP Fitment Rating System Version 1.1.

Table 1.0 Blind Spot Detection Test scoring point

<table>
<tr><th>Side</th><th>Lateral distance TV to SV (meter)</th><th>Status</th><th>Point</th></tr>
<tr><td rowspan="2">Driver</td><td>2 to 3</td><td>Detect (total of 3 runs)</td><td rowspan="2">4 (Max)</td></tr>
<tr><td>6.5</td><td>Not Detect (1 run)</td></tr>
<tr><td rowspan="2">Passenger</td><td>2 to 3</td><td>Detect (total of 3 runs)</td><td rowspan="2">4 (Max)</td></tr>
<tr><td>6.5</td><td>Not Detect (1 run)</td></tr>
</table>

Table 1.1 Blind Spot Visualization Test scoring point

Side	Lateral distance TV to SV (meter)	Status	Point
Driver	2 to 3	Clearly visible	4 (Max)
Passenger	2 to 3	Clearly visible	4 (Max)

3.4.2 Test vehicle must meet all requirements to reach maximum points in the assessment.

3.4.3 Vehicles of which BST system do not meet the above requirements (Table 1.0 or Table 1.1) or are not eligible for BST assessment receive no point.

3.5 Performance Testing

3.5.1 Performance testing is conducted in order to evaluate the functionality and performance of both BST types with regard to detection of motorcyclists.

3.5.2 For detection type BST, ISO 17387 will be used as the basis to demonstrate the functionality and performance of the system equipped in the subject vehicle. The target vehicle (i.e. vehicle closing in on the subject vehicle from behind, or any vehicle that is located in one of the adjacent zones) will be a motorcycle as specified in the ISO 17387. The dimension of the motorcycle (length, width and height) will be based on one of the most common motorcycle models by body type (under bone), as well as its make (brand) in the region. Refer to ASEAN NCAP BST Detection Test Protocol Version 1.0.

3.5.3 For non-detection BST, functionality assessment is based on the system requirement. The car will be subjected to a number of trial sequences designed to highlight the effectiveness of the system. Refer to ASEAN NCAP BST Visualization Test Protocol Version 1.0.

3.5.4 Assessments of both detection and non-detection BST will be performed by ASEAN NCAP Inspector, rider and driver. If the manufacturer requests to perform in-house test, ASEAN NCAP Inspector, rider and driver must be present and conduct the test according to the protocol.

4 ASSESSMENT OF ADVANCED REAR VISUALIZATION (ARV)

4.1 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 (ARV) will assist in determining the presence of motorcycles and other small vehicles.

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 a lane or overtake a vehicle. Therefore, it is very important to always be aware of motorcycles around the vehicle when changing lanes and turning left or right.

During the lane change maneuver, drivers are expected to check the surrounding condition of their vehicle by using the rear-view mirror, before making the decision to change the lane or not.

The benefit of ARV is to increase situation awareness during driving to recognize motorcyclist behavior not only behind but also around the vehicle such as rear side lanes. Its effectiveness will be determined during the phase of "before making lane change decision", whereas effectiveness of the BST is during the phase of “lane change maneuvers”.

4.2 Functional Definitions

4.2.1 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.

4.2.2 Additional features

4.2.2.1 Night adaptation

An image processing of night exposure adjustment to increase rearward visibility.

4.2.2.2 Glare adaptation

An image processing of image glare by sunlight from the rear side to increase rearward visibility.

4.2.2.3 Weather adaptation

Wiping function or other function for making camera-view to clear or camera location inside the rear wiping range for increasing visibility of rearward in bad weather condition such as rain.

4.3 Requirements for Advanced Rear Visualization

4.3.1 ASEAN NCAP assesses the compliance based on the "Functional Definitions" as described in Section 4.2.

4.4 Scoring

4.4.1 Vehicles of which ARV system meet the requirements, as defined in paragraph 4.3 will be eligible for a maximum score of 4 points. Refer to ASEAN NCAP Fitment Rating System Version 1.1.

4.4.2 Scoring policy
Scoring is based on visibility of rearward objects (motorcycle riders) based on the proximity (just behind the vehicle) and field of view expansion. Regarding long distance rearward, it is evaluated by clear visibility of provided camera images. Night visibility is also an important factor for situation awareness. So, it is defined as a multiply factor. Additional features such as glare and rain weather adaptation are defined as additional points.

4.4.3 Proximity visibility
If the number of poles at the proximity line (1.5m) in camera image is larger than the inside mirror, 0.5 point will be given.

4.4.4 Field of view expansion
If the number of poles at the 10m in camera image is larger than the inside mirror, 0.5~0.0 point will be given.

If the numbers of poles counted at 10m rearward position by using rear view technology is larger than the numbers of poles counted by using inside mirror, the field of view expansion get the points (full points: 0.5 point).
If the poles to be seen over 3.0m, 0.5 point will be given.
If the poles to be seen below 3.0m, but field of view expanded by rear view technology, 0.3 point will be given.
If the field of view is not expanded by rear view technology, no point will be given.

4.4.5 Long distance visibility
If the image of poles at the 20m and 30m in camera image is clearer than the inside mirror, 0.5~0.0 point will each be given.
If the poles are seen over 5.25m on each side, 0.5 point will be given.
If the poles are seen over 3.50m on each side, 0.4 point will be given.
If the poles are seen over 1.75m on each side, 0.3 point will be given.
If the poles are seen below 1.75m on each side, 0 point will be given.

4.4.6 Night visibility
If the system has night adaptation function which satisfy the criteria defined in 5.2.3 of test protocol of AVR version 1.0, Night visibility index shall be 1.5. If the system does not have the function, the index shall be 1.0.

4.4.7 Environmental condition visibility

If the system has glare adaptation function which satisfy the criteria defined in 5.3.3 of test protocol of AVR version 1.0, 0.5 point will be given.

If the system has weather adaptation function which satisfy the criteria defined in 5.4.1 of test protocol of AVR version 1.0, 0.5 point will be given.

Environmental score is the sum of those two points.

4.4.8 Total score calculation

ARV total score = (Proximity score + Field of view score + Long distance score) X Night visibility index + (Environmental score)

Example of full score

Proximity score: 0.5 (1.5m)
Field of view score: 0.5 (10m)
Long distance score: 0.5+0.5 = 1 (20,30m)
Night visibility index: 1.5
Environmental score: 0.5+0.5 = 1.0
ARV total score = (0.5+0.5+1.0) X 1.5 + 1.0 = **4.0**

4.5 Performance Testing

4.5.1 Performance testing is conducted in order to evaluate the functionality and performance of ARV system with regard to detection of motorcyclists.

4.5.2 The detailed specification and test performance will be shown in the result page and made known to the public. Refer to ASEAN NCAP ARV Test Protocol Version 1.0.

5 ASSESSMENT OF PEDESTRIAN PROTECTION (PP)

5.1 Introduction

Pedestrian Protection (PP) is a safety technology that allows vehicle components that may come into contact with a pedestrian in a collision to deform or break apart easily for better impact energy absorption.

The issue of pedestrian safety may not be too worrying in ASEAN countries. Regardless, ASEAN NCAP believes it is still important to lend support to the existing initiatives introduced by several car manufacturers pertaining to pedestrian protection.

Of late, new cars have been designed with the concept of protecting pedestrians. Since pedestrian safety falls under the Vulnerable Road User category, ASEAN NCAP feels that Pedestrian Protection must be regarded as part of the Motorcyclist Safety segment.

5.2 Requirements for PP

5.2.1 The manufacturer must provide a certificate showing UNECE Regulation No. 127 ‘Uniform provisions concerning the approval of motor vehicles with regard to their pedestrian safety performance’ approval of the vehicle type being assessed.

5.2.2 A technical report from a laboratory or technical service is acceptable as, at the time the vehicle is assessed by ASEAN NCAP, all homologation should be completed and a certificate or test report should have been obtained. Refer to ASEAN NCAP Guideline In-House Test Report Documentation Submissions Version 1.0.

5.2.3 The variant tested by the Technical Service during type-approval does not need to be the same as ASEAN NCAP test variant. However, if it is not, it should be clear that the certificate of approval covers all variants, including ASEAN NCAP test variant.

5.3 Scoring

5.3.1 Manufacturers must submit the certification of UNECE Regulation No. 127/00 or later series or technical report from a laboratory or technical service to ASEAN NCAP inspector for assessment.

5.3.2 Vehicles of which system meet the requirements as mention in paragraph 5.3.1 will be eligible for a maximum score of 2 points.

5.3.3 If the manufacturer is unable or unwilling to submit documents as stated in paragraph 5.3.1, ASEAN NCAP will not reward any point.

6 ASSESSMENT OF AUTO HIGH BEAM (AHB)

6.1 Introduction

Automatic High Beam technology is one of the features of ADAS (automatic driver assistance system) which detects oncoming and preceding vehicles and automatically switches between high and low beams during night driving, making it easier for the driver to recognize hazards such as impending motorcyclists.

It is found that in certain areas, the condition of motorcycles on the road is not up to the mark whereby some of their equipment are not in working order. For example, the headlight or the tail light might not work.

The issue pertaining to conspicuousness of motorcyclists will definitely result in a dangerous situation; which could eventually lead to road crashes. This stems from the difficulty faced by car drivers to notice the presence of nearby motorcyclists.

With the Auto High Beam function in a new car, this problem may reach a solution and may result in a significant reduction of motorcyclist fatalities in the ASEAN region.

6.2 Functional Definitions

6.2.1 Lighting function means the light emitted by a device to illuminate the road and objects in the direction of vehicle movement with sufficient illumination.

6.2.2 'Automatic switching type' refers to the function which has the capability to automatically switch between the high beam and the low beam.

6.2.3 The system must able to automatically change from low beam to high beam or vice-versa based on vehicle speed, traffic or surrounding in front of vehicle.

6.2.4 The system shall be able to switch the headlights to low beam when the vehicle is driven in brightly lit urban areas or at speeds below 50km/h when the high beam is not required.

6.2.5 The system shall provide automatic modifications, such as when good road illumination is achieved and no discomfort is caused to both the driver and other road users.

6.3 Requirements for AHB

6.3.1 ASEAN NCAP assesses the compliance based on the "Functional Definitions" as described in Section 6.2.

6.4 Scoring

6.4.1 Vehicles of which AHB system meet the requirements as mentioned in paragraphs 6.3.1, will be eligible to get a maximum score of 2 points.

Table 2.0 Auto High Beam Test scoring point

Test	Headlight	Activated Speed or Distance	Status	Point
Operational Speed	Low to High Beam and Vice Versa	< 50 km/h	Auto switching	1
Illuminance measurement	High Beam	100 meters	5 Lux (Min)	1

6.4.2 Test vehicle must meet all requirements in Table 2.0 to attain maximum points in the assessment. Refer to ASEAN NCAP Fitment Rating System Version 1.1.

6.4.3 Vehicles of which AHB system does not meet the above requirements (Table 2.0) receive no point.

6.4.4 If the manufacturer is unable or unwilling to perform testing or to submit documents of UNECE Regulation No. 48-08, section 6.1.9.3.3.2 and UNECE Regulation No.122-

01, section 6.3.3 class B or technical report from a technical service approval of the AHB system, ASEAN NCAP will not reward any point.

6.5 Performance Testing

6.5.1 Performance testing is conducted in order to evaluate the functionality and performance of AHB with regard to detection of motorcyclists.

6.5.2 The detailed specification and test performance will be showcased in the result page and made known to the public. Refer to Auto High Beam Test Protocol Version 1.0.

6.5.3 Assessments on AHB system will be performed by ASEAN NCAP Inspector, driver and rider. If a manufacturer requests to perform in-house test, ASEAN NCAP Inspector, driver and rider must be present and conduct the test according to the protocol.

6.6 Equivalent Test Procedure

6.6.1 Manufacturers must provide a certificate showing UN Regulation No. 48-06 (or later), section 6.1.9.3.3.2 and UN Regulation No. 122-01 (or later), section 6.3.3 class B or UN Regulation No. 123, section 6.3.2 approval of the vehicle type being assessed.

6.6.2 A technical report from a laboratory witnessed by technical service provider or tested by the Technical

Service is acceptable as, at the time the vehicle is assessed by ASEAN NCAP, all homologation should be completed and a certificate should have been obtained. Refer to ASEAN NCAP Guideline In-House Test Report Documentation Submissions Version 1.0.

6.6.3 The variant tested by the Technical Service during type-approval does not need to be the same as ASEAN NCAP test variant. However, if it is not, it should be clear that the certificate of approval covers all variants, including ASEAN NCAP test variant.

6.6.4 The manufacturer shall submit sufficient documentation to prove the capability of the system to comply based on the "Functional Definitions" as described in Section 6.2.

7 ASSESSMENT OF ADVANCED MOTORCYCLIST SAFETY TECHNOLOGY (MST)

7.1 Introduction

Current technologies fitted in a car that could increase motorcyclist safety have been few and far between. As a means to further encourage the use of such inventions, ASEAN NCAP wishes to reward an additional 2 points for any two technologies that could benefit to reduce the possibility of an accident between the car and motorcycle. Regardless, the 2 points will not be added to the main pillar but rather acts as a bonus point, whereby it will not exceed the full score under Motorcyclist Safety.

7.2 Functional Definitions of Technologies that are considered by ASEAN NCAP

7.2.1 Any technology that could help reduce the possibility of a collision between the car and motorcycle.

7.2.2 Advanced MST proposed by manufacturers, subject to ASEAN NCAP approval.

7.3 Requirements for Advanced MST

7.3.1 Currently, ASEAN NCAP will not perform any field test to assess the functionality and performance of Advanced MST. Nevertheless, it is the responsibility of ASEAN NCAP to ensure that the system works and functions as intended. Therefore, as an alternative and to promote the fitment of Advanced MST in the region, ASEAN NCAP assesses the compliance based on the "Functional Definitions" as described in Section 7.2. If needed, the manufacturer is requested to perform a full demonstration of the proposed technologies to ASEAN NCAP.

7.4 Scoring

7.4.1 A score of 1 point is awarded for each MST proposed by manufacturer based on the following conditions.

- The MST is equipped as standard or optional fitment.
- If the tested model is available in more than one country in any Sector, the technology shall be available in

at least one country of the respective Sector. For example, Vehicle Model A is available in Malaysia and Thailand which are under Sector 1. If the technology is available in any other country, then the tested model qualifies for 1 point.

7.4.2 Manufacturer is encouraged to offer more MST, however the maximum score for this section is 2 points (i.e. 2 MSTs).

If there is any technical issue that may impede the performance of any technology due to various reasons in a certain country and the manufacturer wishes to waive the requirement, a detailed justification report shall be submitted to ASEAN NCAP for consideration.

8 REFERENCES

ECE Regulation 127 – Uniform provisions concerning the approval of motor vehicles with regard to their pedestrian safety performance, Date of entry into force; 17 March 2010.

ISO 17387 – Intelligent transport systems – Lane change decision aid systems (LCDAS) – Performance requirements and test procedures (First edition), date of entry into force; 1 May 2008

Prasad, P. and H. Mertz. *The position of the US delegation to the ISO Working Group 6 on the use of HIC in the automotive environment.* SAE Paper 851246. 1985

Regulation No. 122 – Uniform provisions concerning the approval of motor vehicle headlamps emitting an asymmetrical passing beam or a driving beam or both and equipped with filament lamps and/or light-emitting diode (LED) modules.

Regulation No. 123 - Uniform provisions concerning the approval of adaptive front-lighting systems (AFS) for motor vehicles

Regulation No. 48 - Uniform provisions concerning the approval of vehicles with regard to the installation of lighting and light-signaling devices

Mertz, H., P. Prasad and G. Nusholtz. *Head Injury Risk Assessment for forehead impacts.* SAE paper 960099 (also ISO WG6 document N447)

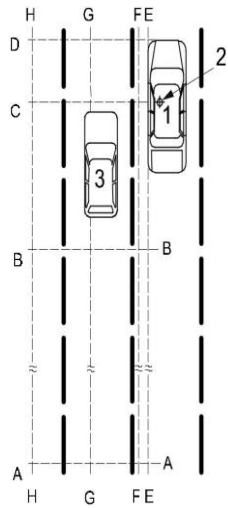
EEVC WG17 Report, 'Improved Test Methods to Evaluate Pedestrian Protection Afforded by Passenger Cars', September 2002.

IISH. Headlight Test and Rating Protocol (Version II). November 2016

APPENDIX I

Blind spot warning example cases

A.5 In this case, the blind spot warning function must give a warning. The target vehicle is entirely behind line C.



Key

1 subject vehicle

2 centre of the 95th percentile eyellipse

3 target vehicles

Figure A.5

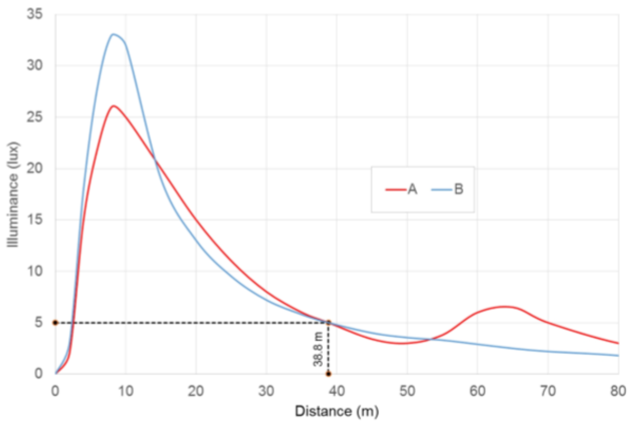
APPENDIX II

IIHS
Headlight Test and Rating Protocol Version II

Visibility Illuminance Examples

Figure B1 shows two example data curves, both of which result in 5 lux distances of 38.8 m. Although Example A initially reached the 5 lux level at a greater distance than this, the illumination fell below 5 lux again while the vehicle was still more than 10 m from the measurement point.

Figure B1
Example Visibility Illuminance Measurements



Glare Illuminance Examples

Figure B2 shows three example glare illuminance measurements for a left curved approach. All three fulfill the first glare criterion with maximum illuminance for 5-10 m below 10 lux. Examples A and B also remain under the threshold illuminance values for 10-120 m with identical illuminance threshold versus exposure distance curves (Figure B3). However, Example C does not remain below the allowable glare threshold. For example, the illuminance exceeds 2 lux for a total of 28.5 m of the approach distance, which is 8.5 m more than allowed. The arrows show the percentage by which Example C exceeds the limit at three different points. In this example, the maximum percentage over the limit is 33 percent. This percentage would be multiplied by the corresponding glare demerit multiplier in Table 4 to determine the number of glare demerits for this curve ($0.33 \times 6 = 2.0$ glare demerits).

Figure B2
Example Glare Illuminance Measurements

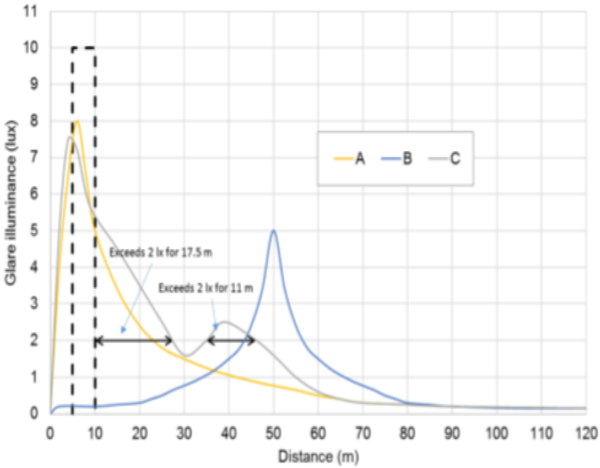
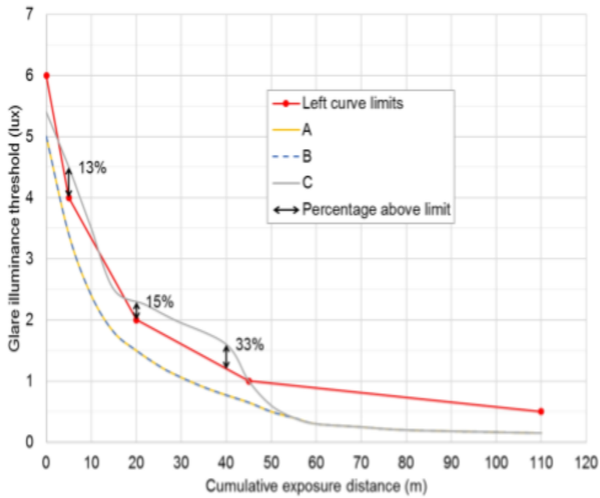


Figure B3
Example Glare Exposure Distances



ACKNOWLEDGEMENT

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ACKNOWLEDGEMENT

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2021 - 2025

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