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ASEAN NCAP PROTOCOL

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TEST PROTOCOL – BLIND SPOT DETECTION

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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 –
BLIND SPOT DETECTION

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

TEST PROTOCOL – BLIND SPOT DETECTION

1 INTRODUCTION

Each year, passenger vehicles are launched with new innovative mechanical and electronic features to enhance drivability and safety. Blind Spot Technology (BST) systems are an example of such innovations. BST uses sensors to detect one or more vehicles in adjacent lanes that may not be directly observable by the driver. The system warns the driver of an impending vehicle to help facilitate safe lane changes.

A small number of these systems is also equipped to intervene by applying brakes and guiding the vehicle back into the unobstructed lane if the warnings are ignored. BST is most effective when the equipped vehicle is passing, being passed, or preparing to make a lane change. Some systems warn when the BST sensors detect that one or more vehicles have entered either of the driver's two rear blind zones, and some warn only when other vehicles are in a driver's blind zone at a time when the vehicle turn signal is activated.

Not all BST have the same detection capabilities or operating conditions. In the vehicle owner’s manual, many

automotive manufacturers state that their systems are designed to detect only highway vehicles, and not other objects such as bicycles, motorcycles, humans, or animals. Various systems have a threshold speed where if the speed of the equipped vehicle is below the threshold speed, typically ranging from 5 to 20 km/h, the system is inactive. Some systems will not detect vehicles passing through blind zones at speeds substantially higher or lower than that of the equipped vehicle. Other systems may not operate when reversing.

In ASEAN NCAP assessment, the vehicles equipped with Blind Spot Detection are evaluated using a series of tests which refer to the **ISO 17387** as Lane Change Decision Aid Systems (LCDAS). They are fundamentally intended to "warn the driver of the subject vehicle against potential collisions 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 maneuvers" in which blind spot technology system could be used to avoid crashes.

2 DEFINITIONS

Throughout this protocol the following terms are used:

2.1 Subject vehicle (SV)

Vehicle equipped with the system in question and related to the topic of discussion

2.2 Target vehicle (TV)
Motorcycle that is closing in on the subject vehicle from behind, or any vehicle that is located in one of the adjacent zones

2.3 Coverage zone
The entire area to be monitored by a BST. A system's coverage zone comprises a specific subset of the following zones: left adjacent zone, right adjacent zone, left rear zone and right rear zone

2.4 Adjacent zones
Zones to the left and right of the subject vehicle

2.5 Closing speed
⟨of a target vehicle⟩ the difference between the target vehicle's speed and the subject vehicle's speed

NOTE This definition applies to target vehicles in the rear zones only. A positive closing speed indicates that the target vehicle is closing in on the subject vehicle from the rear.

2.6 Overtaking speed
⟨of the subject vehicle⟩ the difference between the subject vehicle's speed and the target vehicle's speed when the subject vehicle is overtaking the target vehicle.

2.7 Blind spot warning function
Function that detects the presence of target vehicles in one or more of the adjacent zones and warns the subject

vehicle driver in accordance with the requirements given in section 3.1.

NOTE: A target vehicle located within the coverage zone will thus be detected by the system.

3 REFERENCE SYSTEM

The International Standard specifies system requirements and test methods for Lane Change Decision Aid Systems (LCDAS). LCDAS is fundamentally intended to warn the driver of the subject vehicle against potential collision with vehicles to the side and/or to the rear of the subject vehicle, and moving in the same direction as the subject vehicle during lane change maneuvers.

3.1 Type I Systems

Provide the blind spot warning function only. These systems are intended to warn the subject vehicle driver of target vehicles in the adjacent zones. These systems are not required to provide warnings of target vehicles that are approaching the subject vehicle from the rear. If the installed system does not warn of the approaching target vehicles, the subject vehicle driver shall be made aware of the limitations of this type of system, at least in the owner's manual. In particular, the owner's manual shall include the following statement: "This system provides support only within a limited area beside the vehicle. The system may not provide adequate warning for vehicles approaching from the rear."

4 MEASURING EQUIPMENT

The basic measurements include vehicle speed (using GPS-based vehicle speed sensors), video logger and performance meter for event recording, and BST alert signal lamp indicators.

4.1 Zone Instrumentations

4.1.1 Blind Spot Technology (BST) assessment jig

The setup process includes preliminary plotting of blind spot zone, fitment angle of video logger and performance meter camera and onboard equipment. Precise and accurate measurement is essential to ensure superior and reliable output from the assessment.

Referring to Figure 1-1, BST jig setup is divided into two parts; part **A** and **B.**

Part **A** is a video logger jig frame for outside camera and is located on the top side of main windshield.

Part **B** is a jig for pre-setup of blind spot zone level 3 which views live-feed video recording taken by video logger and performance meter.

The assessment will be based on video recording system using video logger and performance meter applications which require pre-setup of zone area level 3 in the live-feed view. These two parts are designed to be used in any passenger car and are removeable with static measurement at any flat surface.

Figure 1-1: Blind spot zone setup

As shown in Figure 1-2, the main components to complete the jig structure are:
Component **A** - Black metal connector pipe **C1-24** (Length 130mm x diameter 33mm x hollow 38mm) x 5 pcs.
Component **B** - Black metal connector pipe **C2-5** (Length 130mm x diameter 33mm x hollow 33mm) x 4 pcs.
Component **C** - Black metal connector pipe **C3-11 (**Length 84mm x diameter 33mm x hollow 36mm) x 4 pcs and the last component is a standard steel pipe (diameter 28mm) with 2 different length 1465mm (10 pcs) and 1965mm (2 pcs).

Tools required for setup process: Allen-key size 3mm to tighten the connector and aluminium hollow pipe.

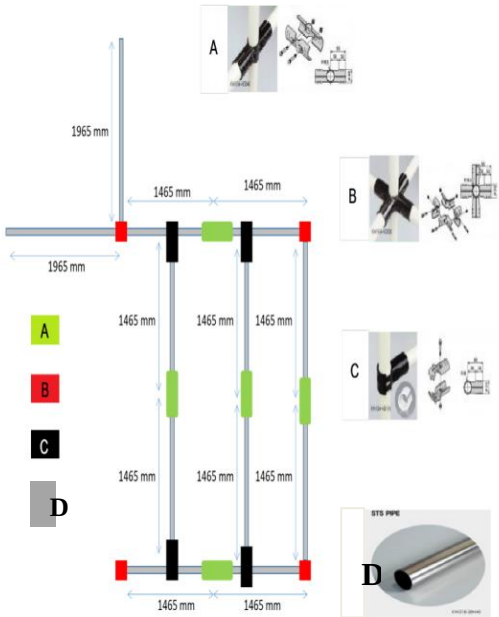


Figure 1-2: Blind spot coverage zone jig

5 TEST CONDITIONS

The test location shall be on a flat, dry asphalt or concrete surface. The ambient temperature during testing shall be within the range of 5°C - 40°C. The horizontal visibility range shall be greater than **1 km** (ISO17387 Sec. 5.2). The test shall be conducted during the day.

5.1 Test Track

5.1.1 The tests are done on a dry (no visible moisture on the surface), uniform, solid-paved surface with a consistent slope between level and 1%.

5.1.2 The surface must be paved and may not contain any irregularities (e.g. large dips or cracks, manhole covers or reflective studs) that may give rise to abnormal sensor measurements within a lateral distance of 3.0m to either side of the test path and with a longitudinal distance of 10m ahead of the VUT when the test ends.

6 TEST PROCEDURE

6.1 Conditioning

6.1.1 General
A car (test vehicle) is used as delivered to the test laboratory. There is not restriction on car selection.

6.1.2 Vehicle Preparation
Prepare the on-board test equipment and instrumentation in the vehicle. Also fit any associated cables, cabling boxes and power sources.

6.1.3 Test Target Vehicle
The main objective of BST testing is to check the functionality of BST with regards to detection of motorcycle which is a prevalent issue in the ASEAN region.

Thus, the dimension of target vehicle used in this protocol will be as follows:

Table 1.0 Target vehicle dimension

	Dimension (m)
Length	1.8 to 2.0
Width	0.6 to 0.8
Height	1.0 to 1.4

6.2 Test Scenarios

The assessment is to evaluate that the blind spot warning system gives warnings when required as the target vehicle overtakes the subject vehicle. Referring to Figure 2-1 and the line definitions in 3.1, the test shall be conducted as follows.

On a straight and flat test course, the test Subject Vehicle (**SV**) shall be driven in a straight line at a maximum steady speed of **40 km/h±2 km/h.** The test Target Vehicle (**TV**) shall be ridden in a straight line as shown in Figure 2-1 so that its closing speed is **10 km/h±2 km/h**.

Both vehicles shall be driven/ridden such that the lateral distance between the outermost edge of the subject vehicle's body (excluding the exterior mirror) and the centreline of the TV is between 2.0 to 3.0 meter for true warning test and at 6.5 meter for false warning test.

The assessment will start when both vehicles reach a steady speed of **40 km/h±2 km/h** and the TV shall be completely behind line A (> 30-meter distance).

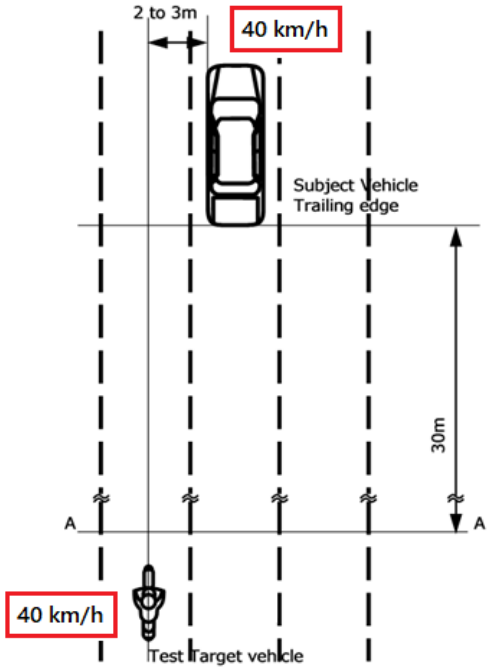


Figure 2-1: Target Vehicle entering 30-meter zone with steady speed

6.3 Test Conduct

6.3.1 Straight-Lane Tests
The test SV is subjected to one type of performance test: the straight-lane test.

In the straight-lane test series, both SV and TV are driven and ridden in separate but parallel, lanes with the target vehicle riding longitudinally past the subject vehicle. TV is ridden on the lane next to the SV either on the driver's or passenger's side as depicted in Figure 3-1.

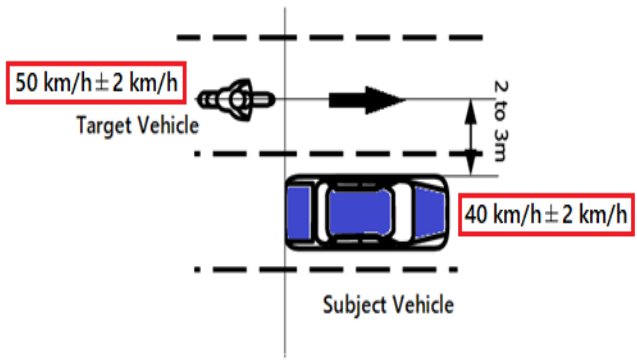


Figure 3-1: Target Vehicle overtaking Subject Vehicle speed

The straight-lane tests are performed on a controlled straightaway test facility containing equal or more than three parallel lanes of concrete surface roadway. All tests are performed during the day.

Once these measurements are completed for the passenger's side, the entire test is repeated for the driver's side sensor.

6.3.2 Functionality Check and Scoring
Check the functionality whether the BST system gives warnings when test is performed according to the test procedure with test conditions and the target vehicle described in sections 5 and 6.1.3.

6.3.3 True warning test
In the true warning test, target vehicle overtaking subject vehicle in between 2 to 3 meters adjacent as described in section 6.3.

BST warning requirements are divided into three sections; must give warning, might give warning and must not give warning. The result should be based on Table 1.1. The subject vehicle must be in fully prepared condition while running at **40 km/h±2 km/h**. The target vehicle speed is **50 km/h±2 km/h** to overtake the subject vehicle. All tests cover both driver and passenger sides of subject vehicle.

Table 1.1: BST warning requirements

BST indicator/ audible/visual warning	Must not on	Might be on	Must be on
Distance	Beyond 30 meter behind car	In 30-meter zone behind car	In 3-meter zone behind car to 95th percentile eyellipse

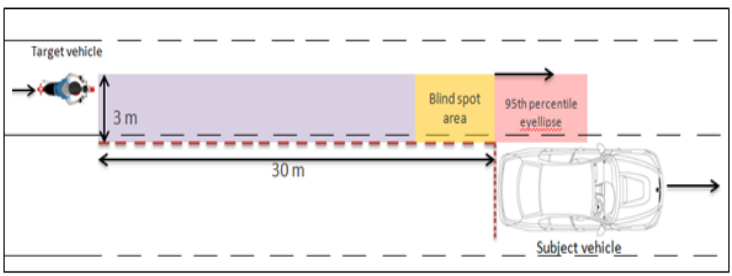


Figure 3-2: Must not give blind spot warning to the driver

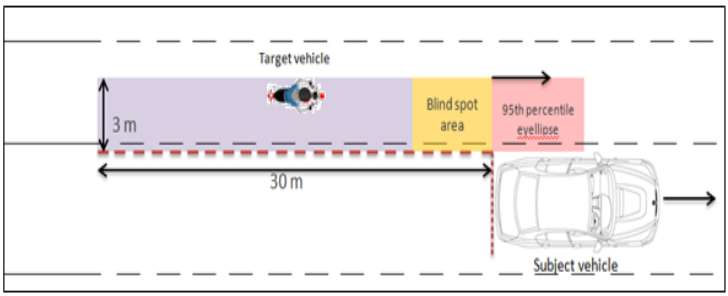


Figure 3-3: Might give blind spot warning to the driver

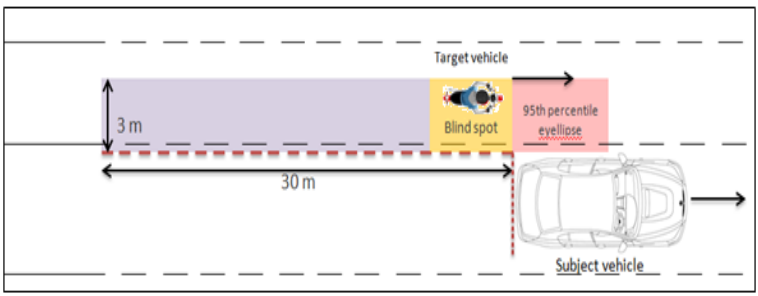


Figure 3-4: Must give blind spot warning to the driver

Three (3) repeated runs of each side sequence are completed to determine sensitivity and repeatability.

If subject vehicle does not meet the requirements for all 3 runs as described in Table 1.1, no point will be rewarded.

6.3.4 False warning test

The purpose of this test is to determine that the lane change warning system gives no warning when the target vehicle is in the lane beyond the adjacent lane. In each test, the lateral distance between the outermost edge of the subject vehicle's body (excluding the exterior mirror) and the centerline of the test target vehicle shall be maintained at 6.5 meters.

The system shall give **no warning** signal during these trials. All tests cover both the left and right side of subject vehicle. Single test run is adequate to complete the assessment.

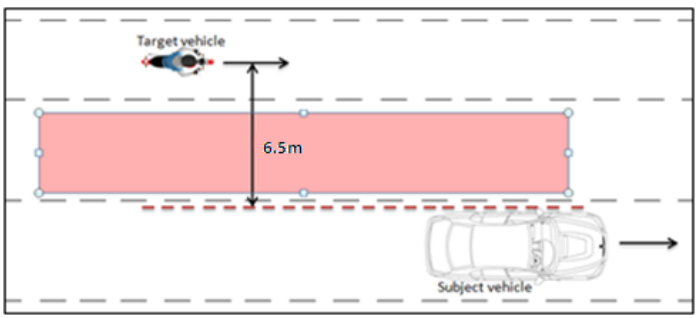


Figure 3-5: Target vehicle shall be maintained at 6.5 meters during test

6.3.5 Test Facility Layout

Based on Figure 3-6, it shows the layout of BST test facility. This layout area includes length (minimum) of 700-meter and 11-meter wide; sufficient for the testing. This layout is divided into three zone A, B and C.

- A is the starting area for the test vehicle.
- B is the bypass area where the target vehicle needs to overtake the subject vehicle.
- C is for braking area and U-turn.

Subject and target vehicle start moving at the same time laterally and achieve constant/steady speed at **40 km/h±2 km/h**, before entering Zone B.

In **Zone B**, the target vehicle needs to accelerate to **50 km/h±2 km/h** to overtake the subject vehicle within 500-meter range. Zone B is a critical area for the test where the blind spot technology needs to function and give warning to driver.

Both vehicles need to slow down and make a U-turn when entering **Zone C** and return to the starting line for the next run. Minimum repetition is four (4) runs for each side.

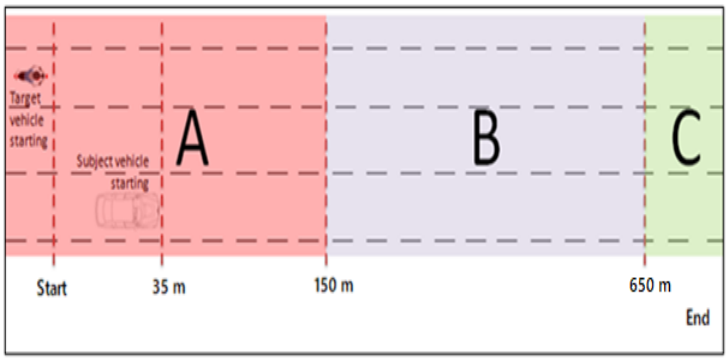
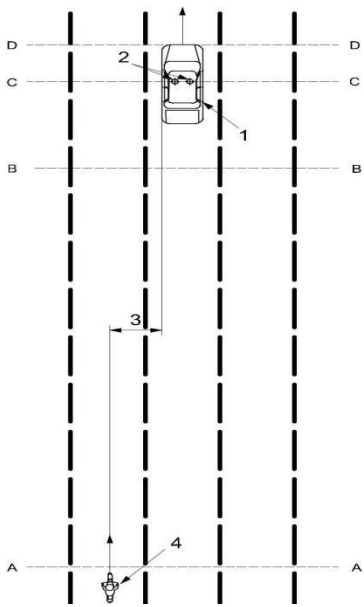


Figure 3-6: Test facility layout

ANNEX A

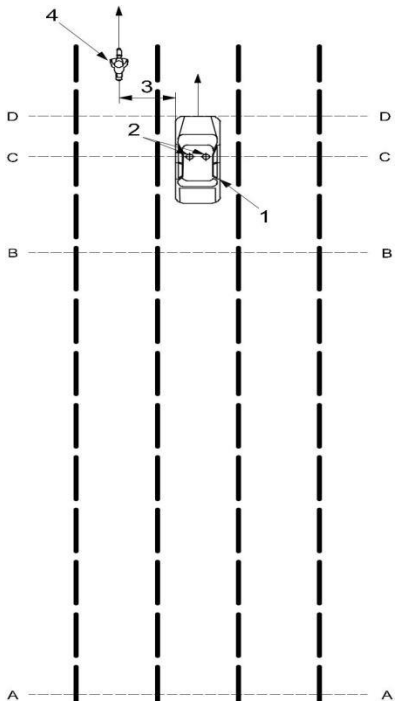
ISO 17387:2008(E)



Key

1 Subject vehicle
2 Centre of the 95th percentile eyellipse
3 Lateral distance
4 Test target vehicle

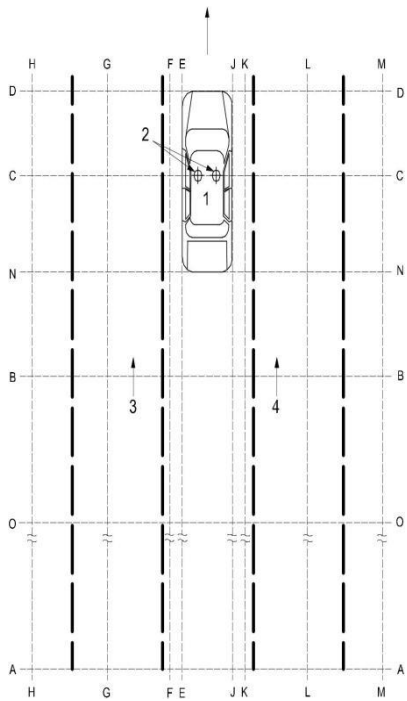
Figure 4-1: Target and subject vehicle starting point



Key

1 Subject vehicle
2 Centre of the 95th percentile eyellipse
3 Lateral distance
4 Test target vehicle

Figure 4-2: Target vehicle overtaking subject vehicle



Key

1 Subject vehicle
2 Centre of the 95th percentile eyellipse
3 Left adjacent zone
4 Right adjacent zone

Figure 4-3: Warning requirements diagram

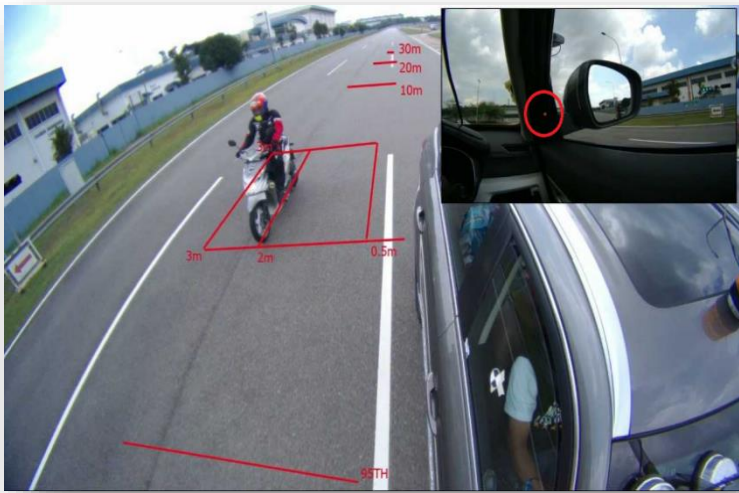


Figure 4-4: Video logger image of BST test

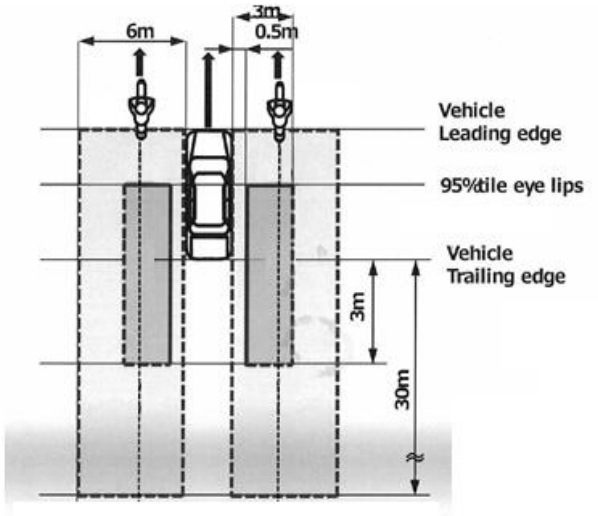


Figure 4-5: Blind Spot Zone

ACKNOWLEDGEMENT

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