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FOR SOUTHEAST ASIAN COUNTRIES

TECHNICAL BULLETIN

TEST PROCEDURES AND EVALUATION METHODS FOR REAR CROSS TRAFFIC COLLISION AVOIDANCE SYSTEMS

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Test Procedures and Evaluation Methods for Rear Cross Traffic Collision Avoidance Systems

This Technical Bulletin specifies the test procedures and evaluation methods for assessing Rear Cross Traffic Collision Avoidance Systems under the ASEAN NCAP 2026–2030 Protocol.

1. Scope of Assessment

Under the ASEAN NCAP 2026–2030 Protocol, Rear Cross Traffic Collision Avoidance Systems are assessed under the following technology domains:

- **Advanced Safety Assist Technologies (SAT)**
 - For Car Rear Crossing (CRC): One (1) point
- **Motorcycle Safety Technologies (MST)**
 - For Motorcycle Rear Crossing (MRC): One (1) point

Scoring is structured to recognize effective implementation of these technologies in supporting real-world crash avoidance and collision mitigation performance.

2. Definitions

2.1 Rear Cross Traffic Collision Avoidance System

A function that detects other road users approaching from the rear side while the vehicle is reversing or preparing to reverse, provides warnings (Rear Cross Traffic Alert - RCTA) to the driver in order to avoid a collision with the approaching road user, and where equipped, automatically applies braking (Rear Cross Traffic Braking - RCTB).

2.2 Vehicle Under Test (VUT)

A vehicle equipped with a Rear Cross Traffic Collision Avoidance System for the purpose of performance evaluation.

2.3 Target Vehicle (TV)

A vehicle approaching from the rear side toward the direction of the vehicle equipped with the Rear Cross Traffic Collision Avoidance System and serving as the detection target.

2.3.1 For Car Rear Crossing (CRC)

A mass-produced mid-size sedan passenger vehicle shall be used for this evaluation. Where applicable, the Global Vehicle Target (GVT – ISO 19206-3:2021) soft target may be used as an alternative test target.

2.3.2 For Motorcycle Rear Crossing (MRC)

A mass-produced motorcycle shall be used for this evaluation. The TV dimensions may refer to the ASEAN NCAP Blind Spot Detection Test Protocol. Where applicable, the ASEAN Motorcycle Target (AMT – ISO 19206-5:2025) soft target may be used as an alternative test target.

2.4 Obstacle Vehicle (OV)

A vehicle maintained in a parked condition on either the left or right side of the VUT, depending on the test scenario to create visual obstruction during testing. A mass-produced mid-size sedan passenger vehicle shall be used.

2.5 Collision Point Reference Line

An imaginary line drawn perpendicular to the driving or riding path of the TV, established at the intersection point between:

- the extension line of the outer tyre contact patches of the front and rear wheels on the side of the VUT first approached by the TV, at the test start position; and
- the extension of the TV driving or riding path.

2.6 Collision Point

The point at which the front reference point of the TV reaches the Collision Point Reference Line during the evaluation.

2.7 Time to Collision (TTC)

The calculated time obtained by dividing the relative distance between the front reference point of the TV and the Collision Point Reference Line by the relative speed at the time the first warning signal is generated by the Rear Cross Traffic Collision Avoidance System. The TTC value shall be rounded to one decimal place.

2.8 Front Reference Point

The foremost point of the TV along its driving or riding direction used for TTC evaluation.

2.9 VUT Initial Line

A reference line established at the rear outer edge of the VUT at its initial test position.

2.10 VUT Stop Limit Line

A reference line established 0.15 m before the TV path, measured in the reversing direction of the VUT, as illustrated in Figures 1 and 2.

2.11 VUT Arrival Time (T_{limit})

The average time in seconds obtained from three (3) measurements of the time taken for the rear outer edge of the VUT to travel from its initial position to the VUT Stop Limit Line, measured from the moment the service brake is released.

Where releasing the service brake alone does not initiate movement of the VUT, the accelerator pedal may be applied only to the minimum extent necessary to initiate vehicle movement. In such cases, measurement of T_{limit} shall commence when the accelerator pedal is first applied.

2.12 Driving or Riding Path

The path travelled by the centreline of the VUT or the TV during the test.

2.13 Laden Condition

The condition in which the vehicle is occupied by the driver and equipped with the measurement equipment required for the test.

3. General Requirements

3.1 Warning Requirements

The warning of the Rear Cross Traffic Collision Avoidance System shall provide at least two (2) types of signals among:

- visual,
- audible, or
- haptic signals.

Where the VUT is stationary and the TV is detected, a visual warning may be provided as the initial warning signal.

Where the VUT is reversing and the TV remains detected, at least one additional warning signal, either audible or haptic, shall be provided together with the visual warning.

In addition, at least one warning signal shall provide directional indication corresponding to the approach direction of the TV.

3.2 Operating Mode Retention

The Rear Cross Traffic Collision Avoidance System shall retain the user-selected operating mode across ignition cycles. Where the system is manually switched OFF by the user, it shall remain OFF after subsequent ignition cycles until manually reactivated.

4. Test Conditions

4.1 Test Surface

- 4.1.1** Tests shall be conducted on a dry and uniformly paved road surface (asphalt or concrete).
- 4.1.2** Tests shall be conducted in an area free from obstacles such as signboards or guardrails and other objects within 20 m of the rear and sides of the VUT, excluding the designated obstacle vehicles.

4.2 Environmental Conditions

- 4.2.1** During testing:
 - the ambient temperature shall be between 0°C and 38°C,
 - the wind speed shall not exceed 10 m/s.
- 4.2.2** Testing shall not be conducted under adverse weather conditions, including rain, snow, hail, fog, or mist. Testing shall be conducted during daylight and under favourable weather conditions.

4.3 Test Vehicles

- 4.3.1** The vehicle loading conditions shall be as follows:
 - VUT - laden condition;
 - Target Vehicle - laden condition; and
 - Obstacle Vehicle - unladen condition.
- 4.3.2** Tire inflation pressures shall be set in accordance with the vehicle manufacturer's recommended tire inflation pressures.

4.4 Test Equipment

- 4.4.1** The data acquisition system shall have a minimum sampling rate of 100 Hz.
- 4.4.2** Speed sensors may consist of contact-type or non-contact-type sensors. Where GPS-based sensors are used, the minimum refresh rate shall be 100 Hz.

5. Evaluation Criteria and Test Procedures for Rear Cross Traffic Collision Avoidance System

5.1 Evaluation Criteria

- 5.1.1** The Rear Cross Traffic Collision Avoidance System shall generate a warning prior to or simultaneously with automatic brake activation, if applicable.

- 5.1.2** The first warning signal generated by the Rear Cross Traffic Collision Avoidance System shall be activated at a TTC of ≥ 1.7 s.
- 5.1.3** After the first warning signal is generated, at least one warning signal shall remain active until:
- the front reference point of the TV has passed beyond the Collision Point Reference Line as shown in Figures 1 and 2; or
 - the Rear Cross Traffic Collision Avoidance function has been activated and the VUT has come to a complete stop condition, where applicable.
- 5.1.4** Where the Rear Cross Traffic Collision Avoidance function is activated without driver intervention, the braking system shall maintain the braking status until the TV has completely passed beyond the driving path of the VUT.
- 5.1.5** The test shall be conducted three (3) times for each condition. A test condition shall be considered passed only if all three test runs satisfy the applicable evaluation criteria.

Where the Rear Cross Traffic Collision Avoidance function includes automatic braking functionality, the VUT shall stop within the VUT Stop Limit Line during all tests.

In addition, where applicable, if the service brake of the VUT is released and the Rear Cross Traffic Collision Avoidance function detects the TV, generates a warning, and maintains the stopped condition, the requirement shall be considered satisfied.

5.2 Test Procedure

- 5.2.1** The Collision Point Reference Line shall be established at the contact point between the front reference point of the TV and the extension line of the outer tyre contact patches of the front and rear wheels on the side of the VUT first approached by the TV, as illustrated in Figures 1 and 2.

The TV shall be positioned such that:

- the TV driving or riding path is perpendicular to the longitudinal axis of the VUT within a tolerance of $90 \pm 5^\circ$; and
- the distance between the outermost lateral point reference line of the TV and the rear end of the VUT is 1.0 ± 0.1 m.

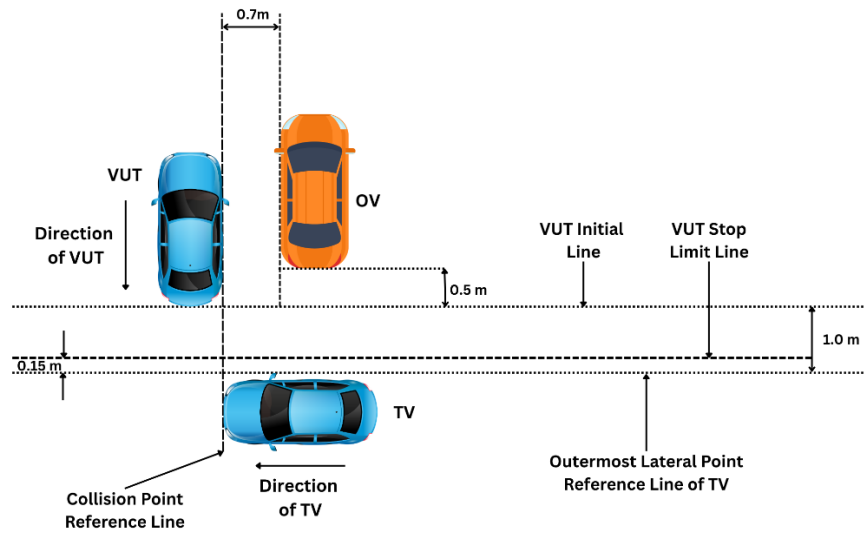


Figure 1: Setting for CRC test configuration showing the Collision Point Reference Line, OV position, and TV driving path

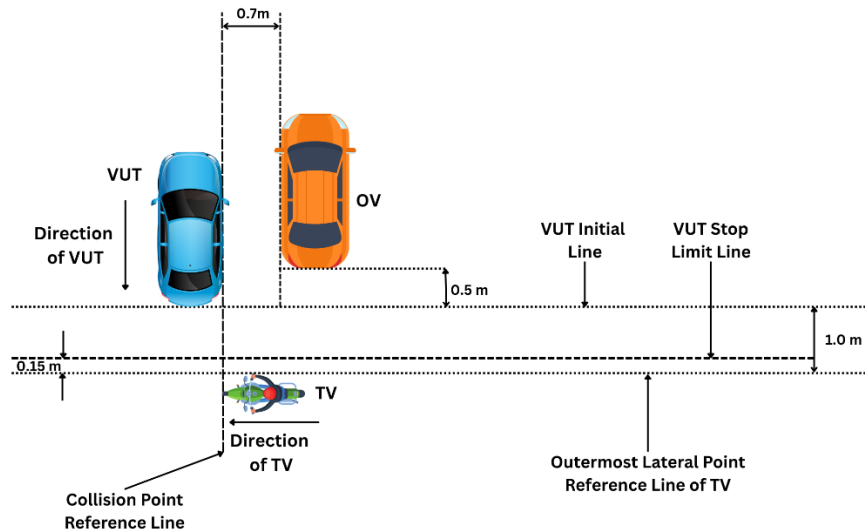


Figure 2: Setting for MRC test configuration showing the Collision Point Reference Line, OV position, and TV driving path

5.2.2 The OV shall be positioned such that:

- the distance between the extension line of the outer side of the VUT wheels and the extension line of the outer side of the OV wheels is 0.7 ± 0.1 m; and
- the distance between the outermost lateral point reference line of the TV and the rear end of the OV is 1.5 ± 0.1 m (see Figures 3 and 4).

5.2.3 The VUT shall be maintained in a stationary condition with the service brake applied and the transmission gear set to “Reverse”.

The TV shall be positioned on the driving or riding path at a point at least 20 m from the Collision Point Reference Line and oriented at an angle of $90 \pm 5^\circ$ relative to the longitudinal axis of the VUT as shown in Figures 3 and 4.

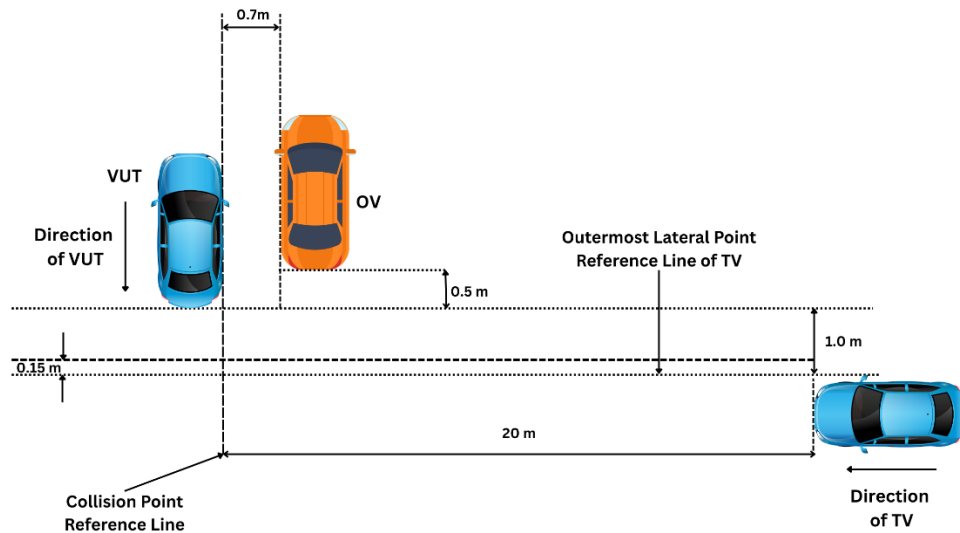


Figure 3: Initial TV position and approach direction for CRC evaluation

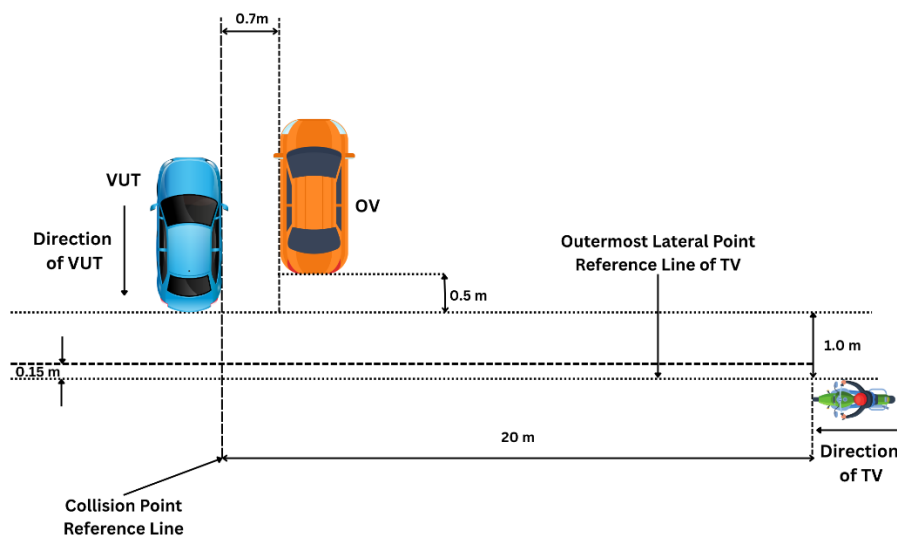


Figure 4: Initial TV position and approach direction for MRC evaluation

- 5.2.4** For vehicles equipped with RCTB, the VUT shall initiate reverse movement by releasing the service brake while the transmission gear remains in “Reverse”.

Where the VUT cannot initiate reverse movement solely by releasing the service brake, the accelerator pedal may be operated within the minimum range necessary to initiate vehicle movement.

No driver braking intervention shall be applied after the VUT begins reversing unless required for safety purposes.

5.2.5 The TV shall be driven toward the VUT from the right side of the VUT (or from the left side for the test specified in Section 5.2.9) at a test speed of 20 ± 1 km/h.

The transmission gear of the TV shall be set to “Drive”. For vehicles equipped with a manual transmission, the highest gear capable of maintaining the required test speed shall be engaged and maintained until completion of the test.

5.2.6 The VUT service brake shall be released when the TV reaches a position at the following distance from the Collision Point:

$$d_{\text{release}} = \left(T_{\text{limit}} \times \frac{20}{3.6} \right) \pm 1.0 \text{ m}$$

where:

- d_{release} is the TV distance from the Collision Point at the moment the VUT service brake is released
- T_{limit} is the VUT Arrival Time, in seconds
- 20 km/h is the nominal TV test speed
- The allowable tolerance for the release position shall be ± 1.0 m.

5.2.7 Testing and data acquisition shall commence when the TV approaches to a distance of 20 ± 0.1 m from the Collision Point.

5.2.8 The following evaluation items shall be verified during the test:

- activation of the Rear Cross Traffic Collision Avoidance System;
- warning generation; and
- maintenance of the braking status, where applicable

5.2.9 For the left rear crossing test scenario (see Figures 5 and 6), the Collision Point setup and OV positions shall be modified accordingly. All procedures specified in Sections 5.2.1 to 5.2.8 shall be repeated with the TV approaching from the left side of the VUT.

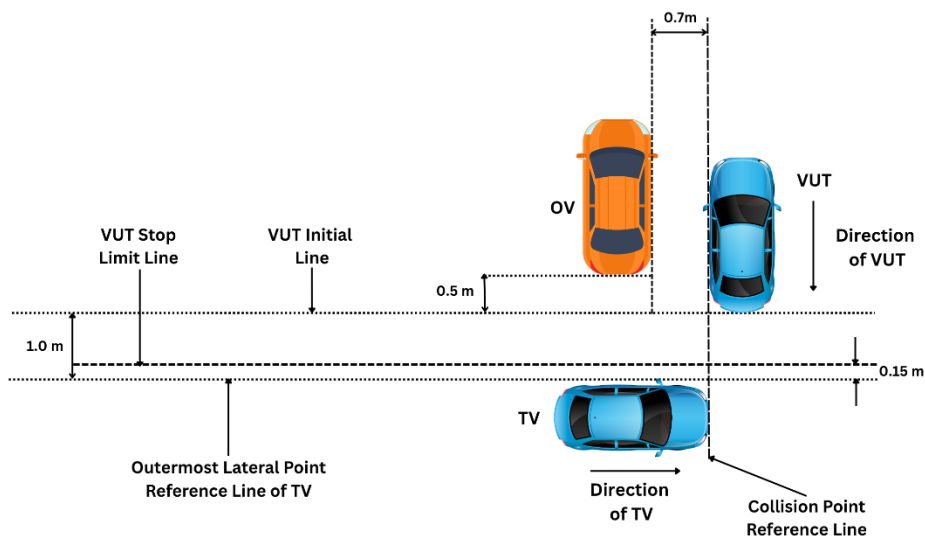


Figure 5: Left rear crossing test scenario for CRC evaluation

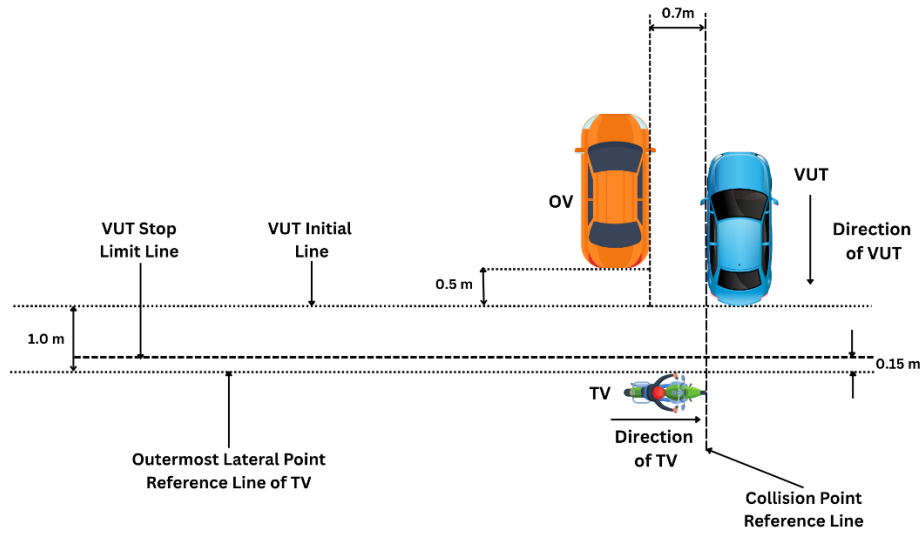


Figure 6: Left rear crossing test scenario for MRC evaluation

5.2.10 The following conditions shall be satisfied during the test.

- The TV speed tolerance shall be within ± 1 km/h.
- The angle between the centerlines of the VUT and the centerline of the TV shall be within $90 \pm 5^\circ$.
- The allowable lateral deviation of the TV driving or riding path shall be within the range of 0 m to +0.5 m, as illustrated in Figures 7 and 8.

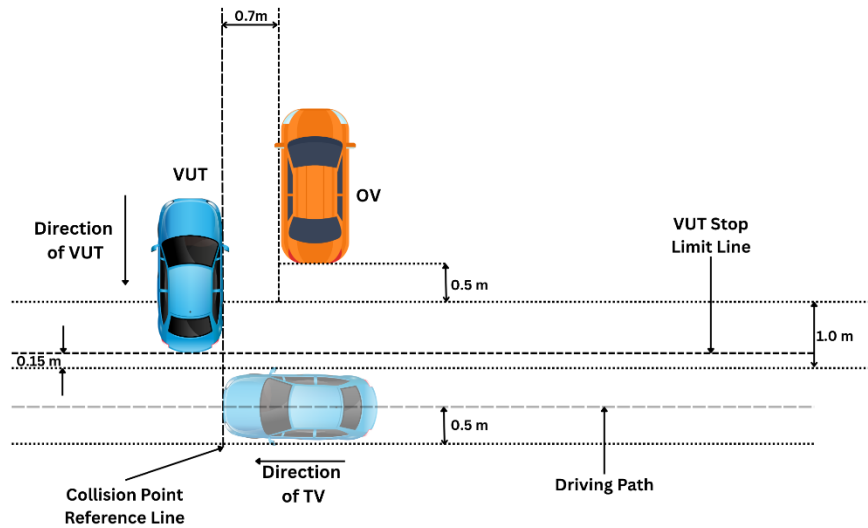


Figure 7: Allowable lateral deviation range of the TV driving path for CRC evaluation

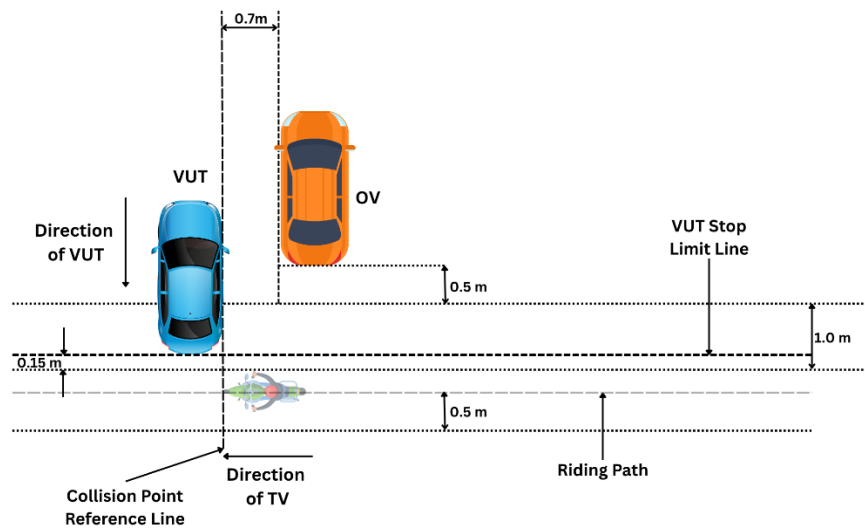


Figure 8: Allowable lateral deviation range of the TV riding path for MRC evaluation

6. Evaluation Method for Rear Cross Traffic Collision Avoidance System

6.1 Test Scoring

If the Rear Cross Traffic Collision Avoidance System under evaluation satisfies:

- the General Requirements specified in Section 3; and
- the Evaluation Criteria specified in Section 5.1,

a score of one (1) point shall be awarded, provided that all required test conditions are satisfied. Failure to satisfy any required test condition shall result in no points being awarded.

6.2 Scoring Applicability for RCTA and/or RCTB Systems

- 6.2.1 The Rear Cross Traffic Collision Avoidance System test item shall carry a maximum score of one (1) point each under SAT and MST, respectively.
- 6.2.2 Vehicles equipped with RCTA shall be evaluated based on compliance with the warning performance requirements specified in this protocol.
- 6.2.3 Where a vehicle is equipped with RCTB, the applicable automatic braking performance may additionally be evaluated and publicly reported by ASEAN NCAP for informational and consumer awareness purposes.
- 6.2.4 The absence of RCTB functionality shall not result in a score deduction, provided that all applicable RCTA performance requirements are satisfied.