Draft

AUTOMOTIVE INDUSTRY STANDARD

Approval of motor vehicles with regard to the Blind Spot Information System for the Detection of Bicycles

Date of hosting on website : 13th June 2022

Approval of motor vehicles with regard to the Blind Spot Information System for the Detection of Bicycles

Contents

		Page
0.	Introduction (for information)	3
1.	Scope	6
2.	Definitions	6
3.	Application for approval	7
4.	Approval	8
5.	Specifications	8
6.	Test procedure	11
7.	Modification of vehicle type and extension of approval	15

Annexes

1	Information on Technical Specifications to be submitted by the vehicle manufacturer	20
2	Procedure to define performance requirements for test cases other than those shown in the test case table	21

Introduction (for information)

0.0 The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the erstwhile Ministry of Surface Transport (MOST) has constituted a permanent Automotive Industry Standards Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India, (ARAI), Pune, being the Secretariat of the AIS Committee, has published this standard. For better dissemination of this information ARAI may publish this document on their web site.

0.1. Turning manoeuvres involving collisions between trucks turning left and cyclists, typically occurring at lower driving speeds or standstill, usually have serious consequences for vulnerable road users (VRU). In the past, the safety of VRU was raised by an improvement of the truck driver's vision by increasing the number of mirrors and by equipping trucks with side underrun protection. Since turning accidents still happen and driver assistance systems have been introduced in a lot of vehicle segments, it is obvious to use such assistance systems for avoiding accidents between turning trucks and cyclists.

0.2. Theoretical considerations show that the criticality of traffic situations involving heavy vehicles and bicycles can be significant due to misunderstanding of the situation be the vehicle operators. In some cases, the increase can occur so suddenly that a high-intensive warning, intended to generate a driver reaction to the situation after an appropriate reaction time, cannot be activated early enough. In general, driver reactions to any information (high or low threshold / warning or information) can be expected only after a reaction time. This response time is much longer than the time required to avoid the accident in many situations – the accident cannot be avoided despite the warning.

0.3. High-intensity warnings during a driving situation are only justified if the probability for an accident is high – otherwise vehicle drivers tend to ignore the system alerts. A (low threshold) informational assistance system, however, can be activated sufficiently early enough, as it helps the driver rather than annoys. It is assumed to be possible to design an human-machine-interface

for blind spot assistance systems in a way that it does not annoy drivers when the information is not needed, for instance by selecting the location of a signal outside of the primary focus area of drivers when looking straight ahead, but in an area that is visible when the gaze is slightly turned towards the planned driving direction. A favourable location that fulfils these requirements is a location approximately 40° off the left from an axis in direction of the vehicle centreline and through the driver's eyepoint.

0.4. Therefore this standard asks for an early activation of an information signal in case a bicycle might be entering a critical area on the passenger side of the vehicle, if the heavy vehicle would initiate a turn towards the bicycle, including situations where a counter-turn (away from the bicycle) is necessary to negotiate the turn. This informational assistance signal shall only be deactivated automatically in case of system failure or contamination of the sensors; a manual deactivation shall not be possible.

0.5. Additionally, standard asks for a different signal which shall be given when the collision becomes unavoidable, e.g. when a clear turn on the steering wheel or the operation of the turn indicators is detected. This additional warning signal may be deactivated manually or automatically; it shall be deactivated together with the information signal in case of failure or sensor contamination.

0.6. The standard defines a test procedure which does not require actual turning manoeuvres; this is acceptable since the information signal needs to be present sufficiently early anyway. Experimental data shows that some turn manoeuvres of heavy vehicles, especially when turning into a narrow street, require a counter-turn that starts approximately 15 m before entering that street, so the test procedure included in this standard requires the information signal to be activated 15 m before the expected collision point.

0.7 This standard allows the Testing Agency to test other, more or less random, parameter combinations that are not laid down in the table 1 in Appendix 1. It is anticipated that the systems will be more robust, but it makes the test procedure also more complex:

To be able to appropriately analyze the pass or fail of the system according to the requirements in paragraph 5, annex 2 is included to calculate pass and fail values. There could, however, be contradicting requirements where an information signal is not allowed for one test case, but is required for another, in the exact same relative positions of bicycle and vehicle, but for different assumed turn radii and impact positions (which are not detectable by the system at the points of information).

Therefore, the evaluation of the criterium "first point of information" is not carried out for these kinds of tests; it shall be considered sufficient if the false information test (traffic sign) is passed."

The AISC panel and Automotive Industry Standards Committee (AISC) responsible for preparation of this standard are given in Annexures *(To be inserted)*

Approval of motor vehicles with regard to the Blind Spot Information System for the Detection of Bicycles

1. Scope

1.1. This standard applies to the blind spot information system of vehicles of categories N_2, N_3, M2 and M3 as specified in IS 14272.

1.2. Based on mutual agreement between testing agency and vehicle manufacturer, the requirements of this standard do not apply to:

1.2.1. off-road vehicles of categories N2G and N3G;

1.2.2. vehicles designed and constructed for special purpose where it is not possible, for practical reasons, to fit such Blind Spot Information System.

2. Definitions

For the purposes of this standard:

2.1. *"Approval of a vehicle type"* means the full procedure whereby a Testing Agency certifies that a vehicle type meets the technical requirements of this standard;

2.2. *"Vehicle type with regard to its Blind Spot Information System"* means a category of vehicles which do not differ in such essential respects as:

(a) The manufacturer's trade name or mark;

(b) Vehicle features which significantly influence the performances of the Blind Spot Information System;

(c) The type and design of the Blind Spot Information System.

2.3. *"Blind Spot Information System (BSIS)"* means a system to inform the driver of a possible collision with a bicycle near side.

2.4. *"Reaction time"* means the time between the information signal is given and a driver reaction has occurred.

2.5. *"Ocular reference point"* means the middle point between two points 65 mm apart and 635 mm vertically above the reference point which is specified in AIS-097 on the driver's seat. The straight line joining the two points runs perpendicular to the vertical longitudinal median plane of the vehicle. The centre of the segment joining the two points is in a vertical longitudinal plane which shall pass through the centre of the driver's designated seating position, as specified by the vehicle manufacturer.

2.6. *"Stopping distance"* means the distance required by the vehicle to come to a full stop after the Blind Spot Information Signal has been given, taking into account reaction time and brake deceleration.

2.7. *"Collision point"* means the position where the trajectory of any vehicle point would intersect with any bicycle points if a turn by the vehicle is initiated.

The theoretical collision point as referred to in Figure 1 of Appendix 1 is the point where a collision would occur in the respective test condition if the vehicle would turn towards the bicycle, e.g. starting with a counter-steer manoeuvre at the last point of information. Note that the actual turning manoeuvre is not tested since the information is required to be given before turn initiation.

2.8. *"Last Point of Information (LPI)"* means the point at which the information signal shall have been given. It is the point preceding the expected turning motion of a vehicle towards a bicycle in situations where a collision could occur.

2.9. *"Near side"* means the side of the vehicle near the bicycle. The near side of the vehicle is the left side.

2.10. *"Information signal"* means an optical signal with the purpose of informing the vehicle driver about a nearby moving bicycle.

2.11. *"Vehicle Trajectory"* means the connection of all positions where the vehicle front left corner has been or will be during the test run.

2.12. "*Bicycle*" means a combination of a bicycle and cyclist. This is simulated in test cases as specified in paragraphs 6.5. and 6.6. below with a test device according to ISO [CD] 19206-4. The reference point for the location of the bicycle shall be the most forward point on the centreline of the bicycle.

2.13. "*Common space*" means an area on which two or more information functions (e.g. symbols) may be displayed, but not simultaneously

2.14 "*Lateral separation*" means the distance between the vehicle and the bicycle at the near side of the vehicle where the vehicle and bicycle are parallel to each other. The distance is measured between the plane parallel to the median longitudinal plane of the vehicle and touching its lateral outer edge, disregarding the projection of devices for indirect vision, and the median longitudinal plane of the bicycle minus half of the bicycle width being 250 mm. The lateral outer edge of the vehicle is only to be regarded in the area between the vehicle's foremost point and up to 6 m rearward.

2.15. "*First point of information*" means the most forward point at which the information signal can be given. It is the last point of information and a distance corresponding to a travel time of 4 seconds, taking into account the moving speed of the vehicle plus an additional distance if the impact position is lower than 6 m.

2.16 "*Vehicle front left corner*" means the projection of the point that results from the intersection of the vehicle side plane (not including devices for indirect vision) and the vehicle front plane (not including devices for indirect vision and any part of the vehicle which is more than 2.0 m above the ground) on the road surface."

2.17. "*Impact Position"* means the location of impact of the bicycle on the left side of the vehicle with respect to the vehicle front left corner, when both vehicles have reached the collision point, as specified in Appendix 1, Figure 3.

2.18. *"Vehicle Master Control Switch"* means the device by which the vehicle's on-board electronics system is brought, from being switched off, as in the case

where a vehicle is parked without the driver being present, to normal operation mode.

3. Application for approval

3.1. The application for approval of a vehicle type with regard to the BSIS shall be submitted by the vehicle manufacturer or by their authorized representative.

3.2. It shall be accompanied by the documents mentioned below ~~in triplicate and include the following particular~~:

3.2.1. A description of the vehicle type with regard to the items mentioned in paragraph 5. below, together with dimensional drawings and the documentation as referred to in paragraph 6.1. below. ~~The numbers and/or symbols identifying the vehicle type shall be specified.~~

3.3. A vehicle representative of the vehicle type to be approved shall be submitted to the Testing Agency conducting the approval tests.

4. Approval

4.1. If the vehicle type submitted for approval pursuant to this standard meets the requirements of paragraph 5. below, approval of that vehicle type shall be granted.

~~4.2.~~ ~~The conformity of the requirements in paragraph 5. below shall be verified with the test procedure as defined in paragraph 6. below, however its operation shall not be limited to these test conditions.~~

~~4.3.~~ ~~An approval number shall be assigned to each vehicle type approved;~~

5. Specifications

5.1. Any vehicle fitted with a BSIS complying with the definition of paragraph 2.3. above shall meet the requirements contained in paragraphs 5.2. to 5.7. of this standard.

5.2. General requirements

5.2.1. ~~The effectiveness of the BSIS shall not be adversely affected by magnetic or electrical fields. This shall be demonstrated by compliance with the technical requirements of AIS-004 (Part 3)~~ *The effectiveness of BSIS with respect to EMI/EMC shall be demonstrated by fulfilling the technical requirements of AIS-004 (Part 3) as amended from time to time.*

5.2.2. With the exception of BSIS external elements which are part of another device subject to specific protrusion requirements, BSIS external elements may protrude up to 100 mm beyond the width of the vehicle."

5.3. Performance requirements

5.3.1. The BSIS shall inform the driver about nearby bicycles that might be endangered during a potential turn, by means of an optical signal, so that the vehicle can be stopped before crossing the bicycle trajectory.

It shall also inform the driver about approaching bicycles while the vehicle is stationary before the bicycle reaches the vehicle front, taking into account a reaction time of 1.4 seconds. This shall be tested according to paragraph 6.6.

The BSIS shall warn the driver, by means of an optical signal, acoustical signal, haptic signal or any combination of these signals, when the risk of a collision increases.

An optical information signal shall be maintained only for as long as the conditions specified in paragraph 5.3.1.4. below are fulfilled. For vehicles of categories N_2 with a technically permissible maximum mass exceeding 8 tonnes, N_3 and M_3 the deactivation of the information signal as a result of the vehicle turning away from the bicycle trajectory is not allowed as long as a collision between vehicle and bicycle is still possible, in case the driver would steer back towards the bicycle trajectory."

5.3.1.1. The information signal shall meet the requirements as defined in paragraph 5.4. below.

5.3.1.2. The warning signal shall meet the requirements of paragraph 5.5. below. It may be deactivated manually. In the case of a manual deactivation, it shall be reactivated upon each activation of the vehicle master control switch.

5.3.1.3. The BSIS shall at least operate for all forward vehicle speeds from standstill to 30 km/h, for ambient light conditions above 15 Lux.

5.3.1.4 The BSIS shall give an information signal at last point of information, for a bicycle moving with a speed between 5 km/h and 20 km/h, at a lateral separation between bicycle and vehicle of between 0.9 and 4.25 metres, which could result in a collision between bicycle and vehicle with an impact position 0 to 6 m with respect to the vehicle front left corner, if typical steering motion would be applied by the vehicle driver.

The information signal shall not be visible before the first point of information. It shall be given between the first point of information and the last point of information.

It shall also give an information signal if a bicycle is moving with a speed between 5 km/h and 20 km/h, at a lateral separation of between 0.25 m up to 0.9 m and longitudinally located between -0.6 m and +0.6 m in reference to the centre of the most forward front wheel while driving straight.

However, the information signal is not required when the relative longitudinal distance between bicycle and front left corner of the vehicle is more than 30 m to the rear or 7 m to the front."

5.3.1.4.1. For vehicles of categories N_2 with a technically permissible maximum mass not exceeding 8 tons and M_2 the Blind Spot Information signal shall be activated for a bicycle target moving longitudinally forward with a speed between 5 km/h and 20 km/h, entering in the zone as specified in paragraph 6.5.11. when the vehicle is moving forward.

5.3.1.4.2. In addition, the Blind Spot Information signal shall be activated for a bicycle target moving longitudinally forward with a speed between 5 km/h and 20 km/h from the rear entering the zone as specified in paragraph 6.6.3. when the vehicle is stationary. In such case, the information signal shall be maintained as long as the bicycle is in the defined zone or as long as it would be in the zone considering a constant speed of the bicycle target until it reaches the front

left corner of the vehicle. The constant speed is based on the speed of the bicyclist when entering the zone."

5.3.1.5. The vehicle manufacturer shall ensure that the number of false-positive warnings due to the detection of static non-VRU objects such as ~~cones~~ ***markers***, traffic signs, hedges and parked cars shall be minimized. However it may give an information signal when a collision is imminent.

5.3.1.6. The BSIS shall automatically deactivate if it cannot operate properly due to its sensoring devices being contaminated by ice, snow, mud, dirt or similar material or due to ambient light conditions below those specified in paragraph 5.3.1.3. This shall be indicated as specified in paragraph 5.6.2. It shall automatically reactivate when the contamination disappears and normal function has been verified. This shall be tested in accordance with the provisions of paragraph 6.9. below.

5.3.1.7. The BSIS also shall provide the driver with a failure warning when there is a failure in the BSIS that prevents the requirements of this standard from being met. The warning shall be as specified in paragraph 5.6.1. This shall be tested in accordance with the provisions of paragraph 6.8. below (failure detection test).

5.3.2. The manufacturer shall demonstrate, to the satisfaction of the Testing Agency, through the use of documentation, simulation or any other means, that the BSIS is performing as specified also for smaller bicycles and smaller bicyclists, differing by not more than 36 per cent from the values detailed in ISO [CD] 19206-4: ~~2018~~ *2020*.

5.4. Information signal

5.4.1. The blind spot information referred to in paragraph 5.3.1.1. above shall be an information signal that is noticeable and easily verifiable by the driver from the driver's seat. This information signal shall be visible by daylight and at night.

5.4.2. The device emitting the information signal shall be located at the near side at a horizontal angle greater than 30° towards an axis parallel to the longitudinal median plane of the vehicle and going through the ocular reference point. If the driver's seating position is located on the near side of the vehicle, this value may be reduced.

5.5. Warning signal

5.5.1. The warning signal referred to in paragraph 5.3.1.2. above shall be a signal differing, e.g. in mode or activation strategy, from the information signal specified in paragraph 5.4.

5.5.2. It shall be easily understandable for the driver to relate the warning signal to the potential collision. In case the warning signal is an optical signal this signal shall also be visible by daylight and at night.

5.5.3. The warning signal shall be activated at the earliest when the system detects a potential collision, e.g. by the intention of a turn towards the bicycle, e.g. by evaluating the distance between or trajectory intersection of vehicle and bicycle, direction indicator activation or similar. The strategy shall be

explained in the information referred to in paragraph 6.1. It shall not depend solely on the activation of the direction indicator.

The Testing Agency shall verify the operation of the system according to the strategy.

5.5.4 The warning signal referred to in paragraph 5.3.1. is not required for vehicles of categories N_2 with a technically permissible maximum mass not exceeding 8 tonnes and M_2.

5.6. Failure warning signals

5.6.1. The failure warning referred to in paragraph 5.3.1.7. above shall be a yellow optical warning signal, and shall be other than or clearly distinguishable from the information signal. The failure warning signal shall be visible by daylight and night, and shall be easily verifiable by the driver from the driver's seat.

5.6.2. The optical warning signal referred to in paragraph 5.3.1.6. shall indicate that the BSIS is temporarily not available. It shall remain active as long as the BSIS is not available. The failure warning signal specified in paragraph 5.3.1.7. above may be used for this purpose.

5.6.3. The BSIS optical failure warning signals shall be activated with the activation of the vehicle master control switch. This requirement does not apply to warning signals shown in a common space.

5.7. Provisions for inspection

5.7.1. It shall be possible to confirm the correct operational status of the BSIS by a visible observation of the failure warning signal status.

6. Test procedure

6.1. The manufacturer shall provide a documentation package which gives access to the basic design of the system and, if applicable, the means by which it is linked to other vehicle systems. The function of the system including its sensing and warning strategy shall be explained and the documentation shall describe how the operational status of the system is checked, whether there is an influence on other vehicle systems, and the method(s) used in establishing the situations which will result in a failure warning signal being displayed. The documentation package shall give sufficient information for the Testing Agency to identify the type of and to aid the decision-making on the selection of worst-case conditions.

6.2. Test conditions

6.2.1. The test shall be performed on a flat**,** dry asphalt or a concrete surface.

6.2.2. The ambient temperature shall be between 0° C and 45° C *or as mutually agreed between vehicle manufacturer and test agency.*

6.2.3. The test shall be performed under visibility conditions that allow safe driving at the required test speed.

6.3. Vehicle conditions

6.3.1. Test weight

The vehicle may be tested at any condition of load, the distribution of the mass among the axles shall be stated by the vehicle manufacturer without exceeding

any of the maximum permissible mass for each axle. No alteration shall be made once the test procedure has begun. The vehicle manufacturer shall demonstrate through the use of documentation that the system works at all conditions of load.

6.3.2. The vehicle shall be tested at the tyre pressures for normal running conditions.

6.3.3. In the case where the BSIS is equipped with a user-adjustable information timing, the test as specified in paragraphs 6.5. and 6.6. below shall be performed for each test case with the information threshold set at the settings that generate the information signal closest to the collision point, i.e. worst case setting. No alteration shall be made once the test run has started.

6.4. Optical failure warning signals verification test

6.4.1. With the vehicle stationary check that the warning signals comply with the requirements of paragraph 5.6. above.

6.4.2. With the vehicle stationary, activate the information and warning signals as specified in paragraphs 5.4. and 5.5. and verify that the signals comply with the requirements specified in those paragraphs.

6.5. Blind Spot Information Dynamic Test

6.5.1. Using markers and the bicycle dummy, form a corridor according to Figure 1 in Appendix 1 to this standard and the additional dimensions as specified in Table 1 of Appendix 1 to this standard."

6.5.2. Position the bicycle target at the appropriate starting position as shown in Figure 1 of Appendix 1 to this standard.

6.5.3. Position a local traffic sign corresponding to sign C14 as defined in the Vienna convention on road signs and signals[1] (speed limit 50 km/h) or the local sign closest to this sign in meaning on a pole at the entry of the corridor which as shown in Figure 1 of Appendix 1 to this standard. The lowest point of the sign shall be located at 2 m above the test track surface.

6.5.4. Drive the vehicle at a speed as shown in Table 1 of Appendix 1 to this standard with a tolerance of ±2 km/h through the corridor.

6.5.5. Do not operate the direction indicators during the test.

6.5.6. Put the dummy on the starting point as showed in Figure 1 of Appendix 1 to this standard. The dummy shall be moved along a straight line as showed in Figure 1 of Appendix 1. The acceleration of the dummy shall be such that the dummy shall have reached the speed for the actual test case, as shown in Table 1, after a distance of not more than 5.66 m and after the acceleration the dummy shall move in a steady pace for at least 8 seconds with a speed tolerance of ±0.5 km/h. The dummy shall cross line A (Figure 1 of Appendix 1) with a tolerance of ±0.5 m at the same time as the vehicle cross line B (Figure 1 of Appendix 1) with a tolerance of ±0.5 m.

1 *See ECE/TRANS/196, para. 91 on the Convention on Road Signs and Signals of 1968 European Agreement Supplementing the Convention and Protocol on Road Markings, Additional to the European Agreement.*

If the acceleration distance cannot be achieved, adjust bicycle starting position and vehicle corridor length by the same amount.

The lateral deviation of the dummy with respect to a straight line connecting initial starting position and theoretical collision point (as defined in Figure 1 of Appendix 1) shall be maximum ±0.2 m.

6.5.7. Verify if the Blind Spot Information signal has been activated before the vehicle crosses line C in Figure 1 of Appendix 1 to this standard, and if the Blind Spot Information signal has not been activated before the vehicle crosses line D in Figure 1.

6.5.8. Verify that the Blind Spot Information signal has not been activated when passing the traffic sign and any markers as long as the bicycle dummy is still stationary.

6.5.9. Repeat paragraphs 6.5.1. to 6.5.8. for test cases shown in Table 1 of Appendix 1 to this standard.

Where this is deemed justified, the Testing Agency may select additional test cases different than shown in Table 1 of Appendix 1, within the range of vehicle speed, bicycle speed and lateral clearance as indicated in paragraphs 5.3.1.3. and 5.3.1.4.

The Testing Agency shall check that the parameter combination in the selected test cases would lead to a collision between the bicycle and the vehicle with an impact position in the range as specified in paragraph 5.3.1.4. and shall assure that the vehicle is moving with the selected speed when crossing line C in Figure 1 of Annex 1 by appropriately adjusting starting distances and corridor length for the vehicle and the bicycle.

The criterium "first point of information" is deemed to be complied with when test cases other than those from table 1 in Appendix 1 to this standard are carried out.

6.5.10. The test is passed when the Blind Spot Information signal has been activated in all test cases as shown in Table 1 of Appendix 1 to this standard before the foremost point of the vehicle has reached line C but not before the foremost point of the vehicle has reached line D (see paragraph 6.5.7. above, where line D is only relevant for test cases taken from Table 1 of Appendix 1) and the Blind Spot Information signal has not been activated in any test run when the vehicle passes the traffic sign (see paragraph 6.5.8. above). However, the information signal is not required when the relative longitudinal distance between bicycle and front left corner of the vehicle is more than 30 m to the rear or 7 m to the front.

For vehicle speeds up to 5 km/h, it is deemed satisfactory if the information signal is activated 1.4 seconds before the bicycle has reached the theoretical collision point as specified in Appendix 1, Figure 1.

For vehicle speeds above 25 km/h, where the stopping distance is higher than 15 m, d_c as specified in Appendix 1, Figure 1 shall be as specified in Appendix 1, Table 2."

6.5.11. Vehicles of categories N_2 with a technically permissible maximum mass not exceeding 8 tonnes and M_2 are deemed to meet the requirements of paragraph 6.5. if the Blind Spot Information signal has been activated when the bicycle target is moving forward as specified in paragraph 5.3.1.4.1. and entering a

zone on the nearside of the moving vehicle. In such case, the specification of the relevant zone and the activation of the information signal shall be in accordance with the manufacturer's specifications. These specifications shall however cover both the entry from the front and from the rear of the manufacturer defined zone."

6.6. Blind Spot Information Static Tests

6.6.1. Static Test Type 1

Leave the vehicle under test stationary. Then manoeuvre the bicycle dummy perpendicular to the longitudinal median plane of the vehicle with an impact position 1.15 m in front of the most forward point of the vehicle, with a speed of 5 ± 0.5 km/h and a lateral tolerance of 0.2 m, as shown in Figure 2 in Appendix 1.

The test is passed if the Blind Spot Information signal is activated at the latest when the distance between bicycle and vehicle is 2 m.

6.6.2. Static Test Type 2

Leave the vehicle under test stationary. Then manoeuvre the bicycle dummy parallel to the longitudinal median plane of the vehicle, with a lateral separation of 2.75 ± 0.2 m, with a bicycle speed of 20 ± 0.5 km/h, as shown in Figure 2 of Appendix 1. The bicycle should be at constant speed at least 44 m before passing the most forward vehicle point.

The test is passed if the Blind Spot information signal is activated at the latest when the bicycle is 7.77 m away from the projection of the vehicle's most forward point to the bicycle line of movement.

6.6.3. Vehicles of categories N_2 with a technically permissible maximum mass not exceeding 8 tonnes and M_2 are deemed to meet the requirements of paragraph 6.6. if the Blind Spot Information signal has been activated when the bicycle target is entering longitudinally forward from the rear into a zone adjacent to the vehicle. The zone shall cover a lateral separation between bicycle and vehicle of 0.9 to 3.0 meters and from the vehicle front left corner to the rear of the vehicle. In such case the activation shall occur before the entire bicycle target has entered the zone.

6.7. The manufacturer shall demonstrate, to the satisfaction of the Testing Agency, through the use of documentation, simulation or any other means, that the Blind Spot Information signal is not activated, as described in paragraph 6.5.10., when the vehicle passes any other usual stationary object than the traffic sign. In particular, parked cars and traffic ~~cones~~ ***markers*** shall be addressed.

6.8. Failure detection test

6.8.1. Simulate a BSIS failure, for example by disconnecting the power source to any BSIS component or disconnecting any electrical connection between BSIS components. The electrical connections for the failure warning signal of paragraph 5.6.1. above shall not be disconnected when simulating a BSIS failure.

6.8.2. The failure warning signal mentioned in paragraph 5.3.1.7. above and specified in paragraph 5.6.1. shall be activated and remain activated while the vehicle is being driven and be reactivated upon each activation of the vehicle master control switch as long as the simulated failure exists.

6.9. Automatic deactivation test

6.9.1. Contaminate any of the system's sensing devices completely with a substance comparable to snow, ice or mud (e.g. based on water). The BSIS shall automatically deactivate, indicating this condition as specified in paragraph 5.6.2.

6.9.2. Remove any contamination from the system's sensing devices completely and perform a reactivation of the vehicle master control switch. The BSIS shall automatically reactivate after a driving time not exceeding 60 seconds.

7. Modification of vehicle type and extension of approval

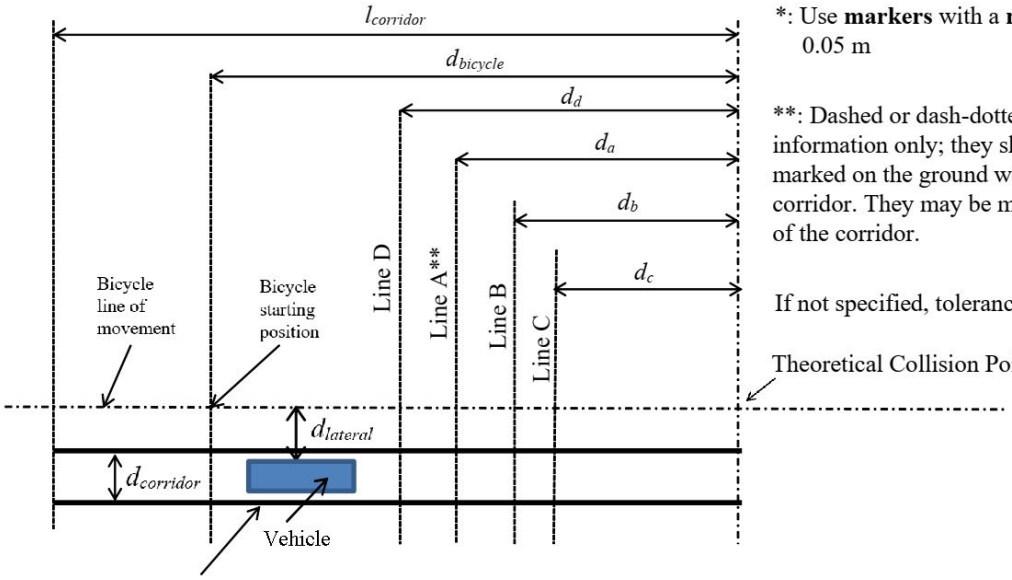
7.1. Every modification of the vehicle type as defined in paragraph 2.2. of this standard shall be notified to the Testing Agency which approved the vehicle type. The Testing Agency may then either:

7.1.1. Consider that the modifications made do not have an adverse effect on the conditions of the granting of the approval and grant an extension of approval;

7.1.2. Consider that the modifications made affect the conditions of the granting of the approval and require further tests or additional checks before granting an extension of approval.

Appendix 1

Figure 1
Dynamic tests



*: Use **markers** with a **max.** height of 0.05 m

**: Dashed or dash-dotted lines are for information only; they should not be marked on the ground within the corridor. They may be marked outside of the corridor.

If not specified, tolerances are +/- 0.1 m

Mark corridor using markers *, spacing not more than 5 m

Figure 2
Static tests

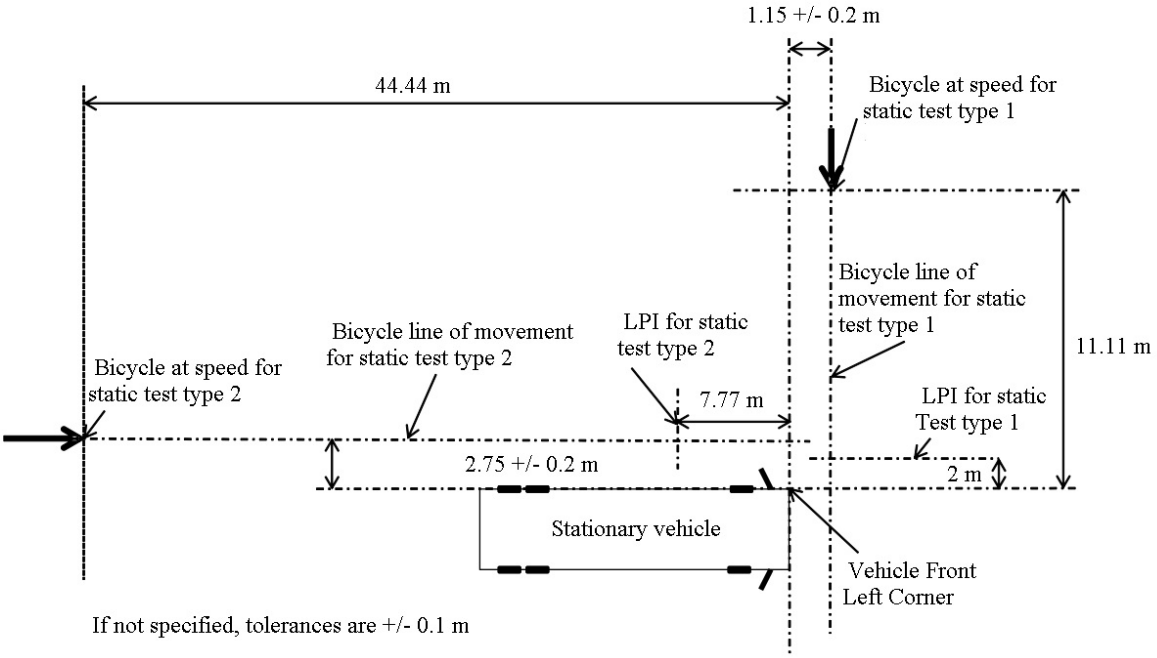


Figure 3
Impact location

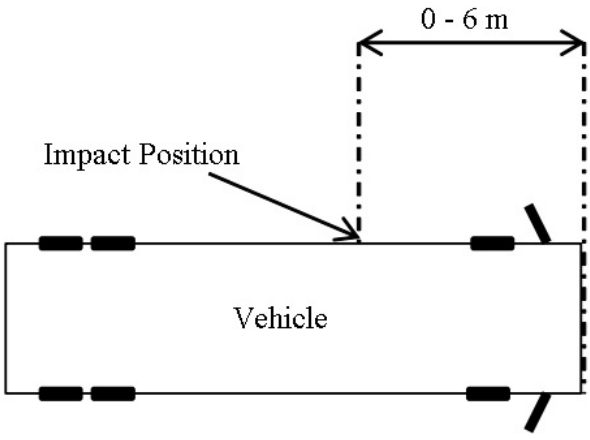


Table 1
Test cases

The following table details the test cases, using the following variables:

$v_{vehicle}$	steady-state velocity of vehicle
$v_{bicycle}$	steady-state velocity of bicycle
d_a	bicycle position when vehicle crosses line b
d_b	vehicle position when bicycle crosses line a
d_c	vehicle position at last point of information
d_d	vehicle position at first point of information (d_c+(6m-Impact Position)+11.11 m for vehicle speeds of 10 km/h and d_c+(6m-Impact Position)+22.22 m for vehicle speeds of 20 km/h)
$d_{bicycle}$	starting position of bicycle
$l_{corridor}$	length of vehicle corridor
$d_{corridor}$	width of vehicle corridor
$d_{lateral}$	lateral separation between bicycle and vehicle

The following variables do not specify test cases, but are given for information only (not influencing test parameters):

(a) Impact position [m], this specifies the impact position for which the values of d_a and d_b in Table 1 have been calculated (d_d is always calculated for either an impact position of 6 m or start of synchronized movement, in case of same speeds for vehicles and bicycle);

(b) Turn radius [m], this specifies the turn radius for which the values of d_a and d_b in Table 1 have been calculated.

Test Case	$v_{bicyclee}$ *[km/h]*	$v_{Vehicle}$ *[km/h]*	$d_{lateral}$ *[m]*	d_a *[m]*	d_b *[m]*	d_c *[m]*	d_d *[m]*	$d_{bicycle}$ *[m]*	$l_{corridor}$ *[m]*	$d_{corridor}$ *[m]*	*For information only (not influencing test parameters)*	
											Impact Position [m]	*Turn Radius [m]*
1	20	10	1.25	44.4	15.8	15	26.1	65	80	vehicle width + 1 m	6	5
2	20	10			22	15	38.4				0	10
3	20	20			38.3	38.3	-				6	25
4	10	20	4.25	22.2	43.5	15	37.2				0	25
5	10	10			19.8	19.8	-				0	5
6	20	10		44.4	14.7	15	28				6	10
7					17.7		34				3	10

Table 2
d_c for speeds above 25 km/h

Vehicle Speed [km/h]	*d_c [m]*
25	15
26	15.33
27	16.13
28	16.94
29	17.77
30	18.61

Annex 1

Information on Technical Specifications to be submitted by the vehicle manufacturer

1. Trademark: .....
2. Type and trade name(s): .....
3. Name and address of manufacturer: .....
4. If applicable, name and address of manufacturer's representative: .....
5. Brief description ~~of vehicle~~ *working of BSIS System*:: .....
6. ~~Date of submission of vehicle for approval:~~ .....

7. AIS 004 (Part 3) Compliance Report for BSIS……..: .....
9. Type of warning used (i.e. acoustic, optical, Haptic or any combination)….

10. Category of the vehicle ……
11. Model Name……..
10. GVW….
11. Axle Weight Distribution in GVW (FAW and RAW) considering test load condition…..
12. Part Number, Model and Make of BSIS System…..
13. Installation Drawing of BSIS System considering test load condition……
14. Recommended Tyre Pressure…..
15. Documentary evidences as per Clause No. 5.3.2, 6.1 and 6.7….

Annex 2
Procedure to define performance requirements for test cases other than those shown in the test case table

According to paragraph 6.5.9., the Testing Agency may test other test cases than those shown in Table 1, Appendix 1. In this case, the Testing Agency is obliged to verify that the selected parameter combination would lead to a critical situation. As a guidance for this, the following procedure assists in specifying the performance requirements.

d_a – the value d_a is used for synchronization between vehicle and bicycle movement. It is computed by multiplying 8 seconds of constant speed travel with the bicycle speed as specified in the table:

$$d_{\mathrm{a}} = 8\mathrm{s} \cdot v_{\mathrm{Bicycle}}$$

d_b – the value d_b is used for synchronization between vehicle and bicycle movement. It is composed of three parts. The first part corresponds to 8 seconds of constant travel of the truck:

$$d_{\mathrm{b,1}} = 8\mathrm{s} \cdot v_{\mathrm{Vehicle}}$$

The second part shifts the synchronization by taking into account the impact position of the bicycle. It is given using the Impact Location L:

$$d_{\mathrm{b,2}} = L$$

The third part then takes into account the longer travel of the truck due to negotiating a constant radius turn towards the collision point rather than just going straight ahead as the bicycle does.

The turn segment is approximated by a constant radius circle that ends as soon as the desired lateral displacement is achieved. Therefore d_b needs to be shifted by the difference distance between straight and turning.

It can be calculated using the turn radius R, the lateral displacement $Y=d_{\mathrm{lateral}}$ + 0.25 m (distance bicycle centreline to vehicle edge) and the impact location L.

$$d_{\mathrm{b,3}} = R \cdot \cos^{-1}\left(\frac{R-Y}{R}\right) - \sqrt{R^2-(R-Y)^2}$$

The final value for d_b is $d_{\mathrm{b,1}}$ minus the other two parts $d_{\mathrm{b,2}}$ and $d_{\mathrm{b,3}}$:

$$d_b = 8\mathrm{s} \cdot v_{\mathrm{Vehicle}} - L - R\ \cos^{-1}\left(\frac{R-Y}{R}\right) + \sqrt{R^2-(R-Y)^2}$$

The value d_c defines the last point of information. For vehicle speeds of 10 km/h and higher, it is the maximum of two values:

the first value has been derived from physical test runs and characterizes at what distance from the collision point the heavy vehicle turn is started at the earliest and by turning towards the outside, the value is:

15 m.

The second value is the stopping distance, considering reaction time and the brake deceleration *a*, using the parameters deceleration and reaction time (5 m/s² and 1.4 seconds, respectively):

$$d_{\text{Stop}} = v_{\text{vehicle}} \cdot t_{\text{react}} + \frac{v_{\text{Vehicle}}^2}{2\,|a|}$$

Therefore, d_c is defined by

$$d_c = MAX\left(15\text{ m}; v_{\text{vehicle}} \cdot t_{\text{react}} + \frac{v_{\text{Vehicle}}^2}{2\,|a|}\right)$$

For vehicle speeds below 5 km/h, it is sufficient if the information signal is given at a distance corresponding to a TTC value of 1.4 seconds (similar to the static tests).