Finalised Draft

AUTOMOTIVE INDUSTRY STANDARD

Approval of motor vehicles with regard to the Moving Off Information System for the Detection of Pedestrians and Cyclists

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Approval of motor vehicles with regard to the Moving Off Information System for the Detection of Pedestrians and Cyclists

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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. Low-speed moving off from rest manoeuvres that involve collisions between M_2, M_3, N_2 and N_3 vehicle category vehicles (subject vehicles) and pedestrians and cyclists have serious consequences for these vulnerable road users (VRUs). In the past, VRU safety was raised by increasing the number of mirrors to provide better visibility of the area in front of the vehicle. Since collisions with these characteristics still occur and advanced driver assistance systems have been introduced in a lot of vehicle segments, it is obvious to use such assistance systems for avoiding accidents between subject vehicles and VRUs.

0.2. Theoretical considerations show that the criticality of traffic situations that involve subject vehicles and VRUs can be significant due to the misunderstandings of the situation by the vehicle operators. In some cases, the increase in situation criticality can occur so suddenly that high-urgency warnings, intended to generate a driver reaction to the situation, cannot be activated early enough for the driver to react in time. In general, driver reactions to any information (high/low urgency signals) can be expected only after a certain reaction time. This response time, particularly during close-proximity manoeuvres, 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-urgency warnings during a driving situation are only justified should the probability for an accident be high – otherwise vehicle drivers tend to ignore the system alerts. Should lower urgency information signals be activated sufficiently early, however, it may help the driver rather than annoy them. It is assumed to be possible to design a human-machine interface (HMI) for moving-off driver assistance systems in a way that it does not annoy drivers when the information is not needed, for instance by requiring the use of a less intrusive signal mode.

0.4. Therefore, this standard requires the activation of a proximity information signal in case pedestrians or cyclists enter the critical blind spot area in front of the vehicle, should the subject vehicle either be preparing to move off from rest in a straight line or be travelling straight ahead at low-speeds. This signal shall be deactivated automatically in case of system failure or contamination of the sensors, whilst manual deactivation may also be possible through a sequence of actions by the driver to avoid unintentional deactivation.

0.5. Furthermore, this standard asks for an additional signal, which shall be given when the collision becomes imminent, e.g. when the vehicle accelerates from rest and the pedestrian or cyclist is located directly in front of the vehicle. The activation and deactivation strategy for this collision warning signal may be determined by the manufacturer; however, in case of system failure or sensor contamination, the proximity information signal and collision warning signal shall be deactivated together.

0.6. This standard defines a test procedure based on subject vehicles that are stationary, moving-off from rest and moving ahead at low-speeds in a straight line for speeds of 10 km/h or less. Collision analysis data shows that the provision of information and warnings during these vehicle manoeuvres is appropriate since the information signal needs to be present sufficiently early to alert the driver of pedestrians and cyclists in close-proximity to the front end of the vehicle.

0.7. This standard cannot cover all the traffic conditions and infrastructure features in the type-approval process; this standard recognises that the performances required in this standard cannot be achieved in all conditions (vehicle condition, road environment, weather conditions and traffic scenarios etc. may affect the system performances). Actual conditions and features in the real world should not result in false warnings to the extent that they encourage the driver to switch the system off.

The AISC panel and Automotive Industry Standards Committee (AISC) responsible for preparation of this standard are given in Annex 3 and 4.

Approval of motor vehicles with regard to the Moving Off Information System for the Detection of Pedestrians and Cyclists

1. Scope

1.1. This standard applies to the approval of vehicles of categories M_2, M_3, N_2 and N_3 as specified in IS 14272 with regard to an onboard system to detect and inform the driver of the presence of pedestrians and cyclists in the close-proximity forward blind-spot of the vehicle and, if deemed necessary based on manufacturer strategy, warn the driver of a potential collision.

1.2. The following vehicles of category M and N shall be exempted from this standard:

Vehicles where installation of any device for moving off information system is incompatible with their on-road use may be partly or fully exempted from this standard, subject to the decision of the Testing Agency.

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

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

1.3.2. vehicles designed and constructed for special purpose where it is not possible, for practical reasons, to fit such Moving Off Information System.

2. Definitions

For the purposes of this standard:

2.1. **"Moving Off Information System (MOIS)"** means a system to detect and inform the driver of the presence of pedestrians and cyclists in the close-proximity forward blind-spot of the vehicle and, if deemed necessary based on manufacturer strategy, warn the driver of a potential collision.

2.2. **"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.

2.3. **"Vehicle type with regard to its Moving Off 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 MOIS;

(c) The type and design of the MOIS.

2.4. **"Subject vehicle"** means the vehicle being tested.

2.5. **"Vulnerable Road User (VRU)"** means an adult or child pedestrian or an adult or child cyclist.

2.6. **"Information signal"** means a signal emitted by the MOIS with the purpose of informing the vehicle driver about a VRU in close-proximity to the front of the vehicle.

2.7. **"Collision warning signal"** means a signal emitted by the MOIS with the purpose of warning the vehicle driver when the MOIS has detected a potential frontal collision with a VRU in close-proximity to the front of the vehicle.

2.8. **"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 a normal operation mode.

2.9. **"Initialisation"** means the process of setting-up the operation of the MOIS after the vehicle master control switch is activated until it is fully functional.

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

2.11. **"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.

2.12. **"Vehicle front"** means the plane perpendicular to the median longitudinal plane of the vehicle and touching its foremost point, disregarding the projection of devices for indirect vision and any part of the vehicle greater than 2.0 m above the ground.

2.13. **"Nearside"** means the left side of the vehicle.

2.14. **"Nearside vehicle plane"** means the plane parallel to the median longitudinal plane of the vehicle and touching its most outboard point in the nearside direction forward of the driver ocular reference point, disregarding the projection of devices for indirect vision and any part of the subject vehicle higher than 2.0 m above the ground.

2.15. **"Offside"** means the right side of the vehicle

2.16. **"Offside vehicle plane"** means the plane parallel to the median longitudinal plane of the vehicle and touching its most outboard point in the offside direction forward of the driver ocular reference point, disregarding the projection of devices for indirect vision and any part of the subject vehicle higher than 2.0 m above the ground.

2.17. **"Vehicle width"** means the distance between the nearside and offside vehicle planes.

2.18. **"Vehicle trajectory"** means the connection of all positions within the vehicle width where the vehicle front has been or will be during the test runs.

2.19. **"Soft target"** means a target that will suffer minimum damage and cause minimum damage to the subject vehicle in the event of a collision.

2.20. **"Pedestrian test target"** means an adult or child sized pedestrian simulated by a soft target device specified according to ISO 19206-2:2018.

2.21. **"Cyclist test target"** means an adult sized cyclist and bicycle simulated by a soft target and bicycle device specified according to ISO (CD) 19206-4:2020.

2.22. **"Blind spot boundary"** means the line, described as defined in Annex 2, that joins all points located at the boundaries of the visible areas forward of the vehicle front and in close-proximity to the subject vehicle.

2.23. **"Collision point"** means the position where the trajectory of any point of the vehicle front would intersect with any VRU soft target reference point should a moving off or low-speed manoeuvre be performed by the vehicle.

2.24. **"Forward separation distance"** means the distance in the forward direction between the vehicle front and the nearest point of the soft target.

2.25. **"Maximum forward separation plane"** means the plane perpendicular to the longitudinal plane of the vehicle representing the greatest forward separation distance that the MOIS is required to detect the presence of a VRU. The distance of this plane from the vehicle front shall be selected as either 3.7 m or the most forward point of the blind spot boundary at the manufacturer's choosing, and shall be no less than 1.0 m.

2.26. **"Minimum forward separation plane"** means the plane perpendicular to the longitudinal plane of the vehicle representing the shortest forward separation distance that the MOIS is required to detect the presence of a VRU. The distance of this plane from the vehicle front shall be 0.8 m.

2.27. **"Nearside separation plane"** means the plane parallel to the longitudinal plane of the vehicle and located 0.5 m outboard from the nearside vehicle plane.

2.28. **"Offside separation plane"** means the plane parallel to the longitudinal plane of the vehicle and located 0.5 m outboard from the offside vehicle plane.

2.29. **"Forward vehicle mode"** means the vehicle mode when the powertrain moves the vehicle forward, on release of the brake system or by the application of pressure to the accelerator pedal (or activation of an equivalent control).

2.30. **"Potential moving off manoeuvre"** means the subject vehicle being stationary, the vehicle master control switch activated, the vehicle in a normal operation mode and with the forward vehicle mode or a forward gear engaged/selected.

2.31. **"Low-speed manoeuvre"** means the subject vehicle being in a normal operation mode, moving forward in a straight line at speeds of below 10 km/h.

2.32. **"Last Point of Information (LPI)"** means the point at which the information signal shall have been given.

3. Application for approval

3.1. The application for approval of a vehicle type with regard to the Moving Off Information Systems (MOIS) shall be submitted by the vehicle manufacturer or by their authorized representative.

3.2. It shall be accompanied by the documents mentioned below

3.2.1. A description of the vehicle type with regard to the items mentioned in paragraph 5., together with dimensional drawings and the documentation as referred to in paragraph 6.1.

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.

5. Specifications

5.1. General requirements

5.1.1. Any vehicle fitted with a MOIS complying with the definition of paragraph 2.1. above shall meet the requirements contained in paragraphs 5.2. to 5.8. of this standard.

5.1.2. The effectiveness of MOIS 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. Performance requirements

5.2.1. The MOIS shall at least operate during all potential moving off manoeuvres and low-speed manoeuvres, for ambient light conditions above 15 Lux with or without passing beam headlamps activated.

5.2.2. The MOIS shall inform the driver about VRUs in close-proximity to the vehicle front that might be endangered during a potential moving off manoeuvre or low-speed manoeuvre. This information shall be provided to the driver so that the vehicle may be prevented by the driver from interacting with the trajectory of the VRU.

5.2.2.1. The information signal shall be provided at least for as long as the conditions specified in paragraphs 5.2.2.2. and 5.2.2.3. are fulfilled.

5.2.2.2. Potential moving-off manoeuvre

5.2.2.2.1. When performing a potential moving-off manoeuvre, the MOIS shall provide an information signal for VRUs moving at speeds of between 3 km/h and 5 km/h, when travelling from the nearside and offside of the vehicle in a direction perpendicular to the vehicle median longitudinal plane and located within an area bounded by the maximum and minimum forward separation planes and the nearside and offside separation planes.

5.2.2.3. Low-speed manoeuvre

5.2.2.3.1. When performing a low-speed manoeuvre, the MOIS shall provide an information signal for adult and child cyclists that are stationary or moving forward in a direction parallel to the vehicle median longitudinal plane at speeds of between 0 km/h and 10 km/h and located within an area bounded by the nearside and offside vehicle planes and the maximum and minimum forward separation planes.

5.2.2.3.2. When a vehicle performing a low-speed manoeuvre has already detected an adult or child cyclist and provided an information signal in accordance with 5.2.2.3.1., the MOIS shall maintain the information signal even if the vehicle comes to a standstill. The information signal shall be maintained for as long as the cyclist remains within an area bounded by the nearside and offside vehicle planes and the maximum and minimum forward separation planes.

5.2.2.3.3. When performing a turning maneuver, the MOIS detection strategy may be adjusted. It is not required to adjust the sensors to the steering angle. The detection adjustment strategy shall be explained in the information referred to in paragraph 6.1. The Testing Agency may verify the operation of the system according to the strategy."

5.2.2.4. The information signal shall meet the requirements of paragraph 5.6.

5.2.3. The manufacturer shall demonstrate, to the satisfaction of the Testing Agency, through documentation, simulation or other means, that the MOIS is performing as specified for smaller cyclists and bicycles, similar in size to a child cyclist.

5.2.4. The manufacturer shall demonstrate, to the satisfaction of the Testing Agency, through documentation, simulation or other means, that the number of false

reactions due to the detection of VRUs and static objects (such as cones, traffic signs, hedges and parked cars) located outside of the boundaries defined in 5.2.2.2 and 5.2.2.3 for the relevant vehicle manoeuvres are minimised.

5.3. Automatic Deactivation

5.3.1. The MOIS shall automatically deactivate if it malfunctions or cannot operate properly due to its sensor devices becoming contaminated by ice, snow, mud, dirt or similar material. The MOIS may also automatically deactivate due to ambient light conditions below that specified in paragraph 5.2.1.

5.3.2. Automatic deactivation shall be indicated by the failure warning signal specified in paragraph 5.8.

5.3.3. The MOIS shall automatically reactivate when the normal function of the sensors is verified. This shall be tested in accordance with the provisions of paragraphs 6.8 (failure detection test) and 6.9. (automatic deactivation test).

5.4. Manual deactivation

5.4.1. It may be possible to manually deactivate the MOIS.

5.4.2. Manual deactivation shall be through a sequence of intentional actions to be carried out by the driver, for example by requiring a single input exceeding a certain threshold of time or a double press, or two separate but simultaneous inputs.

5.4.3. It shall not be possible to manually deactivate any other system at the same time as the MOIS or through the same sequence of actions.

5.4.4. When manually deactivated, it shall be possible for the driver to easily manually reactivate the MOIS.

5.4.5. When manually deactivated, the MOIS shall automatically reactivate when the vehicle master control switch is activated.

5.5. System initialization

5.5.1. If the MOIS has not been initialized after a cumulative driving time of 15 seconds above a speed of 0 km/h, information of this status shall be indicated to the driver. This information shall exist until the system has been successfully initialized."

5.6. Information signal

5.6.1. The MOIS information signal referred to in paragraph 5.2.2. above shall be an optical information signal that is noticeable and easily verifiable by the driver from the driver's seat.

5.6.2. This information signal shall be visible by daylight and at night.

5.7. Collision warning signal

5.7.1. The MOIS shall warn the driver when the risk of a collision is imminent by providing the collision warning signal.

5.7.2. The collision warning signal shall be provided by the means of a combination of at least two modes selected from an optical signal, acoustic signal or haptic signal.

Where the collision warning signal is provided by using an optical mode, this shall be a signal differing in activation strategy from the information signal specified in paragraphs 5.2.2. and 5.6.

5.7.3. The collision warning signal 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.

5.7.4. The collision warning signal shall be activated according to the manufacturer strategy. The warning strategy shall be explained in the information referred to in paragraph 6.1.

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

5.7.5. The collision warning signal may be deactivated manually. In the case of a manual deactivation, it shall be reactivated on each activation of the vehicle master control switch.

5.8. Failure warning signals

5.8.1. The failure warning signal referred to in paragraph 5.3.2. above shall be a optical 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.

5.8.2. The failure warning signal shall remain active as long as the MOIS is unavailable.

5.8.3. The MOIS failure warning signal shall be activated with the activation of the vehicle master control switch. This requirement does not apply to failure warning signals shown in a common space."

5.9. Provisions for Periodic Technical Inspection

5.9.1. At a Periodic Technical Inspection, it shall be possible to confirm the correct operational status of the MOIS by a visible observation of the failure warning signal status.

In case of the failure warning signal being in a common space, the common space must be observed to be functional prior to the failure warning signal status check.

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 vehicle type and to aid 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 the target to be observed throughout the test and that allows safe driving at the required test speeds.

6.2.4. Natural ambient illumination shall be homogeneous in the test area and in excess of 1000 lux. It should be ensured that testing is not performed whilst driving towards, or away from, the sun at a low angle.

6.3. Vehicle conditions

6.3.1. Test weight

The vehicle shall be tested in a condition of load to be agreed between the manufacturer and the Testing Agency, with the distribution of mass among the axles stated by the manufacturer. No alteration shall be made once the test procedure has begun. The manufacturer shall demonstrate through the use of documentation that the system works at all conditions of load.

6.3.2. In the case where the MOIS is equipped with a user-adjustable information timing, the tests as specified in paragraphs 6.5., 6.6. and 6.7. 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 procedure has begun.

6.3.3. Pre-Test Conditioning

6.3.3.1 If requested by the vehicle manufacturer, the subject vehicle may be driven a maximum of 100 km on a mixture of urban and rural roads with other traffic and roadside furniture to initialise the sensor system.

6.4. Verification of signals test

6.4.1. With the vehicle stationary check that the optical failure warning signals comply with the requirements of paragraph 5.8 above.

6.5. Static Crossing Tests

6.5.1. The subject vehicle shall remain in a potential moving off manoeuvre with the MOIS active and the test area marked out as shown in Figure 1 of Appendix 1. The relevant test target (*T*) shall be manoeuvred such that it moves on a trajectory perpendicular to the longitudinal median plane of the subject vehicle at the test case distance (d_{TC}) away from the vehicle front and from the relevant crossing direction (*c*) (Table 1 of Appendix 1). The pedestrian test target reference point shall be the H-point (as defined by ISO 19206-2:2018) nearest the subject vehicle. The cyclist test target reference point shall be at the intersection of a plane perpendicular to the test target centreline located at the most forward point of the bicycle and a plane parallel to the test target centreline located at the test target H-point nearest the subject vehicle (as defined by ISO (CD) 19206-4:2020).

6.5.2. The test target shall be accelerated such that it reaches the test target speed (*v*) at a distance of no closer than 15 m from the plane relating to the subject vehicle side nearest the crossing direction. The test case speed shall be maintained until the plane relating to the opposite vehicle side is cleared by a distance of no less than 5 m.

6.5.3. In accordance with paragraph 5.2.2.2., the Testing Agency shall verify the activation of the MOIS information signal before the test target (*T*) reaches a distance corresponding to the last point of information (d_{LPI}) in Table 1 of Appendix 1, and that the MOIS information signal remains on until the test target has at least crossed the separation plane relating to the vehicle side opposite to the crossing direction. The collision warning signal shall not be activated.

6.5.4. The Testing Agency shall repeat paragraphs 6.5.1. to 6.5.3. for two test cases from Table 1 of Appendix 1 to this standard and for one additional test case selected from the combination of a soft target and the range of VRU speeds, VRU travel directions and detection boundaries defined in paragraph 5.2.2.2.

Where deemed justified, the Testing Agency may also select additional test cases within the range of the soft targets, VRU speeds, travel directions and detection boundaries defined in paragraph 5.2.2.2.

6.6. Longitudinal Stopping for Moving Off Cyclist Tests

6.6.1. The cyclist test target (*T*) shall be located within the test area marked out as shown in Figure 2 in Appendix 1. The cyclist test target shall be positioned at the relevant test target starting point (p_{cyc}) in Table 2 of Appendix 1 and face in the direction of travel and parallel to the longitudinal median plane of the subject vehicle. The cyclist test target reference point shall be at the centre of the bottom bracket of the bicycle and on the centreline of the bicycle. Should there be less than 100 mm clearance between the vehicle front and the rear most point of the cyclist test target, then p_{cyc} may be moved an additional clearance distance (d_{clear}) away from the vehicle front, in a direction parallel to the longitudinal plane, such that there is 100 +10/-0 mm clearance between the vehicle front and the rear most point of the cyclist test target.

6.6.2. The subject vehicle shall be accelerated in a straight line to a constant speed of 10 +0/-0.5 km/h, before entering the stopping corridor. The subject vehicle shall maintain this constant speed until the vehicle front passes the braking plane (p_{brake}) shown in Figure 2 of Appendix 1, before braking to a stop such that the vehicle front is positioned at the stopping plane (p_{stop}). The subject vehicle shall be considered to have stopped when it has come to a rest and the vehicle is either no longer in a forward vehicle mode or forward gear.

6.6.3. After a delay of no less than 10 seconds from the point at which the subject vehicle is considered to have stopped, the test target shall then be accelerated in a straight line on a trajectory parallel to the longitudinal median plane of the vehicle to a speed of 10 +0/-0.5 km/h within a distance of 5 m, before being brought to a stop. While accelerating, the lateral tolerance of the test target motion shall not exceed ± 0.05 m.

6.6.4. In accordance with paragraph 5.2.2.3., the Testing Agency shall verify the activation of the MOIS information signal before the subject vehicle reaches a distance from the stopping plane (p_{stop}) corresponding to the last point of information (d_{LPI}) in Table 2 of Appendix 1, and the MOIS information signal remains on until the test target at least crosses a distance from the vehicle front relating to the maximum forward separation distance (d_{FSP}) in Figure 2 of Appendix 1. The collision warning signal may be activated, as appropriate.

6.6.5. The Testing Agency shall repeat paragraphs 6.6.1. to 6.6.4. for two test cases shown in Table 2 of Appendix 1 to this standard and for one additional test case by selecting a cyclist test target and cyclist starting point from within the detection boundaries defined in paragraph 5.2.2.3.

Where deemed justified, the Testing Agency may also select additional test cases within the range of the cyclist test targets and the detection boundaries defined in paragraph 5.2.2.3.

6.7 Longitudinal Moving Off with Cyclist Tests

6.7.1. The cyclist test target (*T*) shall be located within the test area marked out as shown in Figure 2 of Appendix 1. The cyclist test target shall be positioned at the relevant test target starting point (p_{cyc}) in Table 2 of Appendix 1 and face in the direction of travel and parallel to the longitudinal median plane of the subject vehicle. The cyclist test target reference point shall be at the centre of the bottom bracket of the bicycle and on the centreline of the bicycle. Should there be less than 100 mm clearance between the vehicle front and the rear most point of the cyclist test target, then p_{cyc} may be moved an additional clearance distance (d_{clear}) away from the vehicle front, in a direction parallel to the longitudinal plane, such that there is 100 +10/-0 mm clearance between the vehicle front and the rear most point of the cyclist test target.

6.7.2. The subject vehicle shall be accelerated in a straight line to a constant speed of 10 +0/-0.5 km/h, before entering the stopping corridor. The subject vehicle shall maintain a constant speed until the vehicle front passes the braking plane

(p_{brake}) shown in Figure 2 of Appendix 1, before braking to a stop such that the vehicle front is positioned at the stopping plane (p_{stop}). The subject vehicle shall be considered to have stopped when it has come to a rest and the vehicle is either no longer in a forward vehicle mode or forward gear.

6.7.3. After a delay of no less than 10 seconds from the point at which the subject vehicle is considered to have stopped, the test target and subject vehicle shall be accelerated at the same time and in a straight line, on a trajectory parallel to the longitudinal median plane of the subject vehicle, to a constant speed of 10 +0/-0.5 km/h in a distance of no greater than 5 m. The subject vehicle and test target shall maintain this constant speed until a total travel distance of no less than 15 m from the stopping point is traversed by the subject vehicle. The lateral tolerance of the subject vehicle shall not exceed ± 0.05 m, whilst the lateral tolerance of the test target motion shall not exceed ± 0.05 m. The forward separation distance between the vehicle front and test target while moving shall be maintained to be within the boundaries of the maximum and minimum forward separation planes.

6.7.4. In accordance with paragraph 5.2.2.3., the Testing Agency shall verify the activation of the MOIS information signal before the subject vehicle reaches a distance from the stopping plane (p_{stop}) corresponding to the last point of information (d_{LPI}) in Table 2 of Appendix 1, and that the MOIS information signal remains on until the subject vehicle passes a distance of 15 m from the stopping point. The collision warning signal may be activated, as appropriate.

6.7.5. The Testing Agency shall repeat paragraphs 6.7.1. to 6.7.4. for two test cases shown in Table 2 of Appendix 1 to this standard and for one additional test case by selecting a cyclist test target and cyclist starting point from within the detection boundaries defined in paragraph 5.2.2.3.

Where deemed justified, the Testing Agency may also select additional test cases within the range of the cyclist test targets and the detection boundaries defined in paragraph 5.2.2.3.

6.8. Failure detection test

6.8.1. Simulate a MOIS failure, for example by disconnecting the power source to any MOIS component or disconnecting any electrical connection between the MOIS components. The electrical connections for the failure warning signal of paragraph 5.8. above shall not be disconnected when simulating a MOIS failure.

6.8.2. The failure warning signal specified in paragraph 5.8. shall be activated and remain activated while the vehicle is being driven and shall 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. With the MOIS system active, contaminate any of the MOIS sensing devices completely with a substance comparable to snow, ice or mud (e.g. based on water). The MOIS shall automatically deactivate, indicating this condition as specified in paragraph 5.8.

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

7. Modification of vehicle type and extension of approval

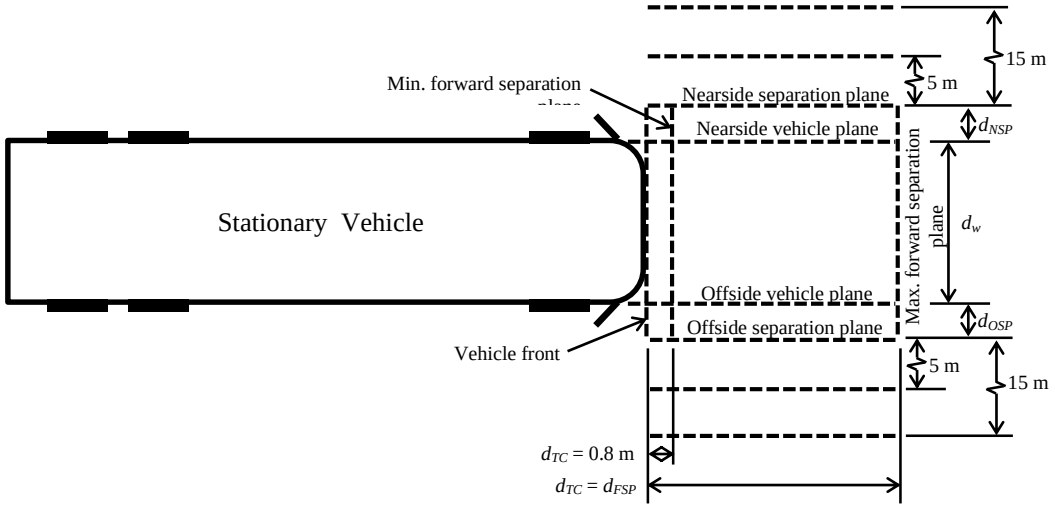
7.1. Every modification of the vehicle type as defined in paragraph 2.3. of this standard shall be notified to the Testing Agency which approved the vehicle type. The Testing Agency may then either:

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
Set Up for Static Crossing Tests



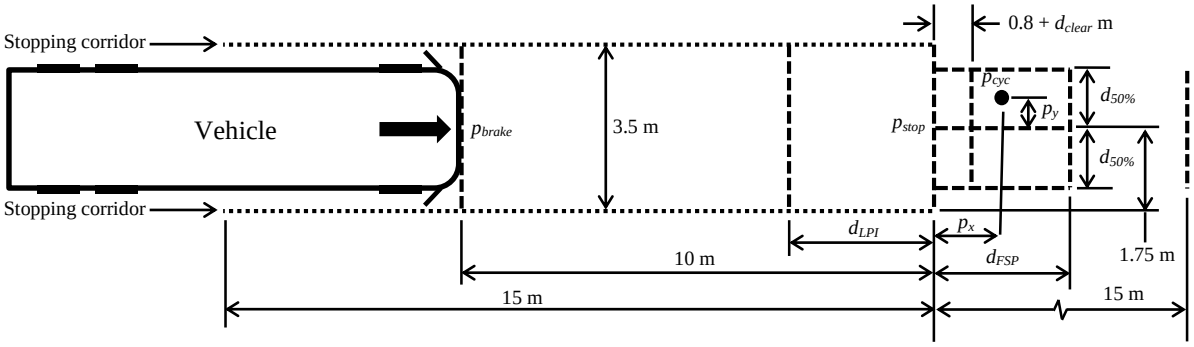
Where the following definitions apply:
d_w vehicle width.
d_{NSP} the distance from the nearside vehicle plane to the nearside separation plane, defined as 0.5 m.
d_{OSP} the distance from the offside vehicle plane to the offside separation plane, defined as 0.5 m.
d_{TC} the forward separation distance for each test case.
d_{FSP} the distance from the vehicle front to the maximum forward separation plane.

Table 1
Test Cases for Static Crossing Tests

Test Case	*Soft Target (T)*	*Test Case Distance (d_{TC}) /m*	*Crossing Direction (c)*	*Soft Target Speed (v) /km/h*	*Distance to Last Point of Information (d_{LPI}) /m*
1	Child Pedestrian	0.8	Nearside	3	d_{NSP}
2	Adult Pedestrian	d_{FSP}	Nearside	3	d_{NSP}
3	Adult Cyclist	0.8	Offside	3	d_{OSP}
4	Adult Cyclist	d_{FSP}	Nearside	5	d_{NSP}
5	Adult Pedestrian	0.8	Offside	5	d_{OSP}
6	Child Pedestrian	d_{FSP}	Offside	5	d_{OSP}

Where the following definitions apply:
d_{NSP} the distance from the nearside vehicle plane to the nearside separation plane, defined as 0.5 m.
d_{OSP} the distance from the offside vehicle plane to the offside separation plane, defined as 0.5 m.
d_{TC} the forward separation distance for each test case.
d_{FSP} the distance from the vehicle front to the maximum forward separation plane.
d_{LPI} the distance relating to the last point of information (LPI)."

Figure 2
Set Up for Longitudinal Cyclist Tests



Where the following definitions apply:

$d_{50\%}$ the distance relating to 50% of the vehicle width.
p_{brake} the vehicle braking plane.
p_{stop} the vehicle stopping plane.
d_{FSP} the distance from the vehicle stopping plane to the maximum forward separation plane.
d_{clear} the additional clearance distance that the cyclist test target is moved by to ensure at least 100 mm clearance between the vehicle front and the rear most point of the cyclist test target
p_{cyc} the cyclist test target starting point, taken from the cyclist test target reference point.
p_x the distance between the stopping plane and cyclist test target starting point.
p_y the distance between the vehicle longitudinal median plane and cyclist test target starting point, with the nearside of the vehicle being the positive direction.
d_{LPI} the distance between the last point of information (LPI) line and the vehicle stopping plane.

Table 2
Test Cases for Longitudinal Cyclist Tests

Test Case	*Test Target (T)*	*Distance to Forward Cyclist Start Point (p_x) /m*	*Distance to Lateral Cyclist Start Point (p_y) /m*	*Distance to Last Point of Information (d_{LPI}) /m*
1	Adult Cyclist	0.8 + d_{clear}	+$d_{50\%}$	d_{FSP} – 0.8 – d_{clear}
2	Adult Cyclist	0.8 + d_{clear}	0.0	d_{FSP} – 0.8 – d_{clear}
3	Adult Cyclist	0.8 + d_{clear}	-$d_{50\%}$	d_{FSP} – 0.8 – d_{clear}
4	Adult Cyclist	d_{FSP} – 0.1	+$d_{50\%}$	0.1
5	Adult Cyclist	d_{FSP} – 0.1	0.0	0.1
6	Adult Cyclist	d_{FSP} – 0.1	-$d_{50\%}$	0.1

Annex 1

Information on Technical specifications to be submitted by 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 / working of MOIS System:.....
6. The detection adjustment strategy
7. Type of warning used (i.e. acoustic, optical, Haptic or any combination)…
8. AIS 004 (Part 3) Compliance Report for MOIS……..
9. Category of the vehicle ……
10. Model Name…….
11. GVW….
12. Axle Weight Distribution in GVW (FAW and RAW) considering test load condition…..
13. Part Number, Model and Make of MOIS System…..
14. Installation Drawing of MOIS System..…..
15. Pre-Test Condition (With / Without running) ……
16. Recommended Tyre pressure….
17. Documentary evidences as per Clause Nos. 5.2.3, 5.2.4 and 6.1…..

Annex 2

Test method for determining blind spot boundary

1. Blind spot boundary

The blind spot boundary defined in paragraph 2.22. of this standard can be determined through the approach described in this annex.

2. Test methods

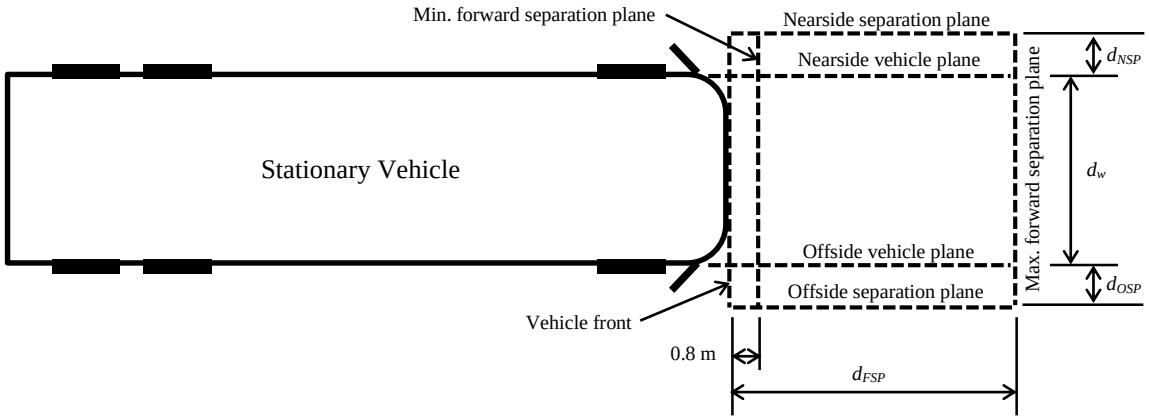
2.1. The test object shall be a circular cylinder that is 50±2 mm in external diameter, with a 10±2 mm high ring, contrasting in colour from the rest of the test object, located such that its lowest edge is 900±2 mm from the base of the test object.

2.2. The test conditions shall be as defined in paragraphs 6.2. of this standard.

2.3. The vehicle conditions shall be as defined in paragraphs 6.3. of this standard.

2.4. The test area shall be marked out as shown in Figure 1 of this annex.

Figure 1
Blind spot boundary test area



Where the following definitions apply:

d_w vehicle width.
d_{NSP} the distance from the nearside vehicle plane to the nearside separation plane, defined as 0.5 m.
d_{OSP} the distance from the offside vehicle plane to the offside separation plane, defined as 0.5 m.
d_{FSP} the distance from the vehicle front to the maximum forward separation plane.

2.5. The ocular reference point shall be as defined in paragraph 2.11. of this standard.

2.6. Test procedure

2.6.1. Locate a 35 mm or larger format still camera, video camera, or digital equivalent such that the centre of the camera image plane is located at the ocular reference point.

The camera shall be capable of viewing the test object in all potential test positions. Should the camera require repositioning to view all potential test positions, it shall be verified that the centre of the camera image plane for all possible camera positions is located at the ocular reference point.

2.6.2. The visibility of the entire ring of the test object from the ocular reference point shall be recorded for test object positions located within the area bounded by the minimum and maximum forward separation planes and the nearside and offside separation planes.

2.6.3. Starting from the minimum forward separation plane, move the test object away from the vehicle front on an assessment plane parallel to the median longitudinal plane of the vehicle until the maximum forward separation plane is met.

2.6.4. The visibility of the test object ring shall be recorded at intervals of no greater than 150 mm in distance along the assessment plane.

2.6.5. This process shall be repeated for assessment planes between the nearside and offside separation planes, with distances of no greater than 150 mm between each assessment plane.

2.6.6. Approaches other than the above methods, such as CAD based or LASER based procedures, may be considered as equivalent by the Testing Agency, should documentary evidence be provided to verify that the requirements of the test procedures described in this annex have been met.

3. Blind spot boundary definition

3.1. The blind spot area shall be determined by all test object positions where the entire ring of the test object is not visible from the ocular reference point.

3.2. The blind spot boundary shall be determined at the first position outside of the blind spot area where the entire ring of the test object is visible from the ocular reference point.

ANNEX 3
(See introduction)
COMPOSITION OF AISC PANEL ON MOVING OFF INFORMATION SYSTEM FOR THE DETECTION OF PEDESTRIANS AND CYCLISTS*

Panel Convener	**Representing**
Mr. M. Sreenivasulu	The Automotive Research Association of India (ARAI)
Panel Co-convener	
Mr. V. S. Khairatkar	The Automotive Research Association of India (ARAI)
Members	
Ms. S. A. Tambolkar	The Automotive Research Association of India (ARAI)
Mr. S. H. Nikam	The Automotive Research Association of India (ARAI)
Mr. Vishal P. Rawal	The Automotive Research Association of India (ARAI)
Mr. S. N. Dhole	Central Institute of Road Transport (CIRT)
Ms. Shubhangi Dalvi	Central Institute of Road Transport (CIRT)
Mr. V M Dhanasekkar	Global Automotive Research Centre (GARC)
Mr. Ravi M	Global Automotive Research Centre (GARC)
Mr. Karthikeyan	Global Automotive Research Centre (GARC)
Ms. Vijayanta Ahuja	International Centre for Automotive Technology (ICAT)
Ms. Sonia Nain	International Centre for Automotive Technology (ICAT)
Mr. Ved Prakash Gautam	SIAM (Ashok Leyland Ltd.)
Mr. V. Faustino	SIAM (Ashok Leyland Ltd.)
Mr. Rama Manikandan	SIAM (Daimler India Commercial Veh. Pvt. Ltd.)
Mr. Sudhir Sathe	SIAM (Mahindra & Mahindra Ltd.)
Ms. Pushpanjali Pathak	SIAM (Mahindra & Mahindra Ltd.)
Mr. Dhotre Abhijit	SIAM (Mahindra & Mahindra Ltd)
Mr. R Deepa	SIAM (Mahindra Mahindra Ltd.)
Mr. Arun Kumar	SIAM (Maruti Suzuki India Ltd.)
Mr. Nitish Seth	SIAM (Maruti Suzuki India Ltd.)
Mr. Sumit Kumar	SIAM (Maruti Suzuki India Ltd.)
Mr. Das Subham Kant	SIAM (Maruti Suzuki India Ltd.)
Mr. Venkatesh Ganesaperumal	SIAM (PSA Stellantis Group)
Mr. Vinod Kumar	SIAM (PSA Stellantis Group)
Mr. Jebin Jowhar	SIAM (Renault Nissan India Pvt. Ltd.)
Mr. Mohit Gupta	SIAM (SML Isuzu Ltd.)
Mr. P. S. Gowrishankar	SIAM (Tata Motors Ltd.)
Mr. Pridhvi Raju Vatsavayi	SIAM (Tata Motors Ltd.)
Mr. Sharad S. Bhole	SIAM (Tata Motors Ltd.)
Mr. D. S. Patil	SIAM (Tata Motors Ltd.)
Ms. Namrata Deb	SIAM (Tata Motors Ltd.)

Mr. B. Sudarshan	SIAM (Tata Motors Ltd.)
Mr. Ravindra Mudgal	SIAM (Tata Motors Ltd.)
Mr. Vijeth Gatty	SIAM (Toyota Kirloskar Motor Pvt. Ltd.)
Mr. Shekar M. B.	SIAM (Toyota Kirloskar Motor Pvt. Ltd.)
Mr. Pavan V.	SIAM (Toyota Kirloskar Motor Pvt. Ltd.)
Mr. Pradeep E. P.	SIAM (Toyota Kirloskar Motor Pvt. Ltd.)
Mr. Dinesh G. M.	SIAM (Toyota Kirloskar Motor Pvt. Ltd.)
Mr. Ramakant Pandey	SIAM (VE Commercial Vehicles)
Mr. Oindri Mazumdar	SIAM (Hyundai Motor India Ltd.)
Mr. Pramodkumar Hugar	SIAM (Volvo Group India Pvt. Ltd.)
Mr. Uday Harite	ACMA
Mr. Raykar Nagendra	ACMA (Bosch Ltd.)
Mr. Alok Kumar	ACMA (Denso International India Pvt. Ltd.)
Mr. Noel Alexander Peters	ACMA (Denso International India Pvt. Ltd.)
Ms. Alka Sharma	ACMA (Denso International India Pvt. Ltd.)
Mr. Anadi Sinha	ACMA (Minda Group)
Mr. Suren Zambre	ACMA (Minda Group)
Mr. Kishor Golesar	Nippon Audiotronix Ltd.
Mr. Sandeep Saxena	Drivebuddy AI
Mr. Pavan V	SIAM (Hero Moto. Corp. Ltd.)

* At the time of approval of this Automotive Industry Standard (AIS)

ANNEX 4

(See Introduction)

COMMITTEE COMPOSITION *

Automotive Industry Standards Committee

Chairperson	
Dr. Reji Mathai	Director, The Automotive Research Association of India
Members	**Representing**
Representative from	Ministry of Road Transport and Highways
Representative from	Ministry of Heavy Industries
Representative from	Office of the Development Commissioner, MSME, Ministry of Micro, Small and Medium Enterprises, New Delhi
Shri Shrikant R. Marathe	Former Chairman, AISC
Shri P. V. Srikanth	Bureau of Indian Standards
Director	Central Institute of Road Transport
Director	Global Automotive Research Centre
Director	International Centre for Automotive Technology
Director	Indian Institute of Petroleum, Dehra Dun
Director	Vehicles Research and Development Establishment
Director	Indian Rubber Manufacturers Research Association
Representatives from	Society of Indian Automobile Manufacturers
Representative from	Tractor Manufacturers Association
Representative from	Automotive Components Manufacturers Association of India
Representative from	Indian Construction Equipment Manufactures' Association
Member Secretary	
Shri Vikram Tandon	The Automotive Research Association of India

* At the time of approval of this Automotive Industry Standard (AIS)