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Awareness of the proximity of Vulnerable Road Users:**New UN Regulation on Blind Spot Information Systems****Proposal for a new UN Regulation on uniform provisions concerning the approval of motor vehicles with regard to the Blind Spot Information System for the Detection of Bicycles****Submitted by the Informal Working Group on Awareness of Vulnerable Road Users proximity in low speed manoeuvres***

The text reproduced below was prepared by the Informal Working Group (IWG) on Awareness of Vulnerable Road Users proximity in low speed manoeuvres (VRU-Proxi) to establish a new UN Regulation on Blind Spot Information Systems (BSIS) intended to be fitted to heavy goods vehicles to protect vulnerable road users. It is based on document ECE/TRANS/WP.29/GRSG/2017/11 presented at the 112th session of the Working Party on General Safety Provisions (GRSG) (see report ECE/TRANS/WP.29/GRSG/91, paras. 47-50).

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, cluster 02.4), the World Forum will develop, harmonize and update UN regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

UN Regulation No. XXX

Uniform provisions concerning the approval of motor vehicles with regard to the Blind Spot Information System for the Detection of Bicycles

0. Introduction (for information)

0.1. Turning manoeuvres involving collisions between trucks turning right 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 by the vehicle operators. In some cases, the increase can occur so suddenly that a high-intensity 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 a 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 right from an axis in direction of the vehicle centreline and through the driver's eyepoint.

0.4. Therefore the UN Regulation 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, the UN Regulation 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 UN Regulation 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 Regulation requires the information signal to be activated 15 m before the expected collision point.

1. Scope

- 1.1. This Regulation applies to the blind spot information system of vehicles of categories [M₂,] N₂ [(> 8 t permissible maximum mass)] and [M₃ and] N₃. Other vehicles may be approved at the request of the manufacturer.
- 1.2. The requirements of this Regulation are so worded as to apply to vehicles which are developed for right-hand traffic. In vehicles that are developed for left-hand traffic, these requirements shall be applied by inverting the criteria, when appropriate.

2. Definitions

For the purposes of this Regulation:

- 2.1. "*Approval of a vehicle type*" means the full procedure whereby a Contracting Party to the Agreement certifies that a vehicle type meets the technical requirements of this Regulation;
- 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 Annex 1 of ECE/TRANS/WP.29/78/Rev.6¹ 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.

¹ See Annex 1 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev.6 - www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

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 right side for right-hand traffic.
- 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 right 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 [WD] 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 forwardmost 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 respective moving speed of the vehicle.
- 2.16. *"Vehicle front right 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) on the road surface.
- 2.17. *"Impact Position"* means the location of impact of the bicycle on the right side of the vehicle with respect to the vehicle front right 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 Technical Service conducting the approval tests.

4. Approval

- 4.1. If the vehicle type submitted for approval pursuant to this Regulation 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; its first two digits (00 for this Regulation in its initial form) shall indicate the series of amendments incorporating the most recent major technical amendments made to this Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to the same vehicle type equipped with another type of BSIS, or to another vehicle type.
- 4.4. Notice of approval or of refusal or withdrawal of approval pursuant to this Regulation shall be communicated to the Parties to the Agreement applying this Regulation by means of a form conforming to the model in Annex 1 and photographs and/or plans supplied by the applicant being in a format not exceeding A4 (210 x 297 mm), or folded to that format, and on an appropriate scale.
- 4.5. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation, an international approval mark conforming to the model described in Annex 2, consisting of either:
 - 4.5.1. A circle surrounding the letter "E" followed by:
 - (a) the distinguishing number of the country which has granted approval;²
and

² The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev.6 - www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

- (b) the number of this Regulation, followed by the letter "R", a dash and the approval number to the right of the circle prescribed in this paragraph;

or

- 4.5.2. An oval surrounding the letters "UI" followed by the Unique Identifier.
- 4.6. If the vehicle conforms to a vehicle type approved under one or more other UN Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.5. above need not be repeated. In such a case, the UN Regulation and approval numbers and the additional symbols shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.5. above.
- 4.7. The approval mark shall be clearly legible and be indelible.
- 4.8. The approval mark shall be placed close to or on the vehicle data plate.

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 Regulation.

- 5.2. General requirements

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 and transitional provisions of UN Regulation No. 10, 04 series of amendments or any later series of amendments.

- 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, acoustic or haptic signal, when the risk of a collision increases.

An optical signal shall be maintained only for as long as the conditions specified in paragraph 5.3.1.4. below are fulfilled. 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 [1,000] 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 right 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. The first point of information may be calculated for any impact position.
- It shall also give an information signal if a bicycle is detected at a lateral separation of between 0.25 up to 0.9 m longitudinally at least located at the most forward front wheel while driving straight.
- 5.3.1.5. The BSIS shall be designed not to give an information signal for static non-VRU objects such as cones, traffic signs, hedges and parked cars, 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 sensing devices being contaminated by ice, snow, mud, dirt or similar material or due to ambient light conditions. 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 Regulation 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 Technical Service and Type Approval Authority, 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 [WD] 19206-4:2018.
- 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 an horizontal angle greater than 30° towards an axis parallel to the longitudinal median plane of the vehicle and going through the ocular reference point.
- 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.

- 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 Technical Service shall verify the operation of the system according to the strategy.
- 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 Type Approval Authority 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.
- 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 cones and the bicycle dummy, form a corridor according to Figure 1 in Appendix 1 to this Regulation and the additional dimensions as specified in Table 1 of Appendix 1 to this Regulation.
 - 6.5.2. Position the bicycle target at the appropriate starting position as shown in Figure 1 of Appendix 1 to this Regulation.
 - 6.5.3. Position a local traffic sign corresponding to sign C14 as defined in the Vienna convention on road signs and signals³ (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 Regulation. 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 Regulation with a tolerance of ± 2 km/h through the corridor.
 - 6.5.5. Do not operate the turn lights during the test.
 - 6.5.6. Put the dummy on the starting point as showed in Figure 1 of Appendix 1 to this Regulation. 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.

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

³ 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.

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 Regulation, 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 cones 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 Regulation.

Where this is deemed justified, the Technical Service may select 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 Technical Service 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.

- 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 Regulation before the vehicle has crossed line C (see paragraph 6.5.7. above) 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).

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.

- 6.6. 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.

- 6.7. The manufacturer shall demonstrate, to the satisfaction of the Technical Service and Type Approval Authority, 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 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 Regulation shall be notified to the Type Approval Authority which approved the vehicle type. The Type Approval Authority 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.
- 7.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 4.4. above to the Contracting Parties to the Agreement applying this Regulation.
- 7.3. The Type Approval Authority shall inform the other Contracting Parties of the extension by means of the communication form which appears in Annex 1 to

this Regulation. It shall assign a serial number to each extension, to be known as the extension number.

8. Conformity of production

- 8.1. Procedures for the conformity of production shall conform to the general provisions defined in Article 2 and Schedule 1 to the Agreement (E/ECE/TRANS/505/Rev.3) and meet the following requirements:
- 8.2. A vehicle approved pursuant to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements of paragraph 5. above;
- 8.3. The Type Approval Authority which has granted the approval may at any time verify the conformity of control methods applicable to each production unit. The normal frequency of such inspections shall be once every two years.

9. Penalties for non-conformity of production

- 9.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirements laid down in paragraph 8. above are not complied with.
- 9.2. If a Contracting Party withdraws an approval it had previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by sending them a communication form conforming to the model in Annex 1 to this Regulation.

10. Production definitively discontinued

If the holder of the approval completely ceases to manufacture a type of vehicle approved in accordance with this Regulation, they shall so inform the Type Approval Authority which granted the approval, which in turn shall forthwith inform the other Contracting Parties to the Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

11. Names and addresses of the Technical Services responsible for conducting approval tests and of Type Approval Authorities

The Contracting Parties to the Agreement applying this Regulation shall communicate to the United Nations Secretariat the names and addresses of the Technical Services responsible for conducting approval tests and of the Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval are to be sent.

Appendix 1

Figure 1
Dynamic tests

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

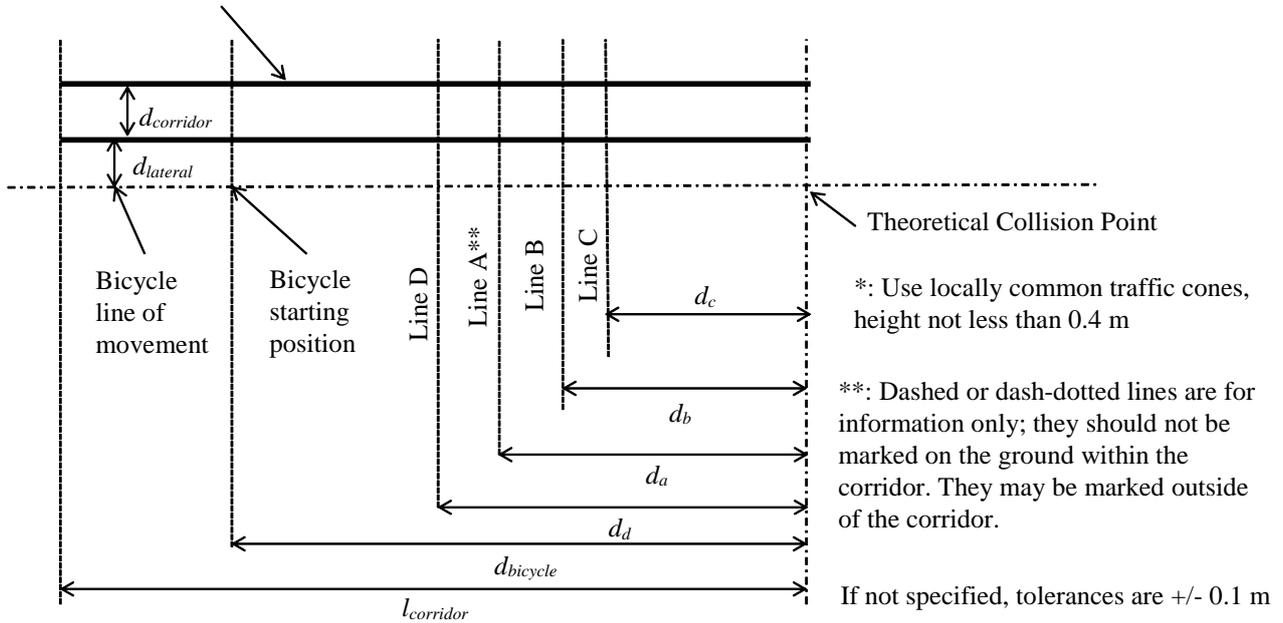


Figure 2
Static tests

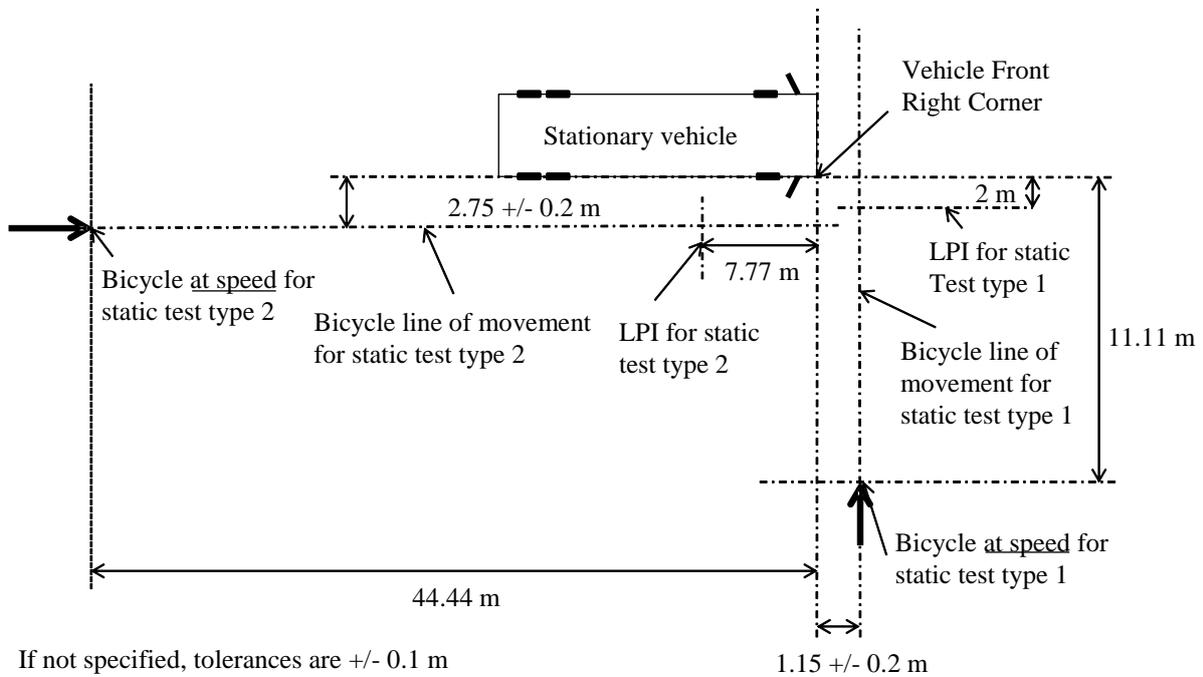


Figure 3

Impact location

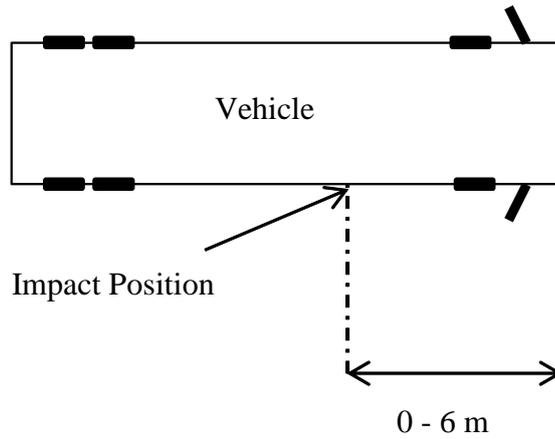


Table 1

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 ($d_c+11.11$ m for vehicle speeds of 10 km/h and $d_c+22.22$ 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	$v_{bicycle}$ [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	32.3				0	10	
3	20	20			38.3	38.3	65				6	25	
4	10	20	4.25	22.2	43.5	15	43.2				0	25	
5	10	10			19.8	19.8	65				0	5	
6	20	10			44.4	14.7	15				26.1	6	10
7						17.7					29.1	3	10

Table 2
 d_c for speeds above 25 km/h

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

Annex 1

Communication

(Maximum format: A4 (210 x 297 mm))



issued by :

(Name of administration)

.....
.....
.....

- Concerning: ²
- Approval granted
 - Approval extended
 - Approval refused
 - Approval withdrawn
 - Production definitively discontinued

of a type of vehicle with regard to the Blind Spot Information System (BSIS) pursuant to UN Regulation No. XXX

Approval No.:

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:
6. Date of submission of vehicle for approval:
7. Technical Service performing the approval tests:
8. Date of report issued by that Service:
9. Number of report issued by that Service:
10. Reason(s) for extension (if applicable) :
11. Approval with regard to the BSIS is granted/refused:²
12. Place:
13. Date:
14. Signature:
15. Annexed to this communication are the following documents, bearing the approval number indicated above:
16. Any remarks:

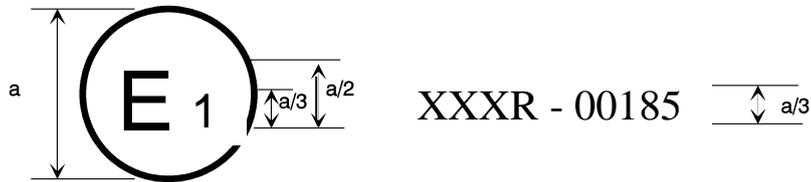
¹ Distinguishing number of the country which has granted/extended/refused/withdrawn an approval (see approval provisions in this Regulation).

² Strike out what does not apply.

Annex 2

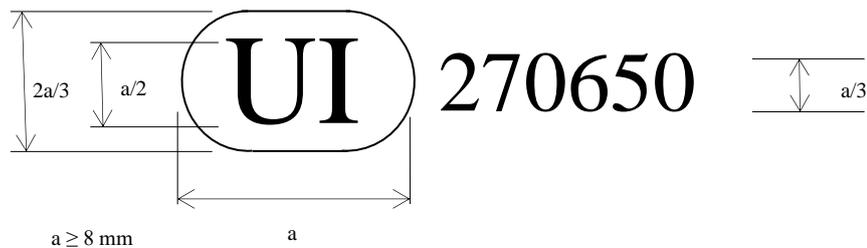
Arrangements of approval marks

(see paragraphs 4.5. to 4.5.2. of this Regulation)



$a = 8 \text{ mm min}$

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in Germany (E1) with regard to the BSIS pursuant to UN Regulation No. XXX. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of UN Regulation No. XXX in its original form.



The above Unique Identifier shows that the type concerned has been approved and that the relevant information on that type-approval can be accessed on the UN secure internet database by using 270650 as Unique Identifier. Any leading zeroes in the Unique Identifier may be omitted in the approval marking.

II. Justification

1. The draft UN Regulation was initially submitted to GRSG as document ECE/TRANS/WP.29/GRSG/2017/11 and further explained during the 112th session of GRSG on the basis of GRSG-112-36. The justification and information about the first iteration of the test procedure was provided in informal document GRSG-109-19 and supplemented with the presentations GRSG-110-18-Rev.1 and GRSG-111-24. During a first reading of ECE/TRANS/WP.29/GRSG/2017/11, the document received a number of comments, e.g. on the definitions and cross-references to other UN Regulations. Following the discussion, GRSG agreed that the IWG on VRU-Proxi shall resume consideration of ECE/TRANS/WP.29/GRSG/2017/11 as a first priority at its forthcoming meetings.

2. During the meeting of the IWG on VRU-Proxi, the consideration resulted in a fruitful discussion on the test procedure. Industry experts verified that the described tests can be conducted and various parties supplied ideas to improve the test procedure and regulatory text.

3. The following modifications to ECE/TRANS/WP.29/GRSG/2017/11 resulted from this process:

- (a) An introductory text is added, with the purpose of providing information on the background of this Regulation, the concepts the blind spot information function is based on, its specifications and criteria for approval. The introduction is for information only.
- (b) The scope of this Regulation is extended towards vehicles of category M₂, M₃ and N₂ below 8 tons, upon the request of several Contracting Parties (this modification has to be confirmed).
- (c) ECE/TRANS/WP.29/GRSG/2017/11 contains a detailed definition of the bicycle dummy to be used. The upcoming international standard ISO 19206-4 (expected to be published in autumn 2018) contains a more recent description of the dummy, so a reference to that standard was added in paragraph 2.12., replacing the former Annex 3.
- (d) In addition to the "last point of information", which specifies the latest point for the information signal, a new criterion for the "first point of information" specifies that the signal shall be given at a point corresponding to a travel time of not more than 4 seconds before the "last point of information" is reached (see paragraph 2.15). Effectively these two requirements specify a time window of 4 seconds in total during which the manufacturer may activate the information signal.
- (e) Several definitions were added to improve the clarity of the document.
- (f) The reference to UN Regulation No. 10 on electromagnetic compatibility was updated as a reference to the 04 series of amendments of that Regulation or any later series of amendments.
- (g) Section 5.3.1. which specifies the function principle of the blind spot information system was refined.
 - (i) A new, additional warning stage needed to be activated when the collision risk increases, for instance when the vehicle actually initiates the turn towards a bicycle.
 - (ii) The IWG agreed on the one hand that this would help to prevent accidents with multiple bicyclists (e.g. when an activated information

signal might be connected towards the first bicyclist, but not to the second cyclist) or other situations where the information signal is accidentally ignored by the driver.

- (iii) The IWG believed on the other hand that it is premature to define actual criteria for the warning stage. Therefore, no concrete timing requirements have been set up and the deactivation of this second warning stage is possible. However, it is NOT possible to deactivate the information signal. A new paragraph 5.5. describes the warning signal in more detail.
- (iv) A requirement for the ambient illumination is introduced: the BSIS should be able to meet the requirements in this Regulation up to a specific illumination value of [1,000] Lux. The limitation to daylight conditions seems to be justified by the accident data that was presented e.g. in GRSG-110-18-Rev.1, where more than 80 per cent of the accidents between right-turning trucks and bicycles occurred during the day and on dry roads.
- (v) To add clarity, the ranges for the lateral distance between bicycle and vehicle have been adjusted to be based on the lateral separation (gap) rather than the distance between bicycle centre and vehicle side. Upon the request of Contracting Parties participating in the IWG, the range of the gap has been extended to include bicycles travelling as close as 90 cm next to the vehicle. The justification of this is a study analysing the typical overtaking behaviour in the Netherlands.
- (vi) The speed range for the system to be operational has been extended to include 0 km/h (stationary vehicles) as well.
- (vii) To account for traffic conditions in some larger cities, the requirement to activate the information signal for even closer bicycles close to the vehicle's foremost front wheel has been added as well (paragraph 5.3.1.4.).
- (viii) An automatic deactivation of the BSIS was required for situations in which the vehicle sensors are subject to contamination by ice, snow or similar or due to ambient light conditions. The reason for this deactivation is to prevent any system from giving erratic information or warning signals in situations that would otherwise lead to nuisance. There is also a new test introduced to verify this deactivation (paragraph 6.9.).
- (h) Section 5.3.2. previously required the BSIS to detect bicyclists that are up to 20 per cent smaller than the specified bicycle dummy. To include the detection of bicycling children, the value is increased to 36 per cent, which is the difference in the dimensions between the adult fiftieth percentile male dummy and the 6-year-old fiftieth percentile.
- (i) The test procedure for BSIS has been amended to not include the actual turning manoeuvre, but at the same time the last point of information has been shifted to be prior to the point at which typical drives would initiate a turning manoeuvre. Data shows that the manoeuvre typically starts 15 m before the collision point (see e.g. VRU-PROXI-03-04, pages 33 and 39). This amendment allows a much less complex and safer test procedure. It also removes the influence of the cornering style of different vehicles and so

improves the robustness of the test procedure. The modification of the last point of information ensures that this change does not affect traffic safety.

- (j) Other modifications to the test procedure include the following:
 - (i) Clarification that user-adjustable information timing shall be tested for all test conditions at the worst-case setting;
 - (ii) Inclusion of static tests to cover roundabout situations and situations with a stationary (waiting) vehicle where bicycles approach from behind;
 - (iii) Introduction of accuracy requirements for all variables;
 - (iv) Provisions to test the first point of information, if appropriate (not possible for test cases with same speed for bicycle and vehicle);
 - (v) Allow the Technical Service to test other parameter combinations than those defined as test cases, and provisions for the Technical Service to identify pass/fail criteria for these other parameter combinations.
 - (k) Summary of open issues (still in square brackets):
 - (i) The scope of this Regulation has to be decided, taking into account the possibility to include all heavy vehicles or a subset of those (e.g. specified in ECE/TRANS/WP.29/GRSG/2017/11: N_3 and $N_2 > 8$ tons gross vehicle mass).
 - (ii) The dummy definition document ISO 19206-4 is currently in status Working Draft. A publication of the document is expected for autumn 2018.
 - (iii) The ambient conditions required for BSIS to work in was currently set at [1,000] Lux (corresponding to UN Regulation No. 48, Revision 12, Annex 13).
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