Submitted by the Chair of the IWG on VRU-Proxi

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VRU-Proxi-10-02

Revised 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

(Amendments to ECE/TRANS/WP.29/GRSG/2018/24 as adopted by GRSG at its 115th session)

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).

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

0.3. High-intensity warnings during a driving situation are only justified if the probability for an accident is high – otherwise vehicle drivers tend to ignore the system alerts. A (low threshold) informational assistance system, however, can be activated sufficiently early enough, as it helps the driver rather than annoys. It is assumed to be possible to design an human-machine-interface for blind spot assistance systems in a way that it does not annoy drivers when the information is not needed, for instance by selecting the location of a signal outside of the primary focus area of drivers when looking straight ahead, but in an area that is visible when the gaze is slightly turned towards the planned driving direction. A favourable location that fulfils these requirements is a location approximately 40° off the 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 ~~[M_2,]~~ N_2 ~~[~~(> 8 t of technically permissible maximum mass)~~]~~ and ~~[M_3 and]~~ N_3. ~~Other v~~Vehicles of categories N_2 (≤ 8 t of technically permissible maximum mass), M_2 and M_3 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.6 [1]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.

[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

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

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

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

2.9. *"Near side"* means the side of the vehicle near the bicycle. The near side of the vehicle is the 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~~ foremost point and up to 6 m rearward.

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

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

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

An optical information signal shall be maintained only for as long as the conditions specified in paragraph 5.3.1.4. below are fulfilled. Deactivation of

[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

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]~~ 15 Lux.

5.3.1.4. The BSIS shall give an information signal at last point of information, for a bicycle moving with a speed between 5 km/h and 20 km/h, at a lateral separation between bicycle and vehicle of between 0.9 and 4.25 metres, which could result in a collision between bicycle and vehicle with an impact position 0 to 6 m with respect to the vehicle front right corner, if typical steering motion would be applied by the vehicle driver. However, the information signal is not required when the relative longitudinal distance between bicycle and front right corner of the vehicle is more than 30 m to the rear or 7 m to the front.

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 by increasing with the difference between 6 m and 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 vehicle manufacturer shall ensure that the number of false-positive warnings due to the detection of static non-VRU objects such as cones, traffic signs, hedges and parked cars shall be minimized. ~~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~~ However it may give an information signal when a collision is imminent.

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

5.3.1.7. The BSIS also shall provide the driver with a failure warning when there is a failure in the BSIS that prevents the requirements of this 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,

Opmerking [s1]: These values match what was required in the original test cases.

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

5.5. Warning signal

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

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

5.5.3. The warning signal shall be activated at the earliest when the system detects a potential collision, e.g. by the intention of a turn towards the bicycle, e.g. by evaluating the distance between or trajectory intersection of vehicle and bicycle, direction indicator activation or similar. The strategy shall be explained in the information referred to in paragraph 6.1. It shall not depend solely on the activation of the direction indicator.

The 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 signals[3] (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 direction indicators~~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.

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

[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 vehicle has crossed line C ~~(see paragraph 6.5.7. above)~~, but not before the vehicle has passed line D (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). However, the information signal is not required when the relative longitudinal distance between bicycle and front right corner of the vehicle is more than 30 m to the rear or 7 m to the front.

For vehicle speeds up to 5 km/h, it is deemed satisfactory if the information signal is activated 1.4 seconds before the bicycle has reached the theoretical collision point as specified in Appendix 1, Figure 1. ~~For vehicle speeds between 5 and 10 km/h, the value d_c shall be 5 m.~~

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.

In the case of conflicting requirements that result from different impact locations or different assumed radii (both are not detectable by the system before an impact), the requirements both for line C and line D which are more far away from the collision point (which are passed be the vehicle earlier) shall be relevant.

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

Opmerking [s2]: This was forgotten in the original text.

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Opmerking [s4]: This was introduced to limit sensor range to 30 m. However, it is not effective for this, and the sensor range is taken care of explicitly one paragraph above. Now, this line just creates a discontinuity, and therefore it is better to remove it.

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

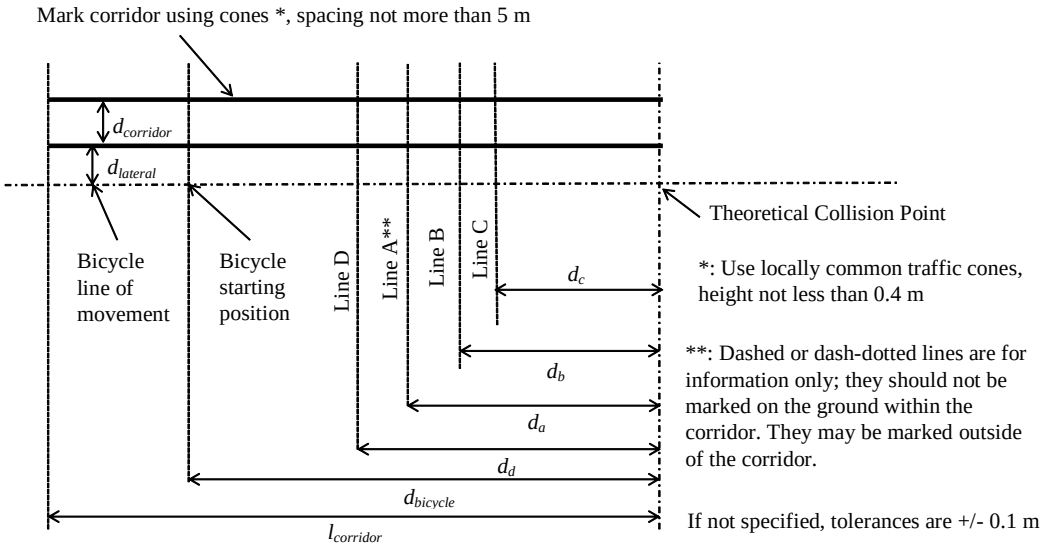
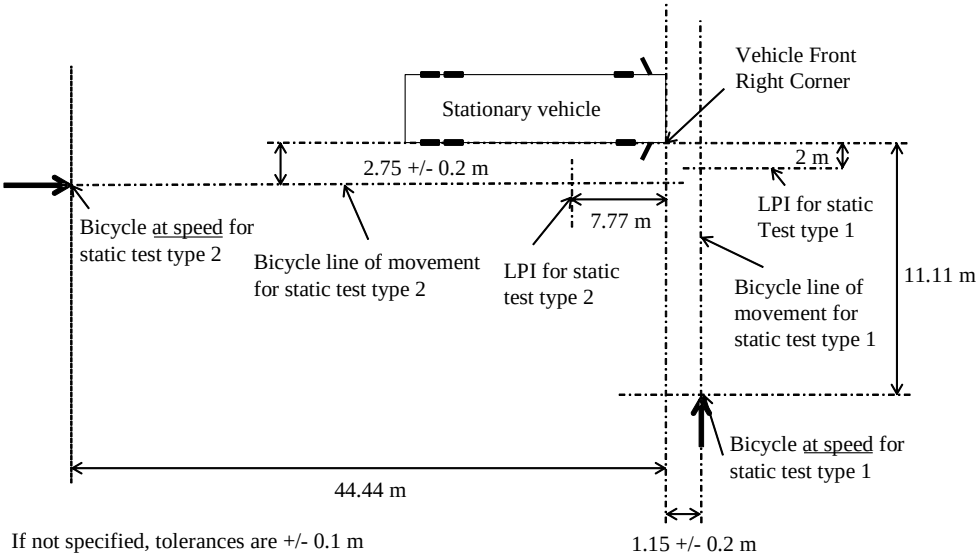


Figure 2
Static tests



If not specified, tolerances are +/- 0.1 m

Figure 3
Impact location

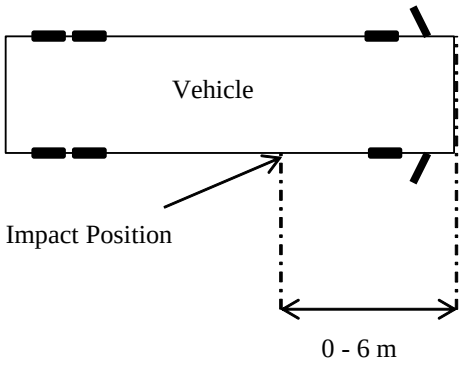


Table 1
Test cases

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

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

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

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

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

Test Case	$v_{bicyclee}$ *[km/h]*	$v_{Vehicle}$ *[km/h]*	$d_{lateral}$ *[m]*	d_a *[m]*	d_b *[m]*	d_c *[m]*	d_d *[m]*	$d_{bicycle}$ *[m]*	$l_{corridor}$ *[m]*	$d_{corridor}$ *[m]*	*For information only (not influencing test parameters)*	
											Impact Position [m]	*Turn Radius [m]*
1	20	10	0.75	44.4	15.8	15	26.1	65	80	vehicle width + 1 m	6	5
2	20	10	1.25		22		32.13				0	10
3	20	20	4.25	22.2	38.3	38.3	65				6	25
4	10	20			43.5	15	43.2				0	25
5	10	10			19.8	19.8	65				0	5
6	20	10	3.75	44.4	14.7	15	26.1				6	10
7					17.7		29.132.1				3	10

Opmerking [s5]: Test cases 2 and 7: dc and dd are not the worst cases (see last sentence of 6.5.10. "conflicting requirements" → other impact points and radii would lead to earlier dc and dd values.

Option 1): Change 2 and 7 to be impact position 6 (then 6+7 are identical)
Option 2): Change dd in 2 and 7 to be the most stringent values
Option 3): Delete case 2 and 7.

Opmerking [s6]: + corridor width, this will be 1.25

Opmerking [s7]: +corridor width, this will be 4.25 m.

Opmerking [s8]: Highest value for dd reached for R=5, L=0 (also for test case 2) → Option 2 from the comment above.

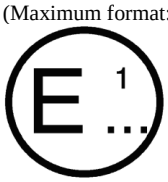
Table 2
d_c for speeds above 25 km/h

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

Annex 1

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.:.....

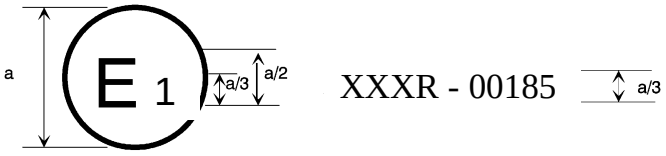
1. Trademark:.....
2. Type and trade name(s):.....
3. Name and address of manufacturer:.....
4. If applicable, name and address of manufacturer's representative: .....
5. Brief description of vehicle:.....
6. Date of submission of vehicle for approval: .....
7. Technical Service performing the approval 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

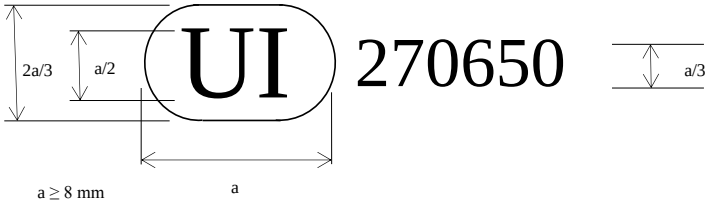
Arrangements of approval marks

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



a = 8 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.

Annex 3

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

Opmerking [s9]: Recheck this in the light of 6.5.10 and 5.3.1.4

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

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

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

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

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

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

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

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

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

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

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

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

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

The value d_c defines the last point of information. For vehicle speeds of ~~105~~ km/h and higher, it is the maximum of two values:

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

15 m.

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

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

Therefore, d_c is defined by

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

For vehicle speeds below 5 km/h, it is sufficient if the information signal is given at a distance corresponding to a TTC value of 1.4 seconds (similar to the static tests)~~, and for vehicle speeds above 5 and below 10 km/h, the value d_c is reduced to 5 m.~~

Finally, d_d is the first point of information. It can be calculated by adding the distance corresponding to 4 seconds of vehicle travel time to d_c and correcting for the impact position in case the impact position is not 6 m:

$$d_d = d_{\text{c}} + 4s \cdot v_{\text{Vehicle}} + (6\text{m} - Impact\ Position).$$

However, as paragraph 6.5.10. mentions clearly that there might be conflicting requirements because it is not possible to identify turn radius R and impact position L before the accident, the requirement for the first point of information d_d shall be checked whether other values of L (within the range as specified in paragraph 5.3.1.4.) and R (always higher than the minimum achievable turn radius of the vehicle) lead to higher values for d_d. The highest possible values for d_d shall be relevant.

These formulas allow to completely populate Table 1 in Apendix 1 for test cases other than those defined there.

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II. Justification

1. Small corrections made throughout the text for clarification.
2. Modification of value d_e for tests performed outside of the test cases. Keeping value d_e at 15 m also for very low vehicle speeds leads to extraordinary high required sensor ranges that are not possible with today's technology.
3. In particular, to take account of the potential sensor range limitations for test cases other than those specified in Table 1, the d_e value has been fixed to 5 m for speeds greater than 5 km/h and below 10 km/h. This limits the required range to 30 m to the back, and the angle between truck edge and bicycle to values above 3°
4. A new annex has been added to give guidance when calculating the performance criteria for test configurations other than the tests specified in Table 1, Appendix 1.

Write new!