

ACTS ADOPTED BY BODIES CREATED BY INTERNATIONAL AGREEMENTS

Only the original UN/ECE texts have legal effect under international public law. The status and date of entry into force of this Regulation should be checked in the latest version of the UN/ECE status document TRANS/WP.29/343, available at:

<http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29fdocstts.html>

Regulation No 130 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of motor vehicles with regard to the Lane Departure Warning System (LDWS)

Date of entry into force: 9 July 2013

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1. SCOPE

This Regulation applies to the lane departure warning system of vehicles of categories M₂, N₂, M₃ and N₃ (¹).

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 Lane Departure Warning 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 Lane Departure Warning System;
 - (c) the type and design of the Lane Departure Warning System;

(¹) As defined in Section 2 of the Consolidated Resolution on the Construction of Vehicles (R.E.3) (document TRANS/WP.29/78/Rev.2, para.2) — www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

- 2.3. '*Lane Departure Warning System (LDWS)*' means a system to warn the driver of an unintentional drift of the vehicle out of its travel lane;
- 2.4. '*Lane*' means one of the longitudinal strips into which a roadway is divided (as shown in Annex 3);
- 2.5. '*Visible lane marking*' means delineators intentionally placed on the borderline of the lane that are directly visible by the driver while driving (e.g. not covered by snow, etc.);
- 2.6. '*Rate of departure*' means the subject vehicle's approach velocity at a right angle to the visible lane marking at the warning issue point;
- 2.7. '*Common space*' means an area on which two or more information functions (e.g. symbols) may be displayed, but not simultaneously.

3. APPLICATION FOR APPROVAL

- 3.1. The application for approval of a vehicle type with regard to the LDWS shall be submitted by the vehicle manufacturer or by his authorised 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 paragraphs 6.2.3.2 and 6.2.3.3 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. An approval number shall be assigned to each vehicle type approved; its first two digits (00 for the Regulation in its initial form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the 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 Lane Departure Warning System, or to another vehicle type.
- 4.3. Notice of approval or of extension 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.
- 4.4. 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:
 - 4.4.1. A circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval (¹);
 - 4.4.2. The number of this Regulation, followed by the letter 'R', a dash and the approval number to the right of the circle prescribed in paragraph 4.4.1 above.
- 4.5. If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1 above need not be repeated; in such a case, the Regulation and approval numbers and the additional symbols shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1 above.
- 4.6. The approval mark shall be clearly legible and be indelible.

(¹) 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.2/Amend.3 — www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

4.7. The approval mark shall be placed close to or on the vehicle data plate.

5. SPECIFICATIONS

5.1. General

5.1.1. Any vehicle fitted with a LDWS complying with the definition of paragraph 2.3 above shall meet the requirements contained in paragraphs 5.1 to 5.5 of this Regulation.

5.1.2. The effectiveness of the LDWS shall not be adversely affected by magnetic or electrical fields. This shall be demonstrated by compliance with Regulation No 10, 03 Series of amendments to the Regulation.

5.2. Performance requirements

5.2.1. Whenever the system is active, as specified in paragraph 5.2.3 below, the LDWS shall warn the driver if the vehicle crosses over a visible lane marking for the lane in which it is running, on a road with a directional form that varies between straight and a curve having an inner lane marking with a minimum radius of 250 m, when there has been no purposeful demand to do so. Specifically:

5.2.1.1. It shall provide the driver with the warning specified in paragraph 5.4.1 below when tested in accordance with the provisions of paragraph 6.5 below (departure warning test) and with lane markings as specified in paragraph 6.2.3 below.

5.2.1.2. The warning mentioned in paragraph 5.2.1 above may be suppressed when there is a driver action which indicates an intention to depart from the lane.

5.2.2. The system shall also provide the driver with the warning specified in paragraph 5.4.2 below when tested in accordance with the provisions of paragraph 6.6 below (failure detection test). The signal shall be constant.

5.2.3. The LDWS shall be active at least at vehicle speeds above 60 km/h, unless manually deactivated as per paragraph 5.3 below.

5.3. If a vehicle is equipped with a means to deactivate the LDWS function, the following conditions shall apply as appropriate:

5.3.1. The LDWS function shall be automatically reinstated at the initiation of each new ignition 'on' (run) cycle.

5.3.2. A constant optical warning signal shall inform the driver that the LDWS function has been deactivated. The yellow warning signal specified in paragraph 5.4.2 below may be used for this purpose.

5.4. Warning indication

5.4.1. The lane departure warning referred to in paragraph 5.2.1 above shall be noticeable by the driver and be provided by:

(a) at least two warning means out of optical, acoustic and haptic; or

(b) one warning means out of haptic and acoustic, with spatial indication about the direction of unintended drift of the vehicle.

5.4.1.1. Where an optical signal is used for the lane departure warning, it may use the failure warning signal as specified in paragraph 5.4.2 below in a flashing mode.

5.4.2. The failure warning referred to in paragraph 5.2.2 above shall be a yellow optical warning signal.

5.4.3. The LDWS optical warning signals shall be activated either when the ignition (start) switch is turned to the 'on' (run) position or when the ignition (start) switch is in a position between the 'on' (run) and 'start' that is designated by the manufacturer as a check position (initial system (power-on)). This requirement does not apply to warning signals shown in a common space.

5.4.4. The optical warning signals shall be visible even by daylight; the satisfactory condition of the signals must be easily verifiable by the driver from the driver's seat.

5.4.5. When the driver is provided with an optical warning signal to indicate that the LDWS is temporarily not available, for example due to inclement weather conditions, the signal shall be constant. The failure warning signal specified in paragraph 5.4.2 above may be used for this purpose.

5.5. Provisions for the periodic technical inspection

5.5.1. At a periodic technical inspection it shall be possible to confirm the correct operational status of the LDWS by a visible observation of the failure warning signal status, following a 'power-on' (off — system OK, on — system fault present).

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

5.5.2. At the time of type-approval, the means to protect against simple unauthorised modification of the operation of the failure warning signal chosen by the manufacturer shall be confidentially outlined.

Alternatively, this protection requirement is fulfilled when a secondary means of checking the correct operational status of the LDWS is available.

6. TEST PROCEDURE

6.1. The manufacturer shall provide a brief 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 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.

6.2. Test conditions

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

6.2.2. The ambient temperature shall be between 0 °C and 45 °C.

6.2.3. Visible lane markings

6.2.3.1. The visible lane markings used in the lane departure warning tests of paragraph 6.5 below shall be those of one of the Contracting Parties as identified in Annex 3 to this Regulation, with the markings being in good condition and of a material conforming to the standard for visible lane markings of that Contracting Party. The visible lane marking layout used for the testing shall be recorded.

6.2.3.2. The vehicle manufacturer shall demonstrate, through the use of documentation, compliance with all the other lane markings identified in Annex 3 to this Regulation. Any such documentation shall be appended to the test report.

6.2.3.3. In the case the vehicle type may be equipped with different variants of the LDWS with regional specific adjustments; the manufacturer shall demonstrate through documentation that the requirements of this Regulation are fulfilled in all variants.

6.2.4. 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 being that 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 recommended by the vehicle manufacturer.

6.3.3. In the case where the LDWS is equipped with a user-adjustable warning threshold, the test as specified in paragraph 6.5 below shall be performed with the warning threshold set at its maximum lane departure setting. No alteration shall be made once the test procedure has begun.

6.4. Optical warning signal verification test

With the vehicle stationary check that the optical warning signal(s) comply with the requirements of paragraph 5.4.3 above.

6.5. Lane departure warning test

6.5.1. Drive the vehicle at a speed of 65 km/h +/- 3 km/h into the centre of the test lane in a smooth manner so that the attitude of the vehicle is stable.

Maintaining the prescribed speed, gently drift the vehicle, either to the left or the right, at a rate of departure of between 0,1 and 0,8 m/s so that the vehicle crosses the lane marking. Repeat the test at a different rate of departure within the range 0,1 and 0,8 m/s.

Repeat the above tests drifting in the opposite direction.

6.5.2. The LDWS shall provide the lane departure warning indication mentioned in paragraph 5.4.1 above at the latest when the outside of the tyre of the vehicle's front wheel closest to the lane markings crosses a line 0,3 m beyond the outside edge of the visible lane marking to which the vehicle is being drifted.

6.6. Failure detection test

6.6.1. Simulate a LDWS failure, for example by disconnecting the power source to any LDWS component or disconnecting any electrical connection between LDWS components. The electrical connections for the failure warning signal of paragraph 5.4.2 above and the LDWS disable control of paragraph 5.3 above shall not be disconnected when simulating a LDWS failure.

6.6.2. The failure warning signal mentioned in paragraph 5.4.2 above shall be activated and remain activated while the vehicle is being driven and be reactivated after a subsequent ignition 'off' ignition 'on' cycle as long as the simulated failure exists.

6.7. Deactivation Test

6.7.1. If the vehicle is equipped with means to deactivate the LDWS, turn the ignition (start) switch to the 'on' (run) position and deactivate the LDWS. The warning signal mentioned in paragraph 5.3.2 above shall be activated. Turn the ignition (start) switch to the 'off' position. Again, turn the ignition (start) switch to the 'on' (run) position and verify that the previously activated warning signal is not reactivated, thereby indicating that the LDWS has been reinstated as specified in paragraph 5.3.1 above. If the ignition system is activated by means of a 'key', the above requirement shall be fulfilled without removing the key.

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 4.3 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 concerning conformity of production shall conform to the general provisions defined in Article 2 and Appendix 2 to the Agreement (E/ECE/324-E/ECE/TRANS/505/Rev.2) 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, he 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.

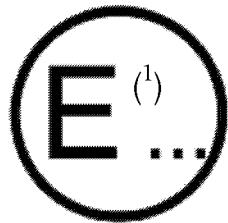
11. NAMES AND ADDRESSES OF THE TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS AND OF TYPE APPROVAL AUTHORITIES

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.

ANNEX 1

COMMUNICATION

(maximum format: A4 (210 × 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 Lane Departure Warning System (LDWS) pursuant to Regulation No 130

Approval No: Extension 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. Approval with regard to the LDWS is granted/refused ⁽²⁾:

11. Place:

12. Date:

13. Signature:

14. Annexed to this communication are the following documents, bearing the approval number indicated above:

15. Any remarks:

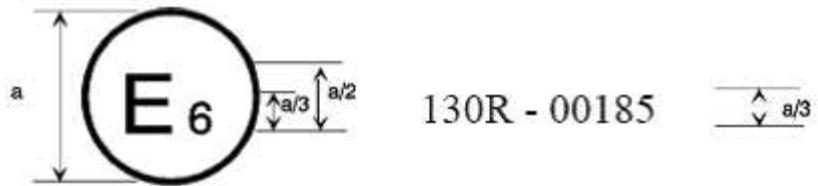
⁽¹⁾ Distinguishing number of the country which has granted/extended/refused/withdrawn an approval (see approval provisions in the Regulation).

⁽²⁾ Delete what does not apply.

ANNEX 2

ARRANGEMENTS OF APPROVAL MARKS

(see paragraphs 4.4 to 4.4.2 of this Regulation)

 $a = 8 \text{ mm min.}$

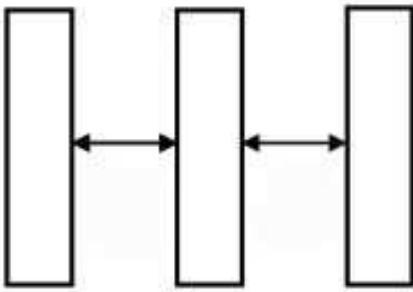
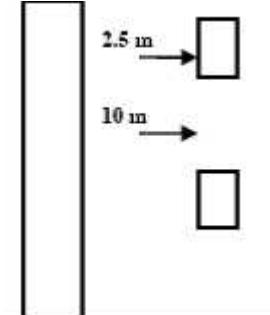
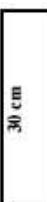
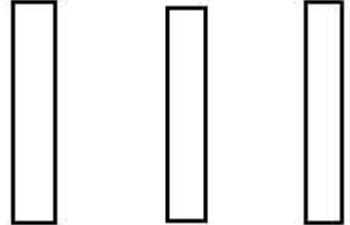
The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in Belgium (E 6) with regard to the LDWS pursuant to Regulation No 130. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of Regulation No 130 in its original form.

ANNEX 3

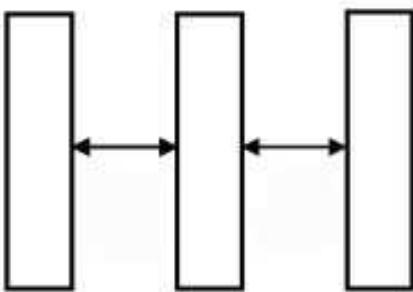
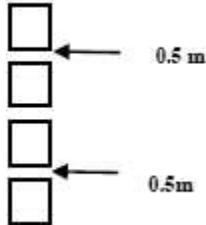
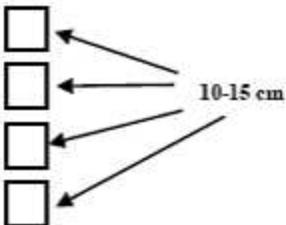
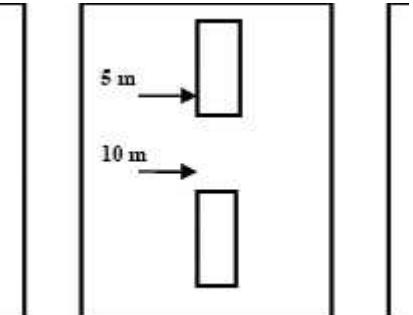
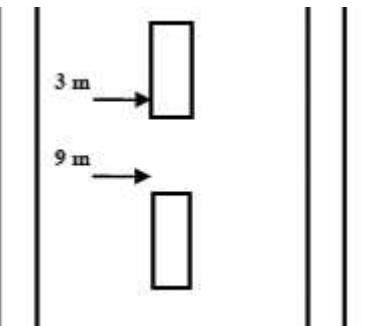
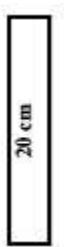
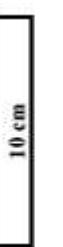
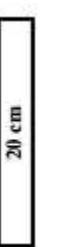
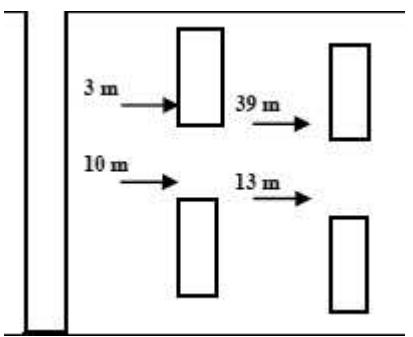
VISIBLE LANE MARKING IDENTIFICATION

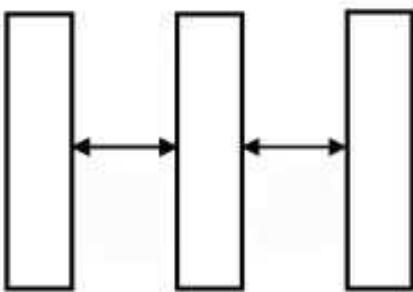
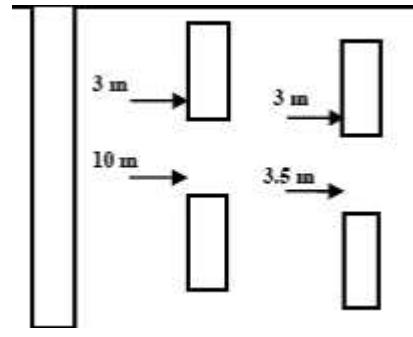
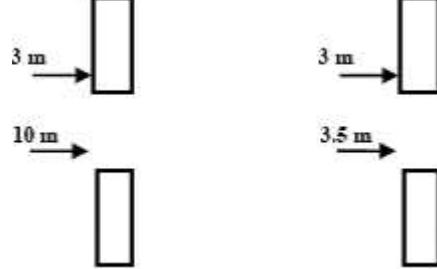
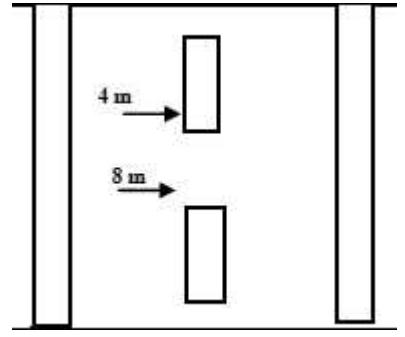
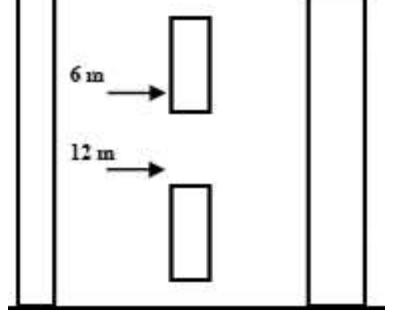
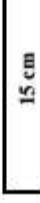
- For the purpose of the approval test referred to in paragraphs 6.2.3 and 6.5 of this Regulation, the test lane width shall be greater than 3,5 m.
- The visible lane markings identified in Table 1 below are assumed to be white, unless otherwise indicated in this annex.
- Table of identified visible lane markings to be used for approval test in accordance with paragraphs 6.2.3 and 6.5 of this Regulation.

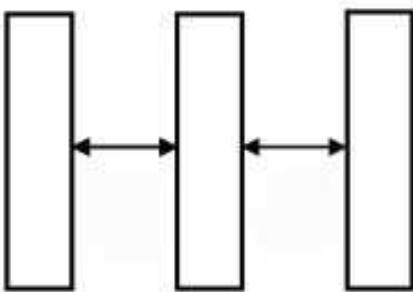
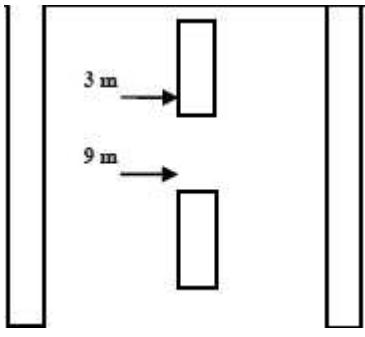
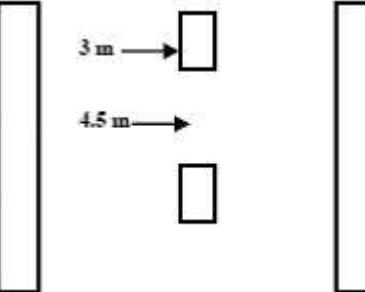
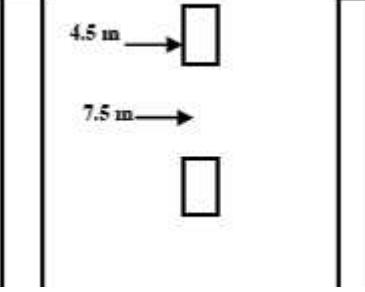
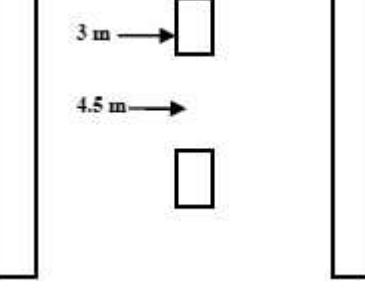
Table 1

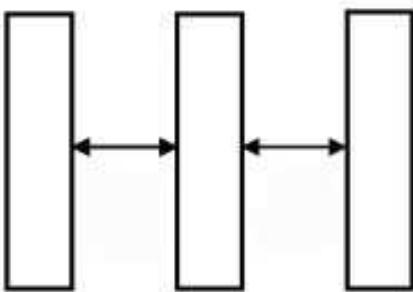
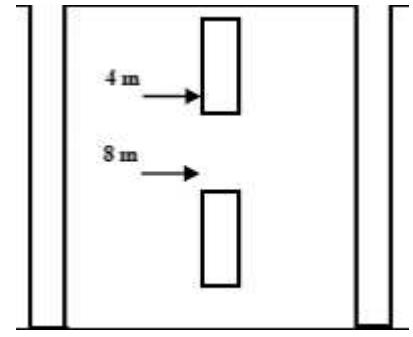
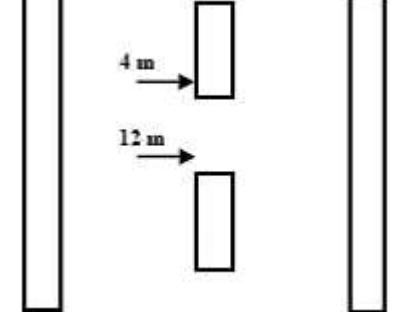
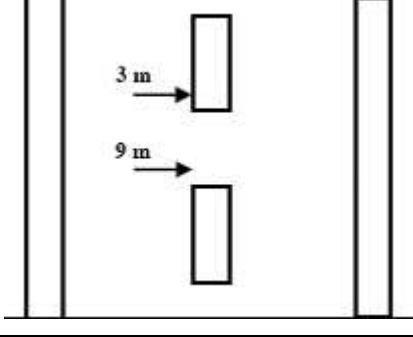
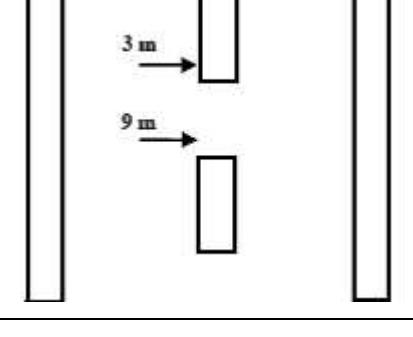
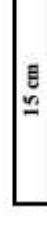
Pattern			Country	Width		
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking
			Definition of lane width for the purpose of this Regulation			
Lane width	Lane width					
			CANADA			
				30 cm	20 cm	30 cm
			CANADA Traffic Flowing in Opposite Direction			
Centrelines yellow, right edge lines white left edge line yellow				20 cm	15-20 cm	20 cm

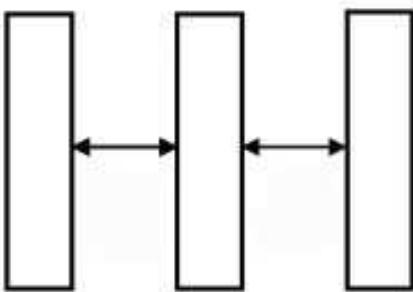
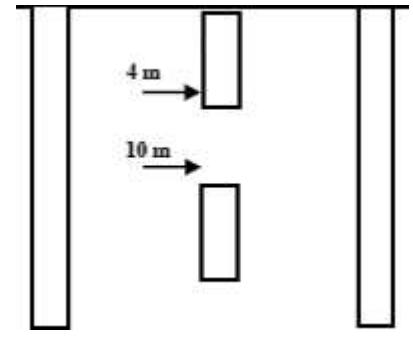
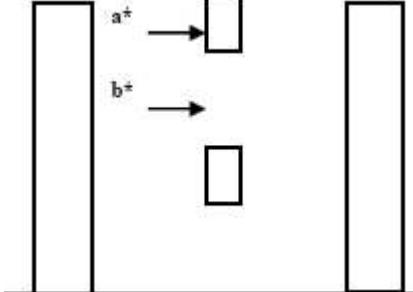
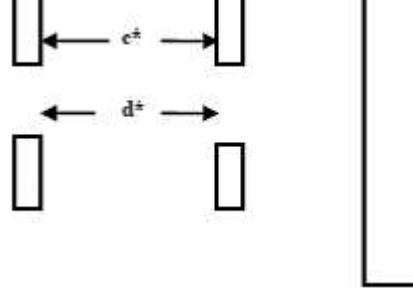
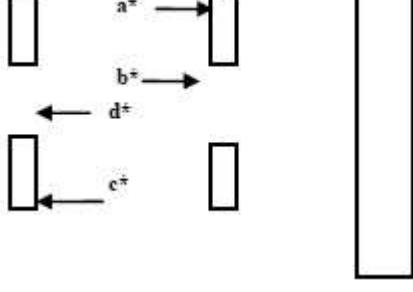
Pattern			Country	Width		
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking
			Definition of lane width for the purpose of this Regulation			
			CANADA Traffic flowing in same direction			
Centrelines yellow, right edge lines white left edge line yellow						
			CANADA Traffic flowing in opposite directions with lane changing prohibited			
Centrelines yellow, right edge lines white left edge line yellow						
			CANADA Traffic flowing in opposite directions with lane changing allowed only from one lane			
Centrelines yellow, right edge lines white left edge line yellow						
			CANADA Continuity lines in merging and diverging areas			
Centrelines white						

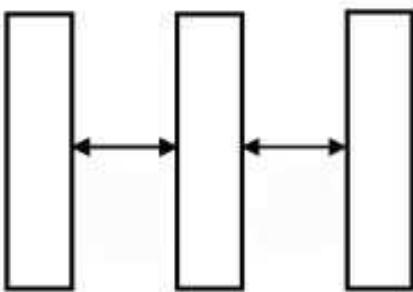
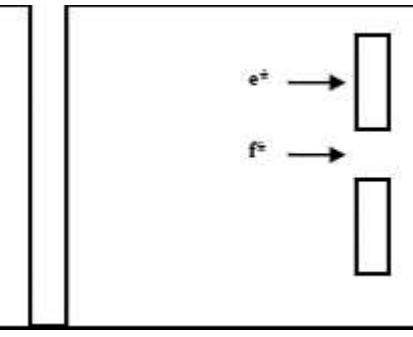
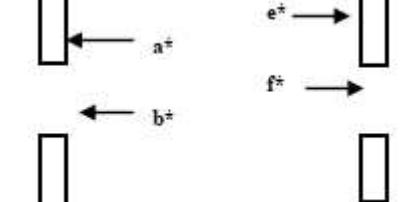
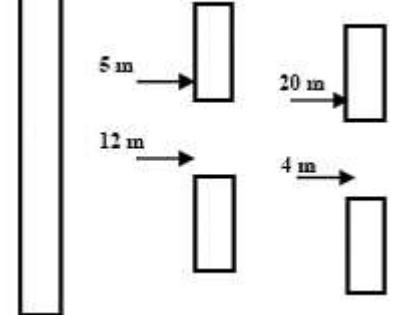
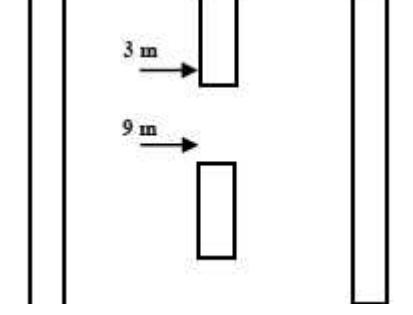
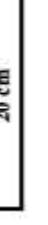
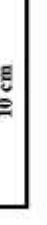
Pattern			Country	Width					
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking			
			Definition of lane width for the purpose of this Regulation						
Lane width	Lane width								
	White Lines		CANADA Guiding Lines		10-15 cm	15 cm			
			DENMARK		30 cm		15 cm		30 cm
			FINLAND		20 cm		10 cm		20 cm
			FRANCE Motorway (1)		22.5 cm		15 cm		22.5 cm

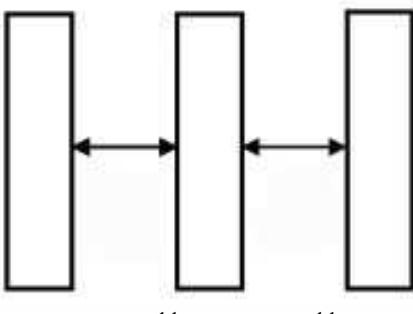
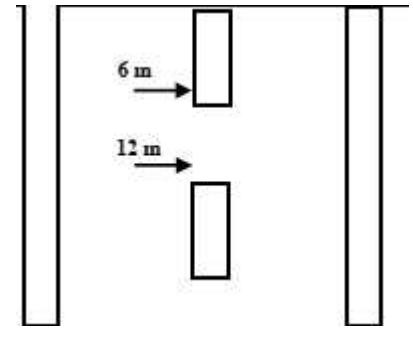
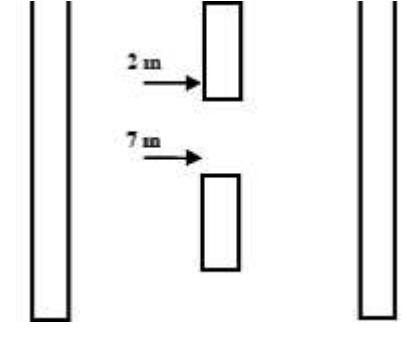
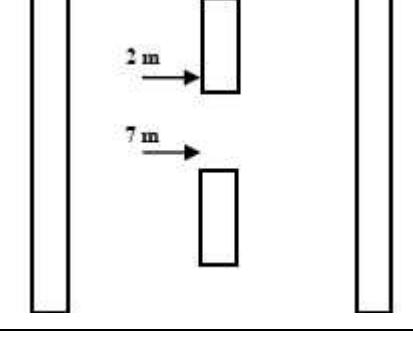
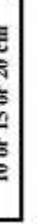
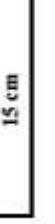
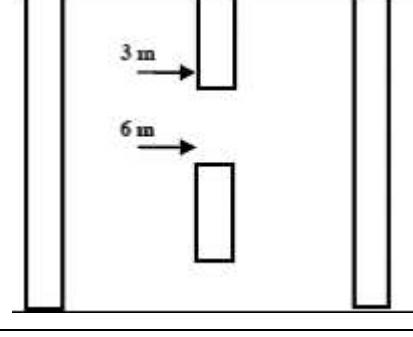
Pattern			Country	Width		
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking
			Definition of lane width for the purpose of this Regulation			
Lane width	Lane width					
			FRANCE Highways (4 lanes or 2 x 2 lanes)	22.5 cm and 37.5 cm		
3 m	10 m	3 m				
3 m	10 m	3.5 m				
			FRANCE (other roads)	10 or 12 cm		
3 m	10 m	3 m				
3 m	10 m	3.5 m				
			GERMANY Secondary	12 cm		
4 m	8 m					
6 m	12 m					
			GERMANY Motorway	15 cm		
6 m	12 m					

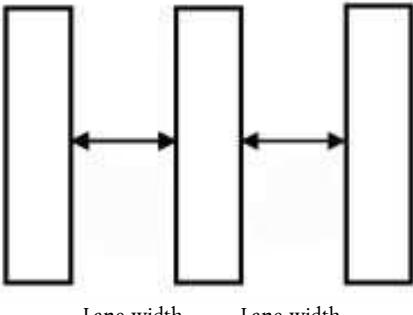
Pattern			Country	Width		
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking
			Definition of lane width for the purpose of this Regulation			
Lane width	Lane width					
			GREECE	12 cm	12 cm	12 cm
3 m	9 m					
			ITALY Secondary and Local	12 or 15 cm	10 or 12 cm	12 or 15 cm
3 m	4.5 m					
			ITALY Motorway	25 cm	15 cm	25 cm
4.5 m	7.5 m					
			ITALY Main	25 cm	15 cm	25 cm
3 m	4.5 m					

Pattern			Country	Width		
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking
			Definition of lane width for the purpose of this Regulation			
Lane width	Lane width					
			IRELAND			
4 m				15 cm	10 cm	15 cm
8 m						
			JAPAN			
4 m				10 cm	10 cm	10 cm
12 m						
			THE NETHERLANDS			
3 m				15 cm	10 cm	15 cm
9 m						
			NORWAY			
3 m				20 cm	15 cm	20 cm
9 m						

Pattern			Country	Width		
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking
			Definition of lane width for the purpose of this Regulation			
Lane width	Lane width					
			PORTUGAL			
			RUSSIAN FEDERATION More than one lane in each direction (Basic variant)			
			RUSSIAN FEDERATION More than one lane in each direction (Variant 1 with a lane for reversing traffic)			
			RUSSIAN FEDERATION More than one lane in each direction (Variant 2 with a lane for reversing traffic)			

Pattern			Country	Width		
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking
			Definition of lane width for the purpose of this Regulation			
Lane width	Lane width					
			RUSSIAN FEDERATION One lane in each direction (Variant 1)			
			RUSSIAN FEDERATION One lane in each direction (Variant 2)			
			SPAIN			
			SWEDEN			

Pattern			Country	Width		
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking
			Definition of lane width for the purpose of this Regulation			
			SWITZERLAND			
			UNITED KINGDOM Motorway (¹)			
			UNITED KINGDOM Dual Carriageway			
			UNITED KINGDOM Single Carriageway (speed limit > 40 mph)			

Pattern			Country	Width		
Left edge lane marking	Centre line	Right edge lane marking		Left edge lane marking	Centre line	Right edge lane marking
			Definition of lane width for the purpose of this Regulation			

(¹) Excepted certain zones (e.g.: slip road, lane for slow vehicles, etc.)

(^{*}) Note:

For the traffic speed limit up to 60 km/h:

$a = 1 \dots 3 \text{ m}$; $b = 3 \dots 9 \text{ m}$; $a:b = 1:3$;

$c = 3 \dots 6 \text{ m}$; $d = 1 \dots 2 \text{ m}$; $c:d = 3:1$;

$e = 1 \text{ m}$; $f = 2 \text{ m}$; $e:f = 1:2$

For the traffic speed limit above 60 km/h:

$a = 3 \dots 4 \text{ m}$; $b = 9 \dots 12 \text{ m}$; $a:b = 1:3$;

$c = 6 \dots 9 \text{ m}$; $d = 2 \dots 3 \text{ m}$; $c:d = 3:1$;

$e = 2 \text{ m}$; $f = 4 \text{ m}$; $e:f = 1:2$