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Working Party on Inland Water Transport

Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation

Forty-ninth session

Geneva, 22–24 June 2016

Item 6 (b) of the **provisional agenda**

Standardization of technical and safety requirements in inland navigation:

Guidelines for Waterway Signs and Marking (Resolution No. 59, revised)

Draft amendments to the Guidelines for Waterway Signs and Marking (Resolution No. 59, revised)

Note by the secretariat

I. Mandate

1. This document is submitted in line with Cluster 5: Inland Waterway Transport, paragraph 5.1 of the programme of work 2016–2017 (ECE/TRANS/2016/28/Add.1) adopted by the Inland Transport Committee at its seventy-eighth session on 26 February 2016.
2. The Working Party on Inland Water Transport at its fifty-ninth session asked the secretariat to prepare an amendment proposal to Resolution No. 59 on the basis of the revised Instruction on the Mode of Installation of Waterway Signs and Marking on the Danube (ECE/TRANS/SC.3/2015/5) and the fifth revised edition of the European Code for Inland Waterways (CEVNI) (ECE/TRANS/SC.3/201, para. 31).
3. The Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation (hereafter the Working Party) at its forty-eighth session asked the secretariat to continue work on revision of Resolution No. 59 on the basis of ECE/TRANS/SC.3/2015/5 and ECE/TRANS/SC.3/WP.3/2016/4 (ECE/TRANS/SC.3/WP.3/96, paras. 25–26).

4. The Working Party may wish to consider the draft amendment proposal prepared by the secretariat in cooperation with the Danube Commission and the International Sava River Basin Commission and to hold in-depth discussions on the proposed draft at its forty-ninth session.

II. Explanations to the amendment proposal

5. Along with the amendment proposal made on the basis of ECE/TRANS/SC.3/2015/5 and the fifth revision of CEVNI, some further amendments are proposed to the Annex to Resolution No. 59:

- (a) Introduce new terms: “floating signs”, “bank marks”, “marking plan”;
- (b) Clarify the use of terms “waterway”, “fairway” and “navigation line” according to definitions given in CEVNI;
- (c) Update the references to the documents referred to in the text;
- (d) Add to Appendix 1 sketches of new signs added to the fifth edition of CEVNI and update the modified sketches;
- (e) Introduce editorial amendments to the existing text in order to ensure consistency of the English, French and Russian versions of Resolution No. 59; some of these changes apply to more than one language version.

III. Amendment proposal for Chapter 1

6. It is proposed to introduce the following amendments to Chapter 1 of the Guidelines for Waterway Signs and Marking:¹

“1. GENERAL

1.1 In terms of the objective pursued, the marking comprises two categories of signs:

- Signs used to regulate navigation² on the waterway, set out in annex 7 of the European code for inland waterways (CEVNI); and
- Signs and signals **installed** on the waterway (**hereafter floating signs**) and **signs installed on the banks** (**hereafter bank marks**) marking the sides of the fairway and navigational hazards, set out in annex 8 to CEVNI.

In order to increase the safety of navigation, the competent authorities referred to in article 1.9 shall place kilometre markings along the inland waterway wherever waterway dimensions allow, as well as mark off each hectometre wherever possible.

1.2 The signs set out in annex 7 to CEVNI are prohibitory, mandatory, restrictive, recommendatory or informative signs and auxiliary signs.

¹ Note of the secretariat: hereafter the new text is bold, the text proposed for deletion is strikethrough.

² Note of the secretariat: Russian text only.

1.3 In accordance with article 5.01 of CEVNI, **vessels' crew members**^{3, 4} ~~boatmen~~ shall obey the requirements and take account of the recommendations or indications brought to their attention by these signs.

1.4 ~~The signs and signals on the water~~ **Floating signs** and bank marks of annex 8 to CEVNI are used to indicate the limits, the direction and the depth of the ~~waterway~~ **fairway** and, in addition, ~~are used~~ to mark obstacles and structures protruding into the fairway or in its vicinity. **Here, the instructions of Section A of Chapter I, annex 8 to CEVNI shall be taken into account.**

1.5 The number of **signs**, bank marks ~~and signs and signals on the water and the plan for floating signs and their on-site locations~~⁵ shall meet the requirements of navigational safety.

1.6 The choice of the marks and the establishment of their number depends on the local characteristics of the ~~waterway~~ **fairway** and the function of each mark. Their installation shall be effected **in cases when it is required by navigation criteria on the respective river section**, in such a way as to ensure visibility from one mark to the next.

1.7⁶ The luminous range of lights is established by the competent authorities of the respective countries in terms of local navigational² conditions. In calculating the luminous range, the atmospheric transmission coefficient 0.6 should be used over a distance of 1 nautical mile.

1.8 In principle, the colours of lights should be in keeping with the ~~recommendations~~ **standard** of the International Commission on Illumination ("Colours of light signals", CIE ~~Publication S 004/E-2001, class A No. 2.2-1975 (TC 1.6))~~ **Publication S 004/E-2001, class A No. 2.2-1975 (TC 1.6))**.

1.9 The marks shall be installed by the competent authorities which:

(a) Regularly observe the state of the **river** bed ~~of the river~~ and the changes taking place in it and, on the basis of the results of these observations, correct the positioning of the signs and marks and, where necessary, add to them so that they indicate the fairway dimensions;

(b) Regularly measure the depth and the width of the marked fairway² and provide boatmasters with the necessary information concerning minimum fairway² depths and widths and the river level regime;

(c) Establish the plan for the installation of signs and marks **(hereinafter the marking plan)** in their respective sectors and establish the type and number of **floating**⁷ signs ~~and signals on the water~~ and bank marks to be used, in terms of the requirements of navigational safety and local conditions;

(d) Ensure **as far as possible** the uninterrupted operation of all **floating**⁷ signs ~~and signals on the water~~ and bank marks;

(e) Inform boatmasters in good time of the date of the installation and removal of signs ~~and signals~~, of all alterations **of importance to navigation** to their

³ Note of the secretariat: English and French texts only.

⁴ Note of the secretariat: the respective amendment could be made in paragraph 2 of Article 5.01 CEVNI (English and French texts only).

⁵ Note of the secretariat: English and Russian texts only.

⁶ Note of the secretariat: the Working Party could take a decision regarding the revision of this paragraph with due regard of ECE/TRANS/SC.3/WP.3/2016/4, para. 19.

⁷ Note of the secretariat: English text only.

number, type, positioning and lighting, and the rules they establish permitting the passage of vessels in restricted sections where meeting and passing are prohibited.”.

IV. Amendment proposal to Chapter 2

7. It is proposed to introduce the following amendments to Chapter 2:

“2. REQUIREMENTS TO BE MET BY SIGNS AND MARKS AND THEIR ~~MARKING~~³ PLAN ~~FOR THEIR INSTALLATION~~”

2.1 **The** marking shall be in operation continuously (by day and **by** night) all along the navigable section of the river, **and, as far as possible**, as from when the waterway is free from ice until the ice appears; it shall be corrected as changes occur in the **water**³ level and in the fairway.

In accordance with the state of the fairway, the marking shall be positioned in such a way that the vessels navigating downstream can use the part of the river with the high current speed and the vessels navigating upstream can use the part of the river with the low current speed.

2.2 During periods of high water and icing, the regular ~~marking~~**floating signs** removed to preserve it from possible damage shall be replaced, as far as possible, by marker posts and spars, the topmarks and colours of which shall correspond to those adopted for the respective⁸ side of the fairway.

~~2.3 The bank marks and the additional signs and signals on the water shall, if possible, operate until navigation becomes completely impossible because of ice.~~

~~2.43~~ Floating⁵ signs ~~and signals on the water~~ shall be installed so as to ensure the safety of vessels on the fairway.

~~2.54~~ Buoys shall be unsinkable and shall remain unsinkable in all storms, and their main body shall therefore be watertight; they shall not only float but also be stable, i.e. conserve a vertical position as far as possible and not be tipped excessively by waves and wind.

~~2.65~~ The basic condition which the **marking** plan ~~for the installation of the signs and marks~~ shall meet is to ensure the safety of the vessels and the continuity of traffic, by day and by night, throughout the sailing season and to give boatmasters clear and unambiguous indications concerning the direction and the limits of the fairway.

~~2.76~~ The marking plan ~~for the installation of the signs and marks~~ shall be prepared in such a way as to permit a rational combination of bank marks and **floating** signs ~~and signals on the water~~. When the plan is drawn up, it should be based on the conditions of navigation and specific hydrographical and hydro-meteorological conditions, the need to ensure the established dimensions of the fairway and create the necessary conditions for the safety and continuity of navigation of all river⁹ vessels and, where necessary, of seagoing vessels.

~~2.87~~ Bank marks serve to guide boatmasters and to indicate the direction of the fairway.² ~~Signs and signals on the water~~ **Floating signs** supplement bank marks in sectors where, in order to ensure the safety of navigation, it is essential to indicate

⁸ Note of the secretariat: French and Russian texts only.

⁹ Note of the secretariat: French text only.

not only the direction of the fairway² but also its limits, and to mark places where there are obstacles.

2.98 In preparing the **marking** plan ~~for the installation of the signs and marks~~, the following requirements should be taken into account:

(a) Only the signs set out in annexes 7 and 8 to CEVNI are to be used to mark the fairway and regulate navigation; in exceptional cases, special additional bank marks may also be used, provided, however, that the marks are not in contradiction with those contained in CEVNI;

(b) The dimensions of the marked fairway shall correspond to the dimensions published by the competent authorities;

(c) The choice of where the signs are to be placed shall be based on the most recent measurements, acquired experience and available data on the state of the fairway, critical points, water levels, etc.;

(d) Signs and marker lights shall be visible, whatever the level of the water, at all points of the fairway² and as long as may be necessary for the guidance of boatmasters;

(e) The marking plan shall contain information on the type of placed signs, bank/side whereon placed, river kilometre of the set-up and recapitulation of all **floating**⁷ signs ~~and signals on the water~~ and bank marks used for marking.

2.409 If there is a subsequent drop in the level of the water, reconnaissance soundings shall be taken on some sections of the river in order to check whether the positioning of the signs is adequate and to establish whether the marking needs to be supplemented by new signs.

2.410 The frequency of these soundings shall be determined by changes in water level. The more rapid the drop in levels, the more frequent the soundings need to be.”.

V. Amendment proposal to Chapter 3

8. It is proposed to introduce the following amendments to Chapter 3:

“3. VISIBILITY OF SIGNS AND LIGHTS

3.1 Whatever the position of the vessel in relation to the sign or the marker light, the characteristics of the sign or light shall remain unchanged. For daytime signs, these characteristics are: the form (topmark) and the colour; for signs ~~and signals~~ at night: the type¹⁰ and colour of the lights.

3.2 The forms² and the colours of the topmarks and the types and colours of the lights are set out in detail in annexes 7 and 8 to CEVNI.

3.3¹¹ Sketches of the signs and marks with the minimal dimensions are given in the Appendix 1 to these guidelines. The numbering of the sketches corresponds to the numbering of the signs and marks given in annexes 7 and 8 to CEVNI.

¹⁰ Note of the secretariat: “the type” could be replaced by “the rhythmicity”, according to ECE/TRANS/SC.3/2015/5.

¹¹ Note of the secretariat: ECE/TRANS/SC.3/2015/5 prescribes not only the sketches and the minimal dimensions, but their technical execution to be in accordance with annexes 1 to 4.

Conditions of visibility and dimensions of signs

3.4 The basic requirement to be met by signs and marking is the guarantee of good visibility of all signs and ~~signals~~ **lights** by day or night.

3.5 In accordance with IALA recommendations,¹² there are three degrees of visibility of signs ~~and signals~~:

(a) First: ~~when, because of the distance, the sign is no more than a blotch on the background and neither shape nor colour can be distinguished (dotted outline); the sign is visible to the naked eye. The meaning of the sign is not yet identifiable (simply visible);~~

(b) Second: when the sign is **clearly** visible and ~~its shape and outline can be seen, but the colour remains unclear; identifiable according to CEVNI (identifiable);~~

(c) Third: ~~When the shape and colour of the sign can be seen distinctly, the sign is identifiable and distinguishable from its surrounding background (conspicuous).~~

Signs that must be seen by a boatmaster at some imperative distance (“no entry”, “keep a particular sharp lookout”, etc.) must have a visibility (due to their proper dimensions) of second or third degree. The type and dimensions of signs should be selected accordingly.

Third degree visibility is required when the sign or light is identifiable in principle, but cannot be easily seen at night owing to the surrounding background (presence of construction or a large number of light sources).

3.6 The degree of visibility of ~~a signs and lights, as of any object, depends primarily on the size of the angle of sight, the colour contrast, the contrast in luminance and weather conditions~~ **on the following conditions:**

Signs:

- Angle of sight;
- Colour contrast and differences;
- Lighting (including natural day light) and weather conditions.

Lights:

- Luminous intensity;
- Competing lights and background lighting;
- Weather conditions.

Conditions of visibility and dimensions of signs

3.7 In order to ensure the **first degree** visibility ~~of first degree, in daytime~~ the sign shall be visible ~~under 1' with an angle of more than 1 angular minute by day and under 10' angle by night¹³~~ **and with sufficient contrast in relation to the environment.** Detailed form and colour of the sign ~~(visibility of second and third~~

¹² Note of the secretariat: amendments to paragraphs 3.5–3.7 are based on the IALA Guideline No. 1094 On Daymarks for Aids to Navigation, Edition 1, December 2012.

¹³ Note of the secretariat: the Working Party may agree with the opinion that a daymark is invisible at night unless it is illuminated; in the latter case, the illumination should be designed to ensure the same visibility as in daytime.

degree visibility) are identified under even larger angles can only be distinguished with a larger angle of sight or with a reduction in the distance L to the object being observed.

3.8 The ~~largest~~ **minimal** angle of distinction ~~by day in daytime~~ for simple shapes (quadrant, triangle, circle, cylinder, cone, sphere etc.) ~~shall be within is~~ **between 3.5°—5° scale 3 and 5 angular minutes**, and for complex shapes (numbers, letters, etc.) ~~within 5°—8° scale between 5 and 8 angular minutes~~. For the boatmaster to be able to recognize **the daymark** (without any optical aids) ~~the shape of the sign~~ at appropriate distances and visibility, ~~the above mentioned implies that~~ the following formula can be used for **the calculation of the required minimum signs² dimensions of simple and complex shapes:**

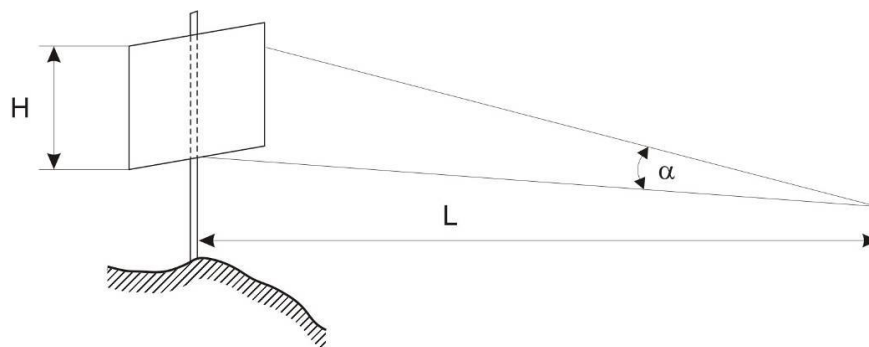
$$H = L \cdot \operatorname{tg} \alpha \cong L \cdot \sin \alpha$$

H (m) – height of the sign;

L (m) – distance;

α (°) – viewing angle.

Figure 1a



Values for H (m) as a function of L (m) and α (°) are presented in Table 1.

Table 1

	α	L (m)				
		500	1 000	2 000	3 000	4 000
For signs of⁵ simple shapes (cylinder, cone, circle, etc.)	3	0.44	0.87	1.74	2.61	3.48
	4	0.58	1.16	2.32	3.48	4.64
	5	0.73	1.45	2.90	4.35	5.80

Table 1 shows that a shape of a sign with dimension $H = 0.5$ m is recognizable at distance $L = 500$ m and viewing angle $\alpha = 4^\circ$; when $L = 1,000$ m, then $H = 1$ m, etc.

When there are simple drawings (dot, line, arrow) on the signs, a 15 per cent visibility reduction must be taken into account, while with complex drawings it shall be 30 per cent.

3.9 Examples of the minimum measurements for the signs, marks and buoys from annexes 7 and 8 to CEVNI are given in Appendix² 1 to these guidelines. Alphanumeric characters on ~~traffic~~ signs should intend to provide a standard for the various ~~traffic~~ signs.

The letters, figures and analogous symbols should be of a height not less than one five-hundredth of the maximum distance from which they must be read, and the thickness of the stroke should be not less than one-seventh of that height.¹⁴

For bank marks and signs, ~~the~~ minimal height from the lower rim of the board down to the ~~ground~~ **base of the lowest sign** shall be 3 m. In places where it is necessary due to the configuration of the terrain (relief), a height of 2 m is allowed.¹⁵ At highest navigation water levels, the height **between the water surface and of the water level up to** the lower rim of the board **of the lowest sign** should not be less than 1.5 m.¹⁶

3.10 As regards the signs and signals of annex 8 to CEVNI, unlighted buoys and unlighted bank mark boards shall be covered with reflective material. Light buoys and lighted bank mark boards may also be so covered. The colours of these materials shall correspond to those established for the buoy lights or the boards.² In all cases, the topmarks of light buoys shall be covered with reflective paint.¹⁷

3.11 In order to ensure that bank marks are clearly visible, their dimensions shall be determined in terms of their purpose, the distance between the fairway and the banks, the nature of the region and the characteristics or other specific conditions of the sector in question.

3.12 The good visibility of a sign or signal depends on the contrast between the luminance of the sign or signal and the background. This shall be taken into consideration in choosing a site for signs ~~and signals~~⁷. For example, of two boards, one red and the other white positioned one beside the other against a light background, the red board will be more visible and visible at a greater distance than the white board while, in contrast, the white board will be easier to see than the red board against a dark background.

3.13 The visibility of signs ~~and signals~~ of annex 7 to CEVNI regulating navigation on the waterway shall be ensured at night by lighting them with fixed directional white lights, operating uninterruptedly and so positioned that the light does not incommode the boatmasters.¹⁸

If electric lighting cannot be used, the sign boards shall be covered with reflective material of a corresponding colour on which the symbol shall be clearly visible to vessels.

3.14¹⁹ When boards are lighted, it should be ensured that the shade of their colour is unchanged. The luminance of the sign or signal perceived, like that of any object, depends not only on the lighting but also on the capacity of the surface of the sign to reflect the light waves falling on it. This shall be taken into consideration when the signs are painted; this shall be done in such a way that the surface of the sign is smooth and reflects the light properly and is not dull and covered with an uneven coat of paint.

¹⁴ This provision is taken from Resolution No. 22 “SIGNI – Signs and signals on inland waterways” (ECE/TRANS/SC.3/108/Rev.2), hereafter – SIGNI.

¹⁵ Note of the secretariat: this sentence was missing in the French text.

¹⁶ **If this requirement cannot be met due to local conditions, the competent authorities may prescribe other requirements to ensure proper visibility.**

¹⁷ Note of the secretariat: this sentence was missing in the Russian text.

¹⁸ The competent authorities may waive these requirements.

¹⁹ Note of the secretariat: the Working Party could take a decision regarding the revision of this paragraph with due regard of ECE/TRANS/SC.3/WP.3/2016/4, para. 19.

Conditions for the visibility of lights

3.15 In certain cases lighting may be provided at night (e.g. lighting of the lower part of a bridge, of the piers of a bridge, of the approaches to a lock, of a section of a canal, etc.). Such lighting may be used to supplement the markings. Lighting shall be so designed as to avoid dazzling.²⁰

3.16²¹ It is recommended that the luminous intensity of a light should be determined according to Part II of Appendix 7 to ~~UNECE Resolution No. 61 of the UNECE Working Party on Inland Water Transport~~ “Recommendations on Harmonized Europe-Wide Technical Requirements for Inland Navigation Vessels”.²²

3.17 Since the intensity of light should be higher for the colour lights produced by application of filters, a stronger source of light is needed. Table 2 shows the intensity of sources of light calculated for atmospheric conditions of light haze:

Table 2

Visibility (m)	Intensity of light (cd)		Intensity of source of light (cd)	
	White light	White light	Red light	Green light
500	0.06	0.06	0.40	0.60
1 000	0.25	0.25	1.70	2.50
2 000	1.40	1.40	9.30	14.00
3 000	4.20	4.20	28.00	42.00
4 000	9.80	9.80	65.00	99.00
5 000	20.00	20.00	133.00	200.00

3.18 The duration of the flash of a signal light shall not be less than 0.5 seconds. Shorter flashes, even if they are frequent, are tiring on the boatmaster's eyes and hinder orientation. Long and infrequent flashes on the other hand also hinder orientation, since while waiting for the next flash the boatmaster cannot be sure that he is still proceeding in the desired direction.

3.19 **Light signals are identified according to their characteristics. The characteristics are given by their colour and the rhythmicity the light source**
~~Details of the characteristics of signal lights used can be found in accordance with annex 8 to CEVNI.~~

Obligation not to hinder road and rail traffic

3.20 Signs and marking shall be installed in such a way that their lights do not hinder the movements of other modes of transport if the road runs close to the river.

3.21 In a sector in which a road or a railway runs close to a river, the installation of all the above-mentioned signs and signals shall be carried out in consultation with the respective competent authorities.”.

²⁰ This text is from SIGNI.

²¹ Note of the secretariat: The Working Party could take a decision regarding the revision of paras. 3.16–3.18 with due regard of ECE/TRANS/SC.3/WP.3/2016/4, para. 19.

²² The alternative proposal is to refer to ~~Recommendation on the Determination of the Luminous Intensity of Marine Aid to navigation Lights, December 1977, published in the IALA Bulletin No. 75-1978-3, as done in SIGNI~~ **IALA Recommendations E-200 on Marine Signal Lights.**

VI. Amendment proposal to Chapter 4

9. Introduce the following amendments to Chapter 4:

“4. INSTALLATION OF SIGNS AND MARKING IN CHARACTERISTIC SECTIONS OF THE RIVER

4.1 *General*

4.1.1 Signs have two possible orientations, namely:

- (a) Parallel to the axis of the fairway;²
- (b) Perpendicular to the axis of the fairway.²

4.1.2 Signs of type (a) are predominantly prohibitory or indicative signs, and are placed on the side of the fairway² to which the prohibition or the indication applies.

Bank marks which are used in relation to navigation in both directions (upstream and downstream)⁹ shall be oriented as under (a). In some cases, (better visibility) the angle between the mark and the axis of the fairway can be 10° or less. (Fig. 1, sign a).

4.1.3 Most signs are positioned as described under (b)⁹, and generally do not apply to one side of the fairway² only. These signs are erected at right angles to the axis of the fairway² so that they are visible to a user when under way.

Bank marks which are used in relation to navigation in one direction (upstream or downstream)⁹ shall be oriented as under (b). In some cases, (better visibility) the angle between the mark and the axis of the fairway cannot be less than 60° (Fig. 1, sign c).

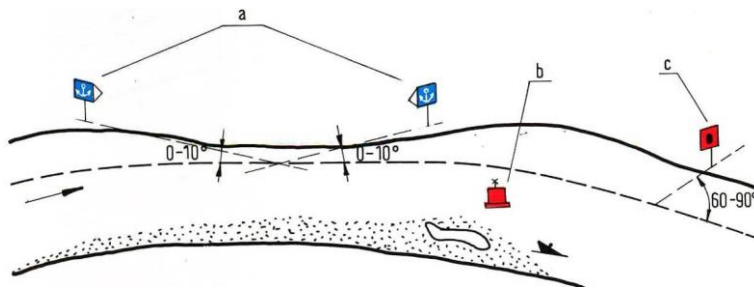
4.1.4 The use of a particular **floating**⁷ sign ~~or signal on the water~~ or bank mark and how⁹ it is installed depends on the one hand on the local features of the river (speed of current, variation in levels, meanders, width of the **river** bed, existence of sills, branches, islands, etc.), and on the other hand on the density of traffic in a given sector and the form and size of convoys.

4.1.5 The position of each **floating**⁷ sign ~~or signal on the water or signal~~ indicating the side of the fairway² shall be determined on the basis of the marking ~~installation~~ plan based on the results of measurements. Depths within the limits of the width of the marked fairway shall under no circumstances be less than the minimum depth reported for the sector in question.

4.1.6 When floating signs ~~and signals~~ are installed, it is essential to take the direction of the current into account. If the current flows in the direction of a **navigational hazard** (obstacle), the sign or signal shall always be placed a long way from ~~the navigational hazard (obstacle) it;~~³ if, on the other hand, it flows in the opposite direction, the sign or signal shall be placed nearer.

4.1.7 Obstacles on the sides² of the fairway are always marked with floating signs ~~or signals~~⁷. When the obstacle is indicated by a single sign, it shall be placed on the upstream extremity of the obstacle, on the fairway side (Fig. 1, sign b).

Figure 1



4.1.8 As a rule, lighted buoys or unlighted buoys² shall be used to mark the upstream and downstream extremities of sills, banks⁹ which narrow the fairway² in **meandering sectors** ~~alluvial channels~~, banks protruding into the fairway², piles of stones, reefs, water supply engineering structures, and underwater hazards or obstacles (sunken vessels, anchors, etc.).

4.1.9 Marker posts and spars shall be used as additional signs supplementing buoys in order to give a clearer indication of the limits of the fairway², ⁹over difficult sills and in order to mark underwater obstacles. In some cases and in some sectors, buoys may be replaced by marker posts or spars.

4.1.10 In order to avoid damage to buoys during the period when ice is carried down, they shall be replaced by spars or marker posts.

4.1.11 On sectors of the river where there is day and night navigation, forks, junctions and the ~~centerline-axis~~⁷ of the fairway, along with obstacles to navigation lying within the fairway, shall be marked by light buoys² or bank **signs and** lights. **Floating**⁷ signs ~~and signals on the water~~ shall be installed at such a depth and at such a distance from the obstacle that the safety and ease of movement of vessels shall be guaranteed at night and in poor visibility.

4.1.12 On sectors where the ~~fairway river bed~~³ is narrow, preference shall be given to **bank**⁷ marks ~~on the banks~~.

4.1.13 Each **bank mark**⁷ ~~sign or signal on the bank~~ shall be established following reconnaissance of the area and selection of the most appropriate site. The need to ensure the visibility of the sign whatever the level of the water should be taken into consideration.

4.1.14 Where it is necessary to ensure good visibility of the symbol on the sign over a long distance, both for vessels proceeding upstream and vessels proceeding downstream, two boards may be installed on the sign pole at an angle to each other, one pointing upstream and the other downstream.

4.1.15 In selecting the site of a ~~sign or signal on the~~ **bank mark**⁷, account shall be taken of the need to ensure easy maintenance and to protect it against ice and flooding⁹.

4.1.16 Before a bank sign or signal is installed, the depth in the area in front of it and in the direction it indicates shall always be measured.

4.1.17 As a general rule, the objective is that only the network of **bank marks**⁷ ~~signs and signals on the bank~~ shall provide an uninterrupted indication of the position of the fairway as a whole, while the **floating**⁷ signs ~~and signals on the water~~ shall help boatmasters to determine the limits of the fairway⁹.

4.2 *Marking of ~~alluvial channels~~ meandering sectors*

4.2.1 *Installation of cross-channel fairway signs and bank lights²*

4.2.1.1 Cross-channel fairway signs and bank lights may be used in ~~alluvial channels~~ **meandering sectors** in order to indicate that the fairway crosses over from one bank to the other (signs featured in 4.C, 4.D, 5.C, 5.D in annex 8 to CEVNI).

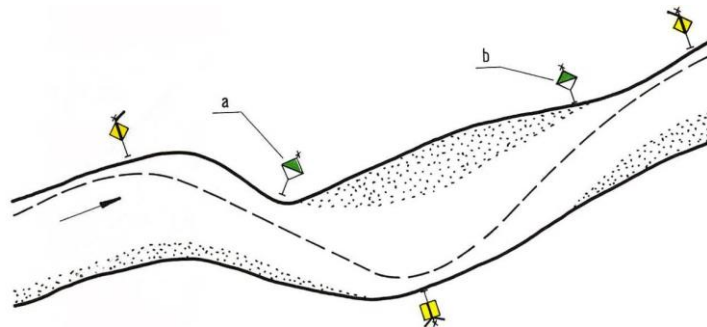
4.2.1.2 Cross-channel fairway signs and bank lights² are placed when the fairway² is sufficiently broad, its safety is ensured, and when the direction only requires² to be indicated approximately.

4.2.1.3 Bank lights and cross-channel fairway signs shall be selected in such a way as to differentiate cross-channel fairways in terms of their length, in other words in terms of the distance between two neighbouring signs. The length of the cross-over is relative, since it depends on the width of the fairway.

4.2.1.4 The cross-channel fairway signs and bank lights have best results on distances up to 3 km. On such sections, cross-channel fairway signs and bank lights (without **floating** signs ~~on the water~~⁷) can be placed under conditions where the available width for navigation² is more than two times² wider than the minimum prescribed width of the fairway² for a particular sector. If the available width for navigation² is less than the minimum prescribed width of the fairway² for a particular sector, cross-channel fairway signs and bank lights (without signs on the water) cannot be placed at distance greater than 1–1.5 km.

4.2.1.5²³ If the distance between two neighbouring cross-channel fairway signs is larger than the calculated visibility, and when the ~~navigation line~~ **fairway** passes ~~close to nearby~~ the bank, the bank lighted ~~sign~~, which additionally marks the position of the ~~navigation line~~ **fairway**, is placed between those two neighbouring cross-channel fairway signs (Fig. 2, sign a). The bank lighted ~~sign~~³ is also placed when the fairway² passes near the bank (Fig. 2, sign b).

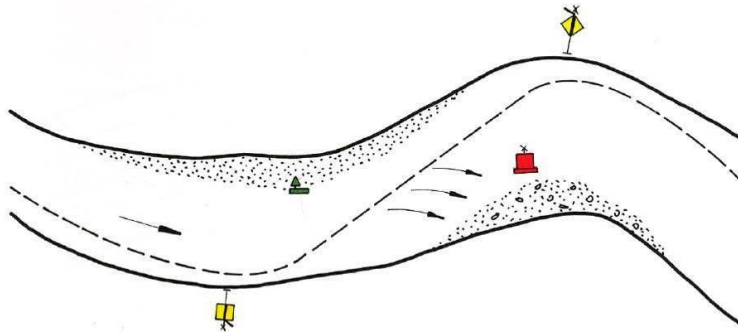
Figure 2



4.2.1.6 In case the direction of the current makes an angle with the fairway, when strong side winds or a similar situation occurs, the fairway² can be marked by additional navigation marks according to the local conditions (Fig. 3).

²³ Note of the secretariat: this paragraph in ECE/TRANS/SC.3/2015/5 has been deleted.

Figure 3

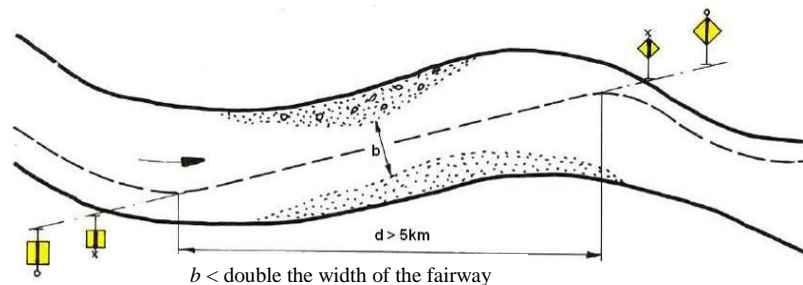


4.2.1.7²⁴ If the fairway² at longer transitions goes through the middle of the river bed or sharply crosses from one bank to another, its axis may be indicated by a **pair of two** cross-channel fairway signs, as shown in Figure 4.

The advantage is given to two cross-channel fairway signs on each side of the fairway in case of straight-line sections longer than 5 km, where the available width for navigation is less than double the width of the minimum prescribed width of the fairway for a particular sector. In this case and when the bank configuration allows so, the cross-channel fairway signs are placed on both margins of the transition (Fig. 4).

~~The advantage is also given to placing~~ **It is always preferable to** two cross-channel fairway signs on each side of the fairway when the fairway² is narrowed by certain obstacles constituting threats to navigation or other hazards marked by **floating⁷ signs⁸ and signals on the water.**

Figure 4

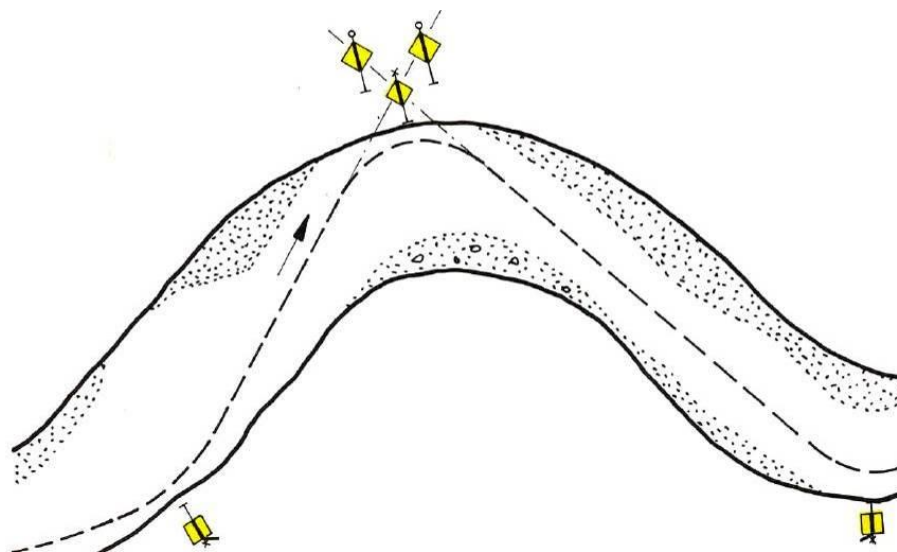


4.2.1.8²⁵ On a section where the ~~navigation line~~ **fairway** returns to the opposite bank immediately after crossing the waterway, three cross-channel fairway signs (the front should have two boards) are mandatorily placed (Fig. 5). In that case, lights of the back cross-channel fairway signs should be strictly oriented to the fairway axis: one to upstream and one to downstream.

²⁴ Note of the secretariat: it is proposed to replace the whole paragraph with the text from para. 4.2.1.6 of ECE/TRANS/SC.3/2015/5.

²⁵ Note of the secretariat: it is proposed to replace the whole paragraph with the text from para. 4.2.1.7 of ECE/TRANS/SC.3/2015/5.

Figure 5



4.2.1.9 Interrelationships of the front and back signs at hidden routes shorter than 4 km are presented in Table 3.

Table 3

L (m)	d (m)	h_o (m)	a (m)	$2a$ (m)
200	17	8.50	2.6	5.0
300	25	8.70	4.0	8.0
400	33	8.85	5.2	10.5
500	42	9.00	6.5	13.0
600	50	9.10	8.0	16.0
700	58	9.20	9.0	18.0
800	67	9.35	10.0	20.0
900	75	9.50	12.0	24.0
1 000	83	9.60	13.0	26.0
1 500	125	10.25	19.0	38.0
2 000	166	10.90	26.0	52.0
2 500	207	11.50	33.0	66.0
3 000	250	12.15	39.0	78.0
3 500	290	12.75	46.0	92.0
4 000	330	13.40	52.0	104.0
> 4 000	760	14.20	25.0	50.0

Where (see Figure 1b):

L (m) – maximal distance when cross-channel fairway signs can be used;

d (m) – distance between front and back signs (is approximately $1/12 L$);

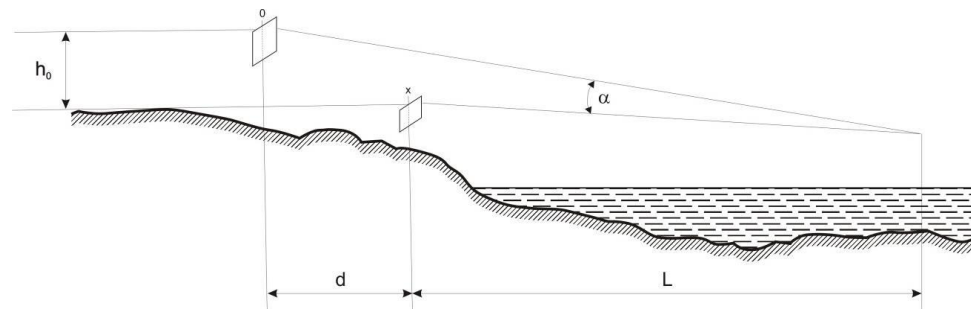
h_o (m) – height between lights of front and back sign;

a (m) – distance necessary for a vessel to adjust its course if the vessel does not go along the cross-channel fairway;

α (°) – viewing angle.

Table 3 also assumes that the observer's sight is 5 m above the water level, and the light of the lower (front) sign is 8 m above the water level.

Figure 1b



Value " a " describes accuracy of the route and it is of significance while navigating through a narrow fairway. Accuracy is, in principle, increased by approaching the cross-channel fairway signs.

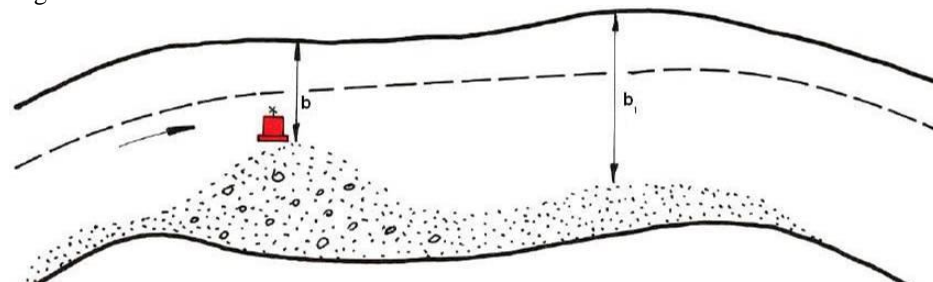
To ensure proper recognition of cross-channel fairway signs and their lights by night, the viewing angle α (°) cannot be less than 4° angular minutes in relation to the vertical³.

4.2.2 Installation of **floating**⁷ signs ~~and signals on the water~~

4.2.2.1 In **meandering** sectors of ~~alluvial channels~~, where the fairway passes along the middle of the river bed, or along the bank or passes slowly from one bank to the other, **floating**⁷ signs ~~and signals on water~~ are used to mark formations in the river bed or obstacles, both natural and artificial, on the sides of the fairway (banks, shores, islands, stones, sunken vessels, wrecks of bridges, etc.), when these obstacles protrude into the fairway and reduce its width (Fig. 6).

These underwater obstacles are marked in **meandering** sectors of ~~alluvial channels~~ by **floating**⁷ signs ~~and signals on the water~~ if, within the limits of width indicated above, the depth of water over such obstacles does not exceed the minimum depth reported for the sector. If the obstacle is not very wide a light **floating**⁷ signal ~~on the water~~ shall be installed ~~on the water~~ on its upstream section. A marker post or a spar may be installed on its downstream section, depending on its length.

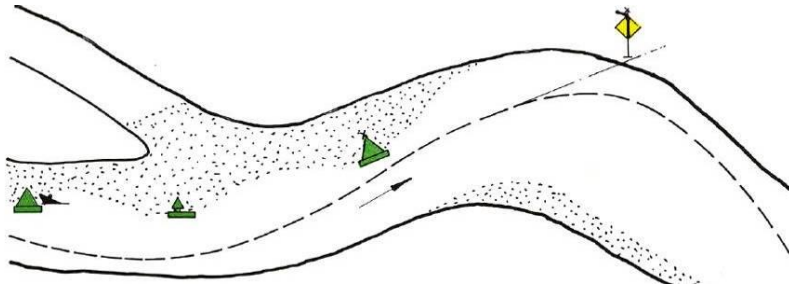
Figure 6



$b < \text{twice the width of the fairway}$ $b_1 > \text{twice the width of the fairway}$

4.2.2.2 **Floating**⁷ signs ~~and signals on the water~~ marking underwater obstacles of considerable length are installed in such a way that the parts situated closest to the fairway² are marked by light² signals between which unlighted signs are placed, thus enabling a given obstacle to be marked completely (Fig. 7).

Figure 7



4.2.2.3²⁶ In the parts of the river bed where the shore opposite that followed by the fairway² is bordered by an inshore bank which favours upstream navigation in calm water, the bank is marked by **floating**⁷ signs ~~and signals on the water~~ independently of the width of the **river**⁷ bed.

4.2.2.4 In **meandering** sectors ~~of alluvial channels~~, the bank marking system in periods of high water generally remains the same as in periods of lowest water level, except in sectors where, when water levels are high, it is advisable to find another fairway with better navigational features. In this case, the selected fairway² shall be marked appropriately.

4.3 *Shallow water* marking of shoals²⁷

4.3.1 In ~~shallow water~~ shoals, as in other sections, **the principle of the continuous marking of the direction**⁷ ~~sets of marks ensuring a continuous marking~~ of the fairway² shall be ~~installed~~ **applied**.

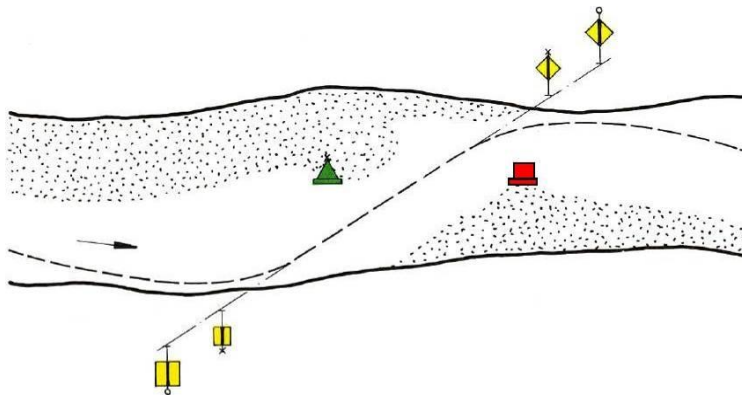
In ~~shallow water~~ shoals the fairway² can be marked by cross-channel fairway signs, bank marks² and **floating** signs ~~and signals on the water~~.

4.3.2 Alternately located ~~shallow waters~~ shoals may also be marked by cross-channel fairway signs, with sufficient available width for navigation in which vessels are passing in a straight line (Fig. 8).

²⁶ Note of the secretariat: this paragraph in ECE/TRANS/SC.3/2015/5 has been deleted.

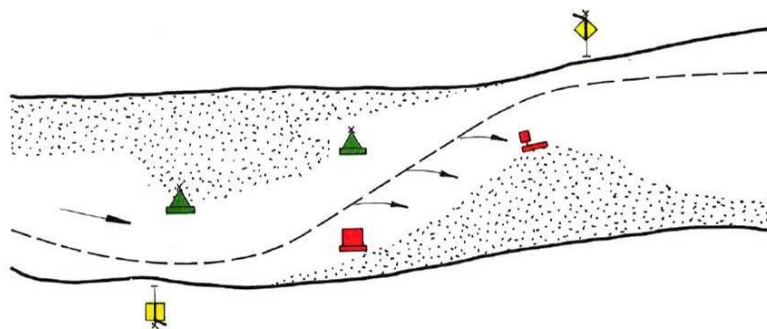
²⁷ Note of the secretariat: in this section the term “shoal” is proposed instead of “shallow water” according to the International Glossary of Hydrology, World Meteorological Organization, Publication WMO-No. 385, 2012.

Figure 8



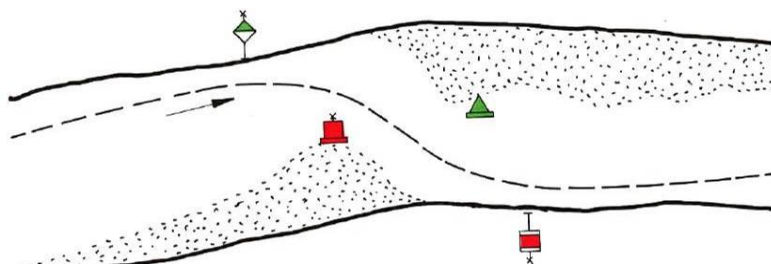
4.3.3 A fairway² passing over ~~shallow water shoals~~ is usually marked by floating signs ~~and signals~~ (Fig. 8 and 9).

Figure 9



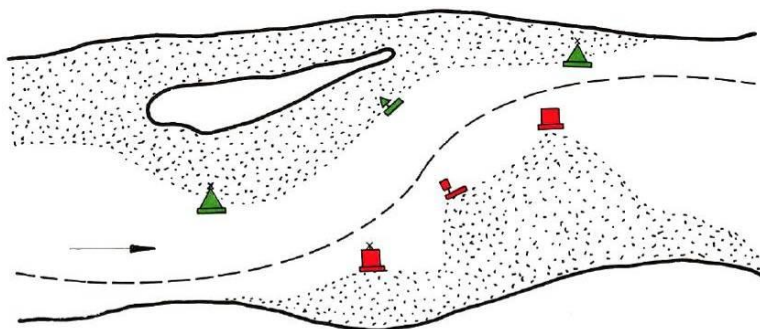
4.3.4 If the fairway passes in a straight line between sandbars, reaching far into the river bed, it is necessary to place at least two **floating**⁷ signs ~~on the water~~ at the entry and the exit of such a section: one at the top of the upstream and one on the top of the downstream sandbar (Fig. 10).

Figure 10



4.3.5 If the fairway² is curved in the section between sandbars, it is necessary to place additional **floating**⁷ signs ~~on the water~~ (Fig. 11).

Figure 11



4.3.6²⁸ Additional **floating** signs ~~on the water~~ shall also be placed on the entry and exit of rugged sections with sandbars, which also characterize the side streams.

4.3.7 In case the application of cross-channel fairway signs is impossible, the fairway² **across a shoal**³ may be marked only by **floating**⁵ signs ~~or signals on the water~~^{Error! Bookmark not defined.}, on one or both sides², depending on the width of the fairway and hydrological conditions.

4.4 *Marking² of the vicinity of bridges and passages⁹ through bridges*

4.4.1 The navigation of vessels and convoys in the vicinity of bridges and through bridge passages⁹ requires particular attention and precautions on the part of boatmasters because of the narrow fairway. These sections must therefore be marked² with the greatest care.

4.4.2 The basic condition to be met to ensure safe passage⁹ through bridges is the marking of the direction of the fairway² and also, where necessary, its sides². **Floating** signs ~~and signals and bank marks⁷ on the water and on the banks~~ may be used in addition to boards and lights for marking the navigable⁹ passage through bridges.

4.4.3 The choice and positioning of the **marking** signs depends in each case on local conditions in the bridge section.

4.4.4 The installation of marking signs² in the vicinity of bridges and the buoying of navigable⁹ passages shall comply with the following conditions:

(a) In order to indicate permission to use the navigable⁹ passage of a bridge, only signs² A.10, D.1 or D.2 in annex 7 to CEVNI shall be used;

(b) The installation of marking signs shall be based on depth and current direction measurements, both in the immediate vicinity of the bridge and in the approach sections;

(c) The positioning of the signs installed in the vicinity of a bridge shall be modified in due course, as conditions of navigation change;

(d) If, when approaching the bridge or the navigable⁹ passage, the direction of the current forms an angle with the bridge, giving rise to eddies around the pillars of the bridge, the floating signs shall be so installed as to indicate the direction of the eddies.

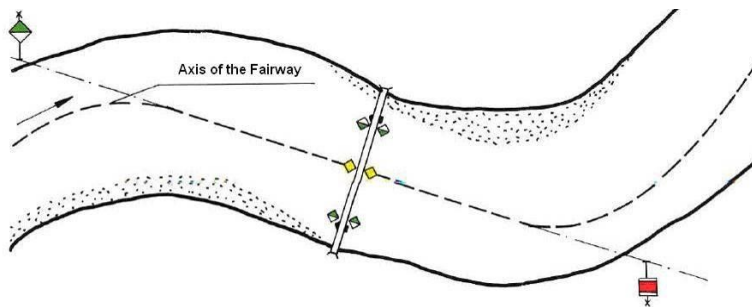
²⁸ Note of the secretariat: It is proposed to modify the text in order to harmonize the three language versions and take note of paragraph 4.3.6 of ECE/TRANS/SC.3/2015/5.

4.4.5 **Floating**⁵ signs ~~and signals~~ may be installed ~~on the water~~ at the approach to the navigable passage to give an exact indication of the position of the fairway².

4.4.6 **The following** examples ~~of show the~~ placement of the aforementioned signs ~~on the water or bank marks~~ marking the section near bridges:

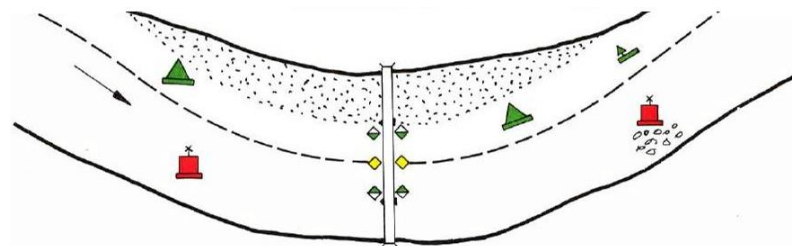
(a) If a bridge is in a meandering⁸ section of the river, the direction of vessels passing through the bridge passages may be marked by bank marks (Figure 12).

Figure 12



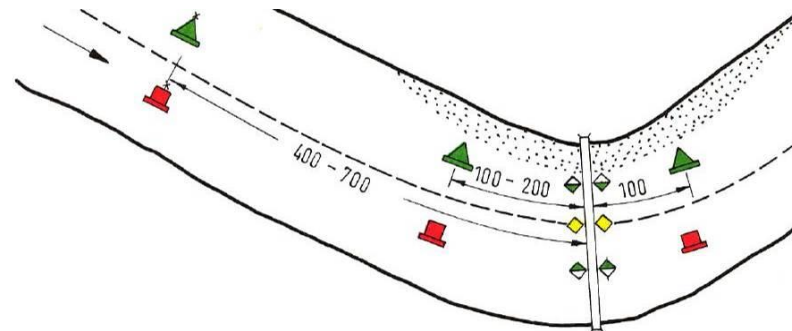
(b) If, due to a larger curvature of the fairway or for some other reasons, marking by the aforementioned signs is not possible, floating signs ~~and signals~~ (buoys, etc.), placed in order to follow the river flow, may be used (Fig. 13).

Figure 13



(c) If the bridge is positioned on the section where the current makes an angle with the ~~fairway-axis of the navigable passage~~³, marking may be done by two pairs of buoys upstream of the bridge. One pair of buoys is placed at a distance of 100 m – 200 m upstream of the bridge, and a second pair, 400 m – 700 m upstream of the bridge. Buoys further away from the bridge are placed in such a way that, in combination with the pair of buoys closer to the bridge, they mark² the river flow. Another pair of buoys may be placed downstream of the bridge at a distance of 100 m from the bridge (Fig. 14).

Figure 14



4.5 *Installation of floating signs ~~and signals~~⁵ restricting berthing points*

4.5.1 Where there is increased intensity of vessels' traffic and the substantial accumulation of vessels in inner harbour basins of ports, not only ~~signs and signals on the banks~~ **bank marks**⁷ should be used in order to restrict berthing places⁹ but also **floating**⁷ signs ~~and signals on the water~~.

4.6 *Reference numbers on buoys and markers²*

4.6.1 On buoys and markers² the use of alphanumeric characters and capital letters is recommended. Where both letters and figures are used, their heights should be the same. Where two such combinations occur, as on junction markers², a hyphen should be used.

4.6.2 Characters should not be less than 200 mm high, white on red or green buoys, or black on yellow buoys.

4.6.3 The characters on a lighted buoy² can be black on a white background. Signs are usually affixed to special nameplates. It is recommended that the characters be displayed on both sides of buoys.”.

VII. Amendments to Chapter 5

10. The Working Party may wish to consider the replacement of the text of Chapter 5 by the text from Chapter 5 of ECE/TRANS/SC.3/2015/5 as well as a new appendix on the basis of Appendix 5 of ECE/TRANS/SC.3/2015/5 (see also Section X).

VIII. Amendment proposal to Chapter 6

11. Introduce the following amendments to Chapter 6:

“6. **INSTALLATION OF RADAR REFLECTORS ON MARKING SIGNS AND SIGNALS AND NAVIGABLE PASSES THROUGH BRIDGES**

6.1 It is important to equip floating signs and bank marks with radar reflectors to ensure their visibility.

6.2 When marking signs equipped with radar reflectors are installed, account must be taken of the furthest distance between the vessel and the sign in terms of the perception of the sign on the radar screen. This distance ~~is not always the same, but~~ depends on the technical²⁹ characteristics of the radar equipment, the **reflective capacity of the** radar reflectors and the specific conditions of the river and the height of the antenna installed on the vessel, as well as the height of the radar reflector, **both** in relation to the water **surface**.⁷

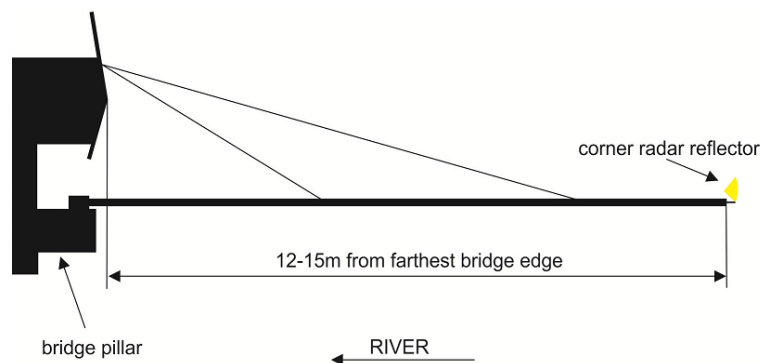
6.3 Vessels and other objectives and objects floating on the surface of the water can be perceived and distinguished on a radar screen as clearly separate from each other depending on the technical²⁹ characteristics of the radar equipment, the distance to the objective, the distance between objectives, etc. Generally speaking, at

²⁹ Note of the secretariat: the Working Party may wish to replace “technical characteristics” by “functional characteristics” in paragraphs 6.2 and 6.3 according to ECE/TRANS/SC.3/2015/5.

a distance of 1 km two objects are perceived as clearly separate from each other when there is approximately 15 m between them.³⁰

6.4 ~~From experience, bridge passages and pillars are not always sufficiently visible on the screen. In order to ensure danger-free passage through bridges, buoys equipped with radar reflectors should be placed on both sides of the passage, not less than 15–20 metres upstream and downstream from the bridge, or passages through bridges should be marked with~~ **Since the visibility of bridge pillars is usually insufficient on radar screens, the bridge pillars for the passage of vessels upstream and downstream must be marked either by buoys equipped with radar reflectors placed not less than 15–20 m before the bridge, or by radar reflectors installed on the bridge itself not less than 12–15 metres from the farthest edge of bridge construction (Fig. 15). A sketch of the recommended radar reflector with minimal dimensions is contained in Appendix 1.**

Figure 15



6.5 Since radar reflectors are extremely³¹ reliable, every effort should be made to install them by means of supports² on the framework of bridges to mark the navigable passage through the bridge.

6.6 Navigational hazards and water supply engineering structures (sunken vessels, groynes, cross-beams, etc.) located in the river bed may also be marked by signs equipped with radar reflectors. If the groynes or cross-beams marked by radar reflector signals are located along one of the banks while the fairway follows the opposite bank, which is low and flat, the radar reflector signals may also be placed on that bank so as to facilitate the orientation of vessels navigating by radar.

6.7 ~~In general, When radar reflectors are used on marking signs and signals, the rule that these reflectors shall not modify the form or size of the sign or signal should be observed~~ **the visibility of the sign must not be diminished.** Their colour shall also correspond to the colour of the sign ~~or signal~~ in question.

6.8 ~~The most common type of radar reflector is the so called square octahedral reflector, i.e. a reflector with eight cavities. It is constructed of 3 flat square plates perpendicular to one another. Radar reflectors on fairway buoys are most often manufactured using two vertical metal plates set as a cross, with a horizontal~~

³⁰ Note of the secretariat: the Working Party may wish to replace this paragraph by paragraph 6.3 from ECE/TRANS/SC.3/2015/5 with due regard of footnote 29 with possible modification of the last sentence. Alternatively, the Working Party may wish to delete this paragraph.

³¹ Note of the secretariat: the Working Party may wish to replace “extremely” by other wording.

metal plate intersecting them at a right angle. The reflectors should be made of aluminium or stainless steel, ~~and not painted so as to enhance reflectivity.~~³²

6.9 Practical experience has shown that there is a need for at least two standard sizes of reflectors on buoys and markers.^{2, 33} Recommended dimensions are as follows:

Type 1: tip to tip height 420 mm;

Type 2: tip to tip height 850 mm.

6.10 The square plate referred to ~~above~~ **in paragraph 6.8** has a diagonal of 300 or 600 mm respectively and sides of 210 or 425 mm respectively. ~~The reflector should be placed in the lying position to maximize its reflectivity.~~ A sketch of the reflector is contained in Appendix 1.”

IX. Amendment proposal to Appendix 1

12. *Add* at the beginning:

Guidance on the maximum distances at which the various signs are visible is given in the figure below.^{34, 35} The distances are valid for boards with dimensions of 100 cm x 100 cm and 150 cm x 100 cm, with the observer positioned at a right angle to the surface of the board. When using boards of other dimensions, the distance at which the sign is visible should be recalculated according to the chosen scale.

³² Note of the secretariat: this sentence seems to be in contradiction with the last sentence of paragraph 6.7. It is proposed to delete it or modify as: “The paint applied must not diminish the reflectivity of the radar reflector”.

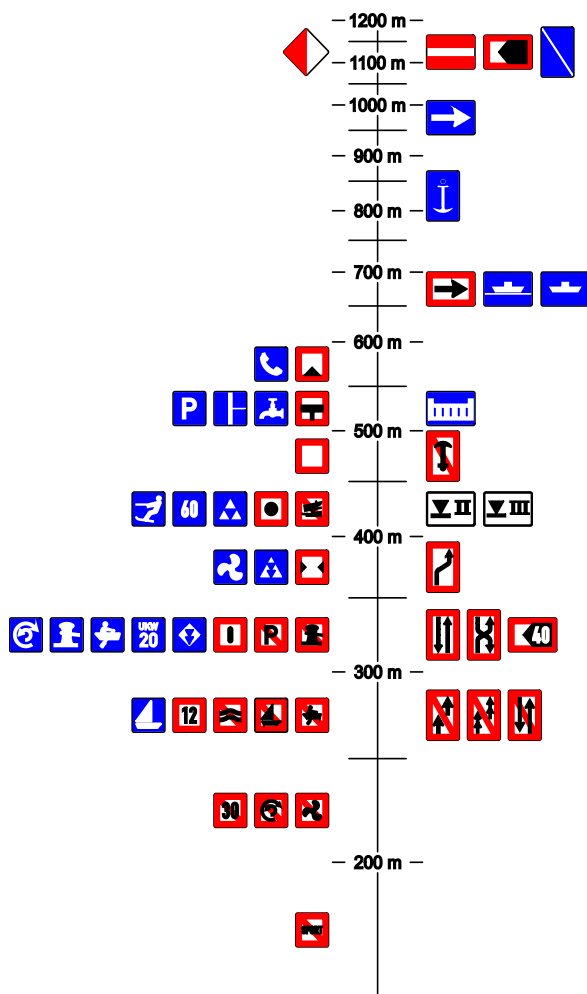
³³ Note of the secretariat: “on buoys and markers” could be replaced by “on floating signs”.

³⁴ Etude de la perceptibilité des symboles et des inscriptions sur les signaux de navigation (Study of symbol and inscription visibility on navigation signs), Gerdes, paper presented at the 1990 International Conference on Maritime Signs.

³⁵ Note of the secretariat: this publication is referred to in the IALA Guideline No. 1094 On Daymarks for Aids to Navigation, Edition 1, December 2012.

Sign images:

Figure 1



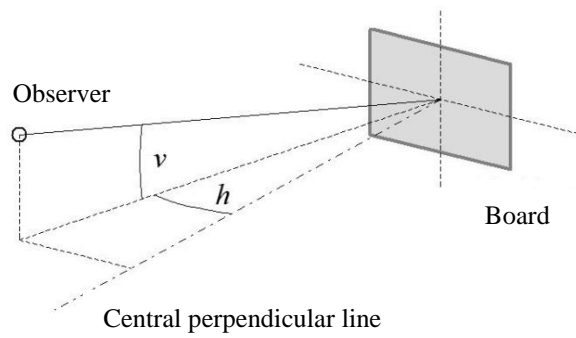
Characters:

For many types of European characters (e.g. DIN 1451), when using black type on a white background, the maximum readability distance D – if the observer is positioned at a right angle to the surface of the board – is approximately $D \approx 465 h$, where h equals the height of the character (height of capital letters above the line).

Viewed at an angle:

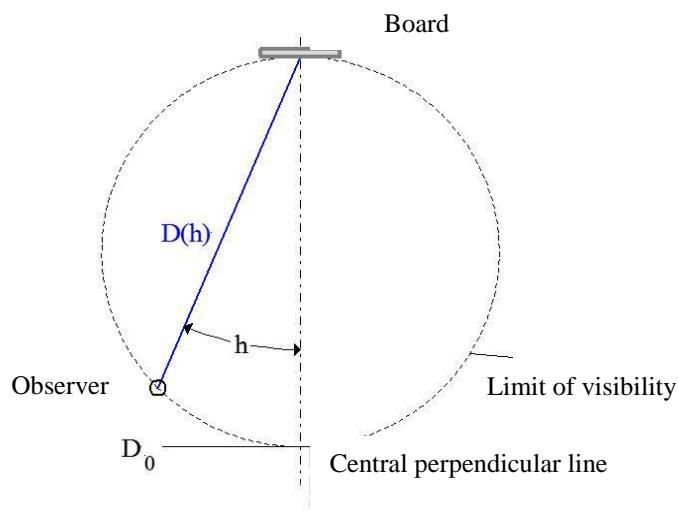
If seen askew, the maximum visibility or readability distance of the board is reduced each time by the cosine of angles h and v between the observer and the central perpendicular line: $D(h, v) = D_o \cos(h) \cos(v)$.

Figure 2



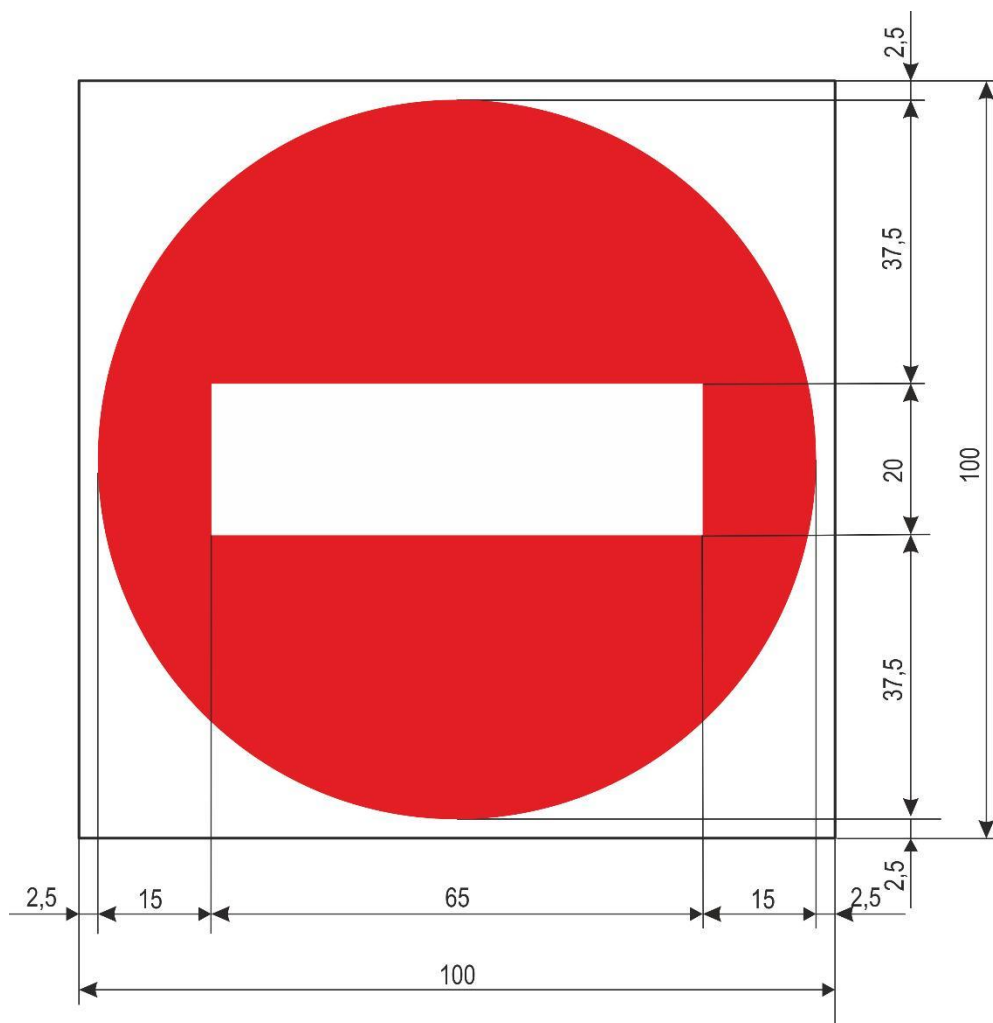
When the observer is at a great distance, the vertical angle shall be considered to be approximately 0: $v \approx 0$. In such cases, the following formula can be used as guidance to determine the visibility distance: $D(h, v) \approx D(h) = D_0 \cos(h)$. The area of visibility is thus a circle with a diameter of D_0 .

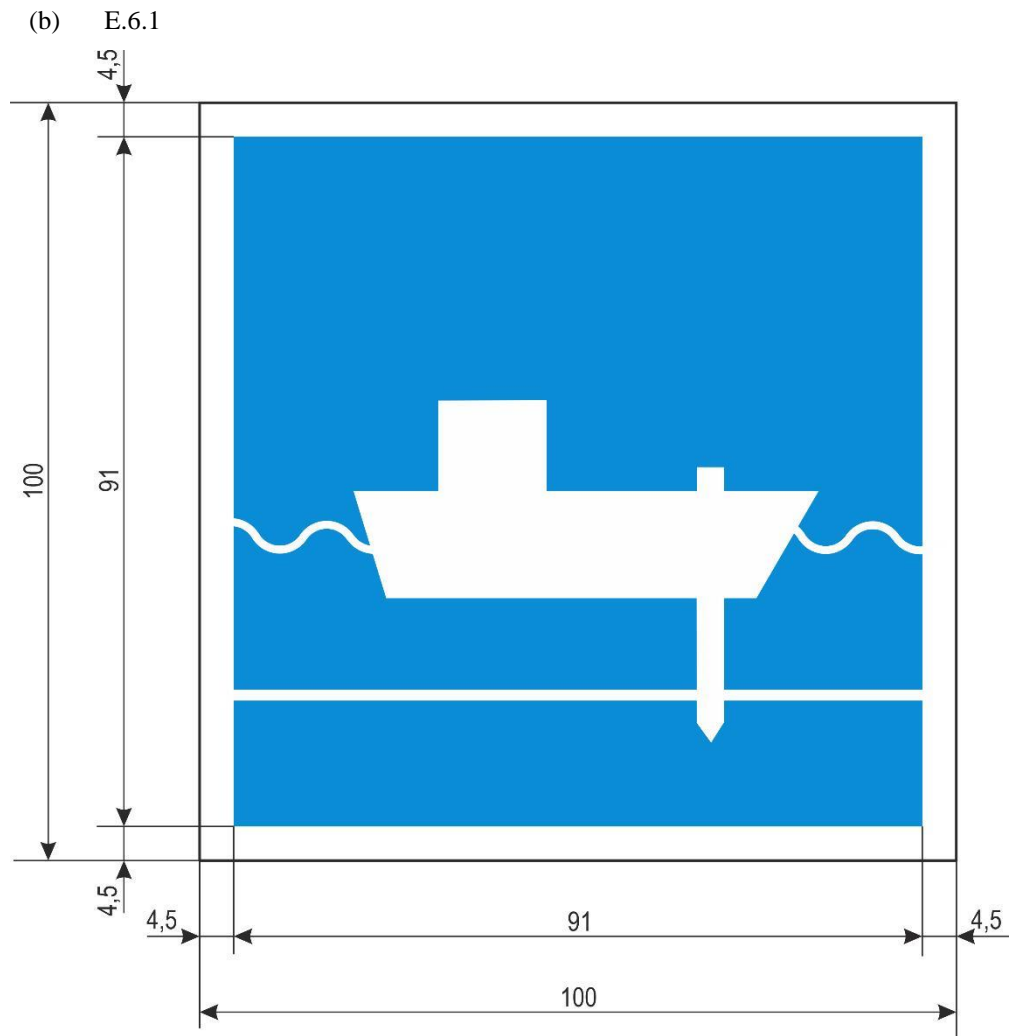
Figure 3



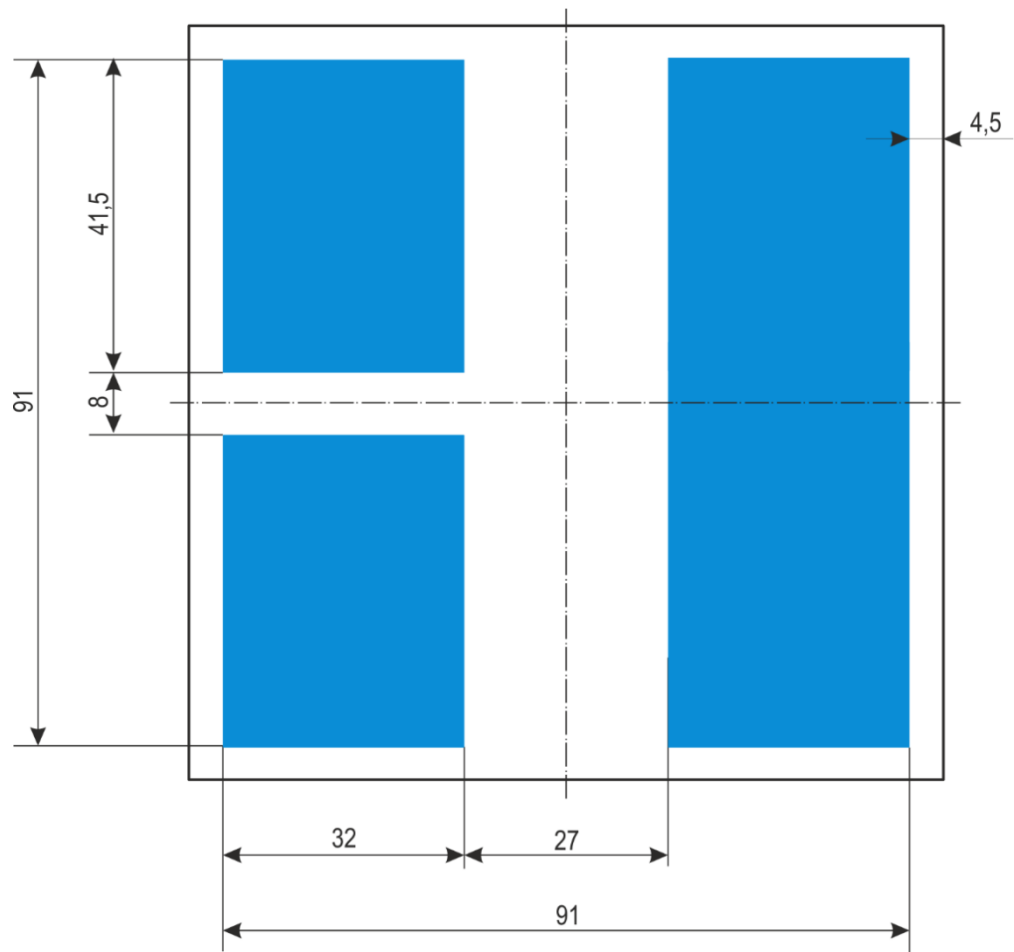
13. Add the following new sketches:

(a) A.1.1

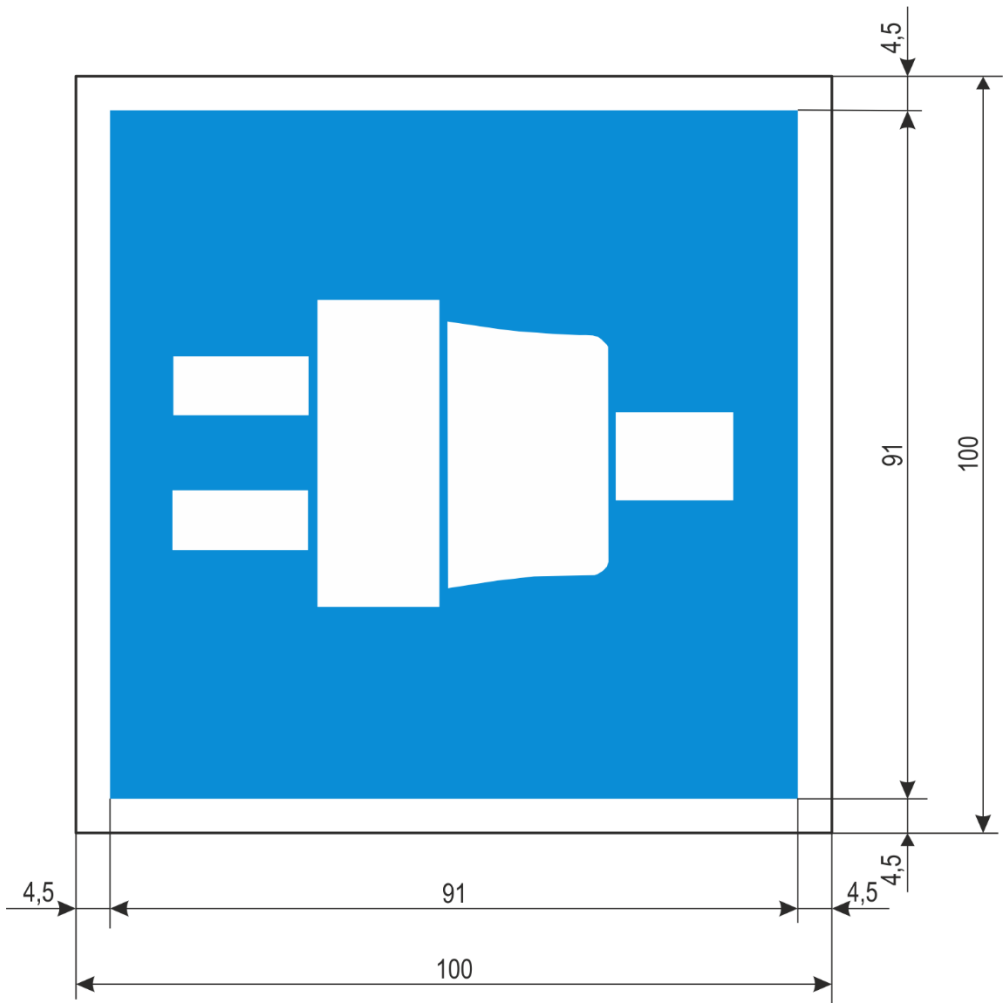




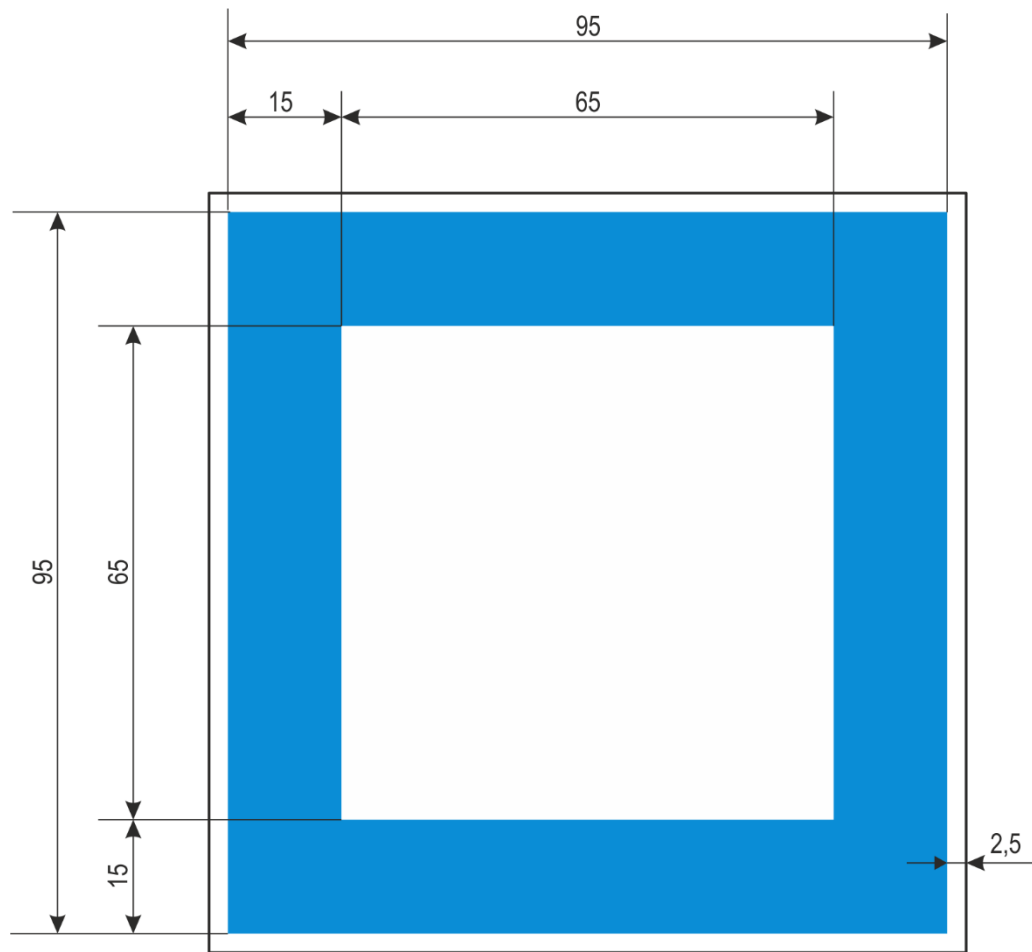
(c) E.9c



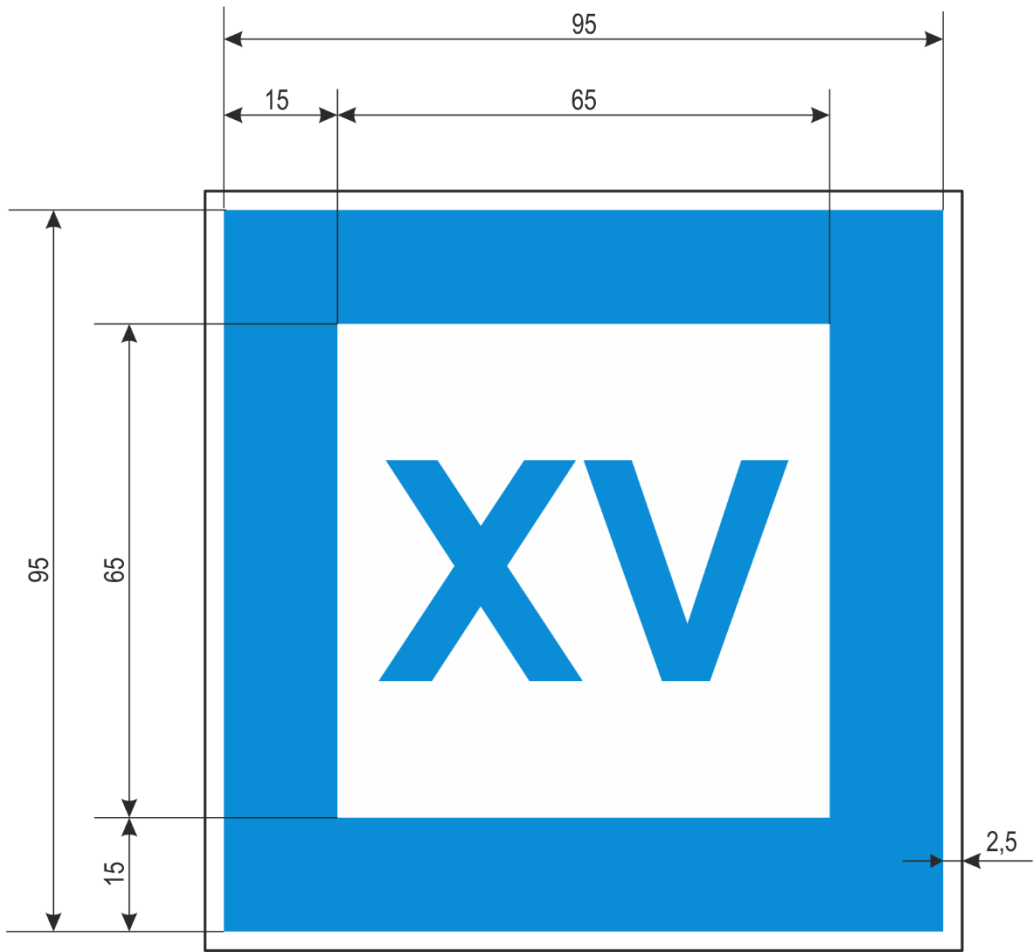
(d) E.25



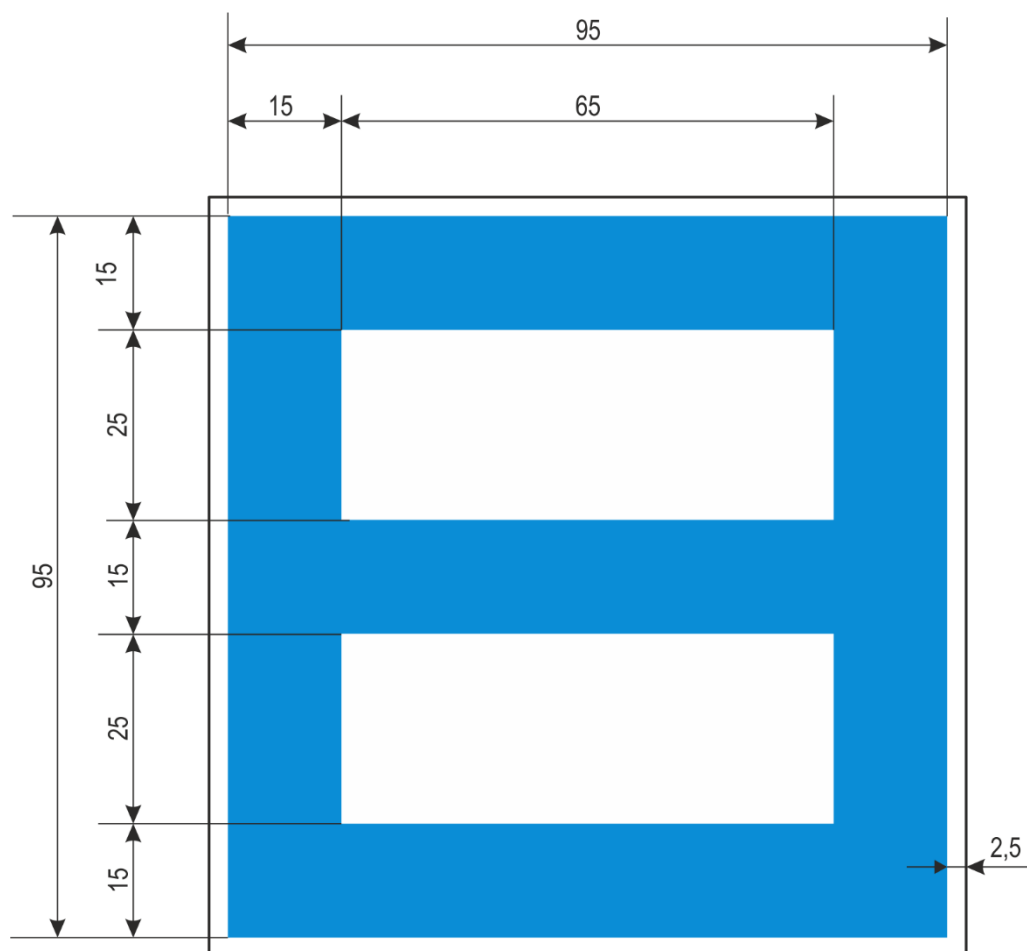
(e) E.26



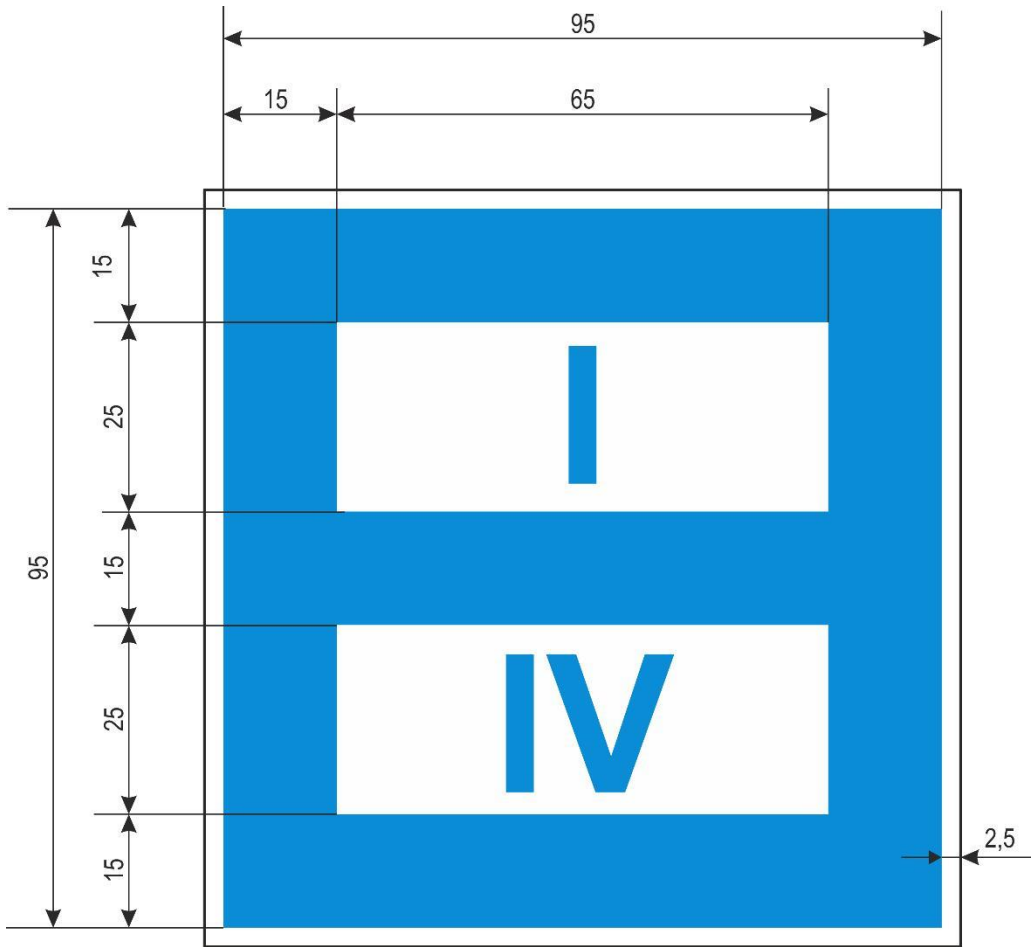
(f) E.26.1



(g) E.27

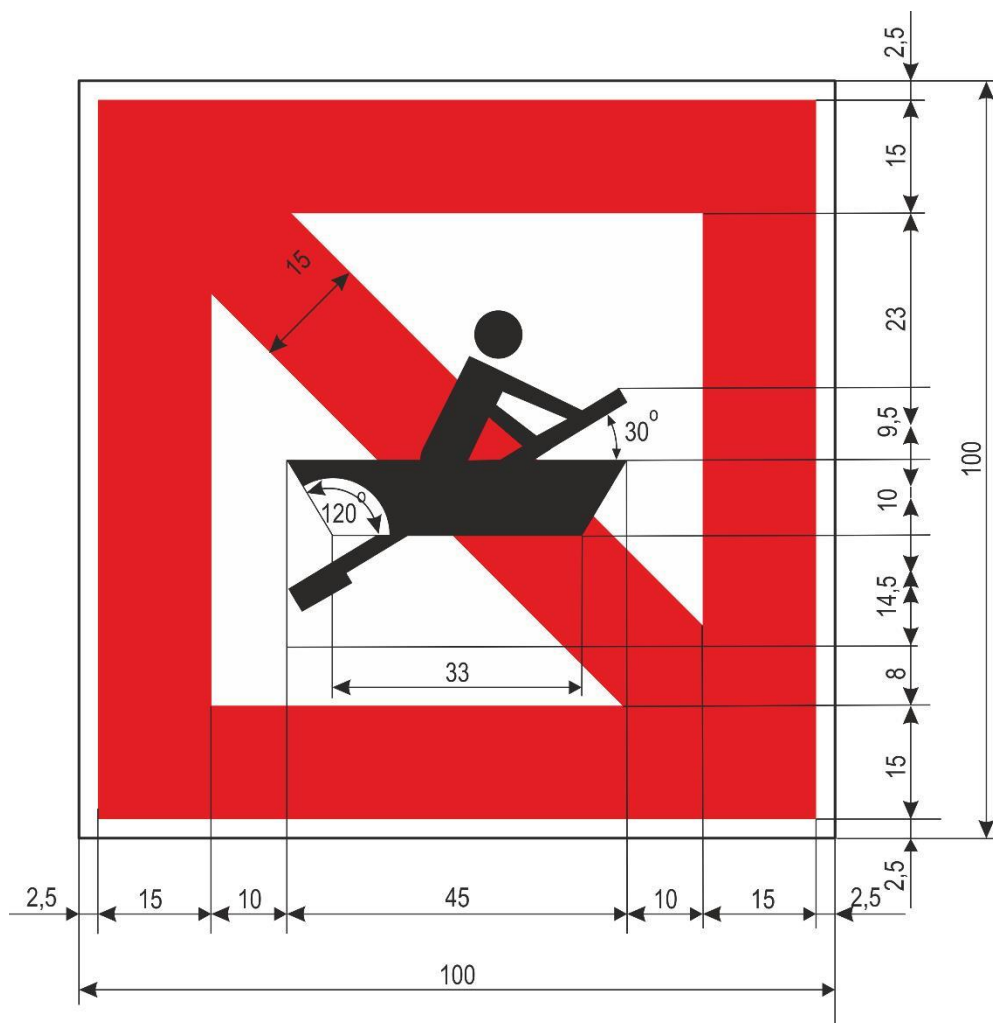


(h) E.27.1



14. Replace the existing sketches with the following:

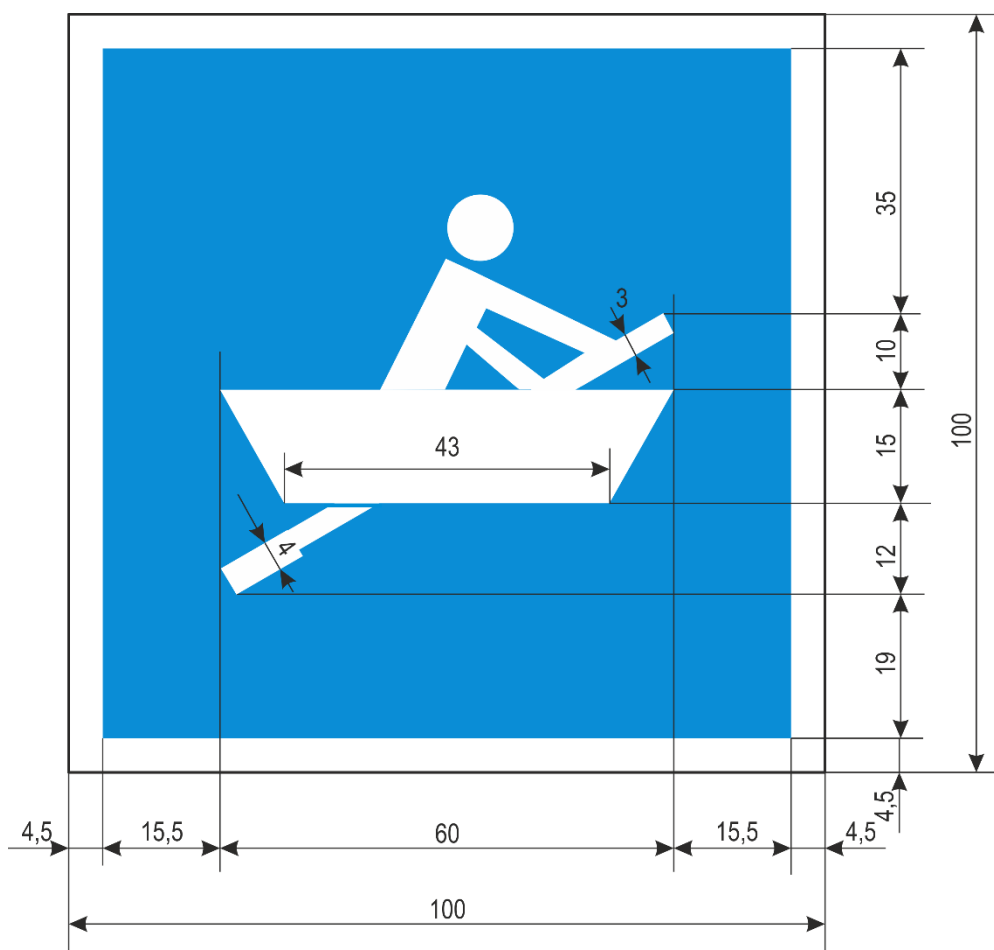
(a) A.16



Technical drawing of a traffic sign (100x100 mm) showing a red border, a red diagonal band, and a black silhouette of a person carrying a rifle. The drawing includes dimensions in millimeters (mm):

- Overall width: 100 mm
- Overall height: 100 mm
- Red border width: 15 mm (top, bottom, left, right)
- Red diagonal band width: 15 mm
- Black silhouette width: 65 mm
- Black silhouette height: 65 mm
- Red diagonal band angle: 45°

(c) E.19



X. Amendments to Appendix 2

15. Appendix 2 contains examples of image display techniques used for signs and marks. Therefore, the Working Party may wish to replace or supplement the existing text with provisions from ECE/TRANS/SC.3/2015/5, annex 4 "Lighting of traffic signs" and annex 5 "Examples for variable-message traffic signs". The Working Party may also wish to supplement Appendix 2 with examples from other relevant standards applied by member States or add references to them.