

IALA RECOMMENDATION (NORMATIVE)

R1001 THE IALA MARITIME BUOYAGE SYSTEM (MBS)

Edition 2.0

June 2023

urn:mrn:iala:pub:r1001:ed2.0



DOCUMENT REVISION

Revisions to this document are to be noted in the table prior to the issue of a revised document.

Date	Details	Approval
June 2017/May 2018	First issue.	Council 64 General Assembly 13
December 2022/June 2023	Edition 2.0	Council 76 General Assembly 14

THE GENERAL ASSEMBLY

RECALLING:

- 1 The function of IALA with respect to safety of navigation, the efficiency of maritime transport and the protection of the environment.
- 2 Article 8 of the IALA Constitution regarding the authority, duties, and functions of the Council.
- 3 The “*Agreement on the IALA Maritime Buoyage System*”, (“the Agreement”) signed in Paris on the 15th of April 1982 by accredited representatives of 53 nations or Marine Aids to Navigation services to implement the IALA Maritime Buoyage System so initiating the harmonization of maritime buoyage world-wide and that accredited representatives of other nations or Marine Aids to Navigation services subsequently acceded to this agreement.
- 4 That the IALA Maritime Buoyage System described in the Agreement was superseded by IALA Recommendation *R1001 IALA Maritime Buoyage System* Edition 1.0 published May 2018.
- 5 That the *International Convention for the Safety of Life at Sea* Chapter V Regulation 13 requires Contracting Governments to take into account the recommendations and guidelines of IALA, including the Maritime Buoyage System (IMO SN.1/Circ.297).

RECOGNIZING:

- 1 That the current IALA Maritime Buoyage System has been adopted by almost all Marine Aids to Navigation authorities world-wide.
- 2 That the United Nations Economic Commission for Europe has issued its Resolution No. 90 on 5th October 2018 adopting the principles of the maritime buoyage rules of IALA into its “*European Code for Signs and Signals on Inland Waterways*”.
- 3 That the IALA Standard *S1010 Marine Aids to Navigation Planning and Service Requirements* recognises the IALA Maritime Buoyage System as normative.

CONSIDERING the proposals of the IALA Aids to Navigation Requirements and Management Committee,

ADOPTS the Recommendation on the IALA Maritime Buoyage System, as described in the Annex,

INVITES Members and Marine Aids to Navigation competent authorities world-wide to implement the provisions of the Recommendation,

RECOMMENDS that National members and other appropriate competent authorities providing Marine Aids to Navigation services comply with this Recommendation,

REQUESTS the IALA Aids to Navigation Requirements and Management Committee or such other committee as the Council may direct to keep the Recommendation under review and to propose amendments, as necessary. Such amendments shall require General Assembly approval.

CONTENTS

1. INTRODUCTION	7
1.1. REGIONS A and B	7
1.2. GENERAL PRINCIPLES OF THE SYSTEM	8
1.3. METHOD OF CHARACTERIZING MARKS.....	8
2. TYPES OF MARKS	8
2.1. LATERAL MARKS.....	8
2.1.1. Principles	8
2.1.2. General Rules.....	9
2.1.3. Description of Lateral marks used in Region A	10
2.1.4. Description of Lateral marks used in Region B	10
2.1.5. Preferred Channel marks.....	11
2.2. CARDINAL MARKS	12
2.2.1. Principles	12
2.2.2. General rules	13
2.2.3. Use of Cardinal marks.....	13
2.2.4. Description of Cardinal marks	13
2.2.5. Visual depiction	15
2.3. ISOLATED DANGER MARK.....	15
2.3.1. Principles	15
2.3.2. General Rules.....	15
2.3.3. Visual depiction	16
2.4. SAFE WATER MARK.....	17
2.4.1. Principles	17
2.4.2. General Rules.....	17
2.4.3. Visual depiction	18
2.5. SPECIAL MARKS.....	18
2.5.1. Principles	18
2.5.2. General Rules.....	18
2.5.3. Visual depiction	20
2.6. EMERGENCY WRECK MARK	20
2.6.1. Principles	20
2.6.2. General Rules.....	21
2.6.3. Visual depiction	21
2.7. OTHER MARKS	21
2.7.1. Lighthouses.....	21
2.7.2. Leading Lines or Ranges.....	22
2.7.3. Sector Lights	23
2.7.4. Beacons	24
2.7.5. Major Floating Aids.....	25
2.7.6. Auxiliary marks	25
3. VARIOUS TYPES OF MARKS	26
3.1. APPLICATIONS OF THE VARIOUS TYPES OF MARKS.....	26



CONTENTS

3.2.	OTHER CONSIDERATIONS	27
3.2.1.	AIS AtoN.....	27
3.2.2.	Marking of new dangers	27
3.2.3.	Port, harbour, inland waterway and other local marks	27
3.2.4.	Synchronization of lights	28
3.2.5.	Retro-reflecting materials.....	28
3.2.6.	AtoN in relation to Maritime Autonomous Surface Ships (MASS)	28
3.2.7.	Sustainability of AtoN	29
4.	DEFINITIONS.....	29
5.	ABBREVIATIONS	29
APPENDIX 1	REGIONS A AND B	30
APPENDIX 2	REGIONS A AND B BY DAY	31
APPENDIX 3	REGIONS A AND B BY NIGHT	32

List of Tables

Table 1	Description of Lateral marks used in Region A	10
Table 2	Description of Lateral marks used in Region B	10
Table 3	Description of Preferred Channel marks used in Region A	11
Table 4	Description of Preferred Channel marks used in Region B	12
Table 5	Description of North and East Cardinal marks.....	13
Table 6	Description of South and West Cardinal marks	14
Table 7	Description of Isolated Danger mark.....	16
Table 8	Description of Safe Water mark	17
Table 9	Description of Special marks.....	19
Table 10	Description of a MAtoN	20
Table 11	Description of an Emergency Wreck mark.....	21
Table 12	Description of a Lighthouse	22
Table 13	Description of Leading Line or Ranges.....	23
Table 14	Description of a Sector Light	24
Table 15	Description of a Beacon	25
Table 16	Applications of the various types of marks.....	27

CONTENTS

List of Figures

Figure 1	Lateral marks used in Region A	10
Figure 2	Lateral marks used in Region B	11
Figure 3	Preferred Channel marks used in Region A	11
Figure 4	Preferred Channel marks used in Region B.....	12
Figure 5	Visual depiction of Cardinal marks	15
Figure 6	Visual depiction of a Danger mark	16
Figure 7	Visual depiction of a Safe Water mark.....	18
Figure 8	Visual depiction of a Special mark.....	20
Figure 9	Visual depiction of an Emergency Wreck mark.....	21
Figure 10	Visual depiction of a Lighthouse.....	22
Figure 11	Visual depiction of a Leading Line or Ranges	23
Figure 12	Visual depiction of a Sector Light	24
Figure 13	Visual depiction of a Major Floating Aid (Light vessel)	25
Figure 14	Visual depiction of an Auxiliary mark	26
Figure 15	Regions A and B.....	30
Figure 16	Region A by day	31
Figure 17	Region B by day	31
Figure 18	Region A by night.....	32
Figure 19	Region B by night.....	32

1. INTRODUCTION

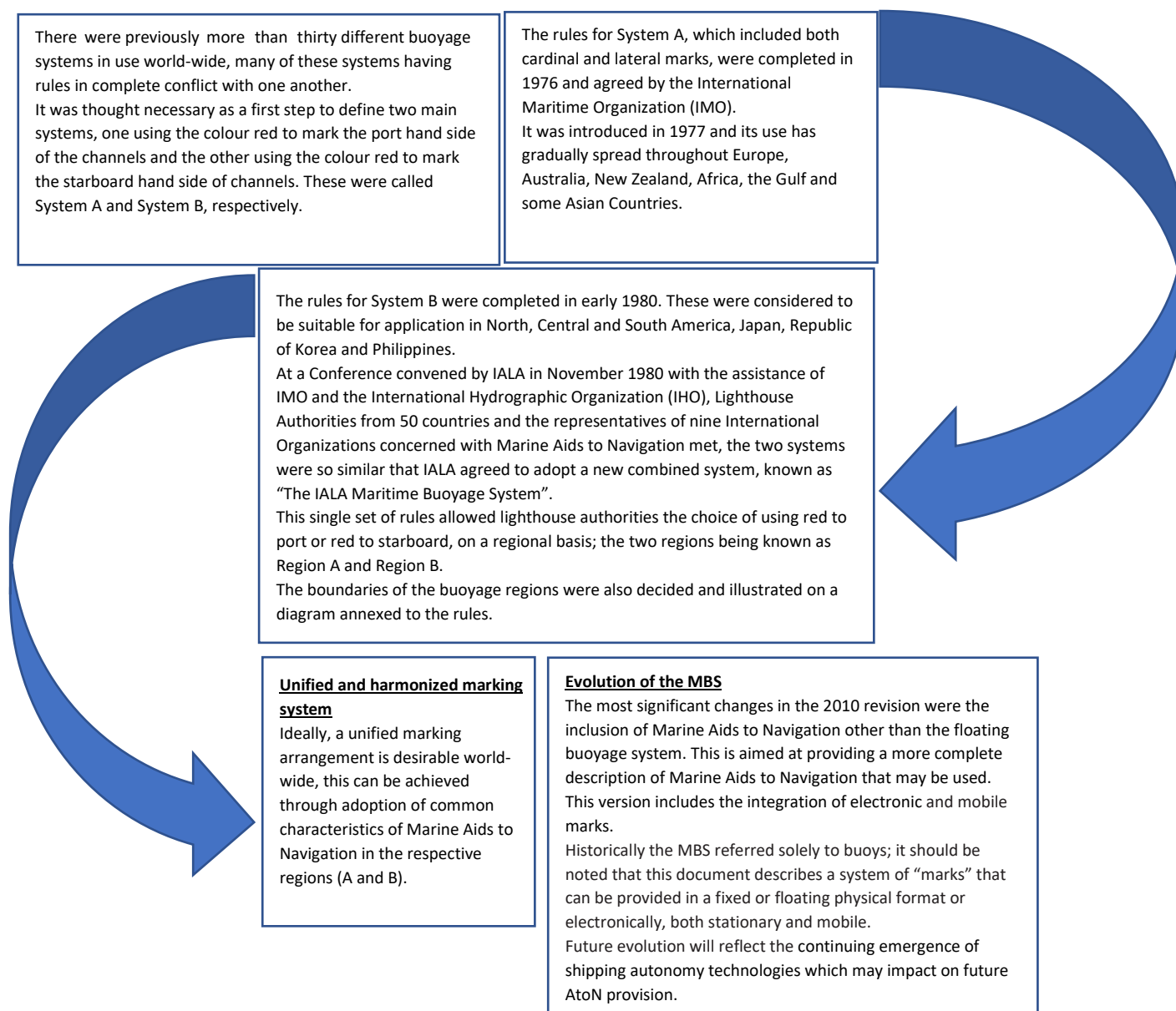
The IALA Maritime Buoyage System, often referred to as the MBS, is a guide to Marine Aids to Navigation (AtoN). The purpose is to help all mariners navigating anywhere in the world to fix their position and avoid dangers without fear of ambiguity. It is also to help competent maritime authorities to harmonize AtoN markings.

The MBS has served the maritime community well since its inception in the 1970s. World-wide consultation indicates that the fundamental principles of the MBS should be retained, however, it has been reviewed considering technological developments in the navigation environment.

IALA recommendations and guidelines provide information on planning, operating, managing, and implementing the marks standardized in the MBS and can be found via the IALA website at www.iala-aism.org

1.1. REGIONS A AND B

This section describes the history and development of IALA regions A and B described in the MBS.



1.2. GENERAL PRINCIPLES OF THE SYSTEM

The responsibility for safe navigation resides with the mariner through the appropriate use of AtoN in conjunction with official nautical documents and prudent seamanship, including voyage planning as defined in IMO Resolutions. The MBS provides guidance on the application of AtoN systems used world-wide for all users.

The MBS is comprised of fixed and floating visual marks and devices. This is primarily a physical system; however, all of the marks may be complemented by electronic means.

Within the MBS, there are six types of marks, which may be used alone or in combination. Mariners can distinguish between these marks by identifiable characteristics. As described below, lateral marks differ between Buoyage Regions A and B, whereas the other five types of marks are common to both regions.

There are four AtoN applications:

- Fixed
- Floating
- Mobile (MAtoN)
- Electronic (AIS AtoN, radar beacon (Racon) and radar target enhancer)

Determining the proper application of a navigational mark or signal involves:

- balancing the benefits derived from new and advancing technologies against safety and security concerns;
- the impact on the environment and on international trade facilitation;
- the potential costs to the industry; and
- their impact on personnel, both on board and ashore.

Note: The MBS document does not include other AtoN, such as radio navigation systems (GNSS or DGNSS) or vessel traffic services (VTS); the IALA NAVGUIDE, the IALA VTS Manual, and other relevant IALA recommendations and guidelines should be consulted in this regard.

1.3. METHOD OF CHARACTERIZING MARKS

A mark is characterized by one or more of the following features:

- Colour and rhythmic character of light and/or illumination enhancement (e.g., retroreflectors) at night
- Colour, shape, topmark, and/or light (including colour and rhythm) during the day
- Electronic (digital) symbology, as a complement to physical marks
- Electronic (digital) symbology only

2. TYPES OF MARKS

2.1. LATERAL MARKS

2.1.1. PRINCIPLES

There are two international buoyage regions (Region A and Region B), where lateral marks differ. The geographical divisions of these two regions are shown on the world map within this document.

With reference to a “conventional direction of buoyage” (see 2.1.1.1), lateral marks in Region A utilize red and green colours (refer to section 2.1.3) by day and night to denote the port and starboard sides of channels, respectively. However, in Region B (refer to section 2.1.4), these colours are reversed with red to starboard and green to port.

A modified lateral mark may be used at the point where a channel divides to distinguish the preferred channel, that is to say, the primary route or channel that is so designated by the competent authority.

2.1.1.1. Definition of conventional direction of buoyage

The conventional direction of buoyage, which must be indicated in appropriate nautical charts and documents, may be either:

- the general direction taken by the mariner when approaching a harbour, river, estuary or other waterway from seaward; or
- the direction determined by the competent authority in consultation, where appropriate, with neighbouring countries. In principle, it should follow a clockwise direction around land masses.

2.1.1.2. Numbering or lettering

If marks at the sides of a channel are numbered or lettered, the numbering or lettering shall follow the conventional direction of buoyage. The protocol for numbering lateral marks, especially in confined waterways, should be even numbers on red, odd numbers on green.

2.1.2. GENERAL RULES

2.1.2.1. Colour

The colour of lateral marks must comply with the IALA MBS Regions as specified in Sections 2.1.3 and 2.1.4.

2.1.2.2. Shapes

Lateral marks should be of cylindrical and conical shape. However, where they do not rely on a distinctive shape for identification, they should, where practicable, carry the appropriate topmark.

2.1.2.3. Topmarks

The following rules apply to lateral topmarks:

- Conical topmarks:
 - The vertical height of a cone from base to apex should be about 90 % of the base diameter.
 - The vertical clear space between the lowest point of the topmark and all other parts of the mark should be at least 35 % of the base diameter of the cone.
 - The base diameter should be 25 % - 30 % of the diameter of the buoy at the waterline.
- Cylindrical (can) topmarks:
 - The vertical height of a cylinder should be one (1) to 1.5 times the base diameter.
 - The vertical clear space between the lowest part of the cylinder and all other parts of the mark should be at least 35 % of the diameter of the cylinder.
 - In the case of a buoy, the base diameter of the cylinder should be 25 % - 30 % of the diameter of the buoy at the waterline.

Note: It should be noted that when the use of topmarks is impractical due to weather or ice conditions, a competent authority may decide topmarks are not to be used.

2.1.3. DESCRIPTION OF LATERAL MARKS USED IN REGION A

Table 1 Description of Lateral marks used in Region A

	2.1.3.1. Port Hand marks	2.1.3.2. Starboard Hand marks
Colour	Red	Green
Shape of buoy	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single red cylinder (can)	Single green cone, point upward
Light (if fitted)		
Colour	Red	Green
Rhythmic character	Any, other than that described in section 2.1.5.	Any, other than that described in section 2.1.5
Supplementary (if any)	AIS AtoN	AIS AtoN
	Racon	Racon

2.1.3.3. Visual depiction



Figure 1 Lateral marks used in Region A

2.1.4. DESCRIPTION OF LATERAL MARKS USED IN REGION B

Table 2 Description of Lateral marks used in Region B

	2.1.4.1. Port Hand marks	2.1.4.2. Starboard Hand marks
Colour	Green	Red
Shape of buoy	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single green cylinder (can)	Single red cone, point upward
Light (when fitted)		
Colour	Green	Red
Rhythmic character	Any, other than that described in section 2.1.5.	Any, other than that described in section 2.1.5.
Supplementary (if any)	AIS AtoN	AIS AtoN
	Racon	Racon

2.1.4.3. Visual depiction

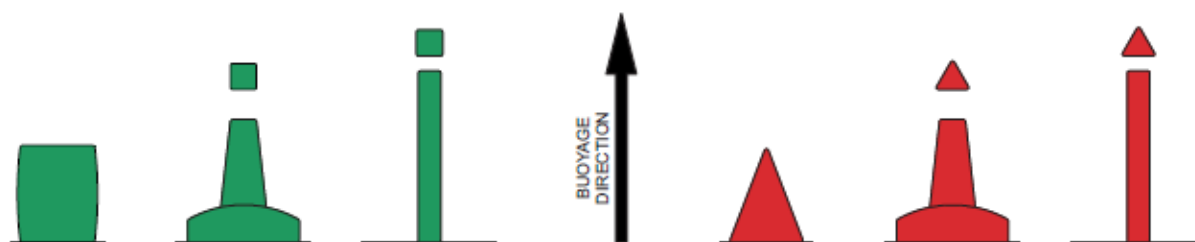


Figure 2 Lateral marks used in Region B

2.1.5. PREFERRED CHANNEL MARKS

In Region A, at the point where a channel divides, when proceeding in the conventional direction of buoyage, a preferred channel may be indicated by a modified Port or Starboard lateral mark as follows:

Table 3 Description of Preferred Channel marks used in Region A

	2.1.5.1. Preferred Channel to Starboard	2.1.5.2. Preferred Channel to Port
Colour	Red with one broad green horizontal band	Green with one broad red horizontal band
Shape of buoy	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single red cylinder (can)	Single green cone, point upward
Light (when fitted)		
Colour	Red	Green
Rhythmic character	Composite group flashing (2 + 1)	Composite group flashing (2 + 1)
Supplementary (if any)	AIS AtoN	AIS AtoN
	Racon	Racon

2.1.5.3. Visual depiction

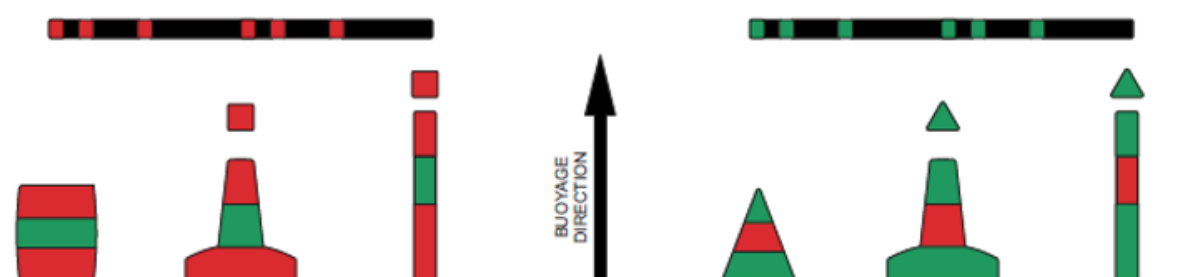


Figure 3 Preferred Channel marks used in Region A

In Region B, at the point where a channel divides, when proceeding in the conventional direction of buoyage, a preferred channel may be indicated by a modified Port or Starboard lateral mark as follows:

Table 4 Description of Preferred Channel marks used in Region B

	2.1.5.4. Preferred Channel to Starboard	2.1.5.5. Preferred Channel to Port
Colour	Green with one broad red horizontal band	Red with one broad green horizontal band
Shape of buoy	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single green cylinder (can)	Single red cone, point upward
Light (when fitted)		
Colour	Green	Red
Rhythmic character	Composite group flashing (2 + 1)	Composite group flashing (2 + 1)
Supplementary (if any)	AIS AtoN	AIS AtoN
	Racon	Racon

2.1.5.6. Visual depiction



Figure 4 Preferred Channel marks used in Region B

2.2. CARDINAL MARKS

2.2.1. PRINCIPLES

Cardinal marks indicate where safer water lies in the area, in relation to a point of interest. For example, safer navigable water lies to the north of a North Cardinal mark but may also have navigable water east and west of it; the relevant chart should be consulted for further guidance.

Cardinal marks do not have a distinctive shape but are normally pillar or spar. They are always painted in yellow and black horizontal bands, and their distinctive double cone topmarks are always black.

2.2.1.1. Definition of Cardinal quadrants and marks

The four quadrants (North, East, South and West) are bounded by the true bearings NW-NE, NE-SE, SE-SW, and SW-NW, taken from the point of interest.

The type of Cardinal mark indicates which side of the mark it should be passed by.

The Cardinal marks in Region A and Region B, and their use, are the same.

2.2.1.2. Numbering or lettering

Numbering or lettering to identify the mark or the point of interest, may be used.

2.2.2. GENERAL RULES

The type of Cardinal mark is indicated by both topmark and coloured bands.

Cardinal marks also have a defined system of flashing white lights. The rhythms are basically all “very quick” (VQ) or “quick” (Q) flashing, but each type of mark uses a different sequence. “Very quick flashing” is defined as a light flashing at a rate of either 120 or 100 flashes per minute, and “quick flashing” is a light flashing at either 60 or 50 flashes per minute.

Note: When similar Cardinal marks are used in close proximity, dissimilar characters should be used.

The concept of three, six or nine flashes is easily remembered when one associates it with a clock face. The long flash, defined as a light appearance of not less than 2 seconds, is to ensure that three or nine very quick or quick flashes cannot be mistaken for six.

It will be observed that two other marks use white lights - Isolated Danger marks and Safe Water marks. Each has a distinctive light rhythmic character that cannot be confused with the very quick or quick flashing light of Cardinal marks.

2.2.2.1. Topmarks

The following rules apply to cardinal topmarks.

For conical topmarks:

- The vertical height of a cone from base to apex should be about 90 % of the base diameter.
- For cardinal marks, the separation distance between cones should be about 50 % of the base diameter of the cone.
- The vertical clear space between the lowest point of the topmark and all other parts of the mark should be at least 35 % of the base diameter of the cone.
- The base diameter should be 25 % - 30 % of the diameter of the buoy at the waterline.

Note: It should be noted that when the use of topmarks is impractical due to weather or ice conditions, a competent authority may decide topmarks are not to be used.

2.2.3. USE OF CARDINAL MARKS

A Cardinal mark may be used, for example:

- To indicate where the deepest water in that area can be found.
- To indicate the safe side on which to pass a danger.
- To draw attention to a feature in a channel such as a bend, a junction, a bifurcation, or the end of a shoal.

Competent authorities should consider carefully before establishing too many Cardinal marks in a waterway, or area, as this can lead to confusion, given their white lights of similar characteristics.

2.2.4. DESCRIPTION OF CARDINAL MARKS

Table 5 Description of North and East Cardinal marks

	2.2.4.1. North Cardinal mark	2.2.4.2. East Cardinal mark
Topmark	2 black cones, one above the other, points upward	2 black cones, one above the other, base to base
Colour	Black above yellow	Black with a single broad horizontal yellow band
Shape of buoys	Pillar or spar	Pillar or spar

	2.2.4.1. North Cardinal mark	2.2.4.2. East Cardinal mark
Light (when fitted)		
Colour	White	White
Rhythmic character	VQ or Q	VQ(3) every 5 s or Q(3) every 10 s
Supplementary (if any)	AIS AtoN	AIS AtoN
	Racon	Racon

Table 6 Description of South and West Cardinal marks

	2.2.4.3. South Cardinal mark	2.2.4.4. West Cardinal mark
Topmark	2 black cones, one above the other, points downward	2 black cones, one above the other, point to point
Colour	Yellow above black	Yellow with a single broad horizontal black band (1/3 of the height)
Shape of buoys	Pillar or spar	Pillar or spar
Light (when fitted)		
Colour	White	White
Rhythmic character	VQ(6) + Long flash every 10 s or Q(6) + Long flash every 15 s	VQ(9) every 10 s or Q(9) every 15 s
Supplementary (if any)	AIS AtoN	AIS AtoN
	Racon	Racon

Note: The double cone topmark is a very important feature of every Cardinal mark by day and should be used wherever practicable and be as large as possible with a clear separation between the cones.

2.2.5. VISUAL DEPICTION

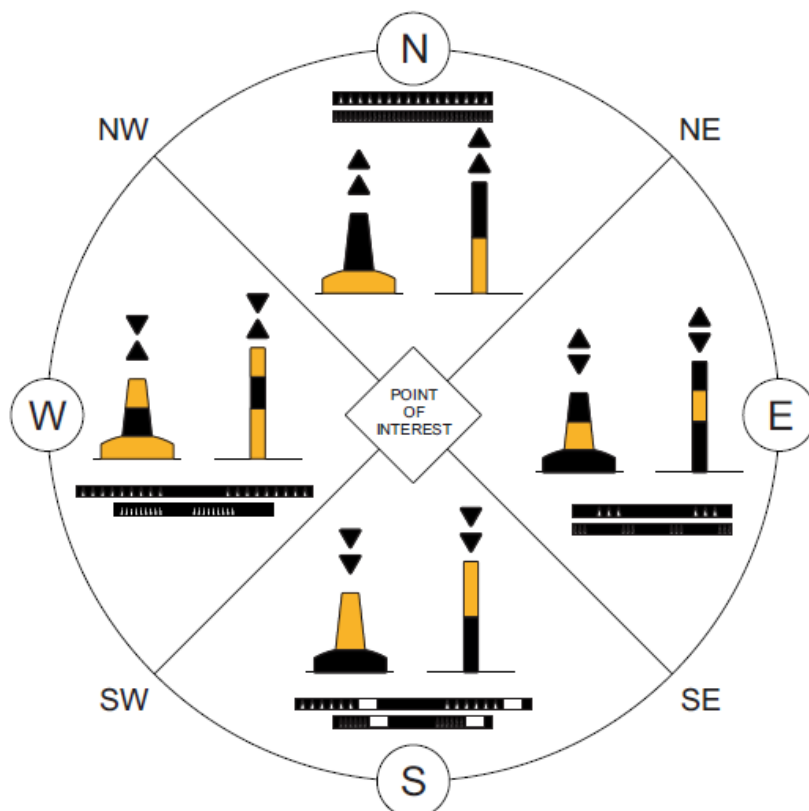


Figure 5 Visual depiction of Cardinal marks

2.3. ISOLATED DANGER MARK

2.3.1. PRINCIPLES

The Isolated Danger mark is placed on or near to a danger that has navigable water all around it. Because the extent of the danger and the safe passing distance cannot be specified for all circumstances in which this mark may be used, the mariner shall consult the relevant charts and nautical publications for guidance.

Isolated Danger marks do not have a distinctive shape but are normally pillar or spar. They are always painted black with one or more horizontal red bands. Distinctive double black spherical topmarks and Group flashing (2) white lights, serve to distinguish Isolated Danger marks from Cardinal marks.

2.3.1.1. Definition of Isolated Danger mark

An Isolated Danger mark is a mark erected on, or moored on or above, an isolated danger which has navigable water all around it.

2.3.1.2. Numbering or lettering

Numbering or lettering to identify the mark may be used.

2.3.2. GENERAL RULES

2.3.2.1. Topmarks

The following rules apply to isolated danger topmarks.

Spherical topmarks:

- In the case of a buoy, the diameter of the spheres should be at least 20 % of the diameter of the buoy at the waterline.
- For isolated danger marks the separation distance between spheres should be about 50 % of their diameter.
- The vertical space between the lowest part of the spheres and all other parts of the mark should be at least 35 % of the diameter of the spheres.

Note: It should be noted that when the use of topmarks is impractical due to weather or ice conditions, a competent authority may decide topmarks are not to be used.

2.3.2.2. Description of Isolated Danger mark

Table 7 Description of Isolated Danger mark

Description	
Topmark	Two black spheres, one above the other
Colour	Black with one or more broad horizontal red bands
Shape of buoy	Optional, but not conflicting with lateral marks; pillar or spar preferred
Light (when fitted)	
Colour	White
Rhythmic character	Group flashing (2)
Supplementary (if any)	AIS AtoN
	Racon

Note: The double sphere topmark is a very important feature of every Isolated Danger mark by day and should be used wherever practicable and be as large as possible with a clear separation between the spheres.

2.3.3. VISUAL DEPICTION

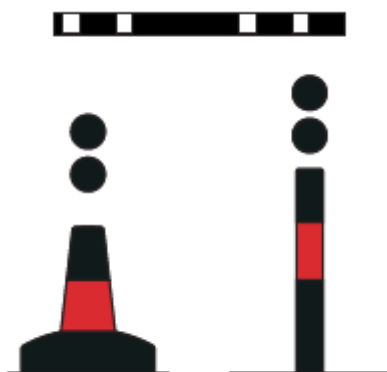


Figure 6 Visual depiction of a Danger mark

2.4. SAFE WATER MARK

2.4.1. PRINCIPLES

The Safe Water mark has navigable water all around it and does not mark a danger. Safe Water marks can be used, for example, as fairway, mid-channel, or landfall marks.

Safe Water marks have an appearance different from danger marking buoys. They are spherical, or alternatively pillar or spar, with red and white vertical stripes and a single red spherical topmark.

2.4.1.1. Definition of Safe Water mark

Safe Water marks serve to indicate that there is navigable water all around the mark. These include centre line marks and mid-channel marks. Such a mark may also be used to indicate channel entrance, port or estuary approach, landfall, or best point of passage under bridges.

2.4.1.2. Numbering or lettering

Numbering or lettering to identify the mark may be used.

2.4.2. GENERAL RULES

2.4.2.1. Topmarks

The following rules apply to Safe Water topmarks.

Spherical topmarks:

- In the case of a buoy, the diameter of the sphere should be at least 20 % of the diameter of the buoy at the waterline.
- The vertical space between the lowest part of the sphere and all other parts of the mark should be at least 35 % of the diameter of the sphere.

Note: It should be noted that when the use of topmarks is impractical due to weather or ice conditions, a competent authority may decide topmarks are not to be used.

2.4.2.2. Description of Safe Water mark

Table 8 Description of Safe Water mark

Description	
Colour	Red and white vertical stripes
Shape of buoy	Spherical; pillar or spar with spherical topmark
Topmark (if any)	Single red sphere
Light (when fitted)	
Colour	White
Rhythmic character	Isophase, occulting, one long flash every 10 s or Morse "A" (• –)
Supplementary (if any)	AIS AtoN
	Racon

2.4.3. VISUAL DEPICTION

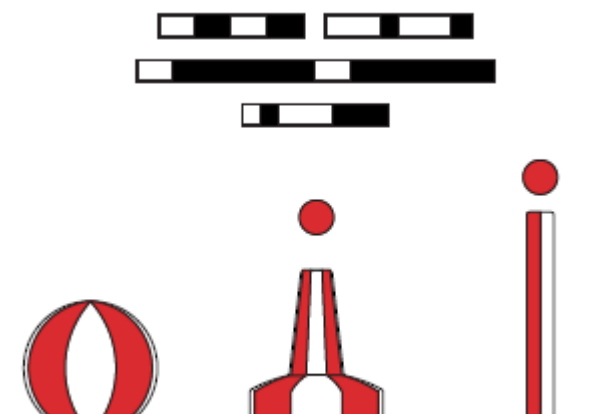


Figure 7 Visual depiction of a Safe Water mark

2.5. SPECIAL MARKS

2.5.1. PRINCIPLES

Special marks are used to indicate a special area or feature whose nature may be apparent from reference to a chart or other nautical publication. They are not generally intended to mark channels or obstructions where the MBS provides suitable alternatives.

2.5.1.1. Numbering, lettering and or pictograms

Special marks may be lettered or numbered and may also include the use of a pictogram to indicate their purpose using International Hydrographic Organization (IHO) symbology where appropriate.

2.5.2. GENERAL RULES

2.5.2.1. Topmarks

The following rule applies to special mark topmarks.

“X” (Single 3-D Yellow Diagonal Cross) topmarks:

The arms of the “X” should be diagonally contained within a square with length of side of about 33 % of the buoy diameter at the waterline. The width of the arms of the “X” should be about 15 % of the length of side of the square.

Note: It should be noted that when the use of topmarks is impractical due to weather or ice conditions, a competent authority may decide topmarks are not to be used.

2.5.2.2. Definition of Special marks

Special marks are yellow. They may carry a topmark, preferably three-dimensional to be visible from all directions, and any light used is also yellow. To avoid the possibility of confusion between yellow and white in poor visibility, the yellow lights of Special marks do not have any of the rhythms used for white lights.

Their shape will not conflict with that of other navigational marks. This means, for example, that a Special mark located on the port hand side of a channel may be cylindrical but will not be conical.

Some examples of uses of Special marks:

- Ocean Data Acquisition Systems (ODAS) marks
- Traffic separation marks where use of conventional channel marking may cause confusion

- Spoil Ground marks
- Military exercise zone marks
- Cable or pipeline marks
- Recreation zone marks
- Boundaries of anchorage areas
- Man-made structures
- Aquaculture
- Mooring buoys
- Moving object / hazard (MAtoN)

Note: Mooring buoys are not usually considered to be Marine Aids to Navigation, although larger moorings are often charted features. If it is considered necessary to increase their conspicuity (e.g., in or immediately adjacent to a channel), they should be marked as a special mark, however the use of a topmark may not be practical and measures should be taken to protect any light.

2.5.2.3. Mobile AtoN (MAtoN)

A Special mark may also be utilized as a Mobile Aid to Navigation (MAtoN) in which a mark is attached to floating objects which may be a collision hazard. A MAtoN has a defined light characteristic of three flickering flashes, followed by two regular flashes. It should be noted that IALA Recommendation *R1016 Mobile Aids to Navigation (MAtoN)*, recommends that IALA members and relevant competent authorities liaise and cooperate with appropriate authorities or providers for vessel traffic services (VTS) before a MAtoN is deployed in a VTS area.

2.5.2.4. Special Channels/Areas

An important application for Special marks is to mark a channel/area of interest to a particular class of vessel, for example, a specially dredged channel for deep draught vessels in an area where there already is adequate depth of water for most vessels. In such a case, the limit of safe navigation for vessels generally will continue to be marked by Lateral (or Cardinal) marks, but the channel/area of special interest will be indicated by Special marks with the appropriate daymark shape.

2.5.2.5. Description of Special marks

Table 9 Description of Special marks

	Description
Colour	Yellow
Shape of buoy	Optional, but not conflicting with Lateral marks
Topmark (if any)	Single yellow “X” shape
Light (when fitted)	
Colour	Yellow
Rhythmic character	Any, other than those reserved for Cardinal, Isolated Danger, MAtoN and Safe Water marks.
Pictogram	The use of pictograms is authorized, as defined by IHO or a competent authority.
Supplementary (if any)	When marking a moving object / hazard, see 2.5.2.6
	AIS AtoN
	Racon

2.5.2.6. Description of MAtoN

Table 10 Description of a MAtoN

	Description
Colour	Yellow
Shape of buoy	Optional, but not conflicting with Lateral marks
Topmark (if any)	Single yellow “X” shape <i>To increase conspicuity, and if practical, the topmark of a special mark should be used</i>
Additional marks	For hazards with low profile/partly submerged and where visual observations are primarily undertaken from the air, an additional mark, like a circular symbol, can be added, if practicable.
Position sensor	If AIS is used, the electronic position fixing system (EPFS) in use, must be in accordance with the latest version of ITU-R M.1371 - <i>Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile frequency band.</i>
Light (when fitted)	
MAtoN Rhythmic character	Flicker 1 s (5 Hz) Eclipse 0.7 s Flicker 1 s (5 Hz) Eclipse 0.7 s Flicker 1 s (5Hz) Eclipse 0.5 s Fl 1 s Eclipse 0.5 s Fl 1 s Eclipse 3 s
Supplementary (if any)	Radar reflectors - to increase radar conspicuity, and if practical, a radar reflector should be installed.
	Reflective markings, if any, should be in accordance with the applicable IALA Recommendation
	AIS AtoN

2.5.3. VISUAL DEPICTION

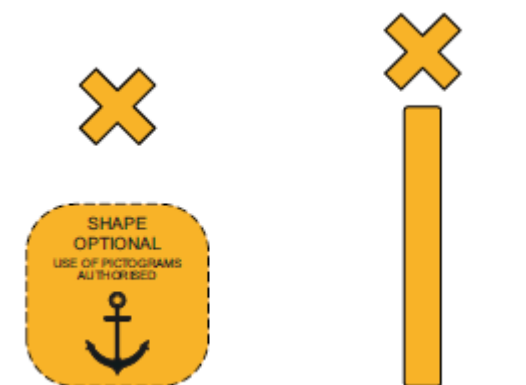


Figure 8 Visual depiction of a Special mark

2.6. EMERGENCY WRECK MARK

2.6.1. PRINCIPLES

New dangers may be marked with an Emergency Wreck mark.

2.6.2. GENERAL RULES

An Emergency Wreck mark has blue and yellow vertical stripes in equal number, with a vertical/perpendicular yellow cross topmark, preferably three-dimensional to be visible from all directions and displays a blue and yellow alternating light.

2.6.2.1. Description of Emergency Wreck mark

Table 11 Description of an Emergency Wreck mark

	Description
Colour	Blue/Yellow vertical stripes in equal number dimensions (minimum 4 stripes and maximum 8)
Shape of buoy	Pillar or spar
Topmark (if any)	Vertical/perpendicular yellow cross
Light	
Colour	Yellow/blue alternating
Rhythmic character	One second of blue light and one second of yellow light with 0.5 sec. eclipse
Supplementary (if any)	AIS AtoN
	Racon, displaying Morse Code "D" (– • •)

2.6.3. VISUAL DEPICTION

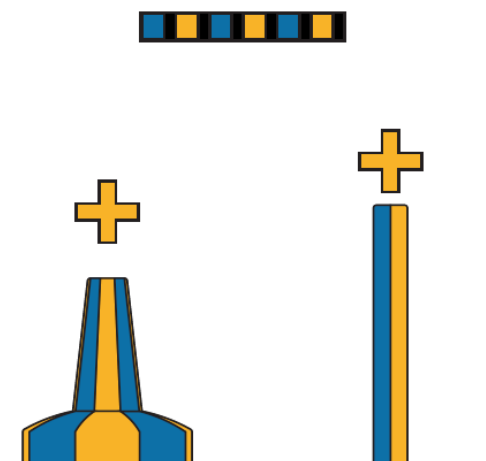


Figure 9 Visual depiction of an Emergency Wreck mark

2.7. OTHER MARKS

2.7.1. LIGHTHOUSES

2.7.1.1. Definition of a Lighthouse

A lighthouse is a tower, or substantial building or structure, erected at a designated geographical location to carry a signal light and provides a significant daymark. It provides a long or medium range light for identification by night.

2.7.1.2. Description of a Lighthouse

A lighthouse is a structure of either traditional or modern design that may provide a daymark for identification by day and a light at night. It may provide a platform for other AtoN such as a differential global navigation satellite system (DGNSS), racon or AIS as an AtoN and other systems such as VHF and VHF Data Exchange System (VDES) to assist marine navigation.

A sector light may also be incorporated into the structure.

The structure may be illuminated at night to assist identification, in accordance with IALA guidance.

Table 12 Description of a Lighthouse

	Description
Colour/Shape	Lighthouse structures can be of any colour, shape, or material generally designed to provide a distinctive daymark.
Light	
Colour	White, Red, or Green
Rhythm	Any number of flashes, is phase or occulting or as appropriate, to allow light to be readily identifiable.
Supplementary (if any)	AIS AtoN
	Racon

2.7.1.3. Visual depiction

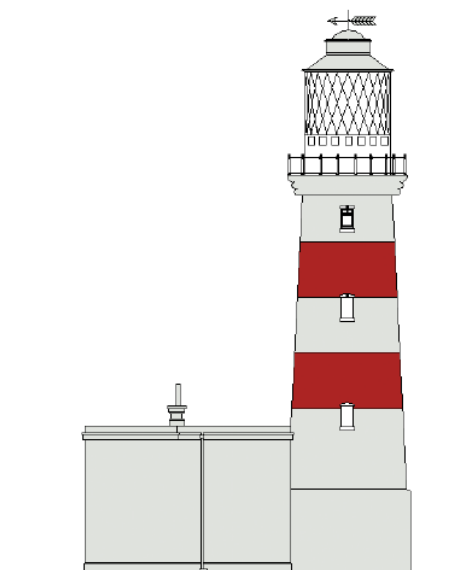


Figure 10 Visual depiction of a Lighthouse

2.7.2. LEADING LINES OR RANGES

2.7.2.1. Definition of Leading Lines or Ranges

A group of two or more marks or lights, in the same vertical plane such that the navigator can follow the leading line on the same bearing.

2.7.2.2. Description of Leading Lines

Leading Line structures can be any colour or shape that provides a distinctive mark that cannot be confused with adjacent structures.

Table 13 Description of Leading Line or Ranges

Description	
Colour	No colour significance. Competent authority determines the optimum colours to contrast with the dominant background colour at the location
Shape	No shape significance. Rectangular or triangular figures are recommended.
Light (when fitted)	
Colour	Any colour. Competent authority determines the optimum colour to contrast with the dominant background colour at the location.
Rhythmic character	Any fixed characteristics, however, should be used sparingly, and the use of synchronization of leading lights can assist in overcoming background lighting/lights.
Supplementary (if any)	AIS AtoN
	Racon

2.7.2.3. Visual depiction

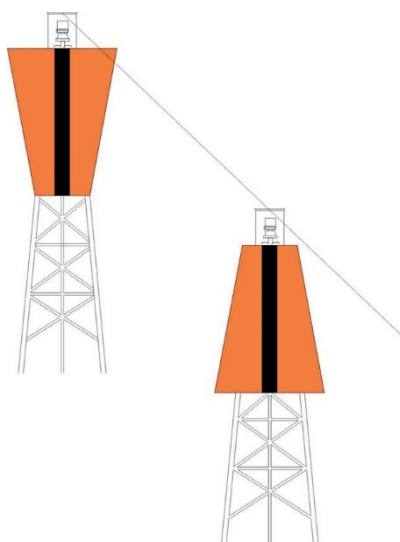


Figure 11 Visual depiction of a Leading Line or Ranges

2.7.3. SECTOR LIGHTS

2.7.3.1. Definition of Sector Lights

A sector light is a fixed Marine Aid to Navigation that displays a light of different colours and/or rhythms over designated arcs. The colour of the light provides directional information to the mariner.

Sector lights are usually used as lights of a lighthouse or a light beacon.

2.7.3.2. Description of Sector Lights

A sector light may be used:

- to provide directional information in a fairway;
- to indicate a turning point, a junction with other channels, a hazard or other items of navigational importance;
- to provide information on hazard areas that should be avoided; or
- in some cases, a sector light with a narrow sector of a single colour (directional light) may be used.

Table 14 Description of a Sector Light

	Description
Colour	Not applicable
Shape	None, light only
Light	
Colour	If using to mark channel limits follow convention direction of buoyage for IALA region indicated in Section 2.1. Lights may have oscillating boundaries
Rhythmic character	As appropriate
Supplementary (if any)	AIS AtoN
	Racon

2.7.3.3. Visual depiction

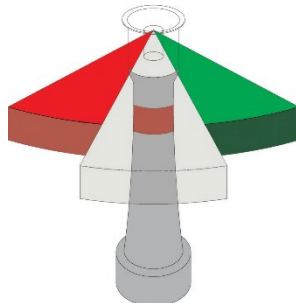


Figure 12 Visual depiction of a Sector Light

2.7.4. BEACONS

2.7.4.1. Definition of a Beacon

A fixed man-made navigation mark that can be recognized by its shape, colour, pattern, topmark, or light character, or a combination of these.

2.7.4.2. General Rules

The general rules for using beacons are:

- Can carry a signal light and in this case is termed a light beacon or lighted beacon.
- If not fitted with a light it is termed an unlighted or unlit beacon and provides only a day mark.
- As a leading line orange or conspicuous radar mark.

Table 15 Description of a Beacon

	Description
Colour	Any
Shape	As appropriate, including cardinal mark
Topmark (if any)	As appropriate
Light (when fitted)	
Colour	White, Red, or Green
Rhythmic character	As appropriate
Supplementary (if any)	AIS AtoN
	Racon

2.7.5. MAJOR FLOATING AIDS

2.7.5.1. Definition of Major Floating Aids

Major floating aids include lightvessels, light floats and large navigational buoys.

2.7.5.2. Description of Major Floating Aids

Major floating aids are generally deployed at critical locations, intended to mark approaches from offshore areas, where shipping traffic concentrations are high. They may provide a platform for other AtoN such as racons or AIS AtoN and other systems such as VHF and VDES to assist marine navigation.

2.7.5.3. Visual depiction

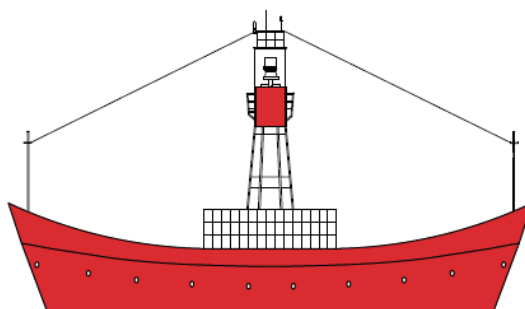


Figure 13 Visual depiction of a Major Floating Aid (Light vessel)

2.7.5.4. Supplementary aids (if any)

The supplementary aids that could be used, in conjunction with a major floating aid are:

- AIS AtoN
- Racon

2.7.6. AUXILIARY MARKS

2.7.6.1. Definition of Auxiliary marks

Minor AtoN that have not been previously described.

2.7.6.2. Description of Auxiliary marks

These marks are usually outside of defined channels and generally do not indicate the port and starboard sides of the route to be followed or obstructions to be avoided.

They also include those marks used to convey information related to navigational safety. These marks shall not conflict with other navigational marks and shall be promulgated in appropriate nautical charts and documents. They should not generally be used if a more appropriate mark is available within the MBS.

2.7.6.3. Visual depiction

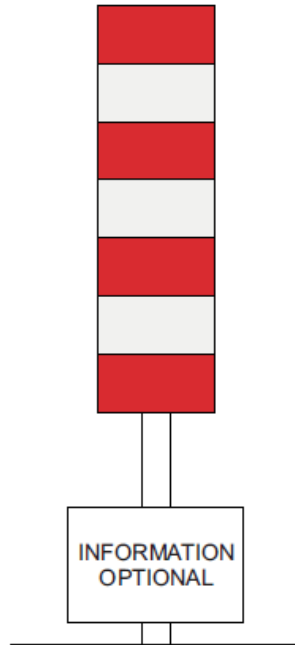


Figure 14 Visual depiction of an Auxiliary mark

3. VARIOUS TYPES OF MARKS

3.1. APPLICATIONS OF THE VARIOUS TYPES OF MARKS

Table 16 indicates the applications of the various types of mark:

Table 16 Applications of the various types of marks

Type of mark	Physical mark (may include AIS AtoN)	Virtual (AIS)	Synthetic (AIS)	MAtoN	Racon	New Danger	Numbering & Lettering	Pictograms
Lateral	X	X	X		X	X	X	
Cardinal	X	X	X		X	X	X	
Isolated Danger	X	X	X		X	X	X	
Safe Water	X	X	X		X		X	
Special	X	X	X	X	X		X	X
Emergency Wreck	X	X	X		X	X	X	

3.2. OTHER CONSIDERATIONS

3.2.1. AIS AtoN

An AIS AtoN can be implemented in three ways, physical, synthetic, and virtual (See IALA recommendations and guidelines).

A physical AIS AtoN Station is an AIS station located on an AtoN that physically exists.

A synthetic AIS AtoN is transmitted to the location of the physical AtoN from an AIS base station or transponder located remotely from the AtoN.

A virtual AIS AtoN broadcast is transmitted from an AIS base station or transponder for an AtoN that does not physically exist. When a virtual AIS AtoN is used, the AtoN symbol or information may be available to a mariner on ENC/ECDIS, even though there is no real AtoN such as a buoy or a beacon.

3.2.2. MARKING OF NEW DANGERS

New dangers are newly discovered hazards, natural or man-made, that may not yet be shown in nautical documents and publications. They will remain a hazard until the competent authority is satisfied that the danger has been removed, or until the hazard information is sufficiently promulgated.

New Dangers should be appropriately marked using Lateral, Cardinal, Isolated Danger marks or by using an Emergency Wreck Marking buoy. If the competent authority considers the risk to navigation to be especially high, at least one of the marks should be duplicated.

For duplicated marks:

- If using a Lateral lighted mark for this purpose a VQ or Q light character shall be used.
- Any duplicate mark shall be identical to its partner in all respects.
- In addition it may be marked by a Racon, coded Morse “D” (–●●) In addition, it may be marked by other electronic means, such as automatic identification system (AIS AtoN).

3.2.3. PORT, HARBOUR, INLAND WATERWAY AND OTHER LOCAL MARKS

Port, harbour, inland waterway and other local marks should comply with the MBS wherever possible, in order that mariners can achieve a seamless transition between different areas.

Breakwaters can be marked using a combination of lateral marks. In many cases, a set of lead and/or sector lights, or port entry lights, are installed to assist vessel entry and departure. Submerged breakwaters, or barriers, may additionally be marked using special marks to show the location and alignment of the structure.

Breakwaters may also be marked using beacons and fixed lights with passages between breakwaters, or through sections of submerged breakwaters or barriers, being marked using fixed or floating AtoN.

The unlit portion of the breakwater (in between AtoN) could present a hazard to navigation for mariners. Pathway, or street lighting may provide a non-conventional means to maximize the area illuminated of a breakwater, thus increasing safety for the mariner.

Various international and national bodies have adopted the principles of the IALA AtoN system as a basis, where applicable to inland waters, (e.g., European Code for Signs and Signals on Inland Waterways (SIGNI)) The provisions are defined in such a way as to avoid, as far as possible, any risk of conflict or confusion between systems of buoyage (e.g., IALA MBS and SIGNI).

However, mariners should be careful to take account of any local marking measures that may be in place and will often be covered by local regulations or by-laws. The boundaries between inland waterways and maritime waterways, are determined by the competent authorities.

Before transiting an area for the first time, mariners should make themselves aware of local marking arrangements.

Local AtoN may include, but not be restricted to, marking of:

- Breakwaters, quays and jetties; leisure areas
- Bridges
- Traffic signals
- Other river, channel, canal, lock and waterways marked within the responsibilities of competent authorities

3.2.4. SYNCHRONIZATION OF LIGHTS

If appropriate, synchronized lights (all flashing at the same time) or sequential lights (flashing one after another) or a combination of both may be utilized. See IALA guidelines.

3.2.5. RETRO-REFLECTING MATERIALS

The use of retroreflecting material on AtoN is becoming increasingly widespread particularly in the case of unlighted aids where the projection of a light by a user (which may range from a hand-held spotlight to a powerful searchlight) can assist in locating an aid and enhance identification of that aid. See IALA guidelines.

Some competent authorities provide only a “standard code” whereby an aid can be detected with a degree of identification, especially for lateral marks. Others, such as the Scandinavian countries with complicated channels and archipelagos frequented by small craft, provide a “comprehensive code” giving more detailed identification of an aid. Mariners operating in areas where retroreflective markings are used, should ensure they are familiar with the applicable markings or codes.

3.2.6. ATOIN IN RELATION TO MARITIME AUTONOMOUS SURFACE SHIPS (MASS)

Current applications, marks and signals exhibited by AtoN as described in this document apply to all vessels, including maritime autonomous surface ships (MASS). MASS operate with varying degrees of autonomy and utilize AtoN based on the level of autonomy and type of technology used. MASS may use AtoN described within the maritime buoyage system and there may be developments of AtoN that are tailored specifically for MASS.

It is the responsibility of the vessel’s command to ensure they can identify, interpret, and assess navigation signals as designed in this reference document, so that levels of safety for life and marine environment are met.

3.2.7. SUSTAINABILITY OF AtoN

IALA and its members recognize that AtoN provided as required by the MBS need to be sustainable and appropriate for the environment in which they are placed. This should be considered when assessing the risk being mitigated and marking required.

4. DEFINITIONS

The definitions of terms used in this IALA Recommendation can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

5. ABBREVIATIONS

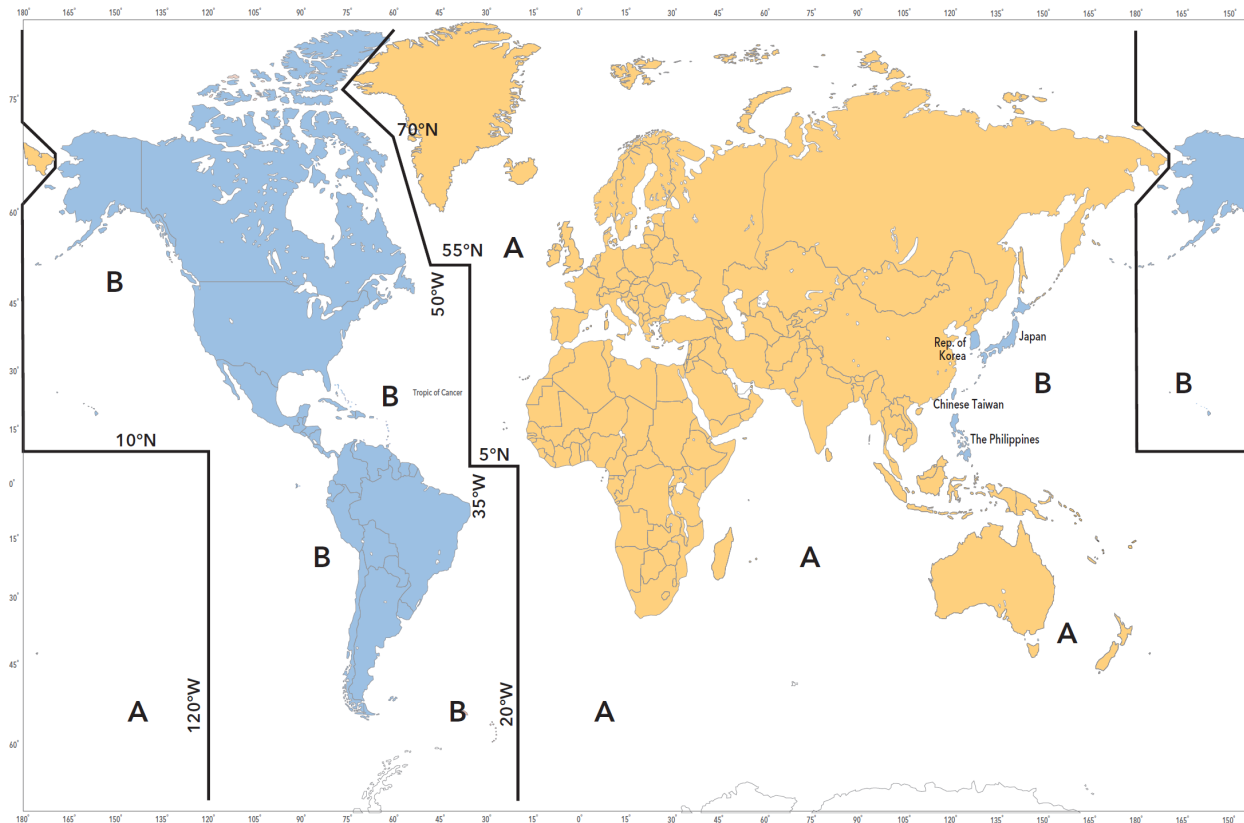
AIS	Automatic Identification System
AtoN	Marine Aid(s) to Navigation
DGNSS	Differential Global Navigation Satellite System
ECDIS	Electronic Chart Display and Information System
ENC	Electronic Nautical Chart
EPFS	Electronic Position Fixing System
GNSS	Global Navigation Satellite System
IHO	International Hydrographic Organization
IMO	International Maritime Organization
MASS	Maritime Autonomous Surface Ships
MAtoN	Mobile Aid(s) to Navigation
MBS	Maritime Buoyage System
MMS	Maritime Marking System
NE	Northeast
NW	Northwest
ODAS	Ocean Data Acquisition Systems
Q	Quick
SE	Southeast
SIGNI	SIGNalisation (des voies) de Navigation Interieure (European Code for Signs and Signals on Inland Waterways)
SN/Circ	Safety of Navigation Circular (IMO)
SOLAS	International Convention on Safety of Life at Sea
SW	Southwest
VDES	VHF Data Exchange System
VQ	Very quick



APPENDIX 1 REGIONS A AND B

IALA / AISM MARITIME BUOYAGE SYSTEM

Buoyage Regions A and B



Information believed to be correct at time of issue by IALA (March 2010)

- Not to be used for navigation
- Users should consult current nautical publications for latest status

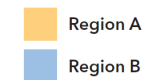


Figure 15 Regions A and B

APPENDIX 2 REGIONS A AND B BY DAY

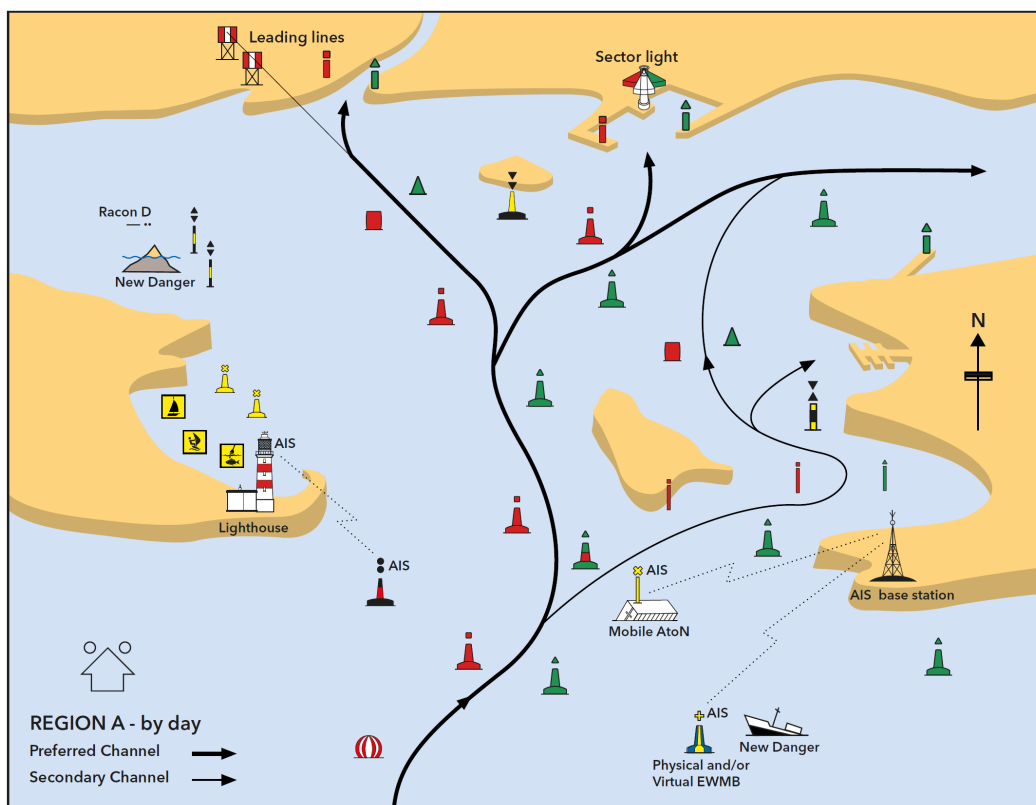


Figure 16 Region A by day

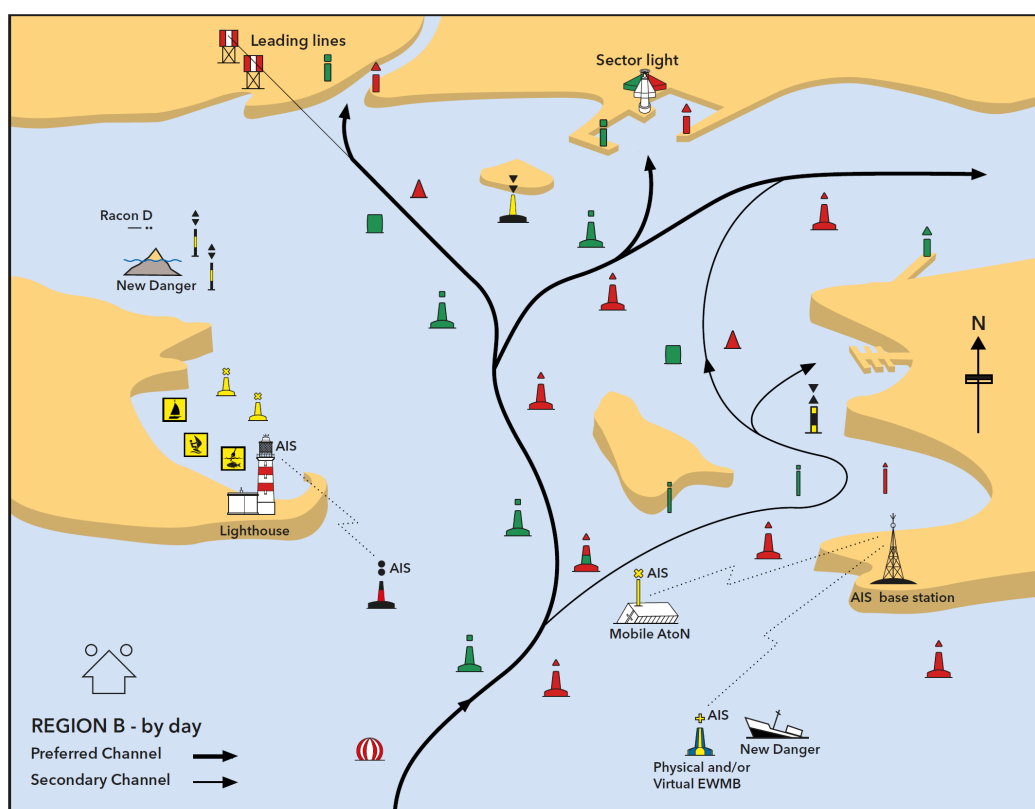


Figure 17 Region B by day

APPENDIX 3 REGIONS A AND B BY NIGHT

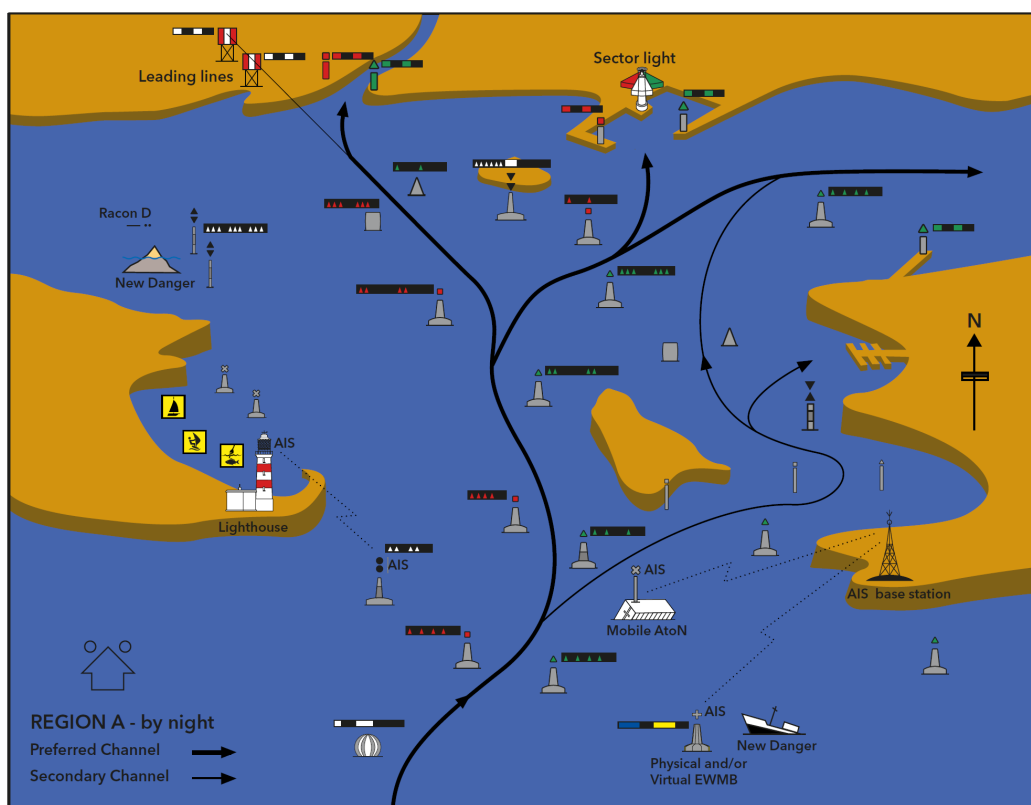


Figure 18 Region A by night

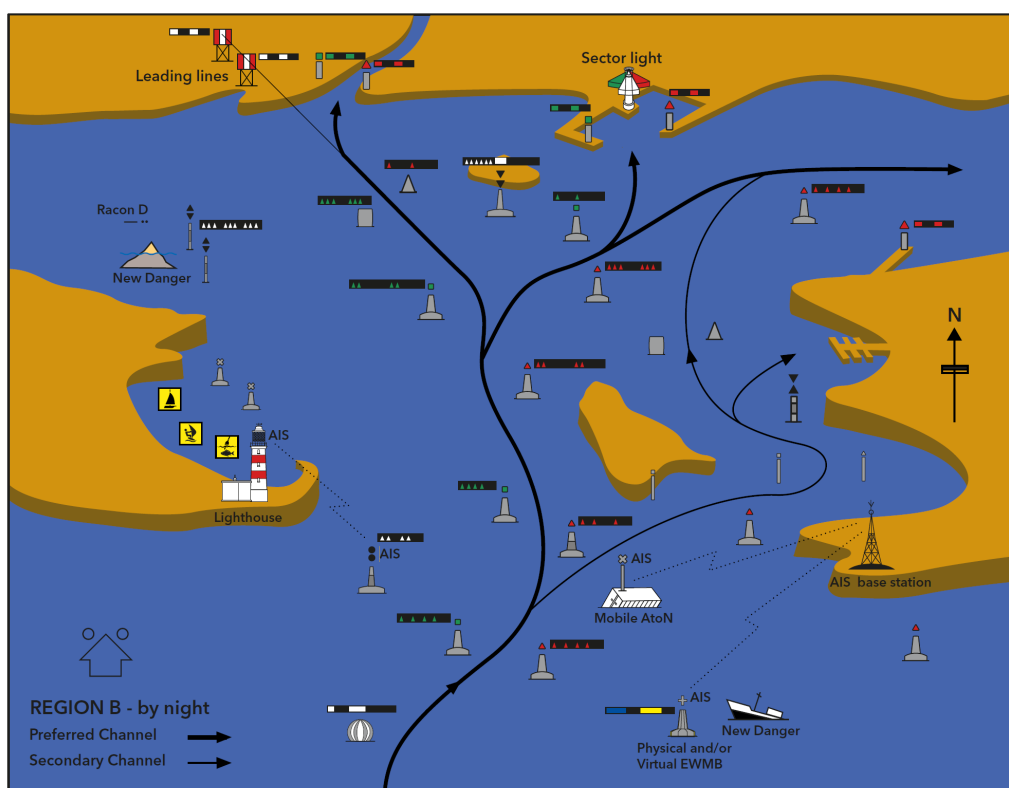


Figure 19 Region B by night