



Directive

for the

**Standardisation of fixed and floating
Aids to Navigation and Demarcation
Markers on all navigable Inland
Waterways in the
Republic of South Africa**

March 2014

Recommendation

Standardisation of fixed and floating Aids to Navigation and Demarcation Markers on all navigable Inland Waterways in the Republic of South Africa

Purpose of the Directive

The purpose of this Directive is to advise on the need to standardise both fixed and floating marine Aids to Navigation (AtoN) and demarcation markers and the required use thereof on all navigable inland waterways in the Republic of South Africa.

Legislative Framework

South Africa is a Member State to the United Nations (UN). The International Maritime Organisation's (IMO) is a specialised agency of the UN and its main task includes the maintenance of a comprehensive regulatory framework for shipping. IMO is responsible for a number of maritime related treaties, including the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended. SOLAS Chapter V addresses Safety of Navigation, and in particular, Regulation 13 addresses AtoN - refer to **Annex B** for the full text of Regulation 13.

South Africa is a Member of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and therefore has the duty to observe and implement IALA Recommendations, as reflected in SOLAS Chapter V - refer to **Annex C** for information on IALA.

South Africa is also a Member of the International Hydrographic Organisation (IHO), which is an intergovernmental consultative and technical organisation established to support safety of navigation and the protection of the marine environment. The IHO relies on acquiescence of its Member States and the inclusion of its standards and specifications in IMO conventions, such as reflected in SOLAS Chapter V.

The South African Maritime Safety Authority (SAMSA) is a statutory body established in terms of the SAMSA Act, 1998 (Act. No. 5 of 1998). The Act enables SAMSA to administer and execute the relevant maritime legislation. One of SAMSA's three mandates is "to ensure safety of life and property at sea".

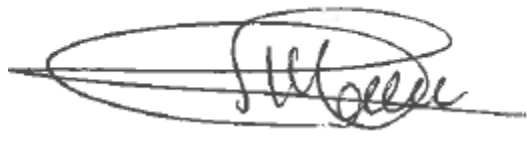
Standardised and harmonised marine Aids to Navigation

It has been identified that, in general, there are provisions of the IMO Conventions that does not find clear articulation in South African national legislation, particularly on the SOLAS mandate. This matter is being addressed at policy as well as at regulatory levels.

Since SAMSA is a government entity responsible to ensure safety of life and property at sea, safety on-board ships and small vessels at sea and inland waterways, therefore it would be the appropriate entity to ensure standardisation, harmonisation and compliance of all AtoN, both at sea and on navigable inland waterways of South Africa.

Recommendation

It is recommended that the principles and requirements described in this Directive are adopted by all entities and individuals that allow access to water surfaces for recreational, commercial and/or any other purposes.



Commander Tsietsi Mokhele
Chief Executive Officer



Date

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SECTION I

Introduction

1. Background

1.1 HISTORICAL BACKGROUND ON INLAND WATERWAYS

An inland waterway is any navigable body of water that could include dams, rivers, lakes and canals. In order for a waterway to be navigable, it must meet several criteria:

- The waterway must be deep and wide enough to allow the safe passage of vessels intending to navigate through it.
- The waterway must be free of barriers or dangers to navigation such as waterfalls, rapids equipment used for irrigation or farming, or have provision made for a way to avoid such dangers safely, such as canal locks and boat lifts.
- The current or tidal stream of the waterway must be mild enough to allow vessels to navigate safely and make headway.

Boats and vessels using waterways could vary from “anything that floats” including canoes, wind boards, jet skis, motorised boats and yachts to small animal-drawn barges to immense ocean tankers and ocean liners, such as cruise ships.

Canals are waterways that can be constructed to provide a new path of travel for vessels or a natural waterway. Major canals have been built to allow the passage of large ocean-going vessels to connect harbours with, or to create a shortcut between seas and existing waterways, such as the Kiel Canal which is between the North Sea and the Baltic Sea, and the Panama Canal which is the most heavily used canal worldwide.

A country's vast system of rivers and lakes could help to create communities and support inland shipping industries. Many great cities and towns rely on a nation's inland waterways to thrive.

1.2 CURRENT STATUS ON INLAND WATERWAYS IN SOUTH AFRICA

South Africa has approximately 60 000 dams and 23 large rivers which could be classed as inland waterways. The rivers and dams are located over a large area of the country in all nine provinces.

These inland waterways are utilised by over 1.2 million boats mostly for sport and recreation, tourism and by local communities for as a food source.

Unlike many other countries where inland waterways are used mostly for transportation of goods and passengers; this is not the case in South Africa.

Of the 60 000 dams, 4 783 are registered by the Department of Water Affairs (DWA) as having a safety risk¹ and 316 are government reservoirs under the custodianship of the DWA.

Safety of navigation

In 2008 SAMSA was delegated the additional responsibility of implementing the Merchant Shipping (National Small Vessel Safety) Regulations on South Africa's inland waterways. SAMSA collaborates with various other government departments and private-sector role-players in order to implement the regulations. This should include departments such as the Department of Water Affairs (DWA), provincial and local governments, as well as accredited agencies, training institutions and clubs.

¹ Dams having a safety risk is described in Article 117 of National Water Act, Act No 36 of 1998

The regulations and requirements described in the National Water Act, Act No 36 of 1998, are in addition to the owners' common law responsibility to ensure the safety of their dams. Furthermore, in terms of the South African Constitution, municipalities are responsible to ensure safe recreational water area within its jurisdiction.

1.3 CHALLENGES IDENTIFIED ON INLAND WATERWAYS

Co-operative Inland Waterway Safety Programme (CIWSP)

The Co-operative Inland Waterways Safety Programme (CIWSP) arose from a concern relating to the inability to enforce and regulate the National Small Vessel Safety Regulations. These regulations are intended to prevent unsafe vessels and untrained or unqualified skippers from operating on South African inland waters.

It has become clear that the regulations and responsibilities of other departments, such as managing invasive alien plants by the Department of Environmental Affairs (DEA), the management and control of water resources by DWA, the policing and events management (sports and recreation) are equally important. These regulations will serve the purpose for which they were intended, unless they implemented in an integrated manner.

CIWSP is a partnership between government departments, agencies or institutions and between the Government and the community. The aim is to enhance the development of a best practice model to ensure a safe and structured inland waters environment and culture, whilst protecting South Africa's precious water resources. This should be done through a phased rollout of the best practice model for dams, rivers and communities in South Africa.

One element of the CIWSP is the standardising of marine Aids to Navigation (AtoN) and demarcation markers to be established on inland waterways.

1.4 HISTORICAL BACKGROUND ON ATO N ON INLAND WATERWAYS

Coastal AtoN are required to be standardised and harmonised worldwide through the implementation of the Recommendations and Guidelines of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA). This is the only international organisation that deals with marine AtoN and related matters, but this however does not apply to inland waterways.

In Europe, CEVNI (*Code Européen des Voies de la Navigation Intérieure*) is the European Code for Inland Waterways and contains the core uniform rules applicable to the traffic on inland waterways. This would include such as visual signs on vessels, sound signals and radiotelephony, waterway signs and markings, rules of the road, berthing rules, and prevention of pollution of water and disposal of waste.

This Code does not apply to countries outside of Europe. Other countries may, or may not have their own rules and regulations governing their inland waterways.

1.5 CURRENT SITUATION OF ATO N ON INLAND WATERWAYS IN SOUTH AFRICA

A number of AtoN exist on South African inland waterways, however, these are not considered adequate, standardised, harmonised and/or comprehensive enough to contribute satisfactorily to the safety of navigation on inland waterways.

2. Governance

2.1 DEPARTMENT OF TRANSPORT (DoT)

The Department of Transport (DoT) is responsible for the regulation of all transportation in South Africa, including shipping and other transport by water or sea. This is being done through legislation, policy and regulations.

2.2 DEPARTMENT OF WATER AFFAIRS (DWA)

The DWA is the custodian of South Africa's water resources. It is primarily responsible for the formulation and implementation of policies governing this resource. It also has an overriding responsibility for water services provided by local governments.

While striving to ensure that all South Africans have access to clean water and safe sanitation, the DWA also promotes effective and efficient water resources management to ensure sustainable economic and social development.

The DWA is responsible, in terms of the National Water Act, to control aquatic weeds and invader plants on all open water systems, excluding privately owned reservoirs.

In terms of the aforementioned, the DWA, its delegated public sector partner, or a delegated water management institution, have the responsibility to provide the required AtoN on all Government Water Works for general navigation. These AtoN include marine navigation buoys.

2.3 DEPARTMENT OF ENVIRONMENTAL AFFAIRS (DEA)

The DEA, Environmental Programmes, is responsible for implementing the control activities and operations of all invasive alien species present in and on all water bodies. These control activities are governed by the Conservation of Agricultural resources Act (CARA) 83 of 1948, and the National Environmental Management: Biodiversity Act (NEM:BA) 10 of 2004.

2.4 SOUTH AFRICAN MARITIME SAFETY AUTHORITY (SAMSA)

SAMSA is a statutory body established in terms of the SAMSA Act, no. 5 of 1998. The Act enables SAMSA to administer and control activities falling under a number of maritime related acts. SAMSA's mandate is to:

- (a) to ensure safety of life and property at sea;
- (b) to prevent and combat pollution of the marine environment by ships; and
- (c) to promote the Republic's maritime interests.

In August 2007, the Minister of Transport promulgated into law the Merchant Shipping (National Small Vessel Safety) Regulations, 2007 ("the 2007 Regulations") which extended SAMSA's mandate to include small vessels operating on inland waterways. This covers the surveying and registration of small vessels, safety awareness and regulations related to these vessels, accident investigation, control of recreational boating, setting examination standards and the issuing of certificates of competence and seaworthiness.

Some provisions of the International Maritime Organisation (IMO) Conventions are clearly implemented in South African national legislation, particularly in regard to the International Convention for the Safety of Life at Sea (SOLAS) mandate.

Since SAMSA is a government agency responsible to ensure safety on-board ships and small vessels at sea and inland waterways, it would therefore be the appropriate authority to ensure compliance with both international conventions and national regulations for all AtoN, both at sea and on navigable inland waters of South Africa.

The standardisation of AtoN on Inland Waters is an integral part of:

- IALA Recommendations and Guidelines
- The South African Maritime Safety Authority Act, Act No. 5 of 1998
- The access and use of Government Water Works for Recreational purposes (Section 113 of the National Water Act, No 36 of 1998) as amended²
- Government Notice R654 of 1964 (Section 70 of the Water Act – Act 54 of 1956) (which remains in force in terms of section 163(4) of the National Water Act)
- The Merchant Shipping (National Small Vessel Safety) Regulations, 2007 as amended (NSVR)
- The South African Constitution

2.5 LOCAL ACCOUNTABLE AtoN PARTIES (LAAP)

In addition to the DWA and other Local Accountable AtoN Parties (LAAP) providing access to Water Works, watercourses, privately owned dams and other navigable watercourses, or requiring a specific demarcated area for specific recreational usage, have a responsibility to ensure that the required AtoN is in accordance with the permission granted by SAMSA.

2.6 INLAND WATERWAYS WITHIN MUNICIPAL BOUNDARIES

In terms of the South African Constitution, municipalities have to ensure safe recreational water areas within its jurisdiction. In order to do so, it has to manage and control the recreational use of public inland waters, and the use of vessels thereon, by, amongst others, the provision of AtoN.

In terms of this Directive, it is required that all of these AtoN are to be provided and maintained in terms of standards determined by SAMSA.

² Amended by the National Water Act Amendment Act, 45 of 1999

SECTION II

Principles of the Standardisation of Fixed and Floating Aids to Navigation on Navigable Inland Waters in the Republic of South Africa

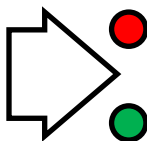
1. SAMSA, as the Competent Maritime Authority, has to ensure safety of navigation by compliance and harmonisation of all maritime AtoN in the Republic of South Africa (RSA), both at sea and on navigable inland waterways by:
 - 1.1 Ensuring that as it deems practical and necessary for appropriate aids to navigation to be provided as the volume of traffic and the degree of risks requires.
 - 1.2 Obtaining the greatest possible uniformity in AtoN by taking into account appropriate international directives, requirements, recommendations and guidelines, including those of IALA.
 - 1.3 Ensuring all AtoN meet acceptable international standards. IALA Recommendations and Guidelines³ would be the guiding factor, with the main emphasis on:
 - (a) Meeting the minimum IALA objectives on availability of the various categories;
 - (b) Compliance to the IALA Maritime Buoyage System
 - (c) Colour. It should be noted that IALA has defined the colour regions⁴, for both marine AtoN lights and surface colours, for each of the following colours: White, Red, Green, Yellow and Blue.
 - (d) Light characteristics.
 - 1.4 Ensuring all AtoN, including inland waters:
 - (a) Meet the requirements of present and changing needs of all mariners;
 - (b) Ensuring natural and or man-made hazards, which are dangers to navigation, are adequately marked.
 - 1.5 Recommending new and or additional AtoN to be established.
2. All AtoN are to be provided according to the latest Recommendations and Guidelines as adopted and published by IALA, which include:
 - (a) Colour
 - (b) Shape
 - (c) Characteristic / coding
 - (d) Colour of daymark
 - (e) Range
 - (f) Categories 1, 2 or 3
 - (g) IALA Maritime Buoyage System (MBS). The IALA MBS rules also apply to all fixed marks, other than lighthouses, leading lights, lightships and large navigational buoys.
 - (h) Availability

All AtoN must be maintained in accordance with the availability criteria laid down by IALA.

³ The IALA Recommendations and Guidelines are available in PDF format on the IALA website, for download(www.iala-aism.org), free of charge, by interested parties

⁴ The IALA chromaticity areas appear on the Annex Section

3. The “**buoyage direction**” on inland waters is upstream. Going upstream, the left hand side is regarded as the Port Hand side and the right hand side as the Starboard Hand side. The following buoyage direction symbol would appear on the appropriate navigational charts and other publications.



4. **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” i.e. numbered upstream. The protocol for numbering lateral marks, especially in confined waterways, should be “even numbers on red - odd numbers on green”.

5. No LAAP, service provider, or any other entity on land, or inland waters shall, without the consent of SAMSA:

- (a) erect or place any fixed or floating AtoN, mark or beacon
- (b) remove or discontinue any fixed or floating AtoN, mark or beacon (a different application form is to be filled in, which can be obtained from the e-mail address given below)
- (c) alter the colour, character, height, etc., or the mode of exhibiting lights of any fixed or floating AtoN, mark or beacon in any lighthouse, buoy or beacon.

In all instances mentioned above, a written case must be submitted to SAMSA for approval in order for the necessary approval to be granted – refer to **Section V** and **Annex H**.

6. **Changes to AtoN to be advised**

It is important that, for all inland waters that SAMSA be notified of all changes promptly, with the implementation date being given.

SAMSA needs to be informed in a written format, of the detail of the relevant AtoN, such as:

- (a) Name, location, geographic position, which is to be based on WGS 84 Datum;
- (b) Characteristics of light and phases;
- (c) Sectors, with bearings as seen on approach towards land, arcs and colours;
- (d) Elevation of the light;
- (e) Nominal range;
- (f) Description and colours of structure (including topmark), with height of the structure above ground level;
- (g) Description, shape and colours of buoys, (including topmark);
- (h) For leading lights, the bearing, distance between front and rear lights and front and rear elevations;
- (i) For direction lights the centre line bearing and colours/bearing of all sectors;
- (j) When any changes have taken place to the AtoN, after approval by SAMSA;
- (k) When the AtoN is to be discontinued, after approval by SAMSA.

The contact details for the information to be sent to, appear under Section III, clause 5.3.

7. Dissemination of information

Appropriate arrangements are to be made to ensure that any changes to AtoN are disseminated promptly and as widely as possible to users and other interested parties. The following AtoN information must be disseminated:

(a) Any AtoN failure. The message should include:

(i) The name / number of the AtoN

(ii) Nature of the failure, e.g.

- Unlit
- Out of position

(b) When the AtoN has been restored

(c) When any changes have taken place to the AtoN

(d) When a new AtoN has been commissioned

8. It is an offense to moor any type of vessel to AtoN or demarcation marker.

9. Unlawful and intentional damage to AtoN, or demarcation markers

Anyone who unlawfully and intentionally alters, moves, disturbs, wilfully damages or destroys any AtoN or demarcation markers, or part thereof, shall be charged with malicious damage to property.

SECTION III

Marine Aids to Navigation

A marine **Aid to Navigation (AtoN)** is defined by IALA as “*A device or system external to vessels that is designed and operated to enhance the safe and efficient navigation of vessels and/or vessel traffic*”.

A marine aid to navigation should not be confused with a navigational aid. A **navigational aid** is an instrument, device, chart, etc., carried on board a vessel for the purpose of assisting navigation.

1. Visual Aids to Navigation

Visual marks for navigation can be either natural or man-made objects. They include structures specifically designed as short range AtoN, as well as conspicuous features such as headlands, mountaintops, rocks, trees, church-towers, minarets, monuments, chimneys, etc.

Short range AtoN can be fitted with a light if navigation at night is required, or left unlit if daytime navigation is sufficient.

Visual AtoN are purpose-built facilities that communicate information to a trained observer on a vessel for the purpose of assisting the task of navigation. The communication process is referred to as *marine signalling*.

The Maritime Buoyage System and other AtoN provide rules that apply to all fixed, floating and electronic marks serving to indicate:

- (a) Landfall, course to steer, and other areas or features of importance to the mariner;
- (b) The lateral limits of navigable channels;
- (c) Natural dangers and other obstructions such as wrecks;
- (d) New dangers.

Common examples of visual AtoN include lighthouses, beacons, leading (range) lines, buoys (lit or unlit), lightvessels, daymarks (dayboards) and traffic signals.

1.1 DEFINITION OF A BEACON

A beacon is a fixed navigation mark that can be recognised by its shape, colour, pattern, topmark, or light character, or a combination of these.

1.2 DESCRIPTION OF A BEACON

- 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/range or conspicuous radar mark;
- It may also carry a topmark.

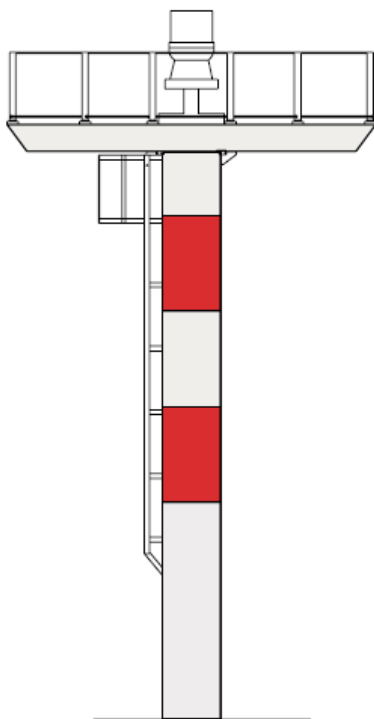
Colour/Shape

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, isophase or occulting or as appropriate, to allow light to be readily identifiable.



Beacons would mostly be used as a fixed AtoN on Inland Waters



A typical Port Hand light marking the entrance to a breakwater/ harbour/ marina

1.3 EFFECT OF BACKGROUND LIGHTING

The range of lights, i.e. the nominal range, is given with no background lighting. Excessive background lighting, from, e.g. street lights, neon signs, etc., frequently makes an AtoN light less effective and, in some cases it becomes completely lost in the general background clutter. In these cases, the light can be made more conspicuous by increasing its intensity, changing its colour or by varying its rhythm.

2. IALA Maritime Buoyage System (MBS)

2.1 METHOD OF CHARACTERISING MARKS

The significance of the mark depends upon one or more of the following features:

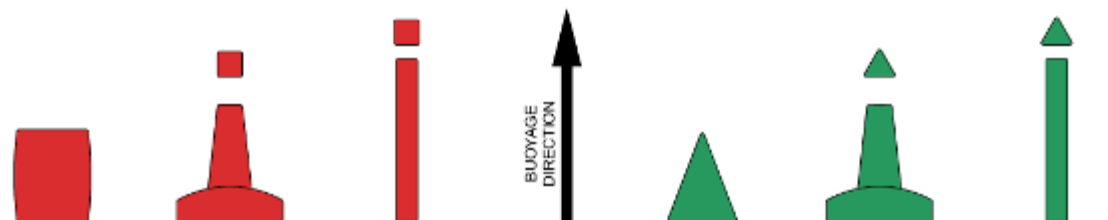
- (a) By night, colour and rhythm of light and/or illumination enhancement;
- (b) By day, colour, shape, top-mark, and/or light (including colour and rhythm);
- (c) By electronic (digital) symbology, e.g. as a complement to physical marks;
- (d) By electronic (digital) symbology solely.

2.2 LATERAL MARKS

Lateral marks, used in conjunction with a “conventional direction of buoyage”, generally employed for well-defined channels. These marks indicate the port and starboard sides of the route to be followed. Where a channel divides, a modified lateral mark may be used to indicate the preferred route.

Lateral marks differ between Buoyage Regions A and B.

2.2.1 Description of Lateral Marks used in Region A

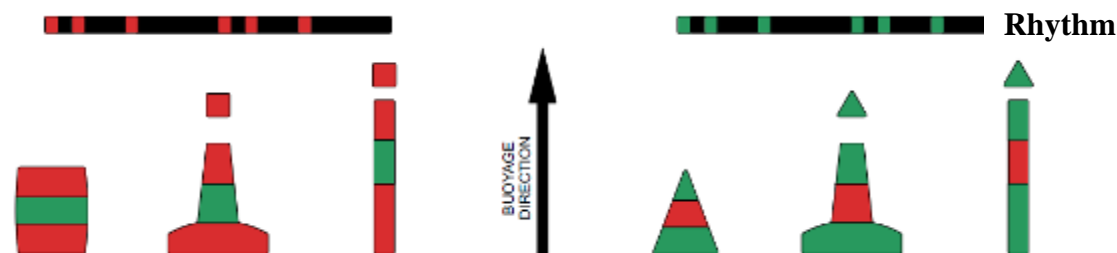


	Port hand Marks	Starboard hand Marks
Colour	Red	Green
Shape of the buoy	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single red cylinder (can)	Single green cone, point upward
Light Colour (when fitted)	Red	Green
Rhythm	Any, but no composite flashes	Any, but no composite flashes

Note: Lateral marks are to be used, where appropriate, to mark lanes, e.g. ski lanes, etc.

2.2.2 Preferred channel

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:



	Preferred channel to Starboard	Preferred channel to Port
Colour	Red with one broad green horizontal band	Green with one broad red horizontal band
Shape of the buoy	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single red cylinder (can)	Single green cone, point upward
Light Colour (when fitted)	Red	Green
Rhythm	Composite group flashing (2 + 1)	Composite group flashing (2 + 1)

2.2.3 General Rules for Lateral Marks

- Shapes: Where lateral marks do not rely upon cylindrical (can) or conical buoy shapes for identification they should, where practicable, carry the appropriate topmark.
- 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” – refer to Section I, clause 8.

2.3 CARDINAL MARKS

Cardinal marks, used in conjunction with the mariner's compass, to indicate where the mariner may find navigable water.

2.3.1 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.

A Cardinal Mark is named after the quadrant in which it is placed.

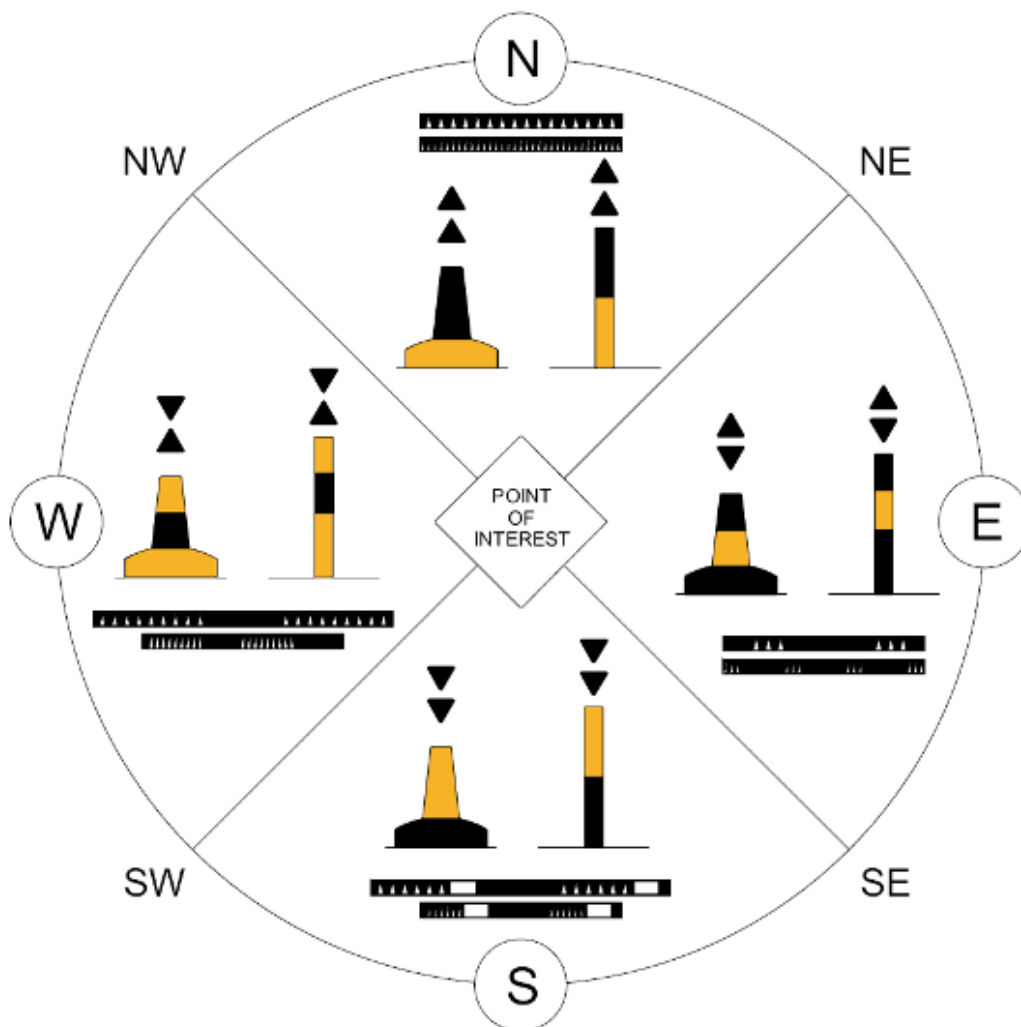
The name of a Cardinal Mark indicates that it should be passed to the named side of the mark.

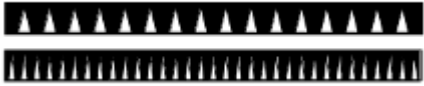

2.3.2 Use of Cardinal Marks



A Cardinal Mark may be used, for example:

- (a) To indicate that the deepest water in that area is on the named side of the mark.
- (b) To indicate the safe side on which to pass a danger.
- (c) To draw attention to a feature in a channel such as a bend, a junction, a bifurcation or the end of a shoal.

2.3.3 Description of Cardinal Marks



	North Cardinal Mark	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 the buoy	Pillar or spar	Pillar or spar
Light Colour (when fitted)	White	White
Rhythm	VQ or Q 	VQ(3) every 5s or Q(3) every 10s 

	South Cardinal Mark	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
Shape of the buoy	Pillar or spar	Pillar or spar
Light Colour (when fitted)	White	White
Rhythm	VQ(6) + Long flash every 10s or Q(6) + Long flash every 15s 	VQ(9) every 10s or Q(9) every 15s 

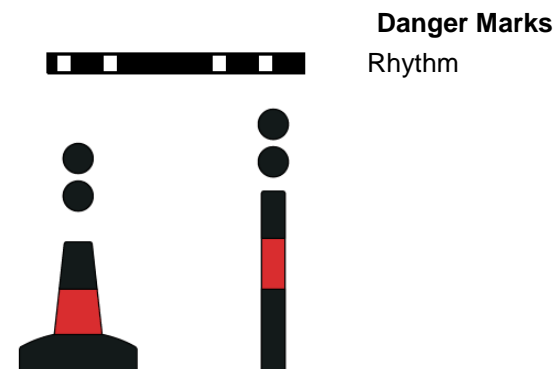
Note: The double cone topmark is a very important feature of every Cardinal Mark by day, and should be used wherever practicable and be as large as possible with a clear separation between the cones.

2.4 ISOLATED DANGER MARKS

2.4.1 Definition of Isolated Danger Marks

An Isolated Danger mark is a mark erected on, or moored on, or as close to an isolated danger that has navigable water all around it.

2.4.2 Description of Isolated



Topmark	2 black spheres, one above the other
Colour	Black with one or more broad horizontal red bands
Shape of the buoy	Optional, but not conflicting with lateral marks; pillar or spar preferred
Light Colour (when fitted)	White
Rhythm	Group flashing (2)

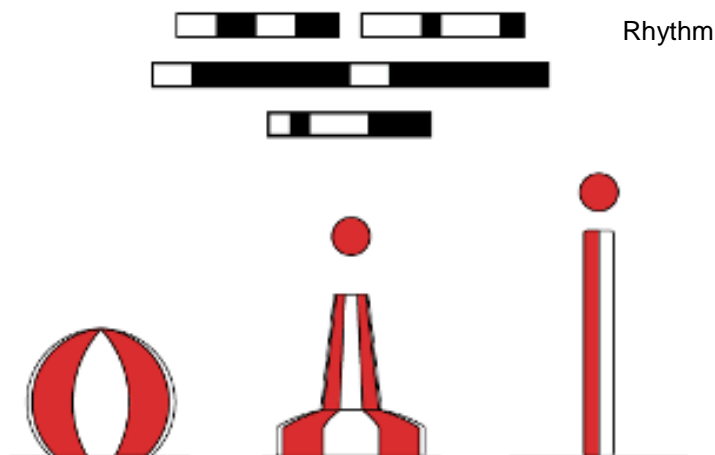
Note: The double sphere topmark is a very important feature of every Isolated Danger mark by day, and should be used wherever practicable and be as large as possible with a clear separation between the spheres.

2.5 SAFE WATER MARKS

2.5.1 Definition of Safe Water Marks

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 as an alternative to a Cardinal or a Lateral mark to indicate a landfall.

2.5.2 Description of Safe Water Marks



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

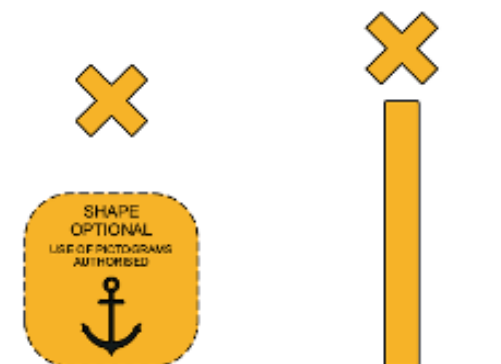
2.6 SPECIAL MARKS

2.6.1 Definition of Special Marks

Marks not primarily intended to assist navigation but which indicate a special area or feature referred to in appropriate nautical documents, for example:

- (a) Ocean Data Acquisition Systems (ODAS) marks
- (b) Traffic separation marks where use of conventional channel marking may cause confusion
- (c) Spoil Ground marks
- (d) Military exercise zone marks
- (e) Cable or pipeline marks
- (f) Recreation zone marks

2.6.2 Description of Special Marks



Colour	Yellow
Shape of buoy	Optional, but not conflicting with lateral marks
Topmark (if any)	Single yellow "X" shape
Light Colour (when fitted)	Yellow
Rhythm	Any, other than those reserved for cardinal, isolated danger or safe water marks as confusion between White and Yellow as colours for lights is liable to occur. <u>The lights of the Special Marks should not show any of the rhythmic characters that have been assigned to the marks showing White lights.</u>
Pictogram	The use of pictograms is authorised, as defined by a competent authority.

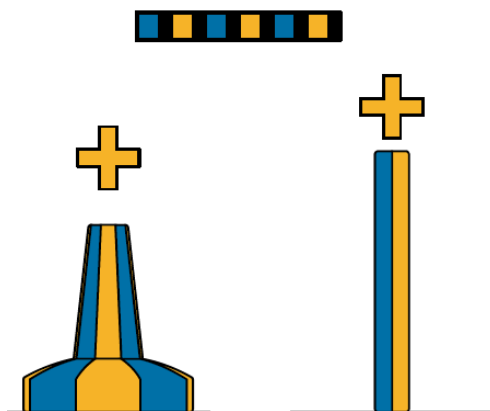
2.7 NEW DANGERS

2.7.1 Definition of New Dangers

The term “New Danger” is used to describe newly discovered hazards not yet shown in nautical documents. ‘New Dangers’ include naturally occurring obstructions such as sandbanks or rocks or man-made dangers such as wrecks.

2.7.2 Marking of New Dangers

- “New Dangers” should be appropriately marked using Lateral, Cardinal, Isolated Danger marks or by using the Emergency Wreck Marking Buoy. If the Authority considers the risk to navigation to be especially high, at least one of the marks should be duplicated.
- 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 other electronic means, such as Automatic Identification System (AIS as an AtoN).
- The marking of the new danger may be removed when the competent Authority is satisfied that information concerning the “New Danger” has been sufficiently promulgated or the danger otherwise resolved.



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
Colour of light	Yellow/blue alternating
Rhythm	One second of blue light and Rhythm one second of yellow light with 0.5 sec. of darkness between

2.8 NOTE OF CAUTION

No reliance can be placed on floating AtoN always maintaining their exact positions. Also, due to the large variation in the water levels from wet to dry periods, and the natural swinging circle of buoys, buoys should be regarded with caution and not as an infallible navigation mark. Vessels should always, when possible, navigate by bearings of fixed objects or angles between them, and not by buoys. Also refer to **Section III, clause 4.3**.

2.9 FIXED ATO N INSTEAD OF BUOYS

Fixed AtoN can be used in place of buoys where circumstances allow.

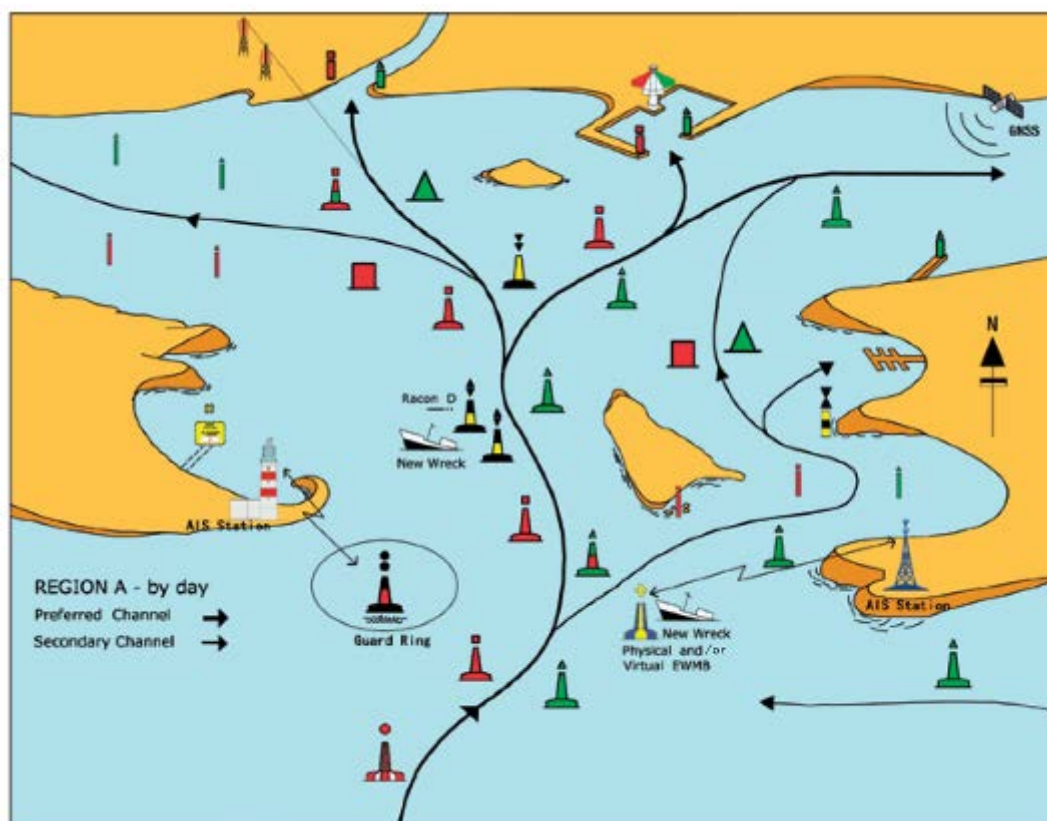
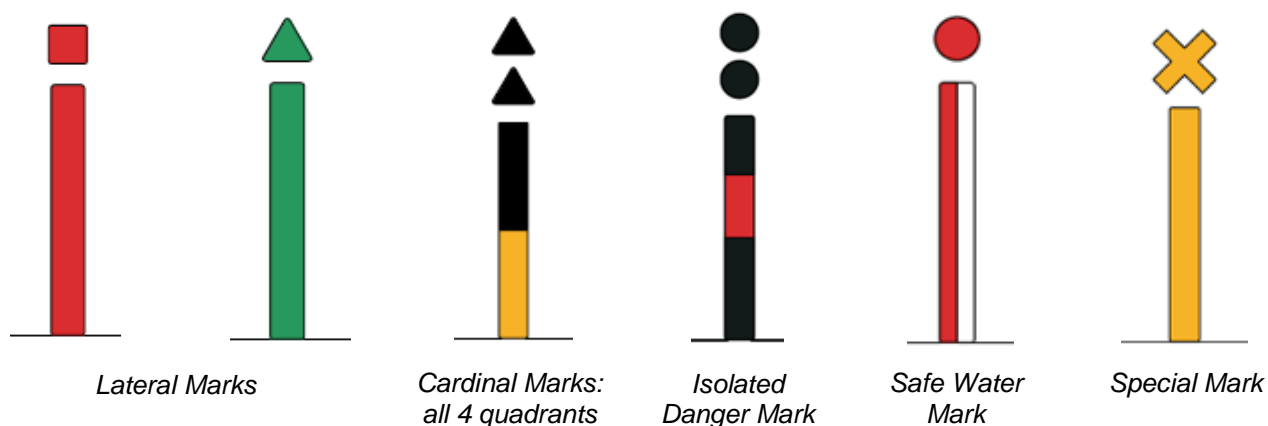


Figure 1 Illustration how the IALA MBS can be applied by day

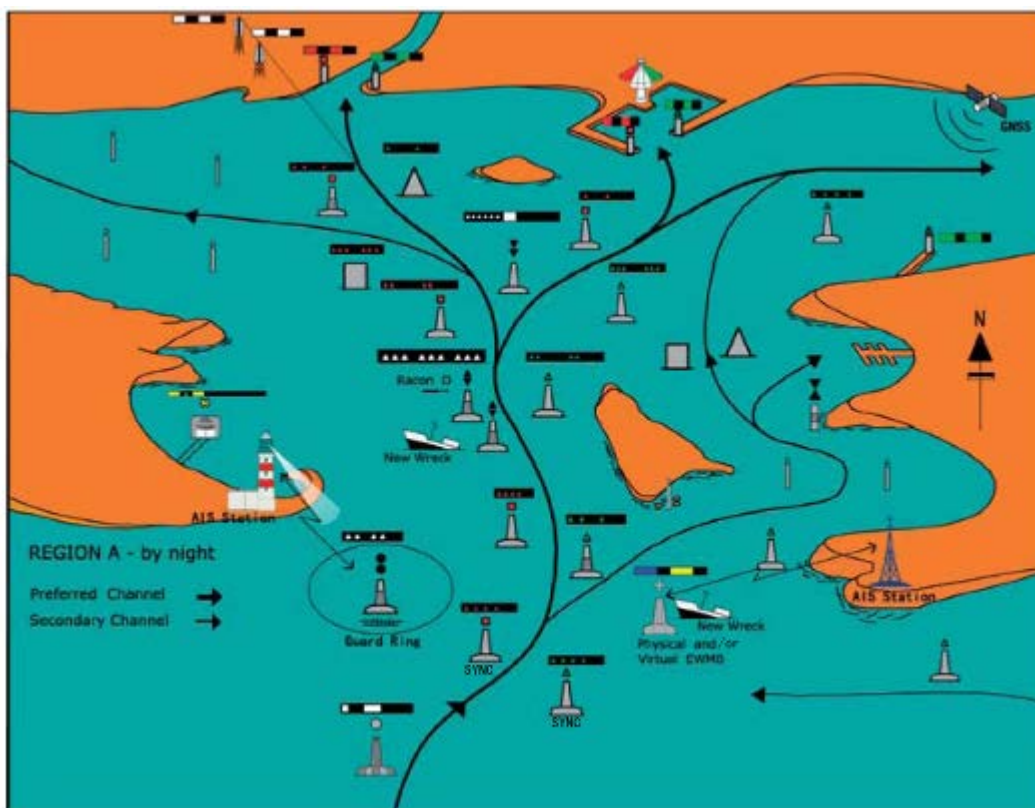


Figure 2 Illustration how the IALA MBS can be applied by night

3. Marking of bridges

Should bridges that cross Inland Waters need special marking to ensure their safety and that of vessels navigating beneath them, the following principles would apply.

3.1 NAVIGATION POSSIBLE IN THE FULL PASSAGE SPAN

If it is deemed necessary to indicate to vessels the most appropriate point to pass under a bridge, this is being referred to as the “best point of passage”, and shall be marked as follows:

3.1.1 Marking by day

- (a) To starboard: a panel showing a solid green equilateral triangle point upwards;
- (b) To port: a panel showing a solid red square

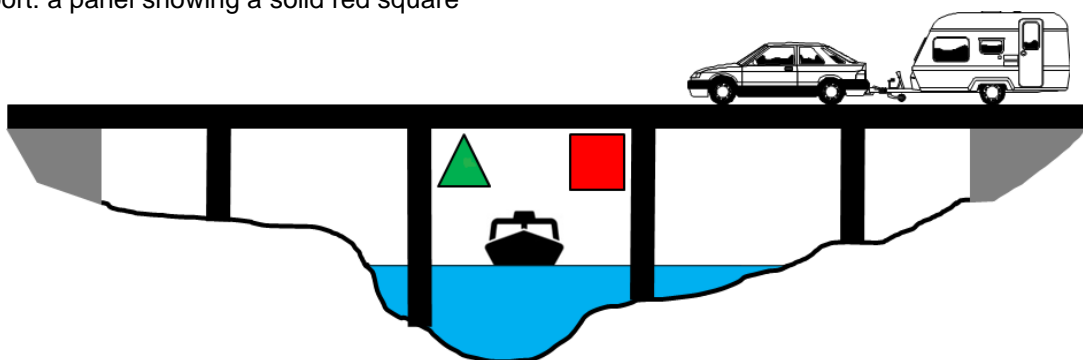


Figure 3 Lateral marks if navigation is possible in the full passage span

3.1.2 Marking by night

- (a) Red or green rhythmic AtoN lights may be used to mark the navigable limits of the channel in accordance with the IALA MBS;
- (b) If navigation is possible in the full passage span, the lights should be located on the bridge piers. If navigation is possible only in a part of the span, the lights should be located under the span, or on buoy and beacons in the water so placed as to indicate the limits of the navigable channel.

3.2 “BEST POINT OF PASSAGE”

3.2.1 Marking by day

The “best point of passage” may be indicated by a circular panel with red and white vertical stripes.

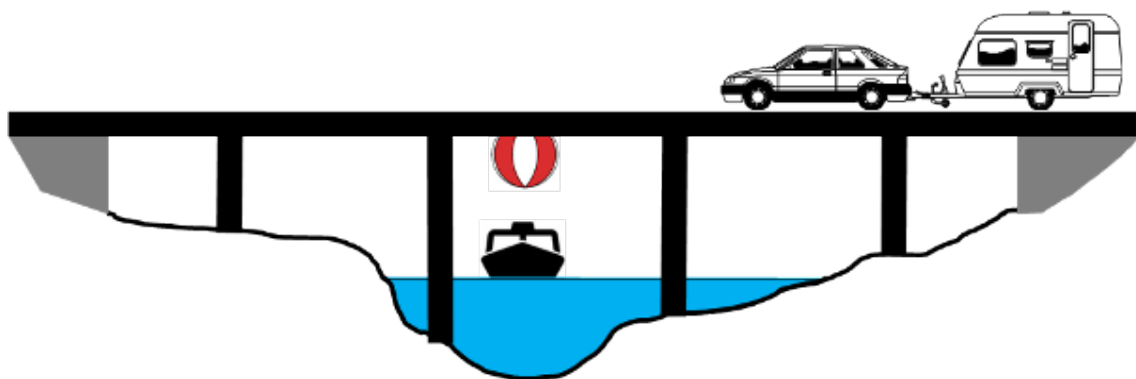


Figure 4 Marking the “best point of passage”

3.2.2 Marking by night

The “best point of passage” may be indicated by a white light, or lights located under the span and exhibiting a safe water mark character.

3.3 MISCELLANEOUS

- 3.3.1 There should be a good contrast between the coloured panels and the colour of the bridge structure. Such a contrast may be achieved by mounting the panels against a white background.
- 3.3.2 If there is more than one navigable channel under the bridge, the same system(s) mentioned above should be used for each channel.
- 3.3.3 Bridge spans other than those marked by red and green lateral marks, e.g. spans to be used by very small craft, may be indicated by special yellow marks as prescribed in the IALA MBS.

4. General Notes

- 4.1 On any inland waterway where night-time activities are allowed, all AtoN must be fitted with the appropriate lights and must be in a working condition.
- 4.2 The charted position of a floating AtoN (buoy) defines the nominal (or true) position for the anchor.

4.3 **Important**

4.3.1 All vessels should pass a buoy at a distance that allows enough space for the mooring line movement (swinging action) of the buoy due to the length of the mooring and changing water levels. It is advisable that vessels maintain a safe distance of at least 20 metres from a buoy, especially when the level of dam is low. Also refer to **Section III, clause 2.8**.

4.3.2 With regards to the Isolated Danger Marker, it must be passed with a minimum distance of at least 20-30m.

4.4 For all Government Water Works, after having received the approval from SAMSA, all buoys must be constructed in accordance with specifications as described by the DWA (specifications are available from the DWA National Boating Co-ordinator – refer to **Section V** for the contact detail).

Note: The same principle applies for demarcation markers.

SECTION IV

Demarcation Markings

The following **demarcation markings**, fixed or floating (buoys), may be used in conjunction with the IALA MBS.

1. These types of markings shall be as follows:
 - (a) Only be round-shaped, except for the No Access Zone (orange buoy) that may be cylindrical;

In the case of a fixed mark, the round shape shall be mounted on top of a support pole. To emphasise the relevant marker, the colour of the pole should be the same as the colour of that demarcation marker;
 - (b) Not be fitted with any light or topmark;
 - (c) Not have any colour, or combination of colours that may conflict with that of the MBS, except for the colour yellow (sporting events, and other areas of interest);
 - (d) No demarcation mark, excluding the support pole, **should be less than 350 mm** in diameter;
 - (e) Appropriate pictograms, or signage as indicated below could be attached to the support pole in case of a fixed demarcation mark.
2. IALA Special Mark buoys may be fitted with appropriate pictograms, or signage as indicated below in order to identify special areas.

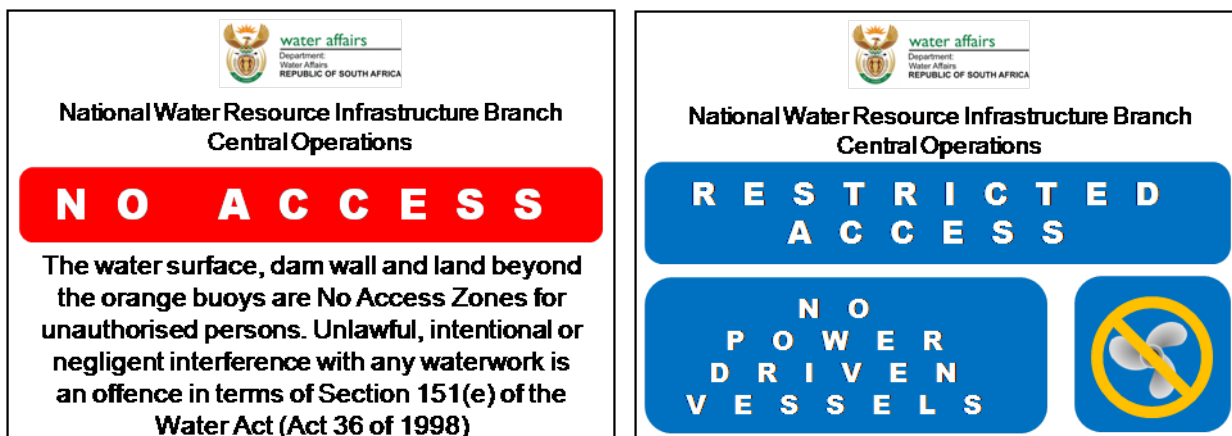
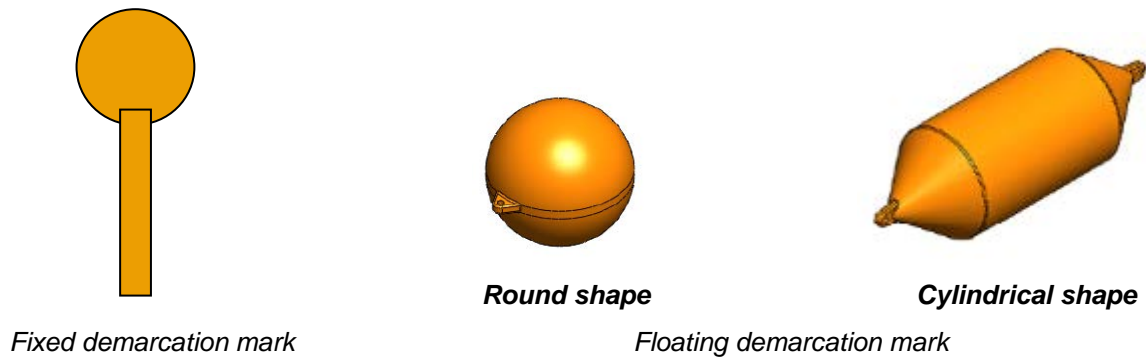


Figure 5 Examples of typical signage / pictograms that may appear on AtoN Special Water Markers on Government Water Works

3. The following are the ONLY demarcation markers to be used.

3.1 **Orange marking - No Access Zone**



Example of how this type of demarcation buoys would be put in practice, in conjunction with IALA Special Mark buoys.

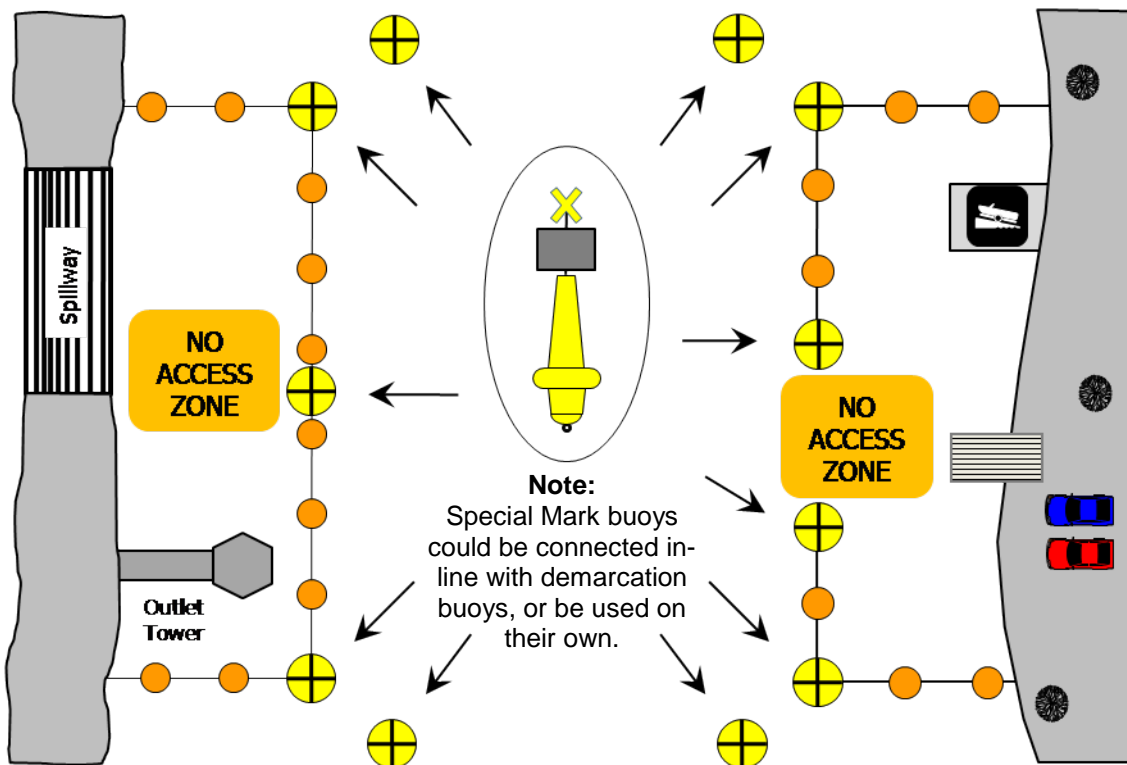


Figure 6 Typical example of NO ACCESS ZONE markings

No access zones, such as near dam spillways, outlet towers, etc. to be marked with No Access Zone demarcation buoys should be used in conjunction with IALA Special Mark buoys fitted with appropriate pictograms, or signage.

3.2 Blue markings – Restricted Access Zone

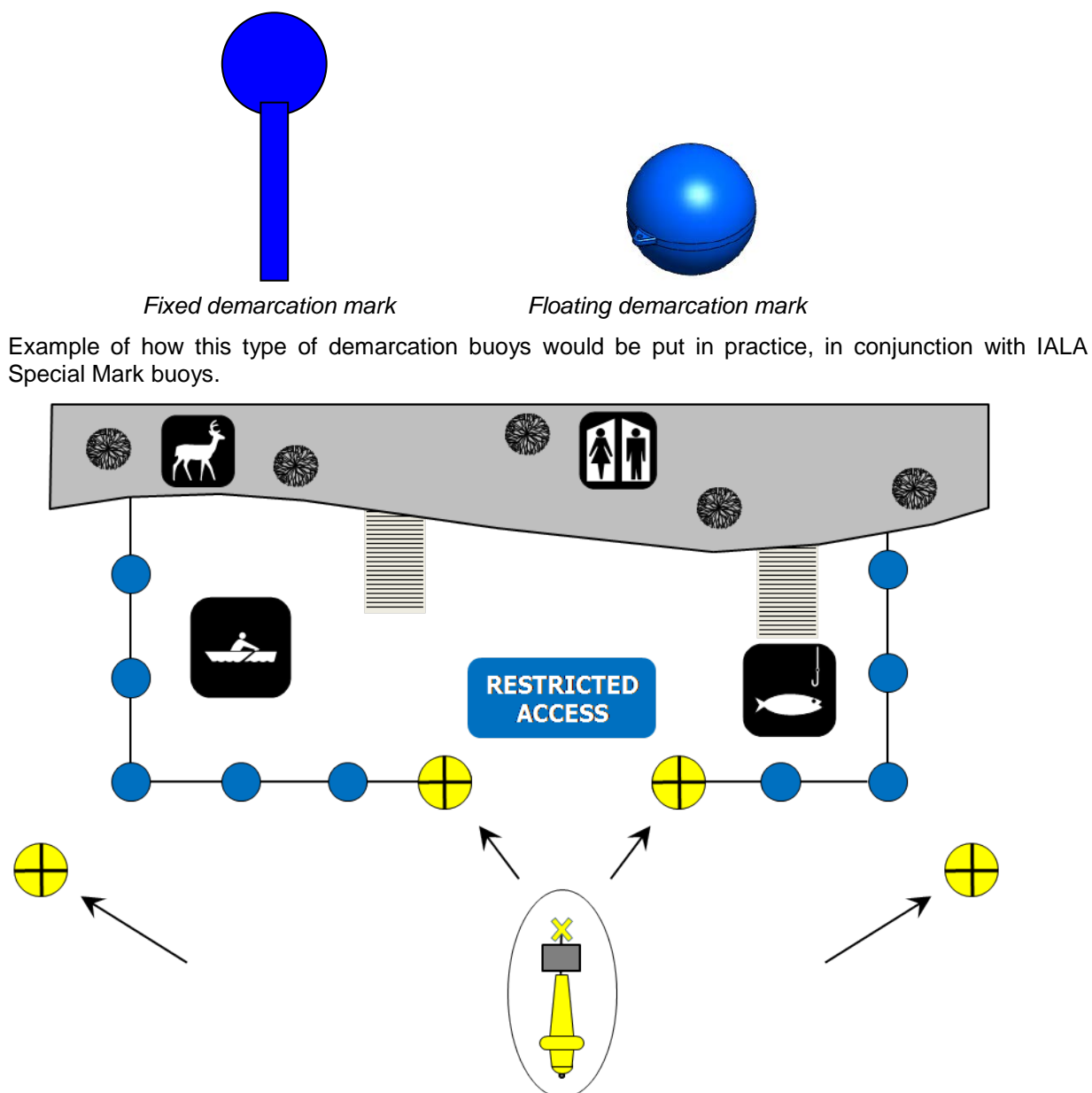


Figure 7 Typical example of *RESTRICTED ACCESS ZONE* markings

Restricted access in nature conservation areas, i.e. no power driven vessels, no fishing; etc. The Restricted Access Zone demarcation buoys are being used in conjunction with IALA Special Mark buoys fitted with appropriate pictograms, or signage.

- 3.3 **White markers** - Dead Slow Zone & for all mooring buoys. Could be supplemented with an indication of the speed limit.

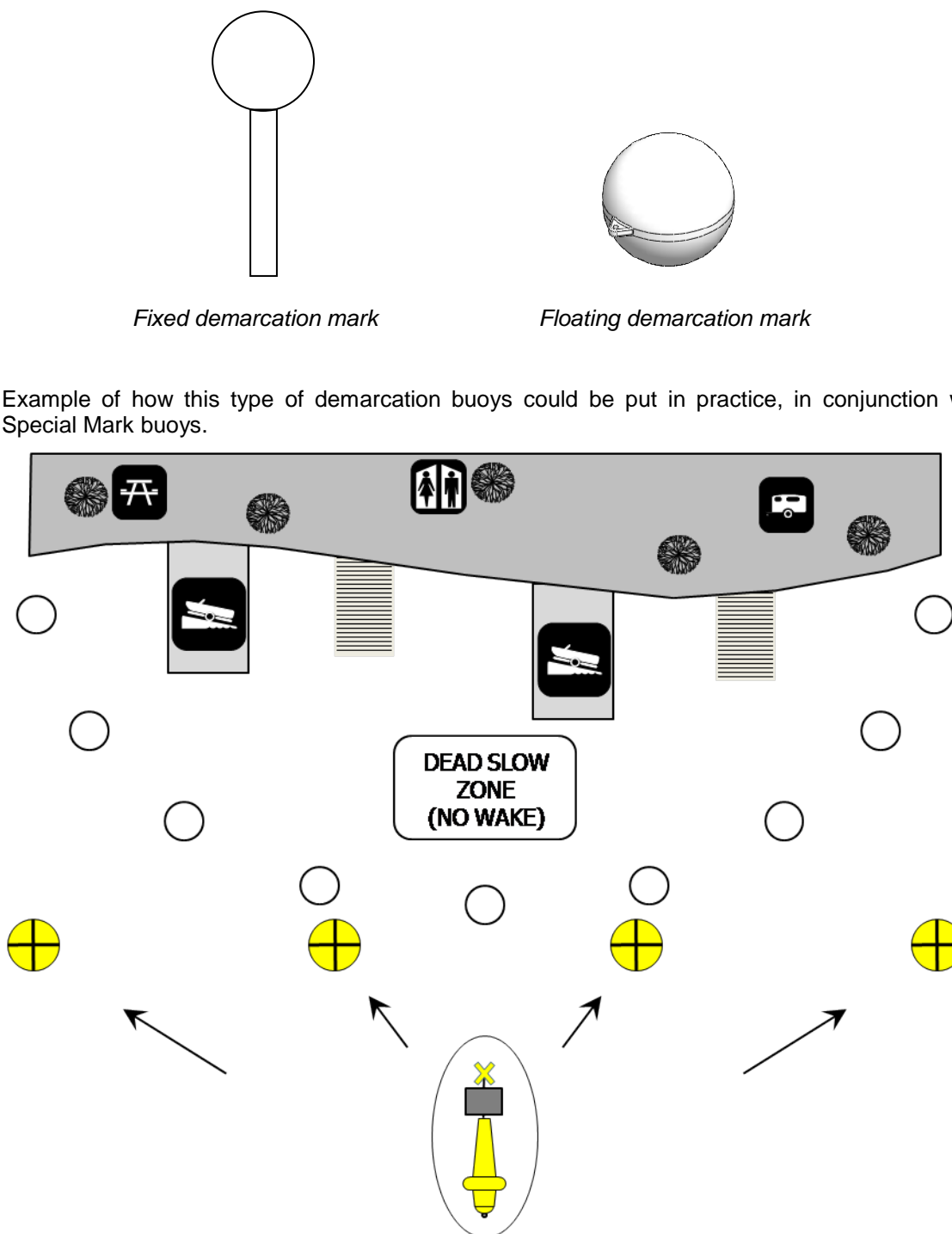
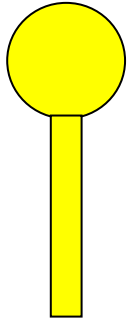
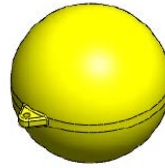


Figure 8 Typical example of DEAD SLOW ZONE and mooring buoy markings

3.4 **Yellow markers** - Special Areas, such as sporting events & other areas of interest



Fixed demarcation mark



Floating demarcation mark

3.5 **Black & white marker** - Shallow Water



Fixed demarcation mark



Floating demarcation mark

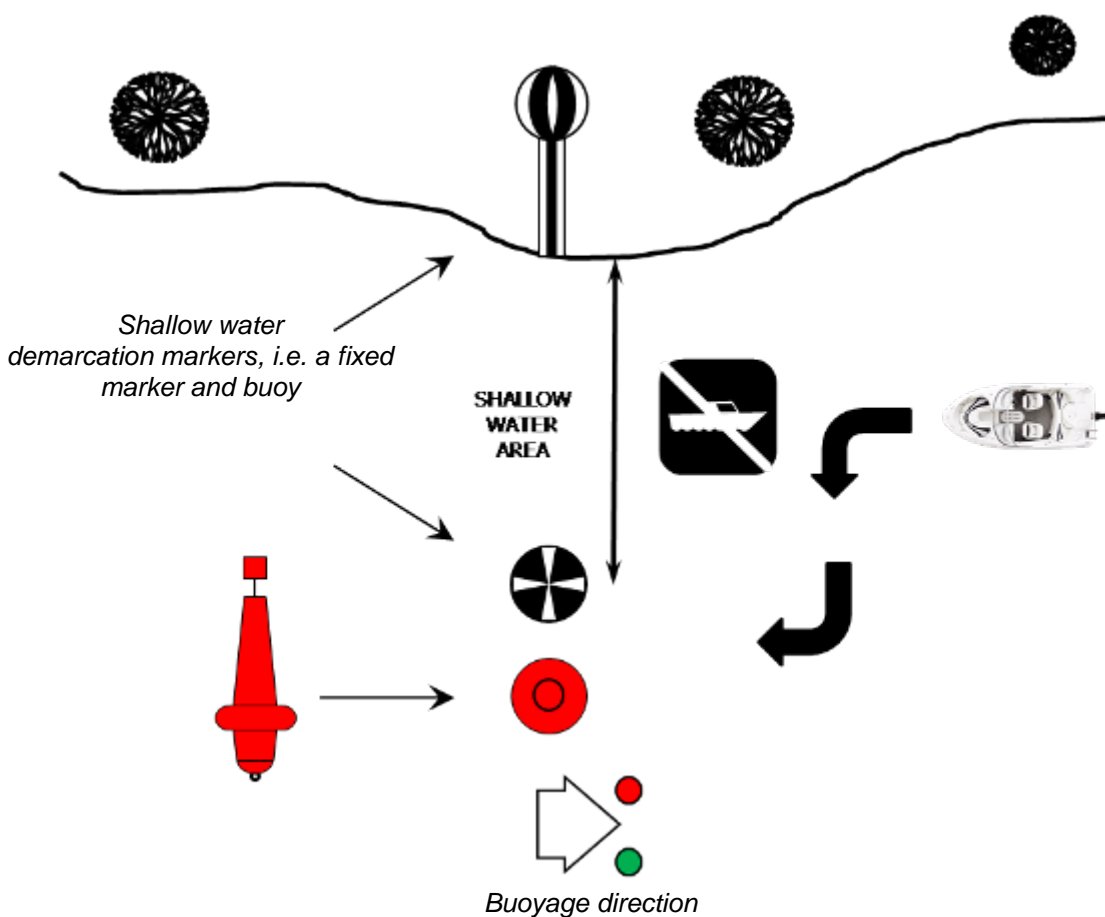


Figure 9 Typical example of SHALLOW WATER AREA markings

Typical example of how this type of demarcation markers could be put in practice, in conjunction with the IALA MBS. Depending on the circumstances, the consideration could be to establish Lateral, Cardinal or Special Mark buoys.

4. **Procedures to establish demarcation markers on Government Water Works and Watercourses**
- 4.1 DWA will approve ALL demarcation markers to be established on Government Water Works and Watercourses. All applications should be directed to the contact as per **Section V**.

SECTION V

Procedures to Establish Aids to Navigation and Demarcation Markers

1. Aids to Navigation (AtoN)

- 1.1. No organ of the State, LAAP, service provider, or any other entity on land, or inland waters shall, without the consent of SAMSA:

- 1.1.1 erect or place any fixed or floating AtoN, mark or beacon
- 1.1.2 remove or discontinue any fixed or floating AtoN, mark or beacon (a different application form is to be filled in, which can be obtained from the e-mail address given in **clause 1.2** below.
- 1.1.3 alter the colour, character, height, shape or other pertinent characteristics , or the mode of exhibiting lights of any fixed or floating AtoN, mark or beacon in any lighthouse, buoy or beacon.

- 1.2. Applications for erecting, removing or altering any AtoN, using the appropriate forms, should be addressed to: (refer to **Annex G** for an example of an application form)

Executive Head: Centre for Sea Watch and Response

SAMSA

PO Box 532, Parow, 7499

Tel: (021) 938 3310

Fax: (021) 938 3334

E-mail: aton@samsa.org.za

Application forms are obtainable from the above mentioned.

- 1.3. **Note:** For all Government Water Works, the application by all 3rd parties to establish AtoN shall include the support thereof by DWA – Strategic Asset Management. The contact detail is given in **clause 2** below.

2. Demarcation Markers

For all Government Water Works, the application by all 3rd parties to establish AtoN and Demarcation Markers is to be directed to:

DWA National Boating Coordinator

National Water Resources Infrastructure Branch

Strategic Asset Management

Department of Water Affairs

Private Bag X313

Pretoria

0001

E-mail: buoys@dwa.gov.za

Reference documents

IALA Dictionary

IALA NAVGuide 2010

IALA Maritime Buoyage System 2010

IALA Recommendation O-113 - Marking of fixed bridges over navigable waters

National Water Act (Act 36 of 1998)

Co-operative Inland Waterways Safety Programme Strategic Plan

Acknowledgement

Co-operative Inland Waterways Safety Programme Project Team

ACRONYMS AND ABBREVIATIONS

In this document, unless the context shows that another meaning is intended, the following mean:

AIS	Automatic Identification System
AtoN	Aids to Navigation
DEA	Department of Environmental Affairs
DoT	Department of Transport
DWA	Department of Water Affairs
GRP	Glass Reinforced Plastic (Fibreglass)
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
LED	Light Emitting Diode
IMO	International Maritime Organisation
LAAP	Local Accountable aids to navigation party
MBS	IALA Maritime Buoyage System
ODAS	Ocean Data Acquisition Systems marks
SAMSA	South African Maritime Safety Authority
SAPS	South African Police Services
SOLAS	International Convention for the Safety of Life at Sea, 1974, as amended
UV	Ultra-violet
WGS	World Geodetic System

DEFINITIONS AND INTERPRETATIONS

In this concept document, unless the context shows that another meaning is intended, the following mean:

“Aid to Navigation (AtoN)” is defined by IALA as *“A device or system external to vessels that is designed and operated to enhance the safe and efficient navigation of vessels and/or vessel traffic”*.

“AIS as an AtoN” means a special type of Automatic Identification System (AIS) station is fitted to an AtoN which provides positive identification of the aid without the need for a special ship-borne display.

“AtoN restored” means an AtoN that was non-available due to scheduled and/or unscheduled interruptions, is now performing its full function again.

“Authority” means an official body that is set up by government to administer an area of activity that has the right or power to enforce rules or give orders, is a source of reliable information on a subject and has the required knowledge, skill, or experience worthy of respect.

“Availability” means it is the percentage of time that an aid, or system of aids, is performing a required function under stated conditions. Non-availability can be caused by scheduled and/or unscheduled interruptions.

“Bearing” in marine navigation terms means it is the direction of one object in relation to another. It is expressed in degrees from a point of reference and is measured clockwise from 000 degrees to 360 degrees.

“Beacon” means it is a fixed navigation mark that can be recognised by its shape, colour, pattern, topmark, or light character, or a combination of these.

“Best point of passage” means the most appropriate point to pass under a bridge. The “best point of passage” will be determined by the competent Authority taking into account all relevant factors, such as:

- maximum available headroom
- water depth under the bridge, particularly where it is not uniform
- protection of the bridge piers and other obstructions
- the need to have one way or two way traffic

“Buoy” means it is a floating, and moored, artificial navigation mark. It can be recognized by means of its shape, colour, pattern, topmark or light character, or a combination of these. It may carry various additional aids to navigation.

“Cardinal Mark” is named after the quadrant in which it is placed. The name of a Cardinal Mark indicates that it should be passed to the named side of the mark, where the mariner may find navigable water.

“Categories” in terms of aids to navigation means:

- **Category 1:** An Aid to Navigation (AtoN) or a system of AtoN that is considered by the Competent Authority to be of vital navigational significance. For example, lighted aids to navigation and racons that are considered essential for marking landfalls, primary routes, channels, waterways, dangers or the protection of the marine environment.
- **Category 2:** An AtoN or a system of AtoN that is considered by the Competent Authority to be of important navigational significance. For example, it may include any lighted aids to navigation and racons that mark secondary routes and those used to supplement the marking of primary routes.
- **Category 3:** An AtoN or a system of AtoN that is considered by the Competent Authority to be of necessary navigational significance.

“Characteristic” means it is a distinctive feature permitting the identification of an aid to navigation.

“Chromaticity” means the colour quality of a colour stimulus definable by its chromaticity co-ordinates, or by its dominant (or complementary) wavelength and its purity taken together.

“Colour” means the aspect of visual perception by which an observer may distinguish differences between two fields of view of the same size, shape and structure, such as may be caused by differences in the spectral composition of the radiation concerned in the observation.

“Colour regions” means the chromaticity boundaries of colours recommended by IALA for lighted AtoN and for surface colours on AtoN – refer to **Annex D** in this regard. Marine AtoN signal lights use a five-colour system comprising white, red, green, yellow and blue. The recommended surface colours for visual signals on AtoN are as follows:

- Ordinary colours should be limited to white, black, red, green, yellow or blue.
- Orange and fluorescent red, yellow, green or orange may be used for special purposes requiring high conspicuity.

“Competent Authority” means any person or organisation that has the legally delegated or invested authority, capacity, or power to perform a designated function. SAMSA is the Competent Maritime Authority.

“Composite group flashing” means it is a group-flashing light in which the flashes are combined in successive groups of different numbers of flashes.

“Conventional direction of buoyage” means the general direction taken by the mariner when approaching a harbour, river, estuary or other waterway from seaward. In the case of Inland Waters, the conventional direction of buoyage is going upstream. Going upstream, the left hand side is regarded as the Port Hand side and the right hand side the Starboard Hand side.

“Course to steer” in terms of the MBS means the direction the vessel should be steered.

“Dam with a safety risk” means any dam which can contain, store or dam more than 50 000 cubic metres of water, whether that water contains any substance or not, and which has a wall of a vertical height of more than five metres, measured as the vertical difference between the lowest downstream ground elevation on the outside of the dam wall and the non-overspill crest level or the general top level of the dam wall, as per the National Water Act, Act No 36 of 1998.

“Daymark” means it is an unlighted navigation mark.

“Dead Slow Zone” means it is a portion of the water surface, as demarcated by the Government, in which all vessels, regardless of the method of propulsion, may only be operated at idle speed and that such speed is not greater than 8 km/h or does not produce a wake.

“Declared Inland Waters” are all waters in the Republic of South Africa that are:

- (a) from time to time capable of navigation; and
- (b) open to or used by the public for navigation, whether on payment of a fee or otherwise.

“Demarcation markings” means a marker, either fixed, or floating (a round buoy having a minimum diameter of 350mm), with a specific colour, marking a specific zone, or area. The colour depicts the zone/area.

“Direction light” means it is a light illuminating a sector of very narrow angle and intended to mark a direction to be followed.

“Eclipse” means an interval of darkness between appearances of a light.

“Electronic (digital) symbology” means it is a symbol that is electronically displayed on specific a software programme to complement to physical marks.

“Elevation of a light” means the height of the light measured from mean sea level.

“Emergency Wreck Marking Buoy” means it is a buoy marking a new, dangerous wreck.

“Equilateral triangle” means a triangle in which all three sides are equal.

“Fixed AtoN” means a fixed artificial navigation mark that can be recognised by its shape, colour, pattern, topmark or light character, or a combination of these. While this functional definition includes lighthouses and other fixed aids to navigation, the terms *lighthouse* and *beacon* are used more specifically to indicate importance and size.

“Fixed light” means that the light is not flashing.

“Flash” means an exhibition of light for a given time between two darknesses.

“Floating mark” means it is a navigation mark carried on a floating body such as a buoy.

“Full passage span” means the “width of the best point of passage under a bridge.

“General navigation” means all navigation that does not involve entry or departure into a marina, harbour, or the marking of jetties and quays.

“Group flashing” means it is a flashing light in which a group of flashes, specified in number, is regularly repeated.

“IALA Maritime Buoyage System” means the rules that were introduced by IALA in 1977 in order to standardise maritime buoyage and other aids to navigation. The rules apply to all fixed, floating and electronic marks serving to indicate:

- The lateral limits of navigable channels
- Natural dangers and other obstructions such as wrecks
- Landfall, course to steer, and other areas or features of importance to the mariner

“LAAPs” means all State organs, public and private entities, applicable body corporates, boat clubs, private lodges/estates and any other entity/body that need to establish AtoN for the purpose to improve safety of navigation.

“Illumination enhancement” means a way to improve the brightness of a light.

“Inland Waters” means the waters of any navigable dam, lagoon, lake, river or wetland, but does not include a tidal lagoon or tidal river, as defined in section 1 of the Sea-Shore Act, 1935 (Act No. 21 of 1935).

“Isolated Danger Mark” means it is a mark erected on, or moored on, or as close to an isolated danger that has navigable water all around it.

“Isophase light” means a rhythmic light for which the alternations of light and darkness are of equal duration

“Lateral limits” means the sideways navigable limits of a channel.

“Lateral Marks” are marks indicating the port and starboard sides of a route to be followed.

“Leading lights” means two or more lights associated to form one or more leading lines (or ranges).

“Light” means an apparatus emitting light of distinctive character, for use as an aid to navigation by night or, exceptionally, by day.

“Light characteristics” means the distinctive feature permitting the identification of an aid to navigation.

“Maritime Buoyage System” – see IALA Maritime Buoyage System.

“Mode” means a manner, or method of exhibiting lights on a buoy or beacon (daytime/night-time).

“Navigable waters” means that for a waterway to be navigable, it must meet several criteria, such as it must be deep enough to allow the draft depth of the vessels using it, it must be wide enough to allow passage for the beam width of the vessels using it, it must be free of barriers to navigation such as waterfalls and rapids, or have a way around them, and the current of the waterway must be mild enough to allow vessels to make headway.

“No Access Zone” means it is a portion of the water surface, as demarcated by the Government, where any vessel, other than an official DWA or SAPS vessel, is strictly prohibited from entering, regardless of the method of propulsion.

“Nominal range” is the distance in nautical miles at which a light produces an illuminance at the eye of the observer of 2×10^{-7} lux for night-time range, and 1×10^{-3} lux for day time range in a homogeneous atmosphere in which the meteorological visibility is 10 nautical miles.

“Numbering or lettering” means the numbers, or text appearing on an AtoN to be able to identify it in terms of its position, e.g. a buoy on a channel.

“Occulting light” means it is a light in which the total duration of light in each period is clearly longer than the total duration of darkness.

“Out of position” means it is a buoy which is not in its charted position.

“Owner of a dam” or **“owner of a dam with a safety risk”** includes the person in control of that dam, as per the National Water Act, Act No 36 of 1998

“Physical mark” means it is a mark that is tangible and/or visual.

“Pictogram” means an ideogram (a graphic symbol that represents an idea or concept) that conveys its meaning through its pictorial resemblance to a physical object.

“Pillar” means a vertical load-bearing member designed to resist compression and buckling and which is usually of circular cross section.

“Port Hand side” is a nautical term which refers to the left side of a vessel or ship as perceived by a person on board facing the bow (front).

“Preferred channel” means at the point where a channel divides, when proceeding in the “conventional direction of buoyage”, a preferred channel would be the “recommended route” to follow.

“Q light” is the abbreviation for a Quick flashing light, i.e. a light in which identical flashes are repeated at a rate of not less than 50 flashes per minute but less than 80 flashes per minute.

“Q(3) every 10s” means it is a light that produces three identical, quick flashes within a 10 second period.

“Q(6) + Long flash every 15s” means it is a flashing character of six identical, quick flashes, with the length of the last flash to be much longer.

“Regions A and B” The IALA Maritime Buoyage System makes provision for a single set of rules, which allows Lighthouse Authorities the choice of using red to port or red to starboard, on a regional basis. The two regions being known as Region A and Region B.

“Restricted Access Zone” means it is a portion of the water surface, as demarcated by the Government, any other organ/s of state, responsible authority/ies, or water management institution/s, where vessels, without obtaining prior approval first, are prohibited from entering.

Such areas could encompass a discrete biological area, within which uses are subject to conditions, restrictions and prohibitions; including access restrictions, to avoid concentrations of uses that could result in significant declines in species populations or habitat, to reduce conflicts between uses, to protect areas that are critical for sustaining important species or habitats, or to provide opportunities for scientific research.

Vessels having obtained the necessary approval may only be operated at idle speed and that such speed is not greater than 8 km/h or does not produce a wake.

“Rhythm” (of a navigation light), alternative term: “Characteristic” means the distinctive colour or periodic rhythm (or both) of a navigation light, enabling it to be identified.

“Safe Water Marks” serve to indicate that there is navigable water all around the mark; these include centre line marks and mid-channel marks.

“Sanction” means the official approval given by SAMSA, as a statutory body in terms of its mandate.

“Sector” of a sector light means the space bounded by two vertical planes passing through the luminous source of the sector light and within which a light of a given character is visible.

“Sector light” is a light presenting different characters (usually different colours) over various parts of the horizon of interest to marine navigation.

“Shallow Water” means it is an area of the water surface, as demarcated, where submerged obstacles, which may not be visible from the surface and might pose a danger, and/or cause severe damage to a hull or propulsion system of a vessel and/or person.

“Short range AtoN” means all AtoN intended for use within visual, audible or radar range of the mariner.

“Spar” means a vertical pole.

“Special Areas” means it is a portion of the water surface, as demarcated by the Government, any other organ/s of state, responsible authority/ies, or water management institution/s, to be used for sporting events and/or other areas of interest.

“Special Mark” means it is a mark not primarily intended to assist navigation, but which indicate a special area or feature referred to in appropriate nautical documents.

“Starboard Hand” side is a nautical term which refers to the right side of a vessel or ship as perceived by a person on board facing the bow (front).

“Topmark” means one or more relatively small objects of characteristic shape or colour (or both), placed on top of a navigation mark (or buoy) to identify it.

“Traffic signal” means it is a signal used to control traffic movements in a port or port approaches.

“Unlit” means that the AtoN does not carry a signal light.

“Visual Aids to Navigation” are purpose-built facilities that communicate information to a trained observer on a vessel for the purpose of assisting the task of navigation. The communication process is referred to as *marine signalling*.

“Visual range” means the maximum distance (usually horizontal) at which a given object can be seen by day in any particular circumstances, as limited by the atmospheric transmission. The distance is such that the contrast of the object with its background is reduced by the atmosphere to the contrast threshold value for the observer.

“VQ light” means it is a very quick flashing light, i.e. a light in which identical flashes are repeated at a rate of not less than 80 flashes per minute but less than 160 flashes per minute.

“VQ(3) every 5s” means it is a very quick group flashing light, which the flashes are combined in successive groups of three, and repeated every 5 seconds.

“VQ(6) + Long flash every 10s” means it is a very quick group flashing light, which the flashes are combined in successive groups of six, followed by a long flash, repeated every 10 seconds.

“VQ(9) every 10s” means it is a very quick group flashing light, which the flashes are combined in successive groups of nine, and repeated every 10 seconds.

“Water management institution” means a catchment management agency, a water user association, a body responsible for international water management, or any person who fulfils the functions of a water management institution in terms of the National Water Act.

“Watercourse” means it is:

- a river or spring;
- a natural channel in which water flows regularly or intermittently;
- a wetland, lake or dam into which, or from which, water flows; and
- any collection of water which the Minister may, by notice in the *Gazette*, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks [As defined in section 1(xxiv) of the National Water Act, 1999 (Act no 36 of 1998)]

“Water Works” means a water work owned or controlled by the Minister (responsible for water affairs) and includes the land on which it is situated, as described in the National Water Act, Act 36 of 1998, as amended.

“WGS 84” means the latest revision of WGS (World Geodetic System) (dating from 1984 and last revised in 2004).

“World Geodetic System” (WGS) is a standard for use in cartography, geodesy, and navigation. It comprises a standard coordinate frame for the Earth, a standard spheroidal reference surface (the *datum* or *reference ellipsoid*) for raw altitude data, and a gravitational equipotential surface (the *geoid*) that defines the *nominal sea level*.

ANNEXURES

Extract from SOLAS Chapter V

Regulation 13 - Establishment and operation of aids to navigation

1. Each Contracting Government undertakes to provide, as it deems practical and necessary either individually or in co-operation with other Contracting Governments, such aids to navigation as the volume of traffic justifies and the degree of risk requires.
2. In order to obtain the greatest possible uniformity in aids to navigation, Contracting Governments undertake to take into account the international recommendations and guidelines (reference is made to IALA) when establishing such aids.
3. Contracting Governments undertake to arrange for information relating to aids to navigation to be made available to all concerned. Changes in the transmissions of position-fixing systems which could adversely affect the performance of receivers fitted in ships shall be avoided as far as possible and only be effected after timely and adequate notice has been promulgated.

Overview of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)

The International Association of Marine Aids to Navigation and Lighthouse Authorities (*IALA*) was established on 1 July 1957, with South Africa being one of the founder members. South Africa is still an *IALA National Member*.

IALA is a non-profit, non-governmental organisation with the aim to foster the safe, economic and efficient movement of vessels for the benefit of the marine community and the protection of the marine environment by:

- continuous improvement and harmonisation of Aids to Navigation (AtoN) worldwide
- bringing together services and organisations concerned with the provision or maintenance of marine AtoN and allied services, at sea and on inland waters.

IALA is the only international organisation that deals with marine AtoN and related matters. IALA brings together services and organisations concerned with the provision or maintenance of AtoN systems and allied activities.

IALA Recommendations represent the highest level of IALA documentation equivalent to a “standard” in an intergovernmental organisation and there is an implicit expectation that national members will observe and implement IALA Recommendations.

Recommendations provide direction to IALA members on uniform procedures and processes that will facilitate IALA objectives. IALA recommendations contain information on how members should plan, operate and manage AtoN and may reference relevant International Standards and IALA Guidelines.

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.

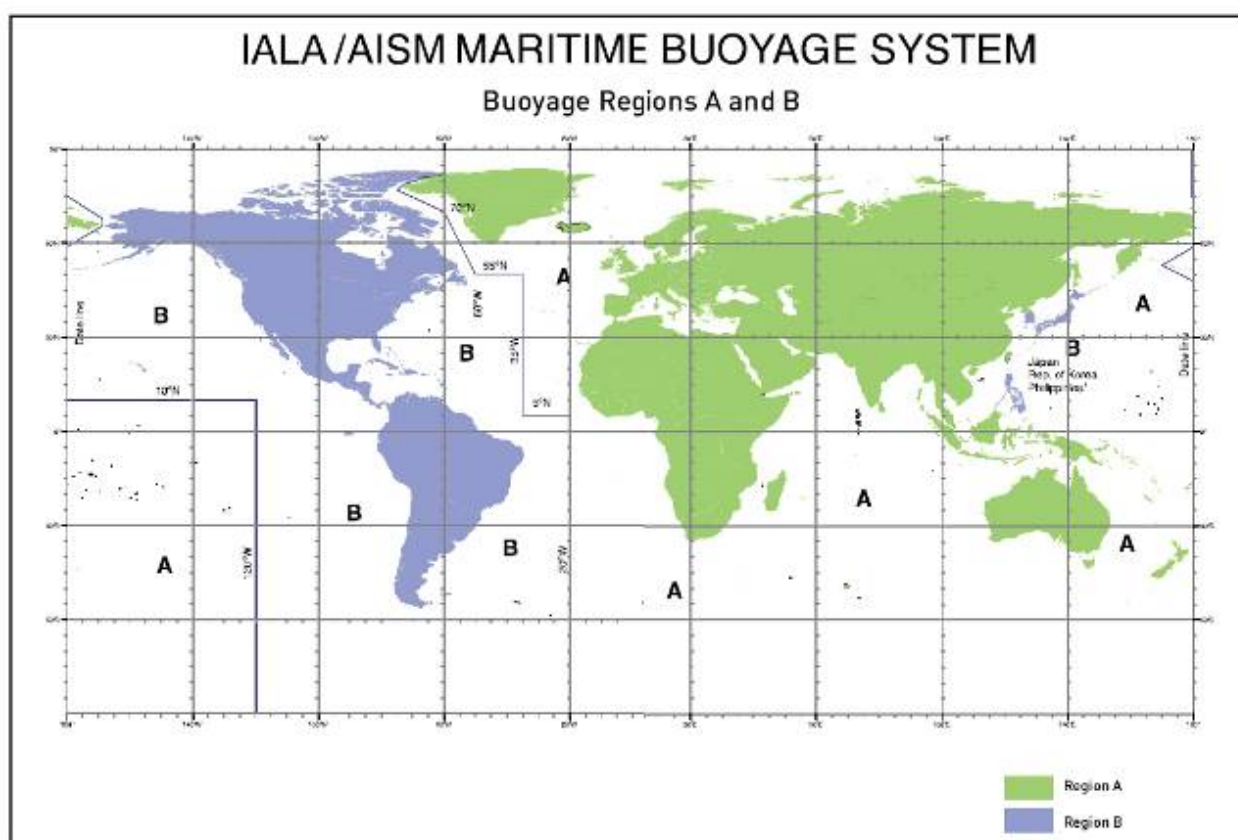
The IALA AtoN system has two components: Fixed and floating (Maritime Buoyage System) AtoN.

Within the Maritime Buoyage System there are six types of marks, which may be used alone or in combination. The mariner can distinguish between these marks by identifiable characteristics.

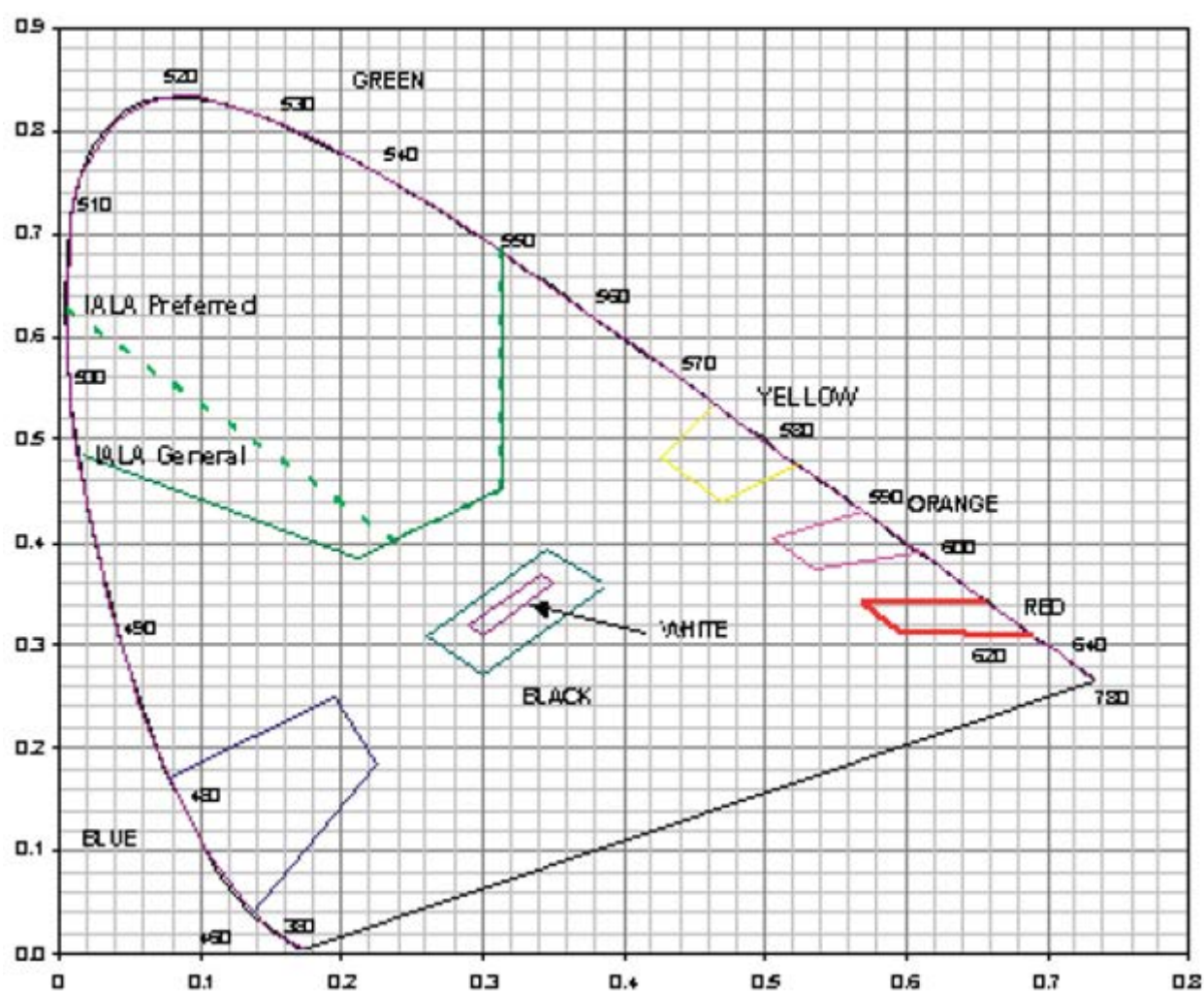
Lateral marks differ between Buoyage Regions A and B⁵, whereas the other five types of marks are common to both regions. South Africa falls within Region A. Refer to **Annex D** in this regard.

⁵ In Region B the colour red is used to mark the starboard hand side of channels

IALA Maritime Buoyage System: Buoyage Regions A & B



IALA chromaticity areas as plotted on the 1983 CIE chromaticity diagram



Marine Aids to Navigation Requirements

1. Fixed Aids to Navigation

All fixed AtoN on Inland Waterways have to comply with the following:

1.1 Design principles

- 1.1.1 Good visual presence and to provide a distinctive daymark
- 1.1.2 Minimum maintenance attention, by using low maintenance materials such as high density polyethylene, Glass Reinforced Plastic (Fibreglass) GRP, hot-dipped galvanized steel, marine-grade aluminium or marine grade stainless steel
- 1.1.3 Minimal marine growth
- 1.1.4 Withstand the high corrosive marine environment it will be operating in
- 1.1.5 Withstand the harsh weather conditions that it will be it will be operating in
- 1.1.6 Be ultra-violet (UV) resistant
- 1.1.7 **Colour/Shape**

- (a) The colours of the structures and their top marks, (colour and shape) shall comply with the following IALA Recommendations:
 - (i) IALA MBS for Region A where structures are to indicate areas as defined in the MBS – refer to **Annex D** in this regard, and
 - (ii) Surface colours used as visual signals on AtoN, i.e. as per the IALA chromaticity areas as plotted on the 1983 CIE chromaticity diagram – refer to **Annex E** in this regard.

1.1.8 Dimensions

A structure and its topmark should comply with the following minimum dimensions. This will depend on navigational requirements and the local environmental conditions and each case will be judged on merit.

(a)	Structure	
(i)	Focal plane height, i.e. the height above the water line should not be less than	1,500mm
(ii)	Diameter should not be less than	110mm
(b)	Topmark	
(i)	The diameter of the topmark should not be less than	350mm

1.1.9 Fasteners

- (a) In the manufacturing process, care should be taken to ensure that threaded inserts are fixed and aligned correctly in the material, otherwise they should be avoided
- (b) Care must be taken when using threaded inserts to avoid detachment of the insert within the polyethylene
- (c) It is desirable to use non-corrosive fasteners including hot-dipped galvanized steel, marine-grade aluminium, and/or marine grade stainless steel

2. Floating Aids to Navigation

2.1 Fixed vs. floating AtoN

Depending on the location where the AtoN is required, it is advisable, where possible, to use fixed AtoN rather than floating AtoN as floating AtoN are more expensive and challenging to maintain.

2.2 Compliance

All floating AtoN on Inland Waterways have to comply with the following:

2.1.1 Design principles of buoys

- (a) Easy deployment
- (b) Good visual presence
- (c) Good station keeping and stability
- (d) To be able to track well in currents of up to 6 knots
- (e) Minimum maintenance attention, by using low maintenance materials such as high-density polyethylene, GRP, etc.
- (f) Minimal marine growth
- (g) Withstand the high corrosive marine environment it will be operating in
- (h) Withstand the harsh weather conditions that it will be it will be operating in
- (i) Be UV resistant
- (j) To be able to take reasonable knocks and/or collisions without being severely damaged and causing it to sink.
- (k) Designed, with the necessary ballast to be able to stand upright on its own and to ensure that the buoy is able to track well (do not lean over excessively); whilst supporting the required top marks and/or A3 Signage; at wind speeds of up to 80 km/h.
- (l) The manufacture and finish of the buoys shall comply with all relevant Codes and/or Standards that are statutory requirements in South Africa.
- (m) A buoy should comply with the following minimum dimensions. This will depend on navigational requirements and the local environmental conditions and each case would be judged on merit, but the:

(a)	Focal plane height, i.e. the height above the water line at any time should not be less than	800mm
(b)	Diameter at water line should not be less than:	
(i)	Pillar type buoy	550mm
(ii)	Spar type buoy	250mm

2.3 Relevant IALA Recommendations

The colours and shapes of the buoys and their top marks shall comply with the following IALA Recommendations:

- (b) IALA Maritime Buoyage System for Region A; and
- (c) Surface colours used as visual signals on aids to navigation, i.e. as per the IALA chromaticity areas as plotted on the 1983 CIE chromaticity diagram – refer to **Annex E** in this regard.

2.4 Buoyancy

The design of the buoy should be to take the following into consideration.

- 2.4.1 Buoyancy is the upward vertical force provided by the immersed part of the buoy displacing a volume of water. It is vital that a buoy will retain sufficient reserve buoyancy for all weather conditions and that the AtoN will remain effective in most weather conditions. There must be sufficient buoyancy to support the entire weight of the buoy and the moorings. If it is anticipated that maintenance personnel will work on the buoy afloat, then the buoy must have sufficient reserve buoyancy and stability for this to be safely carried out. The size and hence the weight of the buoy will depend on the navigational requirements and the local environmental conditions.
- 2.4.2 When there are wind forces and/or tidal flow forces acting on the buoy then these will increase the loads in the mooring and more buoyancy will be required to support the added mooring loads
- 2.4.3 Waves will have some effect on the mooring loads and hence buoyancy requirements. Wave effects are extremely complex. However if the waves are not breaking then the buoy will follow the water surface and there will be some increase in the buoyancy requirements in order to cope with the wave drift.

2.5 Stability

- 2.5.1 Stability measures the ability of the buoy to remain upright so that the AtoN will remain effective in most operating conditions. There are two aspects of stability that have to be incorporated in the buoy design. These are form stability and weight stability.
- 2.5.2 Form stability is the stability provided by the shape of the immersed part of the buoy. In a normal cylindrical buoy the greater the diameter of the buoy the more stable it will be.
- 2.5.3 The centre of gravity of the buoy being in a position such that it tends to right the buoy provides weight stability. The tail tube buoy provides an example of this type. The ballast on the base of the tail tube provides righting forces.
- 2.5.4 Static stability calculations evaluate the combined effects of form stability and weight stability.
- 2.5.5 The buoy should be well-manufactured, using high-quality pigment within IALA chromaticity standards, and virgin material. This should retain an acceptable surface colour for the design life of the buoy, which can be in excess of 15 years in most climatic conditions.
Note: The colour pigments shall be imbedded in the material and not be added as a coating.
- 2.5.6 Some plastic materials may have better resistance to dense marine fouling than other buoy types. Plastic buoys must be sufficiently robust to withstand weed being scraped off, or high-pressure water jetting, regularly during the working life of the buoy.

2.6 Filling

- 2.6.1 To prevent the buoy sinking should a leak occur, the buoy may be divided into separate watertight segments, which may be filled with foam. If foam is used, it must be of the highest quality closed-cell specification to prevent water absorption. Filling material should be of sufficient quality to survive the expected lifetime of the buoy.

2.7 Fasteners / Mooring attachment

- 2.7.1 In the manufacturing process, care should be taken to ensure that threaded inserts are fixed and aligned correctly in the material, otherwise they should be avoided.
- 2.7.2 Care must be taken when using threaded inserts to avoid detachment of the insert within the manufacturing material.
- 2.7.3 It is desirable to use non-corrosive fasteners including hot-dipped galvanized steel, marine-grade aluminium, marine grade stainless steel, or bronze.

Note: It is important that any high loads are distributed throughout the structure of the buoy and not concentrated in small areas of the skin. One solution to avoid these stresses may be to interconnect the mooring and lifting points with a structural core member.

2.8 Placing of buoys

The buoy separation distance should be chosen in such way that the next two buoys are recognised before the nearest one has been passed, or in other cases approximately 100 m before the last buoy can no longer be detected and identified.

2.9 Deployment and Recovery

The type of buoy to be used should take into consideration techniques available resources that are available for the deployment and recovery thereof.

2.10 Mooring System

2.10.1 The mooring system must maintain the floating aid in a sufficiently accurate position for it to perform its function as an AtoN.

2.10.2 The following must be taken into consideration with the design of the mooring:

- (a) The depth of water at the mooring site, taking into consideration the varying depth that may occur during drought and raining seasons
- (b) The buoyancy of the floating aid
- (c) The dam, or river bed conditions at the site
- (d) The loads imposed on the mooring by the floating aid due to wind, wave action, water flow and ice
- (e) Loads imposed on the mooring by water flow
- (f) Local conditions that cause wear and corrosion to the mooring
- (g) Available servicing facilities
- (h) Required life of the mooring
- (i) Cost

3. Daymarks and Top Marks

3.1 Daymarks

The distance at which a daymark can be identified depends on size, shape, colour, contrast to the background, environmental conditions, background and geographical range. The object can be normally identified when it subtends, at the eye, an angle of more than 3' (three minutes of arc).

The contrast between the background and the AtoN depends on the:

- Chromaticity of the paint of the AtoN
- The specific meteorological visibility in the area
- Colour and illumination of the background
- Conspicuity.

Reflective sheets / retro-reflective material on the aid can be used at night to enhance the daymark in low visibility conditions.

3.2 Topmarks

3.2.1 Conical topmarks (for lateral and cardinal marks)

- (a) The vertical height of a cone from base to apex should be about 90% of the base diameter.
- (b) For cardinal marks, the separation distance between cones should be about 50% of the base diameter of the cone.
- (c) 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.
- (d) The base diameter should be 25%-30% of the diameter of the buoy at the waterline.

3.2.2 Cylindrical (can) topmarks (for lateral marks)

- (a) The vertical height of a cylinder should be 1 to 1.5 times the base diameter.
- (b) 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.
- (c) 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.

3.2.3 Spherical topmarks (for isolated danger and safe water marks)

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

3.2.4 'X' (Single 3-D Yellow Diagonal Cross) topmarks (for special marks)

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.

3.2.5 **Signage / Pictograms for Special Marks**

Refer to **Section IV** regarding signage / pictograms for Special Marks when used in conjunction with demarcation markers.

4. **Lit Aids to Navigation, both fixed and floating, on Inland Waterways**

Where nighttime activities are allowed on Inland Waterways and visual (lit) AtoN are required, the lights need to comply with the following requirements.

4.1 The following must be taken into consideration when a light is selected for the AtoN:

- 4.1.1 Use self-contained, Light Emitting Diode (LED) lights as far as possible
- 4.1.2 Type and characteristics of the aid provided
- 4.1.3 Location of the aid relative to typical routes taken by vessels
- 4.1.4 Distance (range) of the aid from the observer
- 4.1.5 Atmospheric conditions
- 4.1.6 Contrast relative to background conditions (conspicuity); and
- 4.1.7 The reliability and availability of the aid

4.2 It is essential that the light complies with the following requirements:

- 4.2.1 Be designed to operate effectively on a marine AtoN
- 4.2.2 Maximum reliability
- 4.2.3 Minimum maintenance attention
- 4.2.4 Easy access for adjustment / programming
- 4.2.5 IALA Recommendations
- 4.2.6 Energy efficient
- 4.2.7 Designed to withstand the harshest of environmental conditions
- 4.2.8 The light shall be maintenance-free, other than periodic cleaning of external surfaces.
- 4.2.9 The light shall be delivered fully assembled and ready for operational purposes

4.3 The light shall operate under the environmental conditions outlined below and must be fully protected against failure and damage by these conditions.

4.3.1 Humidity

Exposure to relative humidity from zero to 100%, including horizontal driving rain.

4.3.2 Moisture Intrusion

The light shall be sufficiently sealed to protect the internal parts from moisture ingress.

4.3.3 Shock and vibration

Continuous exposure to the shock and vibration experienced on marine AtoN , including buoys and fixed support structures.

4.4 Optic

4.4.1 The colour of the light shall meet the IALA chromaticity recommendation.

4.4.2 The lens should be UV-protected

4.4.3 When LED technology is used, the LEDs are to precisely graded and placed to produce a light beam with minimum variation in intensity

4.4.4 Lights shall be tested in a zero range light tunnel to ensure the light output meets the required specification

4.4.5 The light shall produce a uniform 360° horizontal fan beam.

4.5 Daylight control

4.5.1 The light shall be switched on automatically during nighttime and off during daytime or as the ambient light levels dictate. At a minimum, the light shall switch on whenever the ambient illumination, measured on a horizontal plane, falls below 50 – 100 lux. The light shall not switch off until the ambient illumination rises above 150 – 200 lux.

4.5.2 The hysteresis for the daylight control shall be 50-100 lux.

4.6 Low voltage

The light shall make provision for a programmable low voltage cut-out threshold in order to switch off when the programmed low threshold is reached.

4.7 Mechanical

4.7.1 All external materials shall be UV resistant.

4.7.2 The design of the light shall be such as to restrict the ability of birds to roost on the light or any of its components by means of stainless steel bird spikes.

4.8 Polarity protection

The light shall not experience damage in the event that power is connected in reverse polarity. The light shall resume proper operation as soon as the correct polarity is provided.

4.9 Short-circuit protection

The light shall have short-circuit protection so that connecting one of the power leads to the housing while the other is attached to either the positive (+) or negative (-) terminal shall not result in damage to the light. The light shall resume proper operation as soon as the power leads are properly connected to the input terminals.

4.10 Service Conditions / Environment

The light shall be completely watertight and designed to operate reliably in harshest of environmental conditions.

4.11 Power System of a light

4.11.1 Use self-contained lights as far as possible

4.11.2 Autonomy

When photovoltaic technology is used, the autonomy should not be less than 3 days

4.11.3 Power supply requirements

- (a) When calculating the required battery capacity, the following should be considered:
 - (i) required daily cycle
 - (ii) ageing of the battery and modules
 - (iii) temperature impact
 - (iv) future expansion of the load
 - (v) local weather conditions

4.11.4 Solar modules

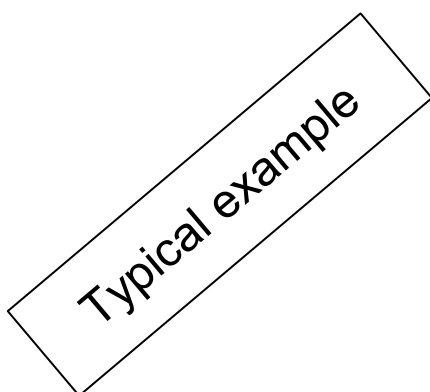
- (a) The solar modules must be able to function in a harsh, salt laden and highly corrosive environment.
- (b) The integrated solar modules shall be of the mono-crystalline.
- (c) The solar modules should be mounted vertically, or at an angle, on the side of the housing. The housing should have a minimum of 3 sides.

4.11.5 Battery Charger

The charger shall contain a microprocessor based charge controller to manage the charge rate to the battery, depending on the temperature and voltage and prevent the overcharging of the battery and possible release of hydrogen gas caused by overcharging.

4.11.6 Battery

- (a) Different battery sizes shall be able to fit in the body to enable the battery to match the capacity of the solar modules.
 - (b) The battery shall be well secured, but easy to be replaced and re-secured.
 - (c) The battery shall be maintenance-free, other than periodic cleaning of external surface and terminals.
-



Marine Aids to Navigation on Inland Waterways

Application for Approval

An application is herewith made for the approval of the South African Maritime Safety Authority (SAMSA) to establish or alter an aid to navigation (AtoN) as described hereunder. The purpose for establishing this AtoN is to assist in the safety of navigation.

Note: No Local Accountable Aids to Navigation Party (LAAP), service provider, or any other entity, on land, sea or inland waterways shall, without the consent of SAMSA:

- (a) erect or place any fixed or floating AtoN, mark or beacon
- (b) remove or discontinue any fixed or floating AtoN, mark or beacon (a different application form is to be filled in, which can be obtained from the e-mail address given below)
- (c) alter (colour, character, height, etc.) or the mode of exhibiting lights of any fixed or floating AtoN, mark or beacon in any lighthouse, buoy or beacon.

Please complete all applicable sections

Note: Application to be sent to: aton@samsa.org.za

1.	Name, address and contact detail of Entity seeking authority	
2.	Name, address and contact detail of Entity for whom the AtoN is to be provided for, if different than in clause 1 above	
3.	Name, address and contact detail of Entity whose asset the AtoN is to be/is, if different than clause 1 or 2 above	
4.	New AtoN	
4.1.	Name, address and contact detail of Entity who would be responsible to position and maintain the AtoN	
4.2.	How long is it intended for the AtoN to be operational/deployed	
4.3.	Intended purpose of the AtoN	

5.	Name of AtoN	
6.	Location / Station	
7.	Geographical Co-ordinates (WGS84 Datum)	
7.1.	Latitude	
7.2.	Longitude	
8.	Type of AtoN (i.e. Light; Leading Lights; Buoy, etc.)	
9.	Fitted with <u>Light</u>, if any:	
9.1.	Colour	
9.2.	Character	
9.3.	Detail of character: Flash, Eclipse (dark period) and Total Period: (i.e. fl 0.2, ec 1.8 = 2.0 sec)	
9.4.	Light Sector(s): (e.g. R212° - 230° (18°), W230°–235° (5°), G235° - 255° (20°))	
9.5.	Leading Line bearing: (e.g. 316°)	
9.6.	Range [Nautical miles (Nm)]	
9.7.	Focal height (mm) above mean sea level	
10.	Floating AtoN (buoy)	
10.1.	Shape (e.g. Spar, Pillar, etc.)	
10.2.	IALA Maritime Buoyage System type (e.g. Lateral, Cardinal, etc.)	
10.3.	Colour	
10.4.	Focal Plane (mm)	
10.5.	Draft (mm)	
10.6.	Colour and shape of Daymarks	
10.7.	Colour and shape of Topmark/s	
10.8.	Buoy body material [e.g. metal, plastic (GRP, polyethylene, etc.)], etc.	
10.9.	Super structure material	

10.10.	Diameter of buoy body (mm)	
10.11.	Approximate Weight (Kg)	
10.12.	Mooring Arrangement (i.e. 36mm chain & 1 tonne sinker)	
11.	AtoN Automatic Identification System (AIS)	
11.1.	Marine Mobile Service Identity (MMSI) number	
11.2.	Message 21 content:	
(a)	The type of AtoN	
(b)	The name of the AtoN	
12.	Any other type AtoN	
13.	Support Structure	
13.1.	Type of support structure (e.g. metal pole, lattice structure, etc.)	
13.2.	Colour of structure	
13.3.	Height of Structure: (mm)	
14.	Type of Power Source: (Solar/Mains, etc.)	
15.	Proposed IALA⁶ Category⁷ (e.g. 1, 2, or 3)	

⁶ IALA means the International Association of Marine Aids to Navigation and Lighthouse Authorities

⁷ "Categories" in terms of AtoN means:

- **Category 1:** An Aid to Navigation (AtoN) or a system of AtoN that is considered by the Competent Authority to be of **vital navigational significance**. For example, lighted aids to navigation and racons that are considered essential for marking landfalls, primary routes, channels, waterways, dangers or the protection of the marine environment.
- **Category 2:** An AtoN or a system of AtoN that is considered by the Competent Authority to be of **important navigational significance**. For example, it may include any lighted aids to navigation and racons that mark secondary routes and those used to supplement the marking of primary routes.
- **Category 3:** An AtoN or a system of AtoN that is considered by the Competent Authority to be of **necessary navigational significance**.

16.	Motivation	
16.1.	Reason why <u>a new AtoN</u> is to be established. If need be, a separate submission can be made.	
16.2.	Reason why <u>a current AtoN</u> is to be altered Note: In order for SAMSA to reach a decision, the reasons given should include, but not limited to: <ul style="list-style-type: none"> • Users' request/opinion • Technical justifications • Feasibility study • Financial analysis • Etc. If need be, a separate submission can be made.	

Note: Approval must also be sought to amend, or discontinue any AtoN, navigational mark or light.

SIGNATURES

1. Entity seeking approval

Name: _____

Signature _____ Date: _____

2. Entity for whom the AtoN is to be provided for, if different than 1 above

Name: _____

Signature _____ Date: _____

For all Government Water Works, the application by all 3rd parties to establish AtoN shall include the support thereof by the Department of Water Affairs (DWA) – Strategic Asset Management.

E-mail: buoys@dwa.gov.za

3. Supported by DWA

Name: _____

Designation: _____

Contact detail:

Tel: _____

Cell no. _____

E-mail address: _____

Signature _____

Date: _____