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| IALA GUIDELINE |

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The Marking of man-made structures

Edition ??

December 20xx

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

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| --- | --- | --- |
| Date | Page / Section Revised | Requirement for Revision |
|  |  |  |
|  |  |  |
| March 2020 | Entire document | Text extracted from original recommendation for transfer to guideline. |
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# INTRODUCTION

There is increasing development of man-made structures at sea, which may affect shipping. These structures can be isolated or in groups, small or large, and close to or far from shipping routes.

IALA is monitoring the developments of these structures and will continue to create and update documentation as required to ensure clear and unambiguous marking of waterways for safe navigation, protection of the environment and protection of the structures themselves. Authorities facing problems in this field are invited to bring them to the attention of IALA to obtain advice on current practice.

The following sections of this document detail the updated IALA recommendations for the marking of each structure type. Appendix 1, contains an inventory and examples of man-made offshore structures.

The marking of structures as defined in these recommendations may be considered as a minimum requirement to ensure the safety of navigation in the vicinity of the structures, however, National Authorities may require more stringent marking.

### SCOPE

These recommendations are for the guidance and information of stakeholders such as National Authorities, Lighthouse, Port, and, Aviation Authorities and other competent Authorities, Aids to Navigation providers, and the Contractors, Developers and Operators involved in each type of the structures mentioned in the following sections. They are further called National Authorities in this Recommendation.

### FIELD OF APPLICATON

The guidance contained in this document applies to all structures fixed in position temporarily or permanently which extend above or below the surface of the sea and which are obstructions to navigation, e.g. structures used for drilling or exploring for oil and/or minerals, oil production platforms, oil well protective jackets, renewable offshore energy installations, ocean data platforms, breakwaters or offshore aquaculture farms.

### INFORMATION AND PROMULGATION

National Authorities must ensure that all stakeholders are informed of installed Aids to Navigation (AtoN) and markings in accordance with these Recommendations. These must be published on nautical charts, in relevant publications and by promulgation of Maritime Safety Information (MSI).

### EMERGENCY PROVISIONS AND CONTINGENCY PLANS

1. In case of main power failure, an adequate backup system is recommended to maintain the function and availability of AtoN, including Racon and AIS, for time specified by the National Authority; typically 96 hours.
2. AtoN and AtoN systems should have availability in accordance with IALA Recommendation R0130 on Categorisation and Availability Objectives for Short Range AtoN and Guideline 1035 on Availability and Reliability of AtoN.
3. Remote monitoring of the AtoN system is recommended.
4. National Authorities are responsible for providing Maritime Safety Information (MSI) when an operator reports any AtoN malfunction.
5. Operators of man-made structures are recommended to develop contingency and emergency response plans which address the possibility of individual devices breaking loose and becoming floating hazards.
6. Operators are recommended to have a reliable maintenance and AtoN defect response regime in place to ensure the required availability targets are met. This will include having the necessary AtoN spares on hand, with provision made at the design stage, where necessary, to ensure safe access.

# 2 MAN-MADE STRUCTURES

Man Made structures present very different characteristics. Therefore, these structures have been grouped as follows:

* Section 2.1: Offshore Structures in General
* Section 2.2: Oil and Gas Platforms
* Section 2.3: Offshore Wind Farms
* Section 2.4: Wave and Tidal Energy Devices
* Section 2.5: Aquaculture Farms
* Section 2.6: Breakwaters

**2.1** **MARKING OF MAN-MADE STRUCTURES**

* + 1. **IN GENERAL**

The marking requirements defined in this section must be complemented with those in sections 2.2 to 2.6 for the specific types of man-made structures.

Consultation between the stakeholders should take place at an early stage. In general, development of all structures mentioned in this section must not prejudice the safe use of Traffic Separation Schemes, Inshore Traffic Zones, recognised sea-lanes and safe access to anchorages, harbours and places of refuge.

On a case-by-case basis, National Authorities may consider establishing Exclusion or Safety Zones and areas to be avoided in order to prohibit or restrict vessels from entering areas of man-made Structures.. Such information must be identified on the nautical charts and publications and promulgated through Maritime Safety Information (MSI).

The National Authority shall bear in mind that the marking recommendations herein may be adjusted based on risk assessments that consider background lighting, traffic density, proximity to ports, proximity to dangers, tidal considerations and other factors.

In order to avoid confusion from a high-density of AtoN (and other general lighting), it is recommended that full consideration be given to the use of synchronised lights, different light characters and varied light ranges.

There has been some evidence that sea-bed erosion, at the bases of offshore renewable energy installations in areas of strong tides or currents has resulted in significant deposits of material in other locations. National Authorities may consider fitting depth-monitoring devices to such installations to measure erosion. This may need to be considered when approving wave and tidal energy extraction proposals / locations.

Power cables between offshore energy devices and the Offshore Sub Station, and between the Offshore Sub Station and the shore should be sufficiently trenched to avoid exposure from erosion / sand migration or trawling activities. Where burial depth is not achieved, or the cable is exposed on/above the seabed additional risk mitigation requirements are recommended. These will vary on the navigable depth of water and may include MSI and additional AtoN if the National Authority deems them necessary.

* + 1. **MARKING**

The general rules for the marking of Offshore Structures are as follows:

1. If implemented, it is recommended that fog signals meet the minimum requirements identified by the National Authority authorizing the development of the off shore structure.
2. Where there is a requirement to identify a particular structure, a radar beacon (Racon) or Automated Identification System (AIS) AtoN may be fitted. The character and code length shall be determined by the National Authority.
3. The National Authority may consider that a group of structures located close together can be marked as one single platform or structure.
4. The National Authority may consider that buoys or beacons are placed to mark the perimeter of a group of structures, to mark channels through a group of structures, or to mark any fixed structure while being erected or dismantled. The characteristics of such marks shall be determined by the National Authority in accordance with the IALA Maritime Buoyage System (MBS).
5. Where underwater obstructions, such as submerged wells, pipelines or breakwaters, are considered to be a hazard to surface borne vessels, it is recommended that they are adequately marked in accordance with the MBS.
6. The Hydrographic Office must be informed of the marking, location and extent of any man-made structure, to permit the appropriate charting.
7. Notices to Mariners must be issued to publicise the establishment of a man-made structure(s) / field. The Notice to Mariners has to include the marking, location and extent of such structure(s) / fields.
8. The National Authority should be satisfied that the selected lighting has a suitable Nominal Range and sufficient autonomy to remain powered through all seasonal conditions – especially in higher latitudes.
9. The aviation authorities may require additional marking of the structure(s).

The table below lists the marking recommendations and considerations for offshore structures:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| \* = RECOMMENDED  + = TO BE CONSIDERED | Lights (white) | Lights (yellow) | Subsidiary  Lights (red) | Intermediate Lights (yellow) | Fog Signal | Radar Beacon | AIS AtoN | Floating AtoN | Pathway or Street Lighting |
| Offshore Oil or Gas Platform – Temporary or Fixed | \* |  | \* |  | + | + | + | + |  |
| Floating Production Storage Offloading | \* |  | + |  | + | + | + |  |  |
| Floating Petrochemical Offloading Points / Single Point Mooring | \* |  | + |  | + | + | + |  |  |
| Aquaculture |  | \* |  |  |  | + | + | \* |  |
| Meteorological Mast | \* |  |  |  | + | + | + | + |  |
| Minimum Facility Platform | \* |  | + |  | + | + | + | + |  |
| Offshore Docks / Loading Islands | \* |  | \* |  | + | + | + | + |  |
| Underwater Pipes, Underwater Manifolds | + |  |  |  |  |  |  | + |  |
| Isolated Tidal / Wave Generator | \* |  | + |  | + | + | + | + |  |
| Tidal/Wave Generator Field |  | \* |  |  | + | + | + | \* |  |
| Offshore Wind Farm |  | \* |  | + | + | + | + | + |  |
| Isolated WTG | \* |  |  |  | + | + | + | + |  |
| OWF Transformer / Sub-Station | \* |  | + |  | + | + | + |  |  |
| Breakwaters |  | \* |  |  | + | + | + | + | + |

* + 1. **CONSIDERATIONS DURING CONSTRUCTION AND DECOMMISSIONING**

It is essential to consider the marking of man-made structures during the different phases of their existence, i.e. construction, operation and decommissioning, when the structure may be a hazard to navigation.

During the construction and decommissioning of man-made structures, it is recommended that working areas are established and marked as appropriate. National Authorities shall also consider the use of guard ships, temporary VTS or the establishment of temporary work vessel routes in areas of high traffic density.

MSI must be promulgated in advance of and during any man-made structure / field construction or decommissioning.

When decommissioning such devices, it is recommended that the National Authority ensures that the operator / contractor remove all obstructions, so that the seabed is verified as being returned to its original depth and topography.

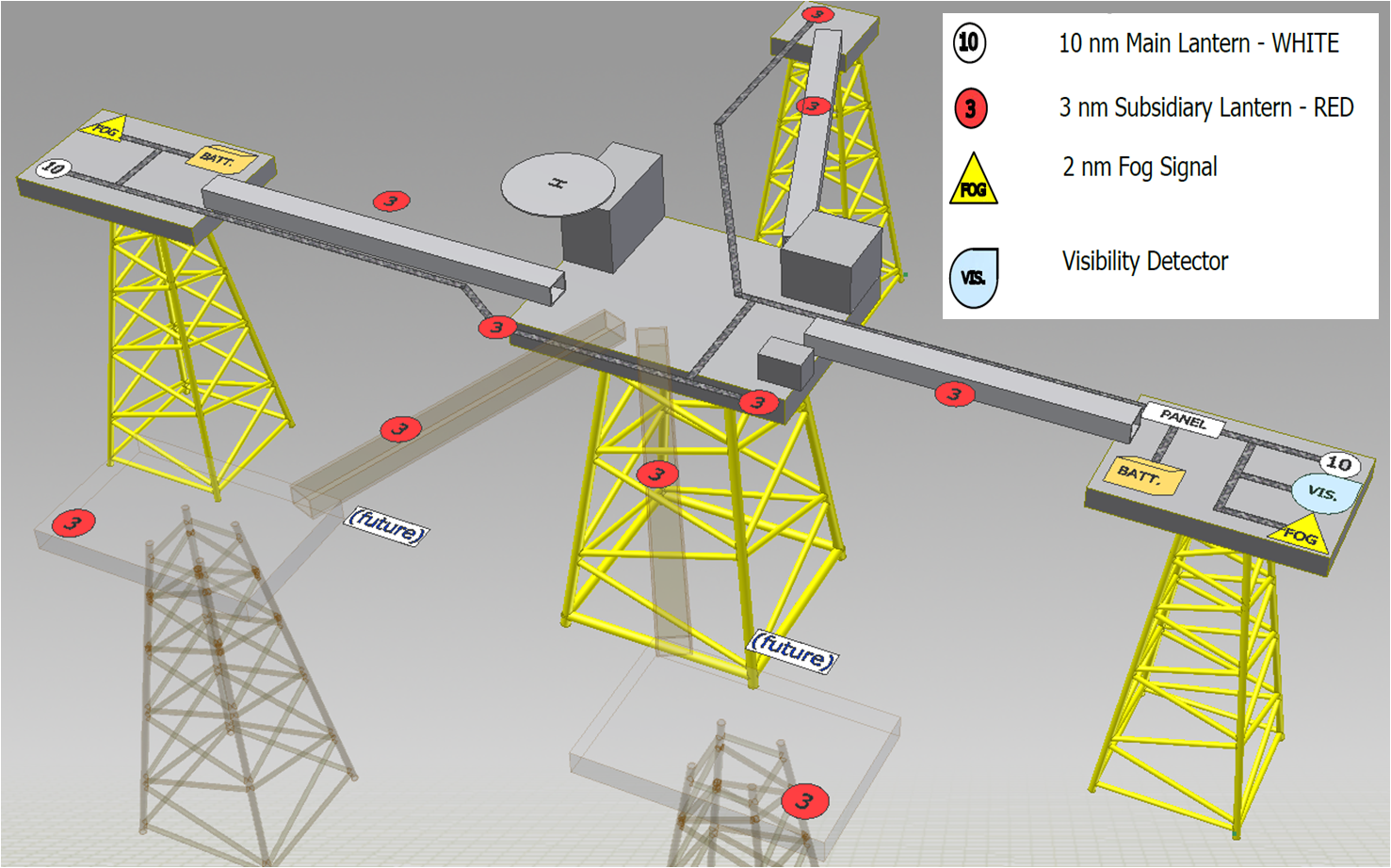
In the event that an obstruction remains which constitutes a danger to navigation, then it is recommended to mark the location based on risk assessment.

### MARKING OF OIL AND GAS PLATFORMS

This section supplements the general rules for marking defined in section 2.1 and must be read in conjunction with it.

The Offshore Structures mentioned in this section are recommended to be marked as a single unit, a block or field, as appropriate, as follows:

1. Any structure shall be marked at night by one or more white lights so constructed and fixed as to ensure that at least one light is visible upon approaching the structure from any direction. Minimum nominal range is to be 10 Nautical miles.
2. Subsidiary red flashing lights shall also be provided and show the same characteristics as the main white lights, i.e. synchronized Mo (U) R ≤15s. These are to be located to mark the horizontal extremities of the structure, excepting those marked with white lights, as well as interconnecting bridges. Minimum nominal range is to be 3 Nautical miles.
3. Each structure, where practicable, displays identification panels with black letters or numbers 1 metre high on a yellow background visible in all directions. These panels shall be easily visible in daylight as well as at night, either by using appropriate illumination or retro-reflecting material.



### MARKING OF OFFSHORE WINDFARMS

This section supplements the general rules for marking defined in section 2.1 and must be read in conjunction with it.

When mentioning Offshore Wind Farms (OWF), the following are included: Meteorological Mast, Wind Turbine Generator (WTG) and Offshore Transformer / Sub-Station.

It is recommended that each structure, where practicable, displays identification panels with black letters or numbers 1 meter high on a yellow background visible in all directions. These panels shall be easily visible in daylight as well as at night, either by using illumination or retro-reflecting material. If illuminated the light should be of an intensity which will not obscure AtoN or affect navigation in the vicinity. National Authorities may consider restricting the range that the identification panels need to be seen.

The structures should be painted yellow all around from the level of HAT up to 15 metres. On a case-by-case assessment alternative marking, where applicable, may include horizontal yellow bands of not less than 2 metres in height and separation. The addition of retro-reflective material may be considered (see figure 1).

When using working lights, such as down lighting on ladders and access platforms, they must not reduce the conspicuity of marking lights. It is recommended these are extinguished when personnel are not working on, or at, the structure.

National Authorities should consider that:

1. OWF structures may affect shipborne and shore based radar systems, which in some cases through inherent system limitations, cause interference strong enough to produce significant degradation of the radar display;
2. Passage close to an OWF boundary, or within the OWF itself, could affect vessels’ capability to manoeuvre;
3. The safety of navigation shall be ensured when approving an OWF;
4. Marking lights should be visible from all directions in the horizontal plane.

Consideration may also be given to the provision of fog signals where appropriate, taking into account the prevailing visibility, topography and vessel traffic conditions. The range of such a fog signal should not be less than two 2 Nautical miles.

* + 1. **MARKING OF ISOLATED WIND TURBINE GENERATORS (WTG), METEOLOGICAL MASTS AND OTHER INDIVIDUAL STRUCTURES**

It is recommended that these structures:

1. Are marked with a white light flashing Mo (U) W ≤15s, and with a nominal range of 10 Nautical miles;
2. Have AtoN mounted below the lowest point of the arc of the rotor blades. They shall be located at a height of at least 6 metres above HAT;
3. Have AtoN that comply with IALA Recommendations and have an availability of not less than 99.0% (IALA Category 2).

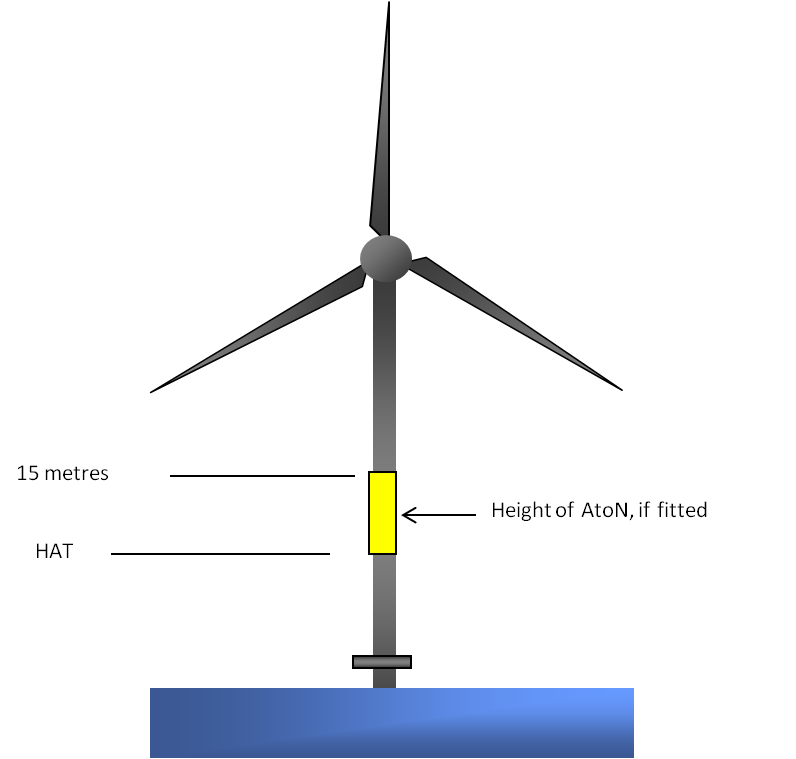


Figure 1 Sample marking of an individual wind turbine

* + 1. **MARKING OF FLOATING WIND TURBINE STRUCUTURES**

Due to the specific movement of the floating wind structures, it is recommended that:

1. National Authorities take into account the interaction between aviation lights and the shipping in the area;
2. The marine lights should have a larger vertical divergence compared to a fixed structure, in order to maximize visibility at range to the mariner (e.g. 30º at 50%).
   * 1. **MARKING OF GROUP OF STRUCTURES (OFFSHORE WIND FARMS)**

A Significant Peripheral Structure (SPS) will include the structures on the corners and other significant points on the periphery of the OWF. It is recommended that:

1. These lights display a Special Mark characteristic, flashing yellow, with a nominal range of 5 Nautical miles;
2. The National Authority may consider the synchronisation of all SPS;
3. In the case of a large or extended OWF, the distance between SPS should not normally exceed 3 Nautical miles.

It is recommended that Intermediate Peripheral Structures (IPS) selected on the periphery of an OWF:

1. Are marked with flashing yellow lights;
2. The flash character of these lights shall be distinctly different from those displayed on the SPS, with a nominal range of 2 Nautical miles;
3. Have a lateral distance between IPS or the nearest SPS which will not normally exceed 2 Nautical Miles.

The National SPS - lights visible from all directions in the horizontal plane. It is recommended to synchronize these lights in order to display a Special Mark characteristic, flashing yellow, with a range of not less than 5 Nautical miles

**SPS**

Intermediate structures on the periphery of an OWF other than the SPS - marked with flashing yellow lights which are visible to the mariner from all directions in the horizontal plane with a flash character distinctly different from those displayed on the SPS and with a range of not less than 2 Nautical miles

**IPS**

Figure 2 Sample marking of an OWF

< 3 nm

< 2 nm

**SPS**

**SPS**

**SPS**

**SPS**

**SPS**

**IPS**

**IPS**

Depending on the marking, lighting and lateral separation of the peripheral structures, the additional marking of the individual structures in general within an OWF may be considered as follows:

* Lighting or marking of each structure;
* Unlit individual structures can be made more conspicuous with illumination and retro-reflecting material;
* Use of flashing yellow lights with a nominal range of 2 Nautical Miles;
* Racons;
* AIS AtoN.

An Offshore Transformer / Sub-Station or a Meteorological Mast, if considered to be a composite part of the OWF, shall be included as part of the overall OWF marking. If not considered to be within the OWF block it shall be marked as an isolated offshore structure.

### MARKING OF WAVE AND TIDAL ENERGY DEVICES

This section supplements the general rules for marking defined in section 2.1 and must be read in conjunction with it.

Wave and Tidal Energy Devices include: Tidal Generator, Tidal Generator field, Wave Generator, Wave Generator field as defined in Appendix 1.

It must be borne in mind that many wave and tidal devices are low freeboard floating structures moored to the seabed. They may be moored in deep or shallow water and some may be located on the seabed or just below the surface. Surface piercing and subsurface elements may extend laterally beyond the surface elements. This could include shared moorings and mid-water connections between units that may also carry electricity, control signals, hydraulics or pneumatics associated with the units.

When identifying the marking requirements, it must be taken into consideration that some tidal devices:

1. Have fast-moving sub-surface elements such as whirling blades;
2. Do not allow for safe under keel clearance (UKC).

The level of marking should be decided after a risk assessment has been conducted.

* + 1. **MARKING**

Wave and Tidal energy extraction devices should be marked as a single unit or as a block or field as follows:

1. When structures are fixed to the seabed or in the water column and extend above the surface, they shall be marked in accordance with the guidance contained in Section 2.3.
2. It is recommended that:
   1. Subject to the proper risk assessment, areas containing on surface or sub-surface wave or tidal devices are marked by appropriate AtoN. In addition, radar reflectors, retro-reflecting material, Racons and / or AIS transponders should be considered where the level of traffic and degree of risk requires;
   2. The AtoN must be visible to the mariner from all relevant directions in the horizontal plane, by day and lighted at night;
   3. ;

cTaking the results of a risk assessment into account, lights must have an appropriate nominal range and vertical divergence and may be synchronized.

* 1. Individual wave and tidal energy devices within a site that extend above the surface are painted yellow above the waterline and have yellow retro-reflective tape. If navigation is permitted within the site, marking of individual devices may be required;
  2. If marked, the individual devices should have flashing yellow lights. The flash character of such lights must be sufficiently different from those displayed on the boundary lights with a nominal range of not less than 2 Nautical miles;
  3. Floating AtoN should be located outside the moorings of the floating structures.

1. Based on risk assessment, a single wave or tidal energy extraction structure, standing alone, may be marked as follows:

* An Isolated Danger Mark or
* Special Mark.

1. Specific guidance to small craft needs early consideration.
2. The AtoN described herein should comply with IALA Recommendations and have an appropriate availability, normally not less than 99.0% (IALA Category 2).

Recommended principles for marking of area for wave energy devices are referred to in the figure below. The National Authority may consider the distances between lit and unlit special marks on a case by case basis and on a risk assessment.

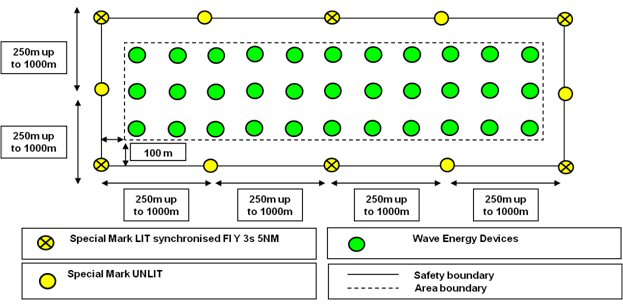


Figure 3 Marking of Wave and tidal devices

#### MARKING OF AQUACULTURE SITES

This section supplements the general rules for marking defined in section 2.1 and must be read in conjunction with it.

The farm, or group of farms, should be marked depending on their size, extent and location. In some cases it may be sufficient to mark only part of the perimeter, or the centre. The use of Racons or AIS AtoN may also be considered.

Recommended principles for marking of area aquaculture farms are referred to in the table below. National Authority may consider the distances between lit and unlit special marks on a case by case basis after conducting a risk assessment.

It should be borne in mind that many aquaculture farms are low freeboard floating structures that are moored to the seabed. They may be moored in deep or shallow water and some may be located on the seabed or just below the surface. Surface piercing and subsurface elements may extend laterally beyond the surface elements. This could include shared moorings and mid-water connections between units that may also carry electricity, control signals, hydraulics or pneumatics associated with the units.

The National Authority should bear in mind that the marking recommendations herein may be adjusted in consideration of traffic density, proximity to ports, proximity to dangers, tidal considerations and other factors.

It is recommended to mark offshore aquaculture farms as follows:

1. Aquaculture farms are normally marked by Special Marks;
2. If there is a requirement for vessel traffic between aquaculture farms, then such channels are normally marked by Lateral Marks;
3. If the prevailing situation warrants, Cardinal Marking alone may be used to direct vessel traffic away from the aquaculture farm(s);
4. It is recommended that areas of aquaculture farms are marked by appropriate AtoN. In addition radar reflectors, retro reflecting material, Racons and AIS AtoN may be considered;
5. To improve the effectiveness of marking and taking into account background lighting, synchronisation of the lights is recommended. Taking the results of a risk assessment into account, lights must have an appropriate nominal range;
6. Specific guidance to small craft needs early consideration;
7. The AtoN described herein should comply with IALA Recommendations and have an appropriate availability, normally not less than 99.0% (IALA Category 2).

### Marking Examples

Examples can be found in the following tables and figures that illustrate the minimum recommended marking arrangement with Special Marks.

* It is recommended that Rectangular Aquaculture Farms are marked according to the length of their sides.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Example* | *X Axis (m)* | *Y Axis (m)* | *Area (m²)* | *Minimum Marking Requirements* |
| A | ≤ 500 | ≤ 500 |  | One light in centre of farm (consider radar reflector) |
| B | ≤ 2500 | ≤ 500 |  | One light on each sea corner; one daymark on each coast corner (consider radar reflector) |
| C | ≤ 500 | ≤ 2500 |  | One light on one sea corner; one light on the diagonally opposite coast corner; one daymark on one sea corner and one daymark on the diagonally opposite corner (consider radar reflector) |
| D | > 500 | ≤ 2500 | ≤ 1250000 | One light on diagonally opposite corners; daymark on diagonally opposite corners (consider radar reflector) |
| E | > 900 | ≤ 2500 | > 1250000 | One light on each corner (consider radar reflector) |

 **Special Mark LIT (Fl Y 3s 5NM) synchronized**

 **Special Mark UNLIT**

** **

**Area borders**

**Safety borders**

**T**

Figure 4 A. Rectangular Aquaculture Farms

**B**

**shore**

**sea**

≤ **500 m**

≤ **2500 m**

**A**

≤ **500 m**

≤ **500 m**

**D**

**shore**

**sea**

**> 500 m**

≤ **2500 m**

**C**

**shore**

**sea**

≤ **500 m**

≤ **2500 m**

**E**

**shore** **shoreeeee** **shoreore shore**

**shore**

**ee**

**e shore eeeeeeeeeee**

**sea**

**> 900 m**

≤ **2500 m**

≤ **2500 m**

* Circular Aquaculture Farms should be marked according to their diameter.

|  |  |  |  |
| --- | --- | --- | --- |
| *Example* | *Diameter (m)* | *Diameter (m)* | *Minimum Marking Requirements* |
| F |  | ≤ 500 | One light in centre of farm (consider radar reflector) |
| G | > 500 | ≤ 1000 | Two lights 180° apart on the circumference; two daymarks positioned 90° to the lights (consider radar reflector) |
| H | > 1000 | ≤ 2000 | Three lights 120° apart on the circumference (consider radar reflector) |
| I | > 2000 |  | Three lights 120° apart on the circumference, three daymarks positions 60° to the lights (consider radar reflector) |

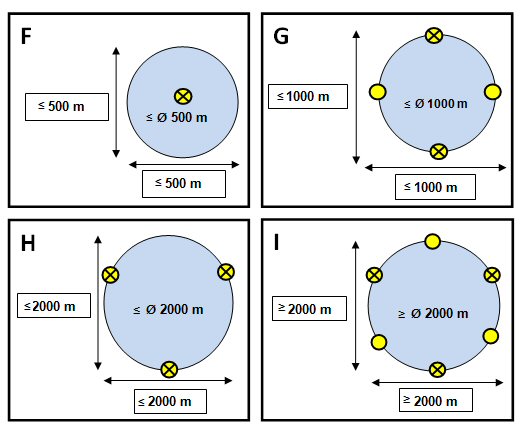


Figure 5 B. Circular Aquaculture Farms

#### MARKING OF BREAKWATERS

This section provides information that will assist in the development of guidance for the marking of ‘above water’, partially or wholly submerged breakwaters.

Breakwaters are large artificial offshore structures designed to serve as a barrier that protects a coast, port, its facilities (e.g. a marina). .

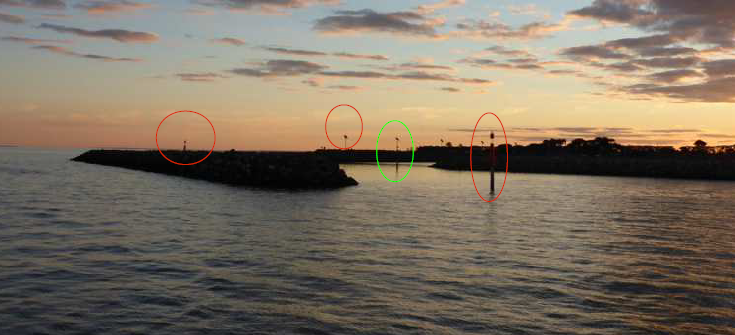
Breakwaters can present challenges to safe navigation if not marked appropriately. A lack of lighting or inconsistent marking can create confusion for transiting ships, domestic vessels and recreational vessels, particularly at night.

**2.6.1. EXPOSED BREAKWATERS**

Other breakwaters are exposed or ‘above water’, and are associated with smaller, regional ports for the domestic and recreational industries. The vast majority of these breakwaters are marked using a combination of lateral marks, and in many cases, a set of lead and/or sector lights to assist approaching vessels in navigating between breakwaters.

**Small and regional ports** - Other breakwaters are exposed or ‘above water’, and are associated with smaller, regional ports for the domestic and recreational industries. The vast majority of these breakwaters are marked using a combination of lateral marks, and in many cases, a set of lead and/or sector lights to assist approaching vessels in navigating between breakwaters.

The following example illustrates the layout of AtoNs for marking the breakwaters at Wyndham Port, Victoria.

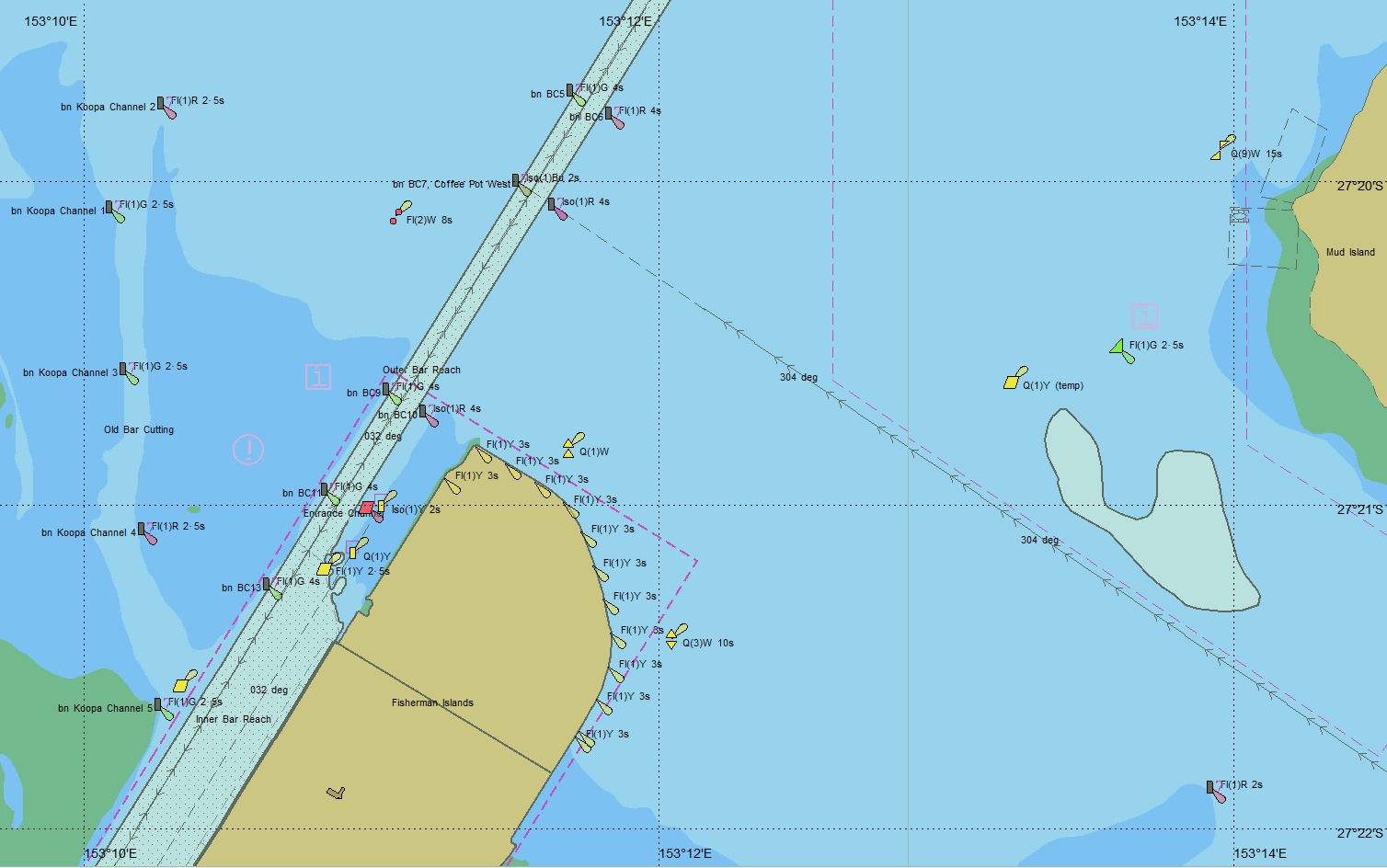




*Figure 1 - Wyndham Harbour, Victoria. (Photo courtesy: Sail Escapade)*

The unlit portion of the breakwater (in between AtoN) presents a hazard to navigation for mariners. Where pedestrian access is permitted, pathway or street lighting is sometimes, but not always, provided. Pathway or street lighting should be considered to provide a non-conventional means to maximize the area illuminated of a breakwater, thus increasing safety for the mariner.

**Large Commercial Ports –** Some larger ports incorporate a combination of special marks, spaced at an equal distance apart (no more than 200m), in a similar fashion to that illustrated in section 3.3. Examples of where ‘Special Marks’ have been used extensively to mark breakwaters include the Port of Brisbane, (Australia?) and Port of Townsville (Australlia?). Examples of marking arrangements are included below:



*Figure 2 - Fisherman’s Island, Port of Brisbane*

**2.6.2. SUBMERGED BREAKWATERS**

There are many breakwaters designs, among them, submerged breakwaters present high risk as they are underwater at high tide, and only partially above water at low tide. Usually, vessels that transit in the proximity of such submerged breakwaters are small vessels, such as fishing boats and leisure boats. Many of these vessels have no electronic chart system or advanced navigational equipment. If a submerged breakwater is not visible to the mariner, it can be very dangerous.

The deployment of submerged breakwater marking shall be recommended in accordance with the following criteria, taking into account various factors, including the structure of submerged breakwater and maritime conditions near the deployment site, traffic density and proximity to the port.

1. Submerged breakwater markings for prevention of collision are generally deployed as special marks

2. If there is a passageway of a vessel around a submerged breakwater, mark the waterway according to the IALA MBS

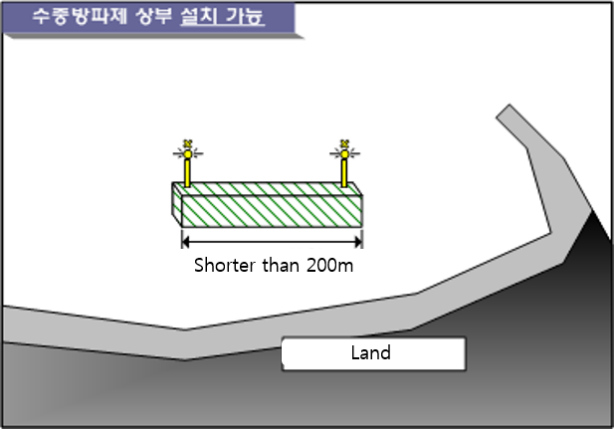
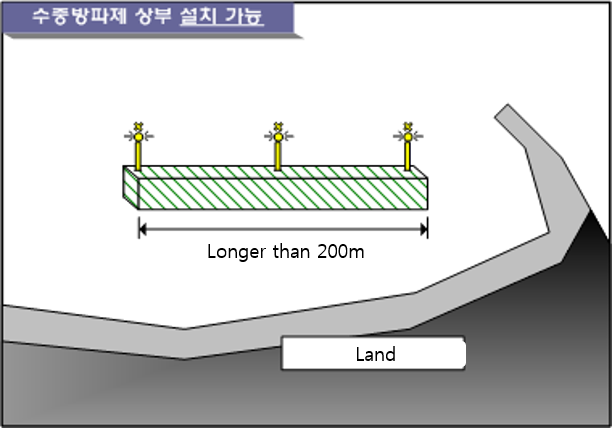
3. If markings are available on the top of submerged breakwater deploy on the top, if not deploy on the vessel passageway side near the submerged breakwater.

4. For single submerged breakwater, deploy at the centre or end of a submerged breakwater depending on the sea conditions.

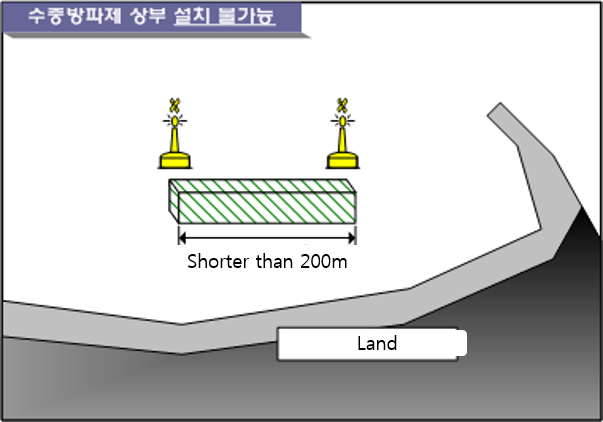
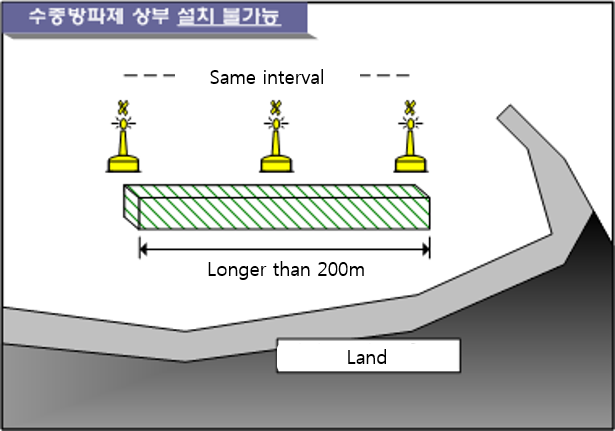
5. If 2 or more of submerged breakwaters are exist, consider the entire submerged breakwaters as one and deploy it at both ends of the submerged breakwater at regular intervals depending on the conditions of the sea

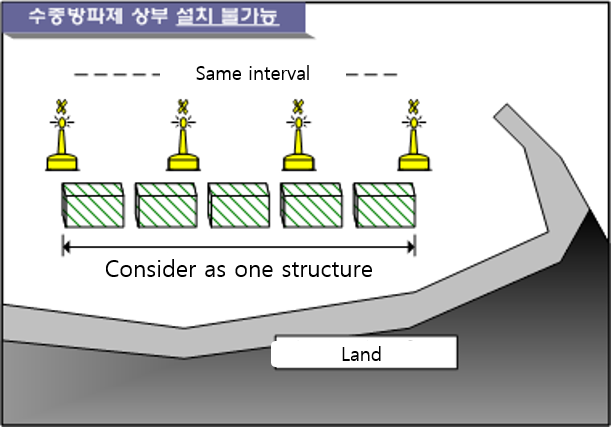
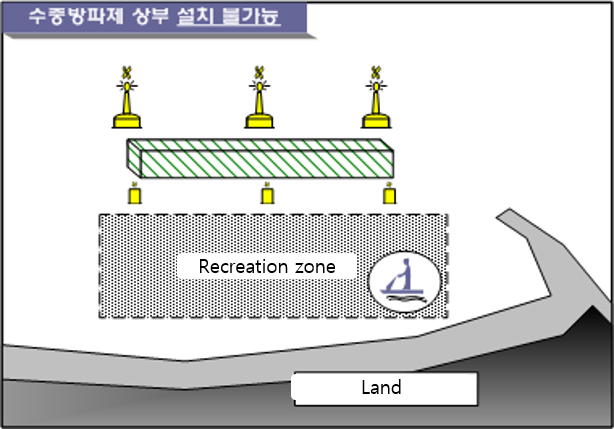
The criteria for the AtoN arrangement of submerged breakwater will be considered on a case by case basis after close consultation with owner of project and the risk assessment.

Examples:1.Marking with fixed AtoN.

2.Marking with floating AtoN

# Future requirements

IALA is aware that there is an increasing quantity of energy devices and structures already in place and many more planned that may affect shipping.

It is therefore recommended that National Authorities continuously monitor developments to ensure that any navigational problems caused by offshore structures are solved in a satisfactory manner.

# definitions and acronyms

**National Authority** - the competent Authority for determining the marking of offshore structures.

**Energy Extraction Device (EED)** - a wave or tidal generator.

**Highest Astronomical Tide (HAT)** - is the highest level that can be expected to occur under average meteorological conditions and under any combination of astronomical conditions. HAT is not an extreme level, as certain meteorological conditions can cause a higher water level.

**Nautical mile** – 1852m.

**Significant Peripheral Structure (SPS)** – the corner wind generator on a rectangular OWF or other significant point on the periphery of an OWF.

**Transformer Station (hub)** – a special structure within or outside the wave and/or tidal energy extraction field and/or OWF to which the individual generators are connected via a power cable. Power is transferred ashore from the transformer station by submarine cable. A ‘hub’ may be a separate fixed or floating platform, a unit very similar to the generators but carrying additional power conversion equipment.

**Usual Range** – the usual range of the fog signal shall be calculated in accordance with IALA Recommendation E-109, on the calculation of the range of a sound signal.

**Subsidiary Light –** additional red light(s) located on offshore platform(s) used to mark the extremities of extensive installations and their interconnecting bridges.

**Promulgation** – to make known by open declaration; publish; proclaim formally or put into operation (a law, decree of a court, etc.).

|  |  |
| --- | --- |
| AIS | Automatic Identification System |
| AIS AtoN | AIS as an Aid to Navigation |
| AtoN | Aid(s) to Navigation |
| CALM | Catenary Anchor Leg Mooring |
| cd | Candela |
| FPSO | Floating Production Storage Offloading |
| HAT | Highest Astronomical Tide |
| IPS | Intermediate Peripheral Structure [OWF] |
| MBS | IALA Maritime Buoyage System |
| MER | Minimum Effective Range |
| MFP | Minimum Facilities Platform |
| MHWS | Mean High Water Springs |
| MSI | Maritime Safety Information (e.g. NAVTEX, Notices to Mariners) |
| OREI | Offshore Renewable Energy Installation |
| OWF | Offshore Wind Farm(s) |
| SOLAS | Safety of Life At Sea [convention]. |
| SPM | Single Point Mooring |
| SPS | Significant Peripheral Structure [OWF] |
| UKC | Under Keel Clearance |
| WTG | Wind Turbine Generator |