Aids to navigation guideline

Guideline for applying to erect, place or alter a navigational aid and exercising delegated approval powers from the Director of Maritime New Zealand
Aids to navigation

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1. Overview

This guideline is for those applying to erect, place or alter aids to navigation and for those holding approval powers delegated by the Director of Maritime NZ (the Director). This document also provides guidance for on-going operation of aids to navigation.

Development of guideline

This guideline was developed in consultation with harbourmasters from around New Zealand and the New Zealand Hydrographic Authority in Land Information New Zealand (LINZ). They replace Providing Aids to Navigation in New Zealand produced by the Maritime Safety Authority (now Maritime New Zealand) in 2004.

1.1 What are aids to navigation?

The term ‘aid to navigation’ is used internationally to refer to devices or systems external to vessels that are designed and operated to enhance the safe and efficient navigation of vessels on the water.

Largely, they are buoys (floating marks) and beacons (fixed lights) and they are usually lit. The wide scope includes:

- lighthouses
- Lateral Marks (red and green) identifying channels and routes
- Cardinal Marks (black and yellow) to show safe water related to the points of the compass
- Isolated Danger, Safe Water and Special Marks
- marks to designate water-ski, marine farm and other reserved areas
- virtual marks using the Automatic Identification System (AIS)
- warning signs and notifications (for speed restrictions, marking cables, marine reserves etc.)
- radio, fog signals or other aids not carried on board any ship.

The legislation in New Zealand (including Maritime Rules and council bylaws) uses the alternative term ‘navigational aid’. This term has the same meaning as ‘aids to navigation’, but the latter is generally used so as to avoid confusion with on-ship aids like radar.
1. Overview (continued)

An international system

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) provides guidance and recommendations on a global system of marks and lights. Its focus is safe coastal maritime navigation, although its guidance is also commonly adopted in inland waters and rivers.

1.2 Roles and responsibilities

Aids to navigation may be owned and maintained by private individuals, operators, councils or Maritime NZ. The roles for different parties, including for oversight, are outlined below.

Operators of maritime facilities:

For example, operators of ports, jetties, marinas, oil rigs and marine farms:

- must provide aids to navigation for any maritime facility they operate (section 200(2) of the MTA)
- require approval from the Director (or delegate) to erect, place or alter an aid to navigation (section 200(7) of the MTA)
- are responsible for maintaining their aids to navigation (i.e. ensure they are in place and working).

Note: a specific Maritime NZ guideline has been produced for marine farm facilities.

Maritime NZ:

- has overall authority for aids to navigation in New Zealand, including coastal, adjacent seas, islands and inland waters (see section 2.1 of this document)
- owns and operates a number of aids to navigation around the coast of New Zealand, including significant long range lights
- supports the Minister of Transport to make maritime rules, which can set standards and requirements for aids to navigation (noting that section 36(1)(ta) of the MTA refers to ‘navigational aids’)
- may place, add to, alter, remove, maintain or inspect any aid to navigation (section 200(3) of the MTA)
- may direct a port operator to provide, replace or remove aids to navigation (section 200(5) of the MTA) and if necessary seek reimbursement for costs incurred.

Regional councils:

- may install aids to navigation for the purpose of ensuring maritime safety – commonly taking on responsibility for inner harbours, freshwater lakes and rivers (where relevant)
- may consider navigational safety and related aids to navigation when processing consent applications (e.g. Resource Management Act 1991 coastal permits)
1. Overview (continued)

- where the approval power is not delegated to the harbourmaster, the applicant must seek approval from the Director on aids to navigation (section 200(7) of the MTA)
- are able to prescribe fees and charges in respect of functions, services etc. it performs in respect of any navigational aid (section 33R of the MTA) – for example, if a regional council establishes aids to navigation it can use a bylaw to recover costs
- may develop bylaws to address navigational safety concerns, for example requiring that:
  - buoys do not mislead or cause confusion for water users
  - signs, marks, or buoys provided are not changed, hidden, damaged, defaced or destroyed.

Refer to the relevant council website for more information on local bylaws.

Harbourmasters (appointed by regional councils):

- may approve aids to navigation when they are delegated by the Director (see section 5 of this document)
- install and manage aids to navigation on behalf of the regional council
- ensure compliance with any local bylaws that control use and installation of aids to navigation
- have the power to cause any floating, submerged, or stranded object that is considered to be a hazard to navigation to be moored, unmoored, anchored, secured, unsecured, placed, or removed (section 33F(1)(f) of the MTA).

There are two unusual circumstances to be noted. The Lake Taupo harbourmaster is appointed by the Minister for Local Government and Maritime NZ has taken on the harbourmaster role for Taharoa (Waitomo District).

Keeping aids to navigation operating is important

- Persons who operate ports, cargo terminals, marinas, jetties, marine farms, or other maritime facilities (including local authorities) must provide navigational aids (aids to navigation) for those facilities and are responsible for them (required by section 200(2) of the MTA).
- For the purpose of ensuring maritime safety, regional councils are authorised to erect, place, and maintain navigational aids in accordance with maritime rules (if any), and to remove obstructions and impediments to navigation (function in section 33(l) of the MTA).
- In the case of pollution damage, a ship owner can argue that they are not liable if they can prove the incident was wholly caused by the negligence of a person responsible for the maintenance of lights or other aids to navigation (set out in section 348 of the MTA).
1. Overview (continued)

- The Act does not impose responsibility in respect of particular hazards to navigation. In the event of an accident, issues of liability for failure to maintain aids to navigation will be determined with reference to the principles of the law of negligence.

- The Port and Harbour Marine Safety Code 2016 (PHMSC) notes:

  Responsibility for aids to navigation in the port and harbour should be clearly defined. Where the provision, ownership and maintenance of aids to navigation are split between different parties, this is formally agreed (PHMSC Appendix 1).
2. Status of international and NZ guidelines

2.1 New Zealand has international obligations

The international system for aids to navigation has been standardised to cater for global movement of vessels and crew.

When New Zealand signed the SOLAS (International Convention on the Safety of Life at Sea) Agreement in 2002 it agreed that it would, as a contracting government, ‘take into account the international recommendations and guidelines when establishing such aids’ (Chapter V, Regulation 13 Establishment and Operation of Aids to Navigation).

Maritime NZ is the responsible authority

Maritime NZ is the authority responsible for giving effect to this international obligation. Its role is to:

- ensure consistency with international guidance on aids to navigation
- adjust the recommended approaches for aids to navigation based on risk assessments.

Maritime NZ ensures international obligations are met through having a formal approval process. Anyone who wants to erect, place, alter or remove an aid to navigation requires approval from the Director (section 200 (7) of the MTA).

This is irrespective of who owns the aid to navigation. Even Maritime NZ officials must seek approval to erect, place, alter or remove aids to navigation operated by Maritime NZ.

Maritime Buoyage System A

New Zealand has agreed to adhere to the IALA Buoyage System A, which is an international standard. This means that the direction of buoyage in New Zealand waters is such that a vessel in the designated channel keeps the red mark on port when entering a harbour.
2. Status of international and NZ guidelines (continued)

The Buoyage System is also commonly adopted for use on inland waterways. There are agreed design standards for Cardinal, Lateral, Special, Safe Water and Isolated Danger Marks.

**International guidance**

The international guidance and recommendations from IALA are publicly available (key documents are referenced in Appendix 5).

Sometimes IALA provides a precise recommended practice (e.g. light sequence for Cardinal Marks). At other times it provides options or factors to consider (e.g. as part of a risk assessment).

As part of the Director’s approval process IALA guidance can be considered and incorporated into the decision and any conditions.

**Maritime NZ guidelines**

This guideline utilises international guidance. It is a good practice document to support decision making about aids to navigation. References to IALA guidance are included.

**Guideline considered by those with delegated authority**

Where the Director’s power to approve aids to navigation is delegated to harbourmasters, the delegated power must be exercised consistently with guidelines and recommendations issued by IALA and the relevant guidance from Maritime NZ. This means that this guideline must be given due weight and consideration by the harbourmaster. Applicants for aids to navigation should be mindful of this duty on local harbourmasters when they are the delegated decision maker.

The Director remains responsible for decisions made under delegation and can withdraw the delegation at any time, if necessary.
3. Design, placement and availability

This section provides good practice advice for those choosing, installing and/or assessing aids to navigation. It does not repeat all the relevant guidance from IALA. Decision makers are expected to be familiar with the IALA Maritime Buoyage System A and IALA standards, recommendations, guidelines and manuals.

3.1 Good practice principles

The overarching principles for buoys, navigation lights, and other navigation marks are:

1. Do no harm - avoid use of buoys and lights (e.g. placement or colour) that may interfere with navigation or mislead any water use
2. Simple is good - i.e. use as few marks as possible (some water users have limited knowledge of aids to navigation)
3. Give time to act - a mark should be large enough, or bright enough at night, to be seen from a distance that gives the water user enough time to safely respond
4. Fit for purpose - consider the conditions, the users and the life of the structure (Appendix 2 provides a check list of matters to consider)
5. Understand the legal framework - check all legislative requirements, particularly regional plans under the Resource Management Act 1991 (RMA)
6. Plan for the lifetime of the aid to navigation - responsibility for maintenance must be clear.

Key references

Useful resources include:

- **IALA Maritime Buoyage System Recommendation R1001**
- Maritime NZ’s publication *New Zealand’s System of Buoys and Beacons* (2008)
- Guidance on the IALA web site (http://www.iala-aism.org/product/), particularly: *Daymarks for Aids to Navigation* 1094
- **IALA NavGuide** - an IALA document updated every 4 years.

3.2 Buoys

A buoy is a floating aid to navigation, normally used where:

- it would be impractical due to water depth, seabed conditions or cost to establish a fixed aid
- hazards shift over time (e.g. sand banks or an unstable wreck)
- the aid is at high risk of damage (e.g. from ship impact)
- a temporary mark is required.
3. Design, placement and availability (continued)

Size and form

Buoys tend to be circular and 1 to 3 metres in diameter. For very sheltered, low traffic areas the visible part of the buoy could be quite small, but Maritime NZ recommends they are not less than 15cm wide and 30cm high. Rigid plastic foam or rigid moulded plastic is commonly used as it is light and easy to clean.

A buoy should be:

- sturdy enough to withstand weather and water conditions
- soft enough to absorb vessel impacts and reduce collision damage
- designed with installation and maintenance in mind - the weight of the mark can affect how easy it is to lift and clean
- designed for the sea conditions and expected traffic.

There are internationally agreed shape options for Lateral, Cardinal, Isolated Danger and Safe Water Marks, and associated topmarks. Special Marks have agreed topmarks (an “X”), but the shape is not specified and can vary, as long as it does not conflict with other navigational marks.

Figure 1: Shapes for Port hand (red) and Starboard hand (green) marks.

For Cardinal Marks, international guidance emphasises the value of using cylindrical shapes for the whole mark. This helps to ensure the stripes appear as the same width.

Identification marks

It is recommended that decision makers consider the need for buoys to display, in a conspicuous location and in a permanent and litigable manner, a contact name and details for the responsible owner or operator. This is helpful if there are any issues with maintenance, drift, loss etc.

Position and mooring

With most floating buoys there is potential for the mooring to move during storms or for errors to occur while laying the anchors/sinkers. It is recommended to use anchors that will keep buoys in the correct position.
3. Design, placement and availability (continued)

When an accurate position is required, differential GPS is the preferred method, generally providing accuracy for a floating, moving buoy of within 10 metres. Controlling the descent of the anchor/sinker can also improve the positional accuracy of the buoy. The current, water depth, shape of the anchor/sinker and the nature of the seabed can influence the final position.

The formula below can be used to calculate the approximate length of mooring required. Assumptions include:

- the mooring system tethered to the sinker is usually tangential to the sea bed
- the buoy axis is vertical under the most common conditions of current and wind
- the ratio of breaking stress of the mooring system to the calculated stress is not less than 5 under the most unfavourable conditions of current and wind
- the reserve buoyancy of the fully equipped floating aid is greater than the combined loads of current and wind under the most unfavourable conditions.

Where:

\[ L = \text{Length of mooring line (metres)} \]

\[ H = \text{Depth of water (metres), defined as the maximum depth of water including the highest tide level and half the maximum wave height at the particular site} \]

\[ L_{\text{minimum}} = 3H \text{ for depths less than 50 metres} \]

\[ L_{\text{minimum}} = 2H \text{ for depths greater than 50 metres} \]

\[ L_{\text{minimum}} = 7H \text{ for shallow moorings where breaking waves occur.} \]


Figure 2: Spar buoy not standing vertical (which decreases visibility) with confused marking, and north cardinal (stable and vertical)
3. Design, placement and availability (continued)

3.3 Topmarks

The dimensions of topmarks should be as large as possible, taking into account the impact on the structure below – including the stability of buoys. The width of the base also affects visibility.

Figure 3: Photos showing benefit of prominent topmarks

In this example of two Cardinal Marks, the east topmark on the left is small and indistinct. It could be mistaken for other Cardinal Marks. On the right, the mark is proportionally bigger and more visible.

The IALA provides guidance on dimensions of topmarks, including for Cardinal Marks.

Figure 4: Guidance on dimensions of Cardinal Mark topmarks

Source: Daymarks for Aids to Navigation 1094 IALA
3. Design, placement and availability (continued)

3.4 Colour

IALA recommendations are:

- colours of marks should be limited to white, black, red, green and yellow. Blue may sometimes be helpful and is used on Emergency Wreck Marking Buoys.
- fluorescent colours - red, yellow, green or orange (or standard orange) may be used for special purposes requiring high visibility.

There are internationally agreed colours for Lateral, Cardinal, Isolated Danger, Safe Water and Special Marks.

Figure 5: Examples of standard colours (Special, Isolated Danger, red and green Lateral and South Cardinal Marks)

IALA has produced specific guidance on preferred colour zones, chromaticity, use of retro-reflecting material and the painting of aids to navigation (refer Daymarks for Aids to Navigation IALA Guideline 1094). In regard to the colour specifications, IALA supports two colour collections: Swedish Natural Colour System (NCS) and German RAL colour. Specialist paint manufacturers can generally produce an RAL colour on request. Maritime NZ recommends using companies that specialise in providing marine grade paint. Adding a clear top coat, which includes a UV inhibitor, also helps extend life and reduce fading. The Resene and Dulux nearest matches are provided in Table 1.

Where a daymark is multi coloured the visibility range is significantly lower than for a single coloured daymark of the same size. This means Cardinal Marks and Isolated Danger Marks, which both have stripes, may need to be larger because they feature more than one colour.

Aids to navigation can be made from moulded plastic. Where this occurs, manufacturers should be familiar with IALA recommended colours.
### Table 1: IALA guidance on luminance factors for colour collections: Swedish Natural Colour System (NCS) and German RAL

<table>
<thead>
<tr>
<th>Colour</th>
<th>IALA recommendation E-108</th>
<th>Resene Colour</th>
<th>Dulux- Protective coatings range</th>
<th>IALA recommendation E-108</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordinary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min. fluorescence</td>
<td>NCS</td>
<td>RAL</td>
<td>Closest colour match (LRV = Light reflectance value)</td>
</tr>
<tr>
<td>Red</td>
<td>&gt; 7%</td>
<td>S 1085-Y80R</td>
<td>3028</td>
<td>Milano Red R48-145-038 LRV 16%</td>
</tr>
<tr>
<td>Yellow</td>
<td>&gt; 50%</td>
<td>S 1080-Y</td>
<td>1023</td>
<td>Moon Yellow Y84-168-085 LRV 61%</td>
</tr>
<tr>
<td>Green</td>
<td>&gt; 10%</td>
<td>S 2070-G10Y</td>
<td>6037</td>
<td>Japanese Laurel G52-109-141 LRV 20%</td>
</tr>
<tr>
<td>Blue</td>
<td>&gt; 7%</td>
<td>S 4050-R90B</td>
<td>5017</td>
<td>Bondi Blue B40-077-256 LRV 11%</td>
</tr>
<tr>
<td>White</td>
<td>&gt; 75%</td>
<td>S 0500-N</td>
<td>9016</td>
<td>Qtr White Pointer N93-006-091 LRV 84%</td>
</tr>
<tr>
<td>Black</td>
<td>&lt; 3%</td>
<td>S 9000-N</td>
<td>9017</td>
<td>Black N24-000-098 LRV 4%</td>
</tr>
</tbody>
</table>

Reference: Surface Colours Used as Visual Signals on AtoN, IALA Guideline 1134 and Recommendation E-108

### Radar reflectors and retro-reflecting material

The use of radar reflectors and retro-reflecting material (including cats eyes) is highly recommended. As long as they are kept clean, this is a cost effective means of highlighting the structure’s position. Retro-reflective material should be the same colour as the mark.

Reference: Retroreflecting Material on Aids to Navigation Marks within the IALA Maritime Buoyage System IALA Recommendation R0106
3. Design, placement and availability (continued)

Fig 6: Starboard and Port Marks with reflective strips

3.5 Marking recreational and reserve areas

Maritime Rules Part 91 Navigational Safety Rules specifies some colours and form requirements for aids to navigation. Consistency with these specifications will be required for approval. The latest version of Part 91 can be found on Maritime NZ’s website.

In addition to using the colours specified in the Maritime Rules (e.g. orange and black for access lanes), buoys and marks used to identify reserve areas should be distinct from other marks in the area.

To mark swimming reserves it is recommended that when installing new buoys, yellow buoys are used. This will assist in developing consistency across New Zealand.

3.6 Signs on land

Signs on land can also be classed as aids to navigation.

The approval process for navigation signs on land, under section 200(7) of the MTA, should be straightforward and generally involve a harbourmaster with delegated authority.

Remember:

- district council plans may have controls on sign size and design that need to be considered
- consent from the landowner must be obtained
- to check other interests – Department of Conservation, Iwi etc.
- consider the local environment
- ensure you can access the sign for repair/maintenance
- there are agreed colour, form and design standards for signs marking overhead wires (refer to: Safety management of powerline waterway crossings (Maritime NZ)
- ensure that vegetation doesn’t obscure the sign.
3. Design, placement and availability (continued)

Figure 7: 5 knot sign on land

3.7 Lights

When aids to navigation have lights, they are usually battery powered and charged using solar power. Light ranges are typically 2 to 5 nm, although much higher ranges are used in some applications.

There is specific guidance from IALA on the light character and colours for marks that are part of the Buoyage system (see Appendix 3), which should be followed. It covers Lateral, Cardinal, Isolated Danger, Safe Water and Special Marks.

General reminders:

- a single fixed light must not be used because it may not be recognised as an aid to navigation light
- lights must be displayed at night and at times of poor visibility
- use retro-reflective material to boost visibility.

Height and brightness

The light needs to be at a sufficient height to allow the water user to see the light from a distance that allows evasive action. For example, the Special Mark at the entrance to Whangarei Harbour sits higher than the two wave rider buoys it is marking, as these buoys sit very low in the water.

Table 2 shows the significant effect of height on visibility. The range indicated assumes that visibility is not adversely affected by luminosity or weather (e.g. fog).
3. Design, placement and availability (continued)

Table 2: Geographic range of a light (observer’s height 2m above water level)

Reference: New Zealand Nautical Almanac (LINZ)

<table>
<thead>
<tr>
<th>Height of the light above water</th>
<th>Geographic range in nautical miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>0m</td>
<td>2.9 nm</td>
</tr>
<tr>
<td>1m</td>
<td>4.9 nm</td>
</tr>
<tr>
<td>2m</td>
<td>5.7 nm</td>
</tr>
<tr>
<td>3m</td>
<td>6.4 nm</td>
</tr>
<tr>
<td>4m</td>
<td>6.9 nm</td>
</tr>
</tbody>
</table>

Figure 8 illustrates how the combination of intensity and height is used in the Special Mark indicating a hazard. The mark has a 3 nm range, is 2 metres above MHSL and flashes yellow for 0.8 seconds every 2 seconds.

Figure 8: Northport Special Mark (Fl. Y 2s 2m 3M) that indicates a hazard – two wave rider buoys close by

Using LED lights

LED lights have the advantage of a long life, provided input power and temperature are carefully controlled. However, while red and green LED lights have high luminous efficiency, white LEDs with red and green filters are not efficient. Note: LED sectored lights do not normally use filters.

3.8 High speed craft operating

International guidance recommends giving specific consideration to areas where high speed vessels operate.

This includes:

- for harbours and port approaches, lights with a multiple flash character rather than a single flash, for example, Fl (3) 15 seconds rather than Fl 15 seconds for more rapid identification
3. Design, placement and availability (continued)

- for channels without turns or bends, use synchronised lights
- considering the divergence of lights - for example, when in close proximity and when viewed from above, there may be difficulty in seeing an LED buoy light or beacon fitted with a solar panel on top
- for in channel or inter-island navigation, indirect lighting of beacons is considered particularly effective
- for coastal passages, shortening the intervals between flashing lights and increasing the flash length (i.e. to at least 1 second)
- for coastal passages and port approaches where there is AIS capability, providing meteorological and hydrological data.

Relevant IALA Guidance: Provision of aids to navigation for different classes of vessels, including high speed craft 1033

3.9 Buoyage direction – what if it is unclear?

When the identification of ‘upstream direction’ under the IALA buoyage systems is unclear, or likely to cause confusion, Cardinal Marks rather than Lateral Marks are recommended to identify navigable channels.

Lateral Marks identify the sides of the navigable waterway in relation to the direction taken by the mariner from seaward upstream – most commonly into a harbour or river mouth. This is not easily determined in inland lakes and may also be unclear in other situations.

Note: the buoyage direction used in New Zealand is clockwise around the North and South Islands and west to east through the Cook Strait.

3.10 Maintenance

Operators should have a maintenance programme in place with clear duties and scheduled checks. The programme needs to reflect the local conditions and the materials used in construction.

Maintenance can be divided into three types:

- corrective maintenance - repair or replacement to restore the system to being fully operational
- preventative maintenance - components or modules are serviced or replaced before failure
- inspections - detection of wear, component degradation and un-revealed failures.

As set out in the Port and Harbour Marine Safety Code, councils and port authorities should ensure that there is a schedule of all aids to navigation in the port and harbour area\(^1\). A category is assigned to each navigational aid according to how critical it is (see recommendations on availability in Table 3 and Appendix 2 for a checklist of monitoring and audit procedures).

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\(^1\) Refer to page 45 of the Port and Harbour Marine Safety Code
3. Design, placement and availability (continued)

3.11 Availability

IALA describes availability as the ‘probability that an aid to navigation or a system of aids to navigation, as defined by the competent authority (Maritime NZ) is performing its specified function at any randomly chosen time’. This is expressed as a percentage of total time.

Table 3: IALA Categories and availability targets

<table>
<thead>
<tr>
<th>IALA Category</th>
<th>Type of aid to navigation</th>
<th>Availability target</th>
<th>Recommended response time (note: outage notification should be made without delay)</th>
<th>Example of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td>Considered to be of primary navigational significance</td>
<td>99.8%</td>
<td>Immediately</td>
<td>Any light essential for marking landfalls, primary routes, channels, waterways, dangers or the protection of the marine environment.</td>
</tr>
<tr>
<td>Category 2</td>
<td>Considered to be of navigational significance</td>
<td>99.0%</td>
<td>24 hours</td>
<td>Lights that mark secondary routes and supplement marking of primary routes.</td>
</tr>
<tr>
<td>Category 3</td>
<td>Considered to be of necessary navigational significance</td>
<td>97.0%</td>
<td>Next working day</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Availability targets are calculated over a continuous three year period, unless otherwise specified.

Reference: Categorisation and availability objectives for short range aids to navigation IALA Recommendation 0-130

Categorising systems and individual aids to navigation

IALA recommends that the categorisation of a system of aids to navigation is independent on the rating of the individual aids within the system. Therefore, a system can be composed of various categories of aids to navigation. For example, a system rated as Category 2 could include individual aids that are rated Category 1, 2 or 3. A buoyed channel rated Category 2 may have an entrance/fairway buoy rated Category 1.

Ports and councils should agree on the categorisation of systems and individual aids to navigation for the purposes of navigational safety.

Where the availability of an individual aid to navigation consistently falls below 95.0%, operators and/or decision makers should consider discontinuing, replacing or modifying it.
4. Automatic Identification System (AIS)

Technology allows aids to navigation to be in the form of an electronic layer on a nautical chart - an Automatic Identification System (AIS) mark.

4.1 Background to AIS aids to navigation

AIS aids to navigation can be used to mark hazards or channels. They will appear as symbols on the vessel’s AIS receiver and can be displayed on a vessel’s integrated navigation system, such as ECDIS. The attributes associated with the symbols give the details of the hazards that are being marked.

There are three types of AIS aids to navigation: Real, Synthetic and Virtual AIS.

**Figure 9: Types of AIS aids to navigation on the water (Green Lateral Starboard mark as an example)**

- **Real AIS aid to navigation**
  A real AIS aid to navigation is specifically fixed to a physical mark such as a lighthouse or buoy.

- **Synthetic AIS aid to navigation**
  A synthetic AIS aid to navigation is also associated with a physical mark, but the actual AIS transmitter is in another location (the AIS station is located remotely from the mark).

- **Virtual AIS aid to navigation**
  A virtual AIS aid to navigation marks the hazard with coordinates, but there is no physical light, buoy or daymark.
4. Automatic identification system (AIS) (continued)

Every AIS aid to navigation has a Maritime Mobile Service Identity (MMSI) number.

**Examples**

MMSI: 995126027  Anchorite Rock (a virtual AIS mark)
- 99 denotes it is an AIS aid to navigation as opposed to a vessel/ship
- the next three digits are the country prefix – 512 denotes New Zealand
- 6 denotes it is a virtual AIS aid (1 would denote real or synthetic)
- The last three digits (027) are a unique individual identifier (from numbers 001 to 999) and provided by the RSM unit.

Synthetic: MMSI 995121024  Vega AIS Type 3 AtoN, Westhaven Marina, Auckland. Red port hand mark

Virtual: MMSI 995126079  AIS Type 3 AtoN, Astrolabe Reef

**Table 4: Symbols for AIS aids to navigation marks (note: photos are illustrative)**

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<thead>
<tr>
<th>Type of AIS aid to navigation</th>
<th>Symbols used</th>
<th>Electronic Navigational Chart (NZ)</th>
<th>Display on the radar screen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real or Synthetic AIS aid to navigation</strong></td>
<td><img src="image" alt="AIS Symbol" /></td>
<td>If the presence of a physical/real or synthetic AIS aid is included on an electronic chart this may occur using the attribute INFORM on the physical aid to navigation structure -for example “Owned by Maritime New Zealand; AIS AtoN, MMSI 995121024”.</td>
<td>The way physical/real or synthetic AIS aids to navigation are shown on displays varies significantly depending on the set up.</td>
</tr>
<tr>
<td><img src="image" alt="Real AIS symbol" /></td>
<td><strong>F(5)Y.20s</strong></td>
<td>Examples</td>
<td>Examples</td>
</tr>
<tr>
<td>Real AIS aid to navigation on a NIWA monitoring buoy/ Special mark</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Synthetic AIS symbol" /></td>
<td><strong>YB</strong></td>
<td>Examples</td>
<td>Examples</td>
</tr>
<tr>
<td>Synthetic AIS aid to navigation on a South Cardinal mark</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Automatic identification system (AIS) (continued)

<table>
<thead>
<tr>
<th>Type of AIS Aid to Navigation</th>
<th>On paper chart (NZ)</th>
<th>Electronic Navigational Chart (NZ)</th>
<th>Display on the radar screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual AIS aid to navigation, e.g. identifying an isolated danger</td>
<td><img src="image1" alt="V-AIS" /></td>
<td><img src="image2" alt="V-AIS" /></td>
<td>Examples</td>
</tr>
<tr>
<td>No physical mark</td>
<td>Or, if on a charted feature</td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image3" alt="Named Rock V-AIS" /></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


### 4.2 AIS approval policy

Approval is also required for AIS aids to navigation under section 200(7) of the MTA.

Factors considered when assessing an application to install an AIS aid to navigation will include:

- accuracy of information, including MMSI numbers and description
- level of risk of the area, including the traffic conditions
- possibility of establishing a physical aid to navigation, including vulnerability (when a virtual AIS aid to navigation is sought)
- navigation equipment carried on the vessels using the area
- risk of too much AIS information in a single area creating confusion
- feedback from consultation with users.

**Policy on virtual AIS aids to navigation**

Virtual aids to navigation can be effective where it is difficult to place or maintain a physical aid to navigation due to water depth, sea state or other environmental conditions.

International guidance is that virtual AIS aids to navigation:

- should only be used as a temporary mark or where a physical mark cannot be installed
- are not currently considered a viable replacement for physical ones.
If the risk to safe navigation exists for all vessels, irrespective of size, then a physical aid to navigation (buoy, daymark, light, etc.) should be the primary choice. However, if the risk to safe navigation only exists to deep draught merchant ships (expected to be carrying compliant AIS equipment) then a virtual aid to navigation may be appropriate.

Technology and availability of compliant systems will continue to develop and virtual AIS aids to navigation are expected to become more common. Maritime NZ will reconsider its policy as appropriate.

Virtual Aids to Navigation

The benefits:

- cheaper and quicker to install and move
- can be used on a temporary basis
- present no risk of physical damage
- can go in areas which can’t be reached physically because of time and/or situation.

However, a cautious approach is required because:

- not all ships can display AIS aid to navigation symbols
- some ships with AIS equipment won’t read the virtual aids to navigation. (ECDIS equipment fitted prior to 2009 will not show virtual AIS aids to navigation until equipment is upgraded or replaced)
- there is a risk that the water user ignores virtual aids to navigation information as it does not physically exist
- they are susceptible to jamming
- due to information overload, the ship crew may choose not to show the AIS data
- there is potential for loss of the AIS signal
- there have been historic problems with some AIS aids to navigation using the wrong MMSI number.

Technology and availability of compliant systems will continue to develop and virtual AIS aids to navigation are expected to become more common. Maritime NZ will reconsider its policy as appropriate.
4. **Automatic identification system (AIS) (continued)**

### Real and synthetic AIS aids to navigation

Maritime NZ will consider the following as part of the approval process:

- for real AIS aids to navigation, water users needing correct information and not being exposed to AIS data overload
- for synthetic AIS aids to navigation on floating buoys, risks that the AIS information will not match the physical position due to the influence of tide and currents
- safety implications of any plan to remove the physical aid to navigation at a later stage (the light/buoy), and rely solely on the AIS aid to navigation.

#### 4.3 Temporary use of AIS aids to navigation

Approval for AIS aids to navigation may be sought for temporary activities.

Examples include:

- temporary marking of a new hazard (e.g. a wreck)
- marking of additional routes or channels for temporary activities
- temporary research activities.

AIS aids to navigation may also be used in urgent situations (refer to section 6.2).

### 4.4 Design standards

There are three technical design types of AIS available. Types 1 and 2 may have lower costs and power consumption, however they do not ensure transmission of the AIS signal. Consequently, Maritime NZ recommends using Type 3.

Type 1 or 2 should only be used where a base station can reserve allocated slots. The reservation of a radio transmission slot – i.e. use of the FATDMA scheme - enables transmission of data from the AIS aid to navigation to be pre-configured and blocks other AIS equipment in the area from using the same slot.

### Key references

For real or synthetic AIS aids to navigation:

- IALA Guidelines 1082 *An overview of AIS*; 1084 *Authorisation of AIS AtoN, and* 1098 *The Application of AIS-AtoN on Buoys*
- IALA Recommendations: A-126 *The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services* and A-124 *The AIS Service*

For Virtual aids to navigation, the list above, plus

- IALA guideline 1081 *Provision Of Virtual Aids To Navigation* and Recommendation O-143.
5. When decisions are made by the harbourmaster

For some aids to navigation, harbourmasters have been delegated the Director’s approval power. This power is in addition to their powers to control the movement of vessels in their areas and enforce bylaws.

The geographic area of responsibility of the harbourmaster is specified by the regional council. At most it will cover all the inland waters in the region and to 12 nautical miles from the coast, or it may be limited to certain waters. The delegation from the Director may also be limited to specific areas, or have specific exclusions.

If approval of an aid to navigation is not within scope of a harbourmaster’s delegation, the application will need to be assessed and approved by Maritime NZ.

5.1 Scope of delegation to harbourmasters

With some exceptions, the ability to approve aids to navigation on behalf of the Director extends to the following:

- **5 knot speed limit signs and buoys**
  - this means installing, amending and removing aids to navigation that mark the 5 knot limit are covered by the delegation. This does not cover approval for all aids to navigation within the waters requiring a 5 knot limit.

- **marking access lanes and reserved areas** - for example, marking access to boat ramps, swimming areas and for other water-based activities

- **marking submarine pipelines, cables and overhead power lines** (excluding where the hazard is in a cable/pipeline protected area and the mark is secured to the seabed)
  - If the area is listed under the Submarine Cables and Pipelines Protection Act 1996, the application is to erect a new navigational aid, and the aid is to be secured to the seabed, this should come through Maritime NZ for approval (the delegation covers erection of a navigational aid on land to mark a protected area and maintenance or replacement of existing marks).

- **aids to navigation on jetties and other vessel landing places** (other than landing places on recognized navigational routes)
  - Commercial ports are not covered by this delegation. A port is on a recognised navigational route, which is a route providing safe sea passage and commonly used by vessels navigating within that area.

- **signs on land** that provide navigational information

- **like for like replacement** of lost or damaged aids to navigation
5. When decisions are made by the harbourmaster (continued)

- marking of new wrecks and responding to emergencies
  
  o The delegation allows harbourmasters to make decisions for the purpose of ensuring maritime safety during emergencies. For this part of the delegation, the scope of emergencies are situations which trigger the use of legislative powers, including powers of direction. Relevant legislation includes the Fire and Emergency New Zealand Act 2017, Civil Defence Emergency Management Act 2002, Hazardous Substances and New Organisms Act 1996 (HSNO Act) and Maritime Transport Act 1994.

- responding to new hazards – previously unknown or altered in character or position
  
  o Some hazards become new because they move - such as changes in channel shape or a relocation of sub-marine cables. Additionally, some changes cannot be anticipated and may require urgent action – ie a stranded object, or a wreck (noting that new wrecks are specifically identified in the delegation).

The delegation specifically excludes Cook Strait.

In some areas, decisions on marking marine farms may be delegated to harbourmasters.

Harbourmasters should refer to their delegation document to confirm the scope. Maritime NZ remains available for advice and the Director is able to withdraw the delegation if he or she is concerned about any decisions made under delegated authority.

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Powers of direction include: powers of an on-scene commander in response to a marine pollution spill (Part 23 of the MTA), a controller under the Civil Defence Emergency Management Act 2002 and an enforcement officer in a hazardous substance or new organism emergency (Part 9 of HSNO Act 1996).
5. When decisions are made by the harbourmaster (continued)

Figure 10: Aids to navigation for which harbourmasters are likely to have delegated authority from the Director

Like for like replacement

Generally, harbourmasters have delegated authority to make decisions on aids to navigation when there is no change to their character and position i.e. like for like replacement.

The replacement must have the same character (e.g. Lateral Port Mark replaced with Lateral Port Mark, with no change to the light sequence) and keep the same position (latitude and longitude).

Where there is an opportunity to improve the quality of an aid to navigation, during a replacement operation, this should be considered. If there is a proposed change to the character or placement, Maritime NZ should be consulted. As required, the Director may make the decision on the proposed change.
5. When decisions are made by the harbourmaster (continued)

When to consult Maritime NZ and/or peers

Harbourmasters holding delegations are expected to assess the circumstances and seek help or advice from Maritime NZ and other harbourmasters when:

- SOLAS ships are involved
- it is a nationally significant event
- local capacity is insufficient
- there are unusual circumstances, or
- they are in any doubt as to the best course of action.

Notifying LINZ and Maritime NZ

Once a navigational aid (or group of navigational aids) has been erected, placed, altered or removed the Hydrographic Authority in Land Information New Zealand (LINZ) needs to be informed as soon as practicable. Maritime NZ should be copied into any notification given to LINZ. See section 7 for more information.
6. New hazards and emergencies

Aids to navigation can be used to address hazards such as new wrecks. Urgent action to erect, alter or remove aids to navigation may also be required because of occurrences such as loss of an aid to navigation in a storm or change in a hazard.

During an emergency, or to prevent an emergency, action may be required to restrict access to parts of the sea and/or to direct vessels. This may include using aids to navigation.

This section outlines factors to consider when using aids to navigation in emergencies and marking of new hazards generally.

Local harbourmasters have important roles in emergencies. Anyone seeking to urgently remove, or put in place, an aid to navigation should contact their local harbourmaster in the first instance (also refer to the section on delegations).

6.1 Marking new dangers – including wrecks

IALA recommends that until information is sufficiently promulgated, or the danger is resolved, new hazards should be indicated by:

- appropriate marks such as Lateral, Cardinal, Isolated Danger Marks, or
- an Emergency wreck marking buoy.

New dangers may also be marked by a RACON with Morse code ‘D’.

It is expected that Maritime NZ and/or the relevant harbourmaster will immediately promulgate Maritime Safety Information (MSI) through all appropriate means.

Initial marking of a wreck

There is specific international guidance on marking wrecks.

- A new wreck location should be marked as soon as practical.
- If an Emergency Wreck Marking Buoy is available, it should be placed as close to the wreck as possible and within any other marks deployed.
- The Emergency Wreck Marking Buoy has blue and yellow vertical stripes. It is fitted with an occulting, alternating blue and yellow light with a phase sequence of three seconds.

These buoys are designed specifically for new, dangerous wrecks and to have ‘high impact recognition’ for the water user.

3 See harbourmaster powers set out in section 33F of the MTA, particularly subsections 33F(1)(c)-(f) & (j)
6. New Hazards and Emergencies (continued)

Figure 11: Emergency Wreck Marking Buoys: NZ example (left) suitable for inshore conditions (2m above waterline) and overseas example (right)

An appropriate risk assessment should be undertaken to determine how long the Emergency Wreck Marking Buoy should stay deployed, but it should stay in position at least until:

- the wreck is well known and has been advertised in nautical publications
- the danger has been addressed, or
- the wreck has been fully surveyed, details (position and swept clearance above the wreck) are known and the wreck has been permanently marked.

For drifting wrecks, the situation will need to be continuously assessed and maritime safety information updated accordingly.


6.2 Use of virtual AIS

In an emergency, the Maritime Incident Response Team (MIRT) are likely to be involved in any decision to deploy a virtual AIS aid to navigation, particularly as they target SOLAS ships. After the immediate notification of the position of the hazard, the deployment of any AIS aid to navigation could then occur in a measured way.

Use of virtual AIS aids to navigation may be sought for:

- marking a new hazard that only affects ships that are expected to carry AIS equipment
- rapid deployment of a navigational aid prior to the installation of a physical aid to navigation e.g. marking a wreck
6. New Hazards and Emergencies (continued)

- marking the position of a physical aid to navigation that has been lost.

\[=\] symbol on ship displays, marking a wreck with a virtual AIS aid to navigation

In preparation, Maritime NZ may provide for harbourmasters to hold an AIS aid to navigation (with MMSI number) in reserve for the purpose of rapid deployment in urgent situations. The decision to deploy must be made by a suitably qualified person and LINZ and Maritime NZ must be informed as soon as practicable.

6.3 Continuously changing hazards

Urgent action may be required to respond to a hazard that has moved. In other circumstances, changes can be planned for.

It is recommended that:

- hazards that move and affect navigation should be identified in harbour safety management systems and routinely checked

- placement of aids to navigation should consider the likely movement of a hazard and provide a buffer covering the potential area affected by the hazard

- means to warn water users of changes in known hazards are explored (e.g. using distinctive light features such as the flashing blue light signalling that the bar over the Grey River mouth is dangerous due to changing conditions).

Notices to Mariners are assumed to be an important form of notification.

6.4 Responsibility for urgent action on aids to navigation

There is no legislative delineation of geographic responsibilities between harbourmasters and Maritime NZ in regard to aids to navigation⁴.

There is some variation in practice around New Zealand. It is common for Maritime NZ to take responsibility for maintaining coastal navigational aids, including some historic lighthouses.

Harbourmasters (employed by regional councils) commonly take responsibility for navigational issues near the coast, in harbours and in inland waters.

For each region there should be agreement and a plan outlining responsibilities, based on potential emergency scenarios and available resources.

⁴ Note: this statement is not meant to refer to the legislative approval process. It is about who takes the lead in an urgent situation. Also the focus is regional council areas – so within 12 nautical miles of the coast. See also section 1.1 on roles and responsibilities.
6. New Hazards and Emergencies (continued)

Agreeing responsibilities

It is strongly recommended that geographic division of responsibility, particularly on the boundaries of harbours, is clearly assigned. Having agreed roles in regard to responding to events, as well as ownership, management and repair of aids to navigation is important. This may include delegations and roles of contractors, as appropriate.

Matters that should be planned for, if they are relevant to the region include:

• outages of aids to navigation, including physical damage and power failure
• setting up reserve areas and exclusion zones
• the potential impact on facilities and aids to navigation of earthquakes and tsunami
• vessel incidents in different areas
• events in another region that may have a significant impact on vessel traffic – type and volume
• business continuity for the operation of the harbourmaster.

Where to describe responsibilities

Information on responsibilities may be described, as appropriate, in:

• safety management systems (including procedure manuals) for ports and harbours
• organisational business continuity plans
• Regional CDEM Plans produced under the Civil Defence Emergency Management Act 2002
• resource consent conditions (under the RMA)
• council quality procedure manuals.

6.5 Notification and consultation

When urgent action is required to remove, alter or place an aid to navigation, the decision maker, either the harbourmaster or Maritime NZ, should inform the other affected party as soon as practicable (i.e. the harbourmaster needs to inform Maritime NZ and vice versa).

Operators or owners of facilities (marinas, ports, marine farms, offshore platforms etc.) may also take urgent action in regard to aids to navigation. As noted above, it is good practice for arrangements with facility owners during emergencies to be agreed beforehand.

Such action by facility owners would need to be consistent with the decision making powers of the harbourmaster or Maritime NZ, as appropriate.
7. Informing the New Zealand Hydrographic Authority

It is important that the position and characteristics of aids to navigation relevant to the production of nautical charts are provided to the New Zealand Hydrographic Authority in LINZ.

This allows marks to be appropriately placed on nautical charts, in the Nautical Almanac and in Notices to Mariners, with the correct attribution.

The Nautical Almanac provides a list of aids to navigation that are fixed in place and have lights. This does not generally include lights associated with buoys, unless they are particularly significant.

7.1 Information required by LINZ

The decision maker must provide the following information to LINZ once the aid to navigation is installed or altered/removed if it already exists.

- The name of the responsible owner of the aid to navigation, or group of aids - for example, marking a structure like a marine farm
- Contact details for the owner - address, phone, mobile, email – and operator contact details if different from the owner
- Marking, location and extent of structures associated with the aid to navigation
- Name of aid to navigation
  Typically this is the charted name: e.g. “Anchorite Rock” - a name less than 20 characters is recommended. Characters should be kept to a minimum as they add clutter when viewed on electronic displays (note that a Minimum Keyboard and Display (MKD) available to the mariner on the bridge can only display 20 characters).
- Full details of the nature and type of aid to navigation
  a) Buoyage type
    i) Light/buoy/fixed structure (relevant for all except virtual AIS aids to navigation)
    ii) Descriptions such as ‘navigation mark’, ‘North Cardinal’, ‘Isolated Danger’, ‘Special’ etc. for both physical aids and AIS aids (Refer Appendix 4)
  b) Description – height, width, shape, topmark, colour (relevant for all except virtual AIS aids to navigation)
  c) Light character (if relevant)
  d) Position (latitude and longitude) - recorded to three decimal places of a minute
    i) the type of position fixing device (GPS, surveyed, Galileo etc. Refer IALA Guideline 1084 Procedure for the Authorisation of AIS AtoN)
7. **Informing the New Zealand Hydrographic Authority (continued)**

e) elevation (if not floating) and in metres above mean high water – or Datum
f) range (nm).

For AIS aids to navigation information required in the Message 21 is:

a) The MMSI number used for national and international identification (refer to section 4 on AIS)
b) Whether it is real, synthetic or virtual
c) The AIS elevation – relevant for base stations and real AIS (synthetic and virtual AIS aids to navigation utilise the base station elevation)
d) Any additional messaging from real AIS aids to navigation or the base station:
   i) Message 6 (for monitoring the aid to navigation)
   ii) Message 8 (for meteorological and hydrological data)
   iii) Messages 12 or 14 (safety related messages – e.g. to warn of aid to navigation malfunctioning)

For content of messages 12 and 14 – refer IALA Recommendation A-126 The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services.

e) AIS Type (1, 2 or 3) – Maritime NZ recommends Type 3 as this typically works autonomously using RATDMA and does not require a base station to reserve a slot.

7.2 **Information not required by LINZ**

In some situations marks and aids to navigation are not charted and are of no interest to LINZ. Table 5 explains LINZ’s interest in matters which may not be charted.

> If in doubt, send the information to LINZ.

<table>
<thead>
<tr>
<th>Matter</th>
<th>Level of interest</th>
<th>Information/details sought by LINZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 knot speed restrictions marks (Commonly 5 knot buoys and signs on adjoining land)</td>
<td>No interest - not charted</td>
<td>Nil</td>
</tr>
</tbody>
</table>
### 7. Informing the New Zealand Hydrographic Authority (continued)

<table>
<thead>
<tr>
<th>Matter</th>
<th>Level of interest</th>
<th>Information/details sought by LINZ</th>
</tr>
</thead>
</table>
| **Reserve areas** Marking areas for certain activities, e.g. water-skiing, access, swimming. | Interested – but decision as to whether it is charted dependant on circumstances.  
No interest in anything set up for less than 6 weeks.  
Anything over 6 months is considered permanent. | Extent of reserve area.  
Reason for the reserve (if applicable).  
Associated light character and position. | **Buoys used to mark water events** e.g. start and racing buoys. | Only interested if permanent.  
Temporary buoys (in place for less than six months) are not charted.  
Expectation is that temporary/seasonal buoys approved by harbormaster. | For permanently installed buoys - standard information required (i.e. character and position).  
Note any buoys in SCAPPA areas require approval from Maritime NZ and LINZ would be informed. | **Marine farms** | High interest in the extent of marine farms.  
Where there are a group of adjacent farms interest is in the total extent not individual farm boundaries.  
No interest in non-lit marks.  
If the actual position cannot be accurately charted a note is put on the chart noting “marine farms in the area”. | Maximum extent of the areas consented for marine farms.  
Positions of Cardinal, Special or other IALA Maritime Buoyage System lights, marking the extent. | **Monitoring buoys** e.g. waverider, water quality and marine mammal monitoring | Interested, but response (e.g. whether notice to mariner sent out) depends on the site and associated risk to navigational safety.  
Temporary buoys (in place for less than six months) are not charted. | Information on buoy character, position and planned timeframes. | **Other information signs on land** e.g. marking overhead lines or undersea cables | High interest in the position of the hazard – e.g. the cables – as they are charted.  
No interest in the information signs – e.g. “Power Line crossing on this waterway” | Position of the hazard and the significant signage – e.g. the large white triangles marking land point of the cable. | **Mooring buoys** | No interest - not considered aids to navigation. | Nil |
7. Informing the New Zealand Hydrographic Authority (continued)

Some geographic areas are not currently charted

In those cases (e.g. Lake Wanaka and Lake Dunstan), the Hydrographic Authority is not currently collecting information. Contact the Hydrographic Authority if you do not know whether an area is charted.

Why does the scale of the chart matter?

Some aids to navigation are not charted due to the scale of the relevant chart. The Hydrographic Authority will, however, still hold the information on aids to navigation in reserve, so that it is available if a larger scale chart is produced in the future.

Contact details for LINZ

The email address is:

ntm@linz.govt.nz
8. When and how to apply

Maritime NZ and harbourmasters both have roles in the approval process due to delegations of the Director’s power to approve aids to navigation. Marine facility owners and private individuals/organisations should contact their local harbourmasters in the first instance. Where Maritime New Zealand is responsible for the approval, information on the application process and fees is available on the Maritime NZ website.

**Note that other legal requirements or processes may apply**

Depending on the circumstances, other legal requirements or processes may be required prior to installing, altering or removing aids to navigation. In addition to approvals under section 200(7) of the MTA, applicants may need:

- permission from the land owner
- resource consent under the RMA
- consent under the Building Act 2004
- Department of Conservation permits (if in particular areas)
- Iwi approval, for example where there are interests in coastal and inland waters
- to be compliant with the Submarine Cables and Pipelines Protection Act 1996
- to meet other conditions under local bylaws.

It is recommended that you check with your local council to confirm relevant matters.
9. Contacts

**Maritime NZ**

If you need more information about aids to navigation, visit the following section of our website.

maritimenz.govt.nz/commercial/safety

If you can’t find the information you need, send us an email:

enquiries@maritimenz.govt.nz

Tell us what you need help with and remember to include your contact details (email address and phone numbers).

**Harbourmasters**

Local harbourmasters are contactable through the relevant council.

**The New Zealand Hydrographic Authority (LINZ)**

The email address is:

ntm@linz.govt.nz
Appendix 1: Definitions and acronyms:

Aid to Navigation (AtoN) - means any mark, sign, device or system external to vessels that is designed and operated to enhance the safe and efficient navigation of vessels and/or vessel traffic. The MTA uses the term ‘navigational aid’ which in effect has the same meaning – see below. In this document the international term ‘aids to navigation’ or AtoN is used unless quoting the Act directly.

<table>
<thead>
<tr>
<th>Maritime Transport Act 1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>navigational aid (term not used in this document) includes—</td>
</tr>
<tr>
<td>(a) any lightship and any floating or other light exhibited for the guidance of ships:</td>
</tr>
<tr>
<td>(b) any description of a fog signal not carried on a ship:</td>
</tr>
<tr>
<td>(c) all marks and signs in aid of marine navigation:</td>
</tr>
<tr>
<td>(d) any electronic, radio, or other aid to marine navigation not carried on board any ship</td>
</tr>
</tbody>
</table>

And ship means every description of boat or craft used in navigation, whether or not it has any means of propulsion; and includes—

| (a) a barge, lighter, or other like vessel: |
| (b) a hovercraft or other thing deriving full or partial support in the atmosphere from the reaction of air against the surface of the water over which it operates: |
| (c) a submarine or other submersible |

AIS Aids to Navigation - Automatic Identification System

- **Real AIS aid to navigation** is attached to a physical mark such as a lighthouse or buoy.
- **Synthetic AIS aid to navigation** is also associated with a physical mark, but the actual AIS transmitter is in another location.
- **Virtual AIS aid to navigation** marks the hazard with the hazard’s coordinates, but there is no physical light, buoy or daymark.

Buoy - A buoy is a floating aid to navigation, although the term can also refer to other floating devices that are not used for navigation – e.g. a mooring buoy

Buoyage System A - the form of international marks (colour and shape). See discussion in section 2.1.

Cardinal Mark – an aid to navigation, four quadrant marks (north, east, south and west) that indicates the mariner should pass to the named side of the mark (e.g. pass north of a North Mark) For the internationally agreed design standards refer to IALA Daymarks For Aids To Navigation 1094, Rhythmic characters of lights on aids to navigation E-110, and Maritime NZ’s publication New Zealand’s System of Buoys and Beacons.

Director – Director of Maritime New Zealand

ENC - Electronic Navigation Chart

ECDIS - Electronic Chart Display and Information Systems
Appendix 1: Definitions and acronyms (continued)

FATDMA - Fixed Access Time Division Multiple Access - a commercial system with a manually managed access scheme in which AIS devices are pre-configured to use specific time division multiple access slots for all transmissions

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

Isolated Danger Mark - an aid to navigation marking a small area of danger that has navigable water all around it. For the internationally agreed design standards refer to IALA Daymarks For Aids To Navigation 1094, Rhythmic characters of lights on aids to navigation E-110, and Maritime NZ’s publication New Zealand’s System of Buoys and Beacons.

Lateral Mark – an aid to navigation marking port and starboard sides of a navigable channel. For the internationally agreed design standards refer to IALA Daymarks For Aids To Navigation 1094, Rhythmic characters of lights on aids to navigation E-110, and Maritime NZ’s publication New Zealand’s System of Buoys and Beacons.

LINZ - Land Information New Zealand (which incorporates the New Zealand Hydrographic Authority)

Luminous range – maximum distance at which a given light signal can be seen by the eye of the observer at a given time, as determined by the meteorological visibility prevailing at that time. It does not take into account the height of the light, observer’s height of eye, or curvature of the earth.

Marine farm – all that part of the consented area that is being or has been developed into a farm for the farming of living resources of the sea; and includes all structures, whether floating or submerged, associated equipment, rafts used in the area in connection with the farm, and all boundary markings.

Maritime NZ – Maritime New Zealand

Marine Facility Operator – refers to ‘a person (including a local authority) who operates a port, cargo terminal, marina, jetty, marine farm, or other maritime facility (an operator) (section 200(2) of the MTA)


MCDEM – Ministry of Civil Defence and Emergency Management

MMSI - Maritime Mobile Service Identity

MTA – Maritime Transport Act 1994

nm - nautical mile (equals 1.852 km or 1.15 land miles)

Nominal range – the luminous range when the meteorological visibility is 10 nautical miles, which is equivalent to a transmission factor of T = 0.74. Nominal range is generally the figure used in official documentation such as nautical charts, lists of lights, etc. Nominal range assumes that the light is observed against a dark background, free of background lighting.

Occulting – an occulting light is one in which the total duration of light in each period is clearly longer than the total duration of darkness (intervals of darkness are occultations)

ODAS buoy – Ocean Data Acquisition Systems buoy - means a buoy intended for the collection of data on properties of the ocean. It may be moored or free-floating. IALA does not class them as an aid to navigation. They are classed as Special Mark/buoys.
**Appendix 1: Definitions and acronyms (continued)**

**Port** - where it is used in the context of the MTA it means (as defined in section 2 of the Act):
(a) an area of land and water intended or designed to be used either wholly or partly for the berthing, departure, movement, and servicing of ships; and
(b) includes any place in or at which ships can or do—
(i) load or unload goods
(ii) embark or disembark passengers; and
(c) also includes a harbour [be it natural or artificial].


**RACON** – (RAdar beaCON) means a device (transmitter-receiver) associated with a fixed aid to navigation which, when triggered by a radar, automatically returns a distinctive signal which can appear on the display of the triggering radar providing range, bearing and identification information.

**Radar reflector** – a device designed to reflect radar energy from incoming radar (ie from a vessel) so that its position shows up as a larger and more consistent “target” (more accurately called a radar target enhancer).

**RATDMA** – Random Access Time Division Multiple Access. These are used for certain types of data transmission and AIS types when a station needs to allocate a slot which has not been pre-announced. Rather than having a fixed slot (under FATDMA) a station transmitting using RATDMA uses its internal ‘slot map’ to randomly select a slot that is not currently in use by another station. It does not announce use of this slot, or subsequent slots used for non-periodic transmissions.

**RMA** – Resource Management Act 1991

**RSM** – Radio Spectrum Management - unit of the Ministry of Business Innovation and Employment

**Safe Water Mark** – an aid to navigation marking an area which has navigable water all around it but does not mark a danger. For the internationally agreed design standards refer to IALA Daymarks For Aids To Navigation 1094, Rhythmic characters of lights on aids to navigation E-110, and Maritime NZ’s publication New Zealand’s System of Buoys and Beacons.

**SOLAS** – the International Convention for the Safety of Life at Sea

**SCAPPA** - Submarine Cables and Pipelines Protection Act 1996

**Special Mark** – an aid to navigation indicating a special area or feature. It is yellow and its topmark is an “X”. For the internationally agreed design standards refer to IALA Daymarks For Aids To Navigation 1094, Rhythmic characters of lights on aids to navigation E-110, and Maritime NZ’ publication New Zealand’s System of Buoys and Beacons.

**Topmark** - one or more relatively small objects of characteristic shape or colour (or both), placed on top of a navigation mark/buoy to identify it. It may be simple e.g. a cone or St George Cross or composite (made up of more than one topmark)

**Virtual AIS aid to navigation** – see ‘AIS’
Appendix 2: Navigation safety checklist

Navigation related matters should be considered in the context of a risk assessment. The below list is designed as a check list for those applying for, or approving, aids to navigation.

Local conditions to consider

1. Navigational routes and vessel traffic
   
   *Is there international and/or local traffic?*
   
   *Consider routes used by commercial vessels to and from ports, but also pleasure craft routes normally used to navigate between popular destinations.*

2. Water depth, tides, currents and seabed composition

3. Headlands – commonly used for navigation

4. Prevailing weather, sea state & swell conditions

5. Safe havens and recognised or recommended anchorages
   
   *A recognised anchorage is one that is referred to in a cruising guide, pilot book or similar publications as being suitable shelter for small/larger craft in adverse weather. A recommended anchorage is an anchorage marked on a nautical chart.*

6. Narrow channels
   
   *For example, structures such as marine farms should keep clear of narrow channels, navigational bottlenecks and port approaches*

7. Seasonal activity

Choosing and installing

The process of designing a buoy involves thinking about its whole life.

1. Operational requirements– what and who is it for?
   
   *Any seasonal changes in location?*

2. Power needs and power source, if relevant

3. Design standards – check latest standards as appropriate for wind loading, aluminium, steel, concrete, electrical installations and lightning protection

4. Maintenance requirements (including type and capabilities of vessels that will service the buoy)

5. Deployment and recovery techniques

6. Protecting any equipment from damage

7. Providing the ability to rectify faults without having to lift the buoy

8. Determining the buoy response to the wave, wind and current conditions at the site(s)

9. Effective anchorage / mooring

10. Swing radius

11. Means of installing and removal
Appendix 2: Navigation safety check list (continued)

Monitoring and audit

Relevant IAIA Guidance: Maintenance of Aids to Navigation 1077

The IALA guidance covers maintenance issues for a wide range of aids to navigation, examples of maintenance schedules, and good practice suggestions.

Items to check include, but are not limited to:

- the colour of marks (both natural colours and reflective material), which can be reduced by exposure to the sun, mechanical abrasion, bird droppings and algae growth – check visibility of colour and the level of reflection with a light after dark
- structural integrity, including any topmarks
- any change in the associated hazard as well as the aid to navigation
- that the documentation remains accurate – look at Nautical Almanac and charts – for description and position
- functionality of power sources – if applicable – as part of the maintenance schedule
- for AIS aids to navigation, the accuracy of messages in the set-up and power sources (including back-ups)
- keep records of visits and inspections, including conditions at the time – picture records are good
- record outages and repairs.
## Appendix 3: Rhythmic characters of lights

*Source: Table 3 in Rhythmic characters of lights on aids to navigation IALA E-110 (2016)*

<table>
<thead>
<tr>
<th>Mark</th>
<th>Rhythmic character of the light</th>
<th>Remarks and further recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral</td>
<td>All recommended classes of rhythmic character(^5), except for a composite group flashing light with a group of ((2+1)) flashes is solely assigned to modified lateral marks that indicate preferred channels.</td>
<td>Only red and green are used.</td>
</tr>
<tr>
<td>Cardinal</td>
<td>-</td>
<td>Only white is used.</td>
</tr>
<tr>
<td>North Cardinal</td>
<td>(a) Continuous very quick light.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Continuous quick light.</td>
<td></td>
</tr>
<tr>
<td>East Cardinal</td>
<td>(a) Group very quick light with a group of three flashes, in a period of 5 s.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Group quick light with a group of three flashes, in a period of 10 s.</td>
<td></td>
</tr>
<tr>
<td>South Cardinal</td>
<td>(a) Group very quick light with a group of six flashes followed by a long flash of not less than 2 s duration, in a period of 10 s.</td>
<td>The duration of the eclipse immediately preceding a long flash should be equal to the duration of the eclipses between the flashes at the very quick rate.</td>
</tr>
<tr>
<td></td>
<td>(b) Group quick light with a group of six flashes followed by a long flash of not less than 2 s duration, in a period of 15 s.</td>
<td>The duration of a long flash should not be greater than the duration of the eclipse immediately following the long flash.</td>
</tr>
<tr>
<td>West Cardinal</td>
<td>(a) Group very quick light with a group of nine flashes, in a period of 10 s.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Group quick light with a group of nine flashes, in a period of 15 s.</td>
<td></td>
</tr>
</tbody>
</table>

\(^5\) A single fixed light must not be used on a mark within the scope of the IALA Maritime Buoyage System because it may not be recognised as an aid to navigation light.
## Appendix 3: Rhythmic characters of lights (continued)

<table>
<thead>
<tr>
<th>Mark</th>
<th>Rhythmic Character of the Light</th>
<th>Remarks and Further Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated Danger</td>
<td>(a) Group flashing light with a group of two flashes, in a period of 5 s.</td>
<td>Only white is used.</td>
</tr>
<tr>
<td></td>
<td>(b) Group flashing light with a group of two flashes, in a period of 10 s.</td>
<td>The duration of a flash together with the duration of the eclipse within the group should be not less than 1 s and not more than 1.5 s.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The duration of a flash together with the duration of the eclipse within the group should be not less than 2 s and not more than 3 s.</td>
</tr>
<tr>
<td>Safe Water</td>
<td>(a) Long flashing light with a period of 10 s.</td>
<td>Only white is used.</td>
</tr>
<tr>
<td></td>
<td>(b) Isophase light.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Single occulting light.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) Morse Code light with the single character “A”.</td>
<td></td>
</tr>
<tr>
<td>Special</td>
<td>(a) Group occulting light.</td>
<td>Only yellow is used.</td>
</tr>
<tr>
<td></td>
<td>(b) Single flashing light, but not a long flashing light with a period of 10 s.</td>
<td>A group flashing light with five flashes at a rate of 30 flashes per minute, in a period of 20 s is assigned to Ocean Data Acquisition Systems (ODAS) buoys.</td>
</tr>
<tr>
<td></td>
<td>(c) Group flashing light with a group of four, five or (exceptionally) six flashes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) Composite group flashing light.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(e) Morse Code light, but not with either of the single characters “A” or “U”.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 4: IALA codes and descriptions for AIS message 21

Source: Table 3 from IALA Recommendation A-126 The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services Edition 1.5 June 2011

Note: Where the AIS aid to navigation is virtual utilise codes 1 or 20-30 (or 4 if held in reserve)

<table>
<thead>
<tr>
<th>Type</th>
<th>IALA Codes</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Default</td>
<td>Type of AtoN not specified</td>
</tr>
<tr>
<td>1</td>
<td>Reference</td>
<td>Reference point</td>
</tr>
<tr>
<td>2</td>
<td>RACON</td>
<td>RACON</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Fixed structure off shore, such as oil platforms (this code should identify an obstruction that is fitted with an aid-to-navigation AIS station).</td>
</tr>
<tr>
<td>4</td>
<td>Spare</td>
<td>Spare, reserved for future use.</td>
</tr>
<tr>
<td>Fixed AtoN</td>
<td>5</td>
<td>Light, without sectors</td>
</tr>
<tr>
<td>6</td>
<td>Light</td>
<td>Light, with sectors</td>
</tr>
<tr>
<td>7</td>
<td>Leading</td>
<td>Leading Light Front</td>
</tr>
<tr>
<td>8</td>
<td>Leading</td>
<td>Leading Light Rear</td>
</tr>
<tr>
<td>9</td>
<td>Beacon</td>
<td>Beacon, Cardinal N</td>
</tr>
<tr>
<td>10</td>
<td>Beacon</td>
<td>Beacon, Cardinal E</td>
</tr>
<tr>
<td>11</td>
<td>Beacon</td>
<td>Beacon, Cardinal S</td>
</tr>
<tr>
<td>12</td>
<td>Beacon</td>
<td>Beacon, Cardinal W</td>
</tr>
<tr>
<td>13</td>
<td>Beacon</td>
<td>Beacon, Port hand</td>
</tr>
<tr>
<td>14</td>
<td>Beacon</td>
<td>Beacon, Starboard hand</td>
</tr>
<tr>
<td>15</td>
<td>Beacon</td>
<td>Beacon, Preferred Channel port hand</td>
</tr>
<tr>
<td>16</td>
<td>Beacon</td>
<td>Beacon, Preferred Channel starboard hand</td>
</tr>
<tr>
<td>17</td>
<td>Beacon</td>
<td>Beacon, Isolated Danger</td>
</tr>
<tr>
<td>18</td>
<td>Beacon</td>
<td>Beacon, Safe Water</td>
</tr>
<tr>
<td>19</td>
<td>Beacon</td>
<td>Beacon, Special Mark</td>
</tr>
<tr>
<td>Floating AtoN</td>
<td>20</td>
<td>Cardinal Mark N</td>
</tr>
<tr>
<td>21</td>
<td>Cardinal</td>
<td>Cardinal Mark E</td>
</tr>
<tr>
<td>22</td>
<td>Cardinal</td>
<td>Cardinal Mark S</td>
</tr>
<tr>
<td>23</td>
<td>Cardinal</td>
<td>Cardinal Mark W</td>
</tr>
<tr>
<td>24</td>
<td>Port hand</td>
<td>Port hand Mark</td>
</tr>
<tr>
<td>25</td>
<td>Starboard</td>
<td>Starboard hand Mark</td>
</tr>
<tr>
<td>26</td>
<td>Preferred</td>
<td>Preferred Channel Port hand</td>
</tr>
<tr>
<td>27</td>
<td>Preferred</td>
<td>Preferred Channel Starboard hand</td>
</tr>
<tr>
<td>28</td>
<td>Isolated</td>
<td>Isolated Danger</td>
</tr>
<tr>
<td>29</td>
<td>Safe</td>
<td>Safe Water</td>
</tr>
<tr>
<td>30</td>
<td>Special</td>
<td>Special Mark</td>
</tr>
<tr>
<td>31</td>
<td>Light</td>
<td>Light Vessel / LANBY/ Rigs</td>
</tr>
</tbody>
</table>
Appendix 5: References

Note: Hyperlinks are underlined


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An overview of AIS IALA Guideline 1082 (Revised June 2016)

Authorisation of AIS AtoN IALA Guideline 1084 (Edition 1.0 June 2011)

Categorisation and Availability Objectives for Short Range Aids to Navigation. IALA Recommendation R0130 (O-130), (Revised June 2017)

Civil Defence Emergency Management Act 2002

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Policy on use of AIS Aids to Navigation, International Maritime Organization MSC Circ. 1473 (May 2014)


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Appendix 5: References (continued)

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