

NEW ZEALAND'S  
SYSTEM OF  
**BUOYS AND  
BEACONS**



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# CONTENTS

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|           |   |
|-----------|---|
| <b>3</b>  | Introduction                                    |
| <b>4</b>  | System of Buoyage and Beaconage                 |
| <b>5</b>  | Description of System                           |
| <b>6</b>  | Rules for Marks                                 |
| <b>7</b>  | Lateral Marks                                   |
| <b>9</b>  | Cardinal Marks                                  |
| <b>12</b> | Isolated Danger Marks                           |
| <b>13</b> | Safe Water Marks                                |
| <b>14</b> | Special Marks                                   |
| <b>15</b> | New Dangers                                     |
| <b>16</b> | Miscellaneous                                   |
| <b>17</b> | Offshore Oil/Gas Rigs and Platforms             |
| <b>18</b> | Marine Farms                                    |
| <b>18</b> | Reflective Strips                               |
| <b>19</b> | Oceanographic Stations                          |
| <b>20</b> | Standard Submarine Cable/Pipeline Marker Beacon |
| <b>21</b> | Bridges and Overhead Power Lines                |
| <b>22</b> | Overhead Power Lines                            |
| <b>22</b> | Safe Clearance Signs                            |
| <b>23</b> | Safe Clearance Diagram                          |
| <b>24</b> | Light Characteristics                           |



# *INTRODUCTION*

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This book explains the buoyage and beaconage system in New Zealand waters. It describes the recommended requirements for aids to navigation in harbours and their approach channels, methods of marking and lighting, and also describes the requirements for oceanographic stations that may be established around our seaboard. Details of standard markings for Marine Farms, Offshore Isolated Dangers, Oil Rigs and other miscellaneous markings are also included.

All members of the maritime community should find this book useful, particularly mariners, Regional Councils, Port Companies, and those studying for nautical examinations.

# SYSTEM OF BUOYAGE AND BEACONAGE

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The waters of New Zealand and adjacent islands are marked for safe navigation using the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) System 'A' Maritime Buoyage System.

This system uses Marks which have a variety of colours, shapes and light characteristics arranged in simple ways to show the side on which a buoy or beacon should be passed when heading in a given direction, indicated on the appropriate chart.

In addition to this system, many unlighted buoys and beacons have reflective marking strips to aid visibility at night.

Within the IALA Buoyage System there are five types of Marks which may be used in combination, and they can be told apart by their shapes.

4

*The five basic shapes are:*

- **Can** (cylindrical)
- **Conical**
- **Spherical**
- **Pillar**
- **Spar**

In the case of **can**, **conical** and **spherical buoys**, their shape indicates the correct side to pass. **Pillar** and **spar** should still have Top Marks and colour in System A. The **pillar** and **spar** buoys' shape does not indicate the side of passage although they should be the appropriate colour and have the correct shaped Top Mark. A **pillar** is a buoy that is smaller than a **Lanby** and has a tall central structure on a broad base. Pillars include beacon buoys, high focal plane buoys and others (except spar buoys) with body shapes that do not indicate the correct side to pass.

A **Lanby** is a large navigation buoy which has a mast on top carrying a light and other aids to navigation, at a height not less than 5 metres (16 feet) above the level of the water.

# DESCRIPTION OF SYSTEM

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## Lateral Marks

In New Zealand, Lateral Marks use red and green colours at night and during the day to define the port and starboard sides of channels respectively, when read in conjunction with the “Buoyage Direction” indicated on the appropriate chart.

Modified Lateral Marks are sometimes used to show where a channel divides, and to indicate the preferred channel or primary route.

## Cardinal Marks

Cardinal Marks indicate that the deepest water in the area lies to the named side of the Mark. This convention is necessary even though, for example, a North Mark may have navigable water not only to the north but also east and west of it. The mariner will be safe to the north, but must consult the relevant chart for further guidance.

## Isolated Danger Mark

The Isolated Danger Mark identifies a small area of danger which has navigable water all around it.

## Safe Water Marks

The Safe Water Mark identifies an area which has navigable water all around it but does not mark a danger. Safe Water Marks can be used, for example, as mid-channel or landfall Marks.

## Special Marks

Special Marks are used to indicate a special area or feature, the nature of which may be identified on a chart or in another nautical document.

## New Dangers

A “new danger” is one that is not yet shown in nautical documents. It may be indicated by exactly duplicating the normal Mark until the information is widely known. A New Danger Mark may carry a **Racon** coded Morse D “ — •• ”.

# RULES FOR MARKS

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New Zealand's system of buoyage and beaconage provides general rules which apply to all fixed and floating Marks other than lighthouses, sector lights, leading lights and marks, lightships and large navigational buoys.

The system indicates:

- the lateral limits of navigational channels,
- natural dangers and other obstructions such as wrecks,
- other areas or features of importance to the mariner, or
- new dangers.

## Types of Marks

The system of buoyage has five types of Marks that may be used in different combinations. They are:

- Lateral
- Cardinal
- Isolated Danger
- Safe Water
- Special

## How to Identify What a Mark Means

The meaning of a mark depends on its:

*By day:*

- Colour
- Shape
- Top Mark

*By night:*

- Colour
- Rhythm of light



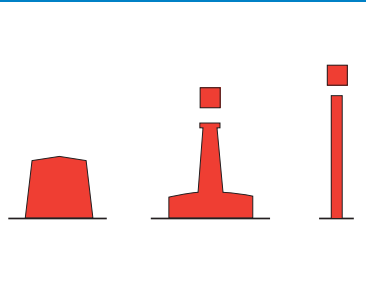
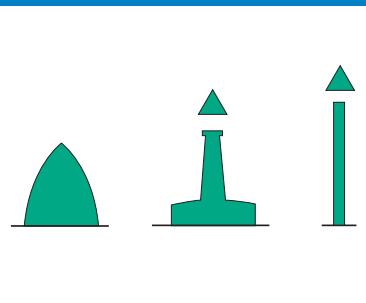
# LATERAL MARKS

## Identifying the Conventional Direction of Buoyage

The conventional direction of buoyage, which is indicated on charts or in other appropriate nautical documents, is either:

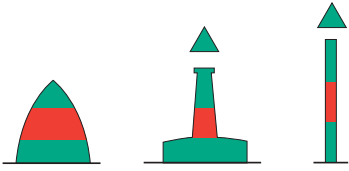
- the general direction taken by the mariner when approaching a harbour, river, estuary or other waterway from seaward, or
- the direction determined by Maritime New Zealand.

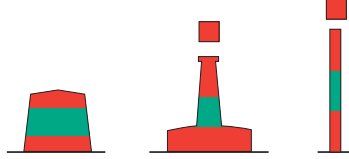
## Lateral Marks

| PORT HAND MARKS   |   |
|---|---|
| <p><b>Colour:</b><br/>Red</p> <p><b>Shape</b> (buoys):<br/>Cylindrical (can), pillar or spar</p> <p><b>Top Mark</b> (if any):<br/>Single red cylinder (can)</p> <p><b>Light</b> (when fitted)<br/><b>Colour:</b><br/>Red</p> <p><b>Rhythm:</b><br/>Any, other than composite group flashing</p> |    |
| STARBOARD HAND MARKS  |   |
| <p><b>Colour:</b><br/>Green</p> <p><b>Shape</b> (buoys):<br/>Conical, pillar or spar</p> <p><b>Top Mark</b> (if any):<br/>Single green cone, point upward</p> <p><b>Light</b> (when fitted)<br/><b>Colour:</b><br/>Green</p> <p><b>Rhythm:</b><br/>Any, other than composite group flashing</p> |  |

## Lateral Marks cont.

At the point where a channel divides, when heading in the “conventional direction of buoyage”, the preferred channel may be indicated by a modified Port or Starboard Lateral Mark as follows:

| PREFERRED CHANNEL TO PORT  |   |
|--|---|
| <p><b>Colour:</b><br/>Green with one broad red horizontal band</p> <p><b>Shape (buoys):</b><br/>Conical, pillar or spar</p> <p><b>Top Mark (if any):</b><br/>Single green cone, point upward</p> <p><b>Light (when fitted)</b><br/><b>Colour:</b><br/>Green</p> <p><b>Rhythm:</b><br/>Composite group flashing (2 + 1)</p> |  |

| PREFERRED CHANNEL TO STARBOARD   |   |
|--|---|
| <p><b>Colour:</b><br/>Red with one broad green horizontal band</p> <p><b>Shape (buoys):</b><br/>Cylindrical (can), pillar or spar</p> <p><b>Top Mark (if any):</b><br/>Single red cylinder (can)</p> <p><b>Light (when fitted)</b><br/><b>Colour:</b><br/>Red</p> <p><b>Rhythm:</b><br/>Composite group flashing (2 + 1)</p> |  |

8

## General Rules for Lateral Marks

### Shapes

If a Lateral Mark does not have a cylindrical (can) or conical buoy shape, it will usually carry the appropriate Top Mark. Appropriate colours: red — Port, green — Starboard.

### Numbering or lettering

If Marks at the sides of a channel are numbered or lettered, the numbering or lettering follows the “conventional direction of buoyage”. The convention is Port = even 2, 4, 6 etc. Starboard = odd 1, 3, 5 etc.

# CARDINAL MARKS

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## Cardinal Quadrants and Marks

The four quadrants (north, east, south and west) are bounded by the true bearings NW–NE, NE–SE, SE–SW, SW–NW, taken from the point of interest.

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

Named Cardinals should be passed to the named side of the Mark (e.g. pass north of a North Mark).

## Use of Cardinal Marks

### *Cardinal Marks:*

- indicate that the deepest water in that area is on the named side of the mark; or
- indicate the safe side on which to pass a danger; or
- draw attention to a feature in a channel such as a bend, a junction, where a channel divides or the end of a shoal.

9

## General Rules for Cardinal Marks

Cardinal Marks are normally pillar or spar. They are always painted in yellow and black horizontal bands and their distinctive double cone Top Marks are always black.

The direction of the Top Cone Marks identifies the type of Cardinal Mark (e.g. arrows up north ▲, arrows opposite ◆ east). The yellow and black bands differ for each mark, the Top Mark pointers act as guides (e.g. north cones point up, band on top and east cones are opposite, band in the middle).

Cardinal Marks also have a special system of flashing white lights. The rhythms are basically all “very quick” (VQ) or “quick” (Q) flashing, broken into varying lengths of the flashing phase. “Very quick” flashing is when a light flashes at a rate of either 120 or 100 flashes per minute; “quick” flashing is when a light flashes at either 60 or 50 flashes per minute.

**The characters used for Cardinal Marks are as follows:**

**North:** Continuous “very quick” or “quick” flashing.

**East:** Three “very quick” or “quick” flashes followed by darkness.

**South:** Six “very quick” or “quick” flashes followed immediately by a long flash, then darkness.

**West:** Nine “very quick” or “quick” flashes followed by darkness.

To help remember the character think of a clock face and the position of three, six and nine o’clock.

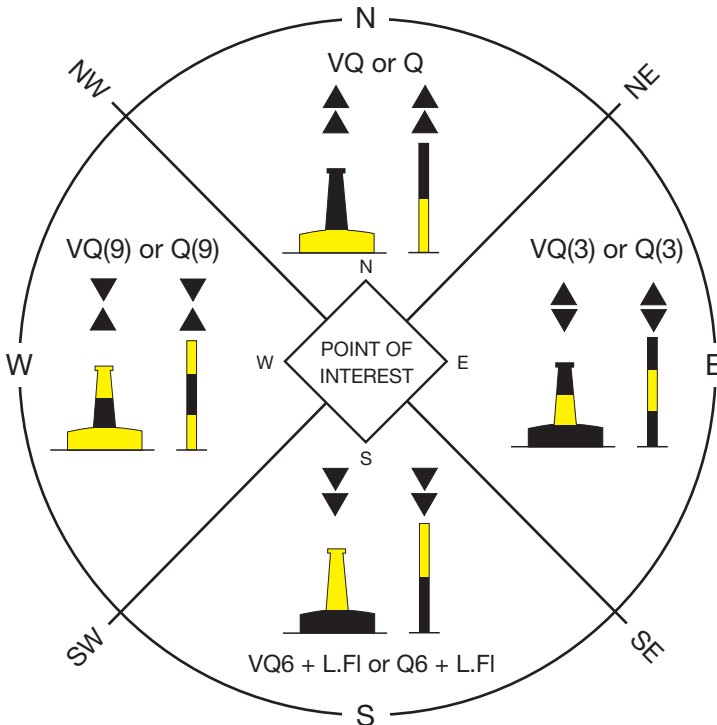
**West** is nine

**East** is three

**South** is six

The long flash, defined as a light appearance of not less than two seconds is merely a device to ensure that three or nine “very quick” or “quick” flashes cannot be mistaken for six.

Two other marks use white lights. Each has a distinctive light rhythm that cannot be confused with the very quick or quick flashing light of the Cardinal marks. These are the **Isolated Danger Mark** and the **Safe Water Mark**.



### NORTH CARDINAL MARK

**Colour:**

Black above yellow

**Shape (buoys):**

Pillar or spar

**Top Mark\* (if any):**

2 black cones, one above the other, point upward

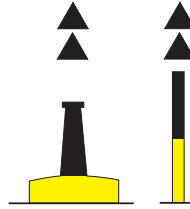
**Light (when fitted)**

**Colour:**

White

**Rhythm:**

Very quick (VQ) or quick (Q)



### EAST CARDINAL MARK

**Colour:**

Black with a single broad horizontal yellow band

**Shape (buoys):**

Pillar or spar

**Top Mark\* (if any):**

2 black cones, one above the other, base to base

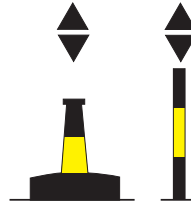
**Light (when fitted)**

**Colour:**

White

**Rhythm:**

VQ(3) every 5s or Q(3) every 10s



### SOUTH CARDINAL MARK

**Colour:**

Yellow above black

**Shape (buoys):**

Pillar or spar

**Top Mark\* (if any):**

2 black cones, one above the other, points downward

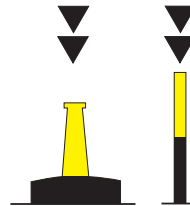
**Light (when fitted)**

**Colour:**

White

**Rhythm:**

VQ(6) +long flash every 10s or Q(6) +long flash every 15s



### WEST CARDINAL MARK

**Colour:**

Yellow with a single broad horizontal black band

**Shape (buoys):**

Pillar or spar

**Top Mark\* (if any):**

2 black cones, one above the other, point to point

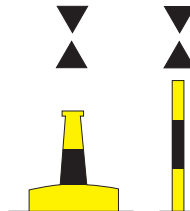
**Light (when fitted)**

**Colour:**

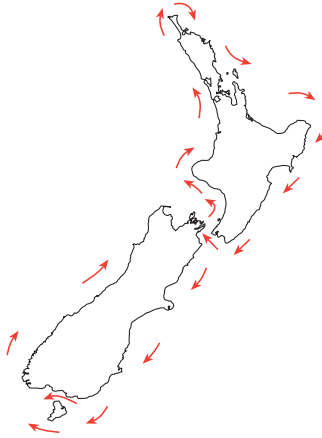
White

**Rhythm:**

VQ(9) every 10s or Q(9) every 15s



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



## ISOLATED DANGER MARKS

An Isolated Danger Mark is erected or moored on or above an isolated danger that has navigable water all around it. Distinctive double black spherical Top Marks, a black base with red band and, when fitted, group flashing (2) white lights, associate Isolated Danger Marks with Cardinal Marks.

### ISOLATED DANGER MARKS

**Colour:**

Black with one or more broad horizontal red bands

**Shape (buoys):**

Optional, but not conflicting with Lateral Marks; pillar or spar preferred

**Top Mark\* (if any):**

2 black spheres, one above the other

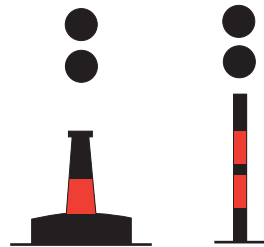
**Light (when fitted)**

**Colour:**

White

**Rhythm:**

Group flashing (2)

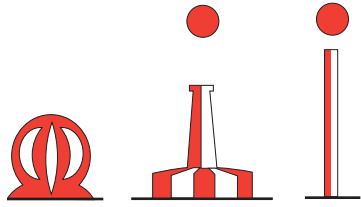


\* The double sphere Top Mark is a very important feature of every Isolated Danger Mark by day, and should be used wherever practicable and be as large as possible with a clear space between the spheres.

# SAFE WATER MARKS

Safe Water Marks indicate that there is navigable water all round the Mark and include centre line marks and mid-channel Marks. They may also be used as an alternative to Cardinal or Lateral Marks to indicate landfalls.

Safe Water Marks look quite different from danger marking buoys. They are spherical, or may be a pillar or spar with a single red spherical Top Mark. They are the only type of Mark with vertical stripes (red and white). Their lights, if any, are white and use isophase, occulting, one long flash or Morse "A" rhythms.

| SAFE WATER MARKS  |   |
|---|---|
| <p><b>Colour:</b><br/>Red and white vertical stripes</p> <p><b>Shape (buoys):</b><br/>Spherical, pillar or spar with spherical Top Mark</p> <p><b>Top Mark (if any):</b><br/>Single red sphere</p> <p><b>Light (when fitted)</b><br/><b>Colour:</b><br/>White</p> <p><b>Rhythm:</b><br/>Isophase, occulting, one long flash every 10s<br/>or Morse "● —".</p> |  |

# SPECIAL MARKS

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Special Marks indicate a special area or feature marked on a chart or referred to in appropriate nautical documents.

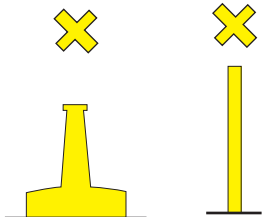
## *Special Marks indicate:*

- Ocean Data Acquisition Systems (ODAS) Marks
- traffic separation marks where use of conventional channel marking may cause confusion
- spoil ground
- military exercise zones
- cables or pipelines
- recreation zones
- marine farms

14

A Special Mark is yellow. It may carry a yellow "X" Top Mark, and if it has a light, that will be yellow. Yellow lights on Special Marks should have characters other than those used for Cardinal, Isolated Danger and Safe Water.

Their special shapes do not conflict with navigational Marks; this means, for example, that a special buoy located on the Port hand side of a channel may be cylindrical, but will not be conical. Special Marks may also be lettered or numbered to indicate their purpose.

| SPECIAL MARKS  |   |
|--|---|
| <p><b>Colour:</b><br/>Yellow</p> <p><b>Shape (buoys):</b><br/>Optional, but not conflicting with navigational marks</p> <p><b>Top Mark (if any):</b><br/>Single yellow 'X' shape</p> <p><b>Light (when fitted)</b><br/><b>Colour:</b><br/>Yellow</p> <p><b>Rhythm:</b><br/>Any, other than those used for Cardinal, Isolated Danger and Safe Water Marks</p> |  |



## Additional Special Marks

Special Marks, other than those already described, may be established by Regional Councils or other authorities in exceptional circumstances.

These additional Marks should not conflict with navigational Marks, and when they are installed should be publicised in nautical documents, such as Notices to Mariners and on revised charts, and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) should be notified as soon as practicable.

# NEW DANGERS

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A New Danger is a newly discovered hazard which is not yet indicated in nautical documents. New Dangers include naturally occurring obstructions such as sandbanks or rocks, or introduced dangers such as wrecks.

## Marking

New Dangers shall be marked in accordance with these rules. If the appropriate authority considers the danger to be especially grave, at least one of the Marks should be duplicated as soon as practicable.

Any lighted Mark used for this purpose has a Cardinal or Lateral VQ or Q light character.

Duplicate Marks are identical to their partners in all respects.

A New Danger may be marked by a **Racon**, coded Morse D “ — ●● ” showing a signal length of one nautical mile on the radar display.

The duplicate Mark may be removed when Maritime New Zealand is satisfied the New Danger has been sufficiently publicised.

# MISCELLANEOUS

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## Leading Lights

Leading lights have colours and characters that ensure they are not mistaken for a light or lights forming part of the buoyage and beaconage system.

## Fixed Supports for Lights and Top Marks

Fixed supports for lights and Top Marks are usually painted in the same colour characteristics of the light or Top Mark.

## Reflectors

When navigation aids have retroreflecting material to help locate them in the dark, the colour of reflective material is the same colour as the lights would be if fitted.

## Water Ski Lanes

These are provided to give priority use to water skiers to travel at high speed to and from a beach.

### *Markings*

Water ski lanes are marked by orange posts with black horizontal bands on shore. On the water orange buoys with black bands may be used in addition to the posts.

## Reserved Areas

Areas that can be reserved for priority use by certain types of vessel, or for specific events or activities.

### *Markings*

Reserved areas are marked by black posts with white horizontal bands on shore and/or black buoys with white horizontal bands.

## Surfing Lane Transit Posts

These are marked on each side by two posts between 2.5 and 3 metres tall, and no more than 6m apart, painted with yellow or bright orange and royal blue 300mm wide horizontal bands. They have royal blue noticeboards with a yellow or bright orange diagonal stripe from top left to bottom right. They also have bright yellow or bright orange wording describing their purpose.

# MARKINGS FOR OFFSHORE/OIL AND GAS RIGS AND PLATFORMS

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Offshore/oil and gas rigs and platforms in New Zealand waters are marked in accordance with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) requirements for the marking of offshore fixed structures.

Details and specifications of markings for each individual structure are submitted to Maritime New Zealand for final approval.

## ***Requirements include:***

White lights on the horizontal extremities of the rig flashing the Morse U “ •• — ” every 15 seconds in unison, range 10 miles. These lights are constructed and fixed so that at least one light is visible upon approaching the structure from any direction. They are placed between 6 and 30 metres above sea level. The light needs to be high enough up the structure that the light can be seen in the immediate vicinity of the structure.

The highest point of the installations are marked with a fixed red light visible all round for 4 miles, or an arrangement of lights that achieve this effect.

They have identification panels with black letters or numbers 1m high on a yellow background visible in all directions and should be lit or reflective.

The installations are required to have fog signals which sound when visibility is less than 2 miles. The signal shall be Morse “U” every 30 seconds (minimum blast length 0.75 seconds) with a range of 2 miles, and be fixed between 6 and 30 metres above sea level.

Installations’ anchor buoys are yellow and have a yellow reflective strip and/or light.

Lights are lit from sunset to sunrise and during the day whenever the visibility is less than 2 miles.

# MARINE FARMS / AQUACULTURE MANAGEMENT AREAS

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Requirements for lights for marine farms are set by the Harbourmaster, if the farm is within waters under the jurisdiction of a Harbour Authority, and by Maritime New Zealand in all other cases. Depending on the size and location, Special Marks, Lateral or Cardinal Marks or a combination may be used. For further details contact Maritime NZ and obtain a copy of *Guidelines for Aquaculture Management Areas*.

## MARKING OF BUOYS AND BEACONS WITH REFLECTIVE STRIPS

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18

Reflective strips help unlighted buoys and beacons to be spotted at night.

### **Size**

Reflective strips are usually 25mm in width on small buoys, beacons, and Top Marks, and usually 50mm in width on other aids.

### **Colours**

In this system, only 4 colours are used for lights: white, yellow, green, red. They are the same colour of the light for the buoy **as if** a light was fitted.

### **Numbering or Lettering**

Numbers or letters outlined with reflective strips are the same colour as a light would be if fitted.

### **Use of Strips**

Reflective strips on buoys, beacons or structures are placed where they will reflect best, depending on the size and shape of the buoy, beacon or structure.

# MARKING OF OCEANOGRAPHIC STATIONS

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## Ocean Data Acquisitions Systems (ODAS)

The science of oceanography is expanding rapidly. Two organisations, the World Meteorological Organisation and the Intergovernmental Oceanographic Commission, foresee a network of buoy and ship stations, collecting and reporting oceanographic data throughout the world's oceans.

ODAS (Ocean Data Acquisition Systems) includes a large range of collecting devices from weather ships to plastic envelopes and drift bottles. Those of the greatest concern to the mariner are instrumented buoyage systems.

These buoy systems vary considerably in size and are either moored or free floating. As far as possible the position of the moored buoys will always be widely promulgated and if considered to be of a permanent enough nature, will be charted.

The recommendations for the markings of ODAS buoys are as follows:

### **Standard colour — Yellow**

ODAS buoys have flashing identification lights clearly distinct from those used in navigational buoys and other aids to navigation.

These lights are visible all round the horizon with a group flash of 5 every 20 seconds (the flash rate not to exceed 30 per minute) usually with a range of at least 5 miles.

These buoys have radar reflectors which can be picked up at a distance of at least 2 miles.

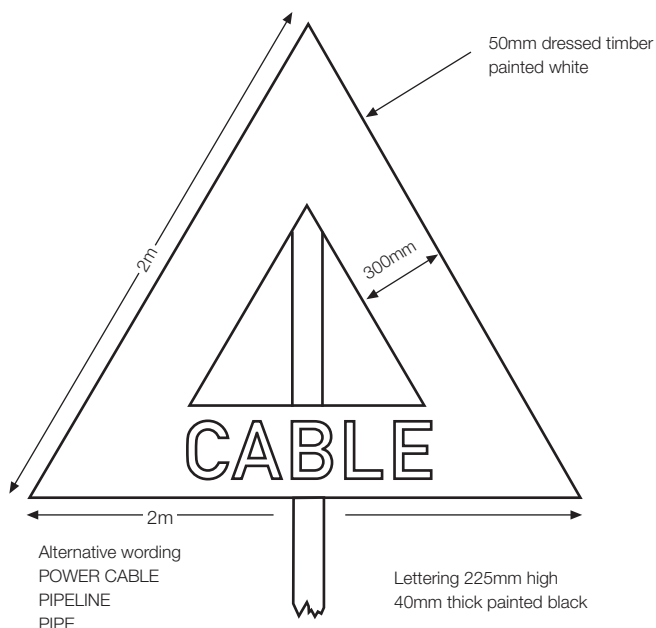
ODAS buoys may be found in unexpected areas, often in deep water where navigation buoys would not be found. The mariner's first reaction may be that the buoy is lost and adrift but **no attempt should be made to recover it** unless it is clear that the buoy is of the moored type and is adrift or has been reported as adrift.

**IMPORTANT:** *Valuable instruments are often suspended beneath these buoy systems or attached to mooring lines. Cases have occurred of the mooring being cut close beneath the buoy by unauthorised salvors, resulting in the loss of the most valuable part of the system.*

# STANDARD SUBMARINE CABLE/ PIPELINE MARKER BEACON

The majority of submarine cables and pipelines are marked on the shore at the point where they enter and leave the water. The standard beacon Top Mark is shown below.

## DIAGRAM AND DIMENSIONS



**SUBMARINE CABLE  
AND SUBMARINE MARKER BEACON**

# MARKINGS OF BRIDGES AND OVERHEAD POWER LINES

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## Non-Hazard Bridges

Channels leading under bridges of sufficient height and without piers in the navigable channel are marked according to the normal regulations for navigational aids.

## Other Bridges

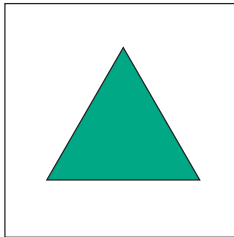
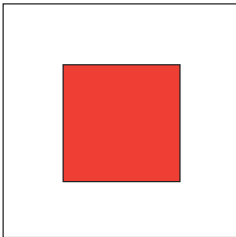
**Visual Marks:** The following system is used when entering from seaward.

*When the direction “entering from seaward” is not obvious, this direction is fixed arbitrarily by the authority involved.*

**Day Marks (if they are considered necessary):**

**Port Hand:** A white panel with a solid red rectangle in the middle.

**Starboard Hand:** A white panel with a solid green equilateral triangle point upwards in the middle.



**Colours for Day Marks:** Red for Port Hand, green for Starboard Hand.

**Colours for Lights:** Either red or green, fixed or flashing according to local circumstances.

If navigation is possible in the full passage span, the Marks and lights are located on the bridge piers. If navigation is possible only in part of the span, the Marks and lights are located under the span, indicating the limits of the navigable channel. A white isophase or quick flashing light may be used to mark the best point of passage. If there is more than one navigable channel under the bridge, the same system is used for each channel.

*Floodlighting of Day Marks is used when it is more convenient.*

# OVERHEAD POWER LINES

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Power lines over launching ramps and across channels can be dangerous to vessels passing underneath. Safe clearance is indicated on large scale navigational charts where power lines cross navigable water, but not on land where lines can be next to launching ramps.

Signage of the types shown below is provided at ramps and where lines cross navigable waterways, but not normally provided at beaches and estuaries used to launch small vessels. Power lines should always be treated as live and potentially lethal.

*SIGN INSTALLED ON RAMPS WHERE THERE ARE OVERHEAD LINE CROSSINGS*



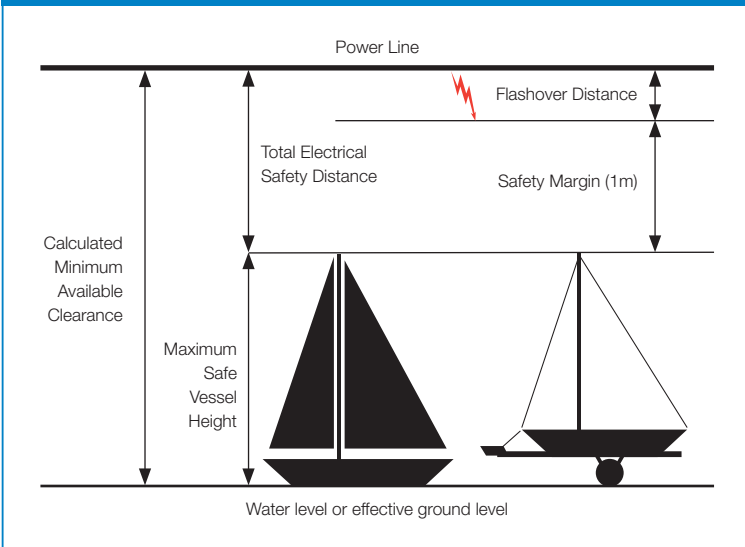
*SIGN INSTALLED ON RAMPS ACCESSING WATERWAYS WHERE THERE ARE OVERHEAD LINE CROSSINGS*







APPLICATION OF SAFETY DISTANCES



This diagram illustrates maximum safe vessel height.

It is **extremely dangerous** to pass under a power line with a total vessel height exceeding that given, as electrical arcing may occur. Severe burns, fire or death may result.

Further information on the marking arrangements for overhead line crossings and calculation of safety distances is found in the *Guide to Safety Management of Powerline Waterway Crossings*, published by the Electricity Engineers' Association of New Zealand (Inc.) and Maritime NZ.

# LIGHT CHARACTERISTICS

| CLASS OF LIGHT  | ABBREVIATION | ILLUSTRATION |
|---|--------------|--------------|
| <b>Fixed</b> ( <i>steady light</i> )                                      | F            |              |
| <b>Occulting</b> ( <i>total duration of light more than dark</i> )        |              |              |
| Single-occulting  | Oc           |              |
| Group-occulting   | Oc(2)        |              |
| Composite group-occulting   | Oc(2+3)      |              |
| <b>Isophase</b> ( <i>light and dark equal</i> )                           | Iso          |              |
| <b>Flashing</b> ( <i>total duration of light less than dark</i> )         |              |              |
| Single-flashing   | Fl           |              |
| Long-flashing ( <i>flash 2s or longer</i> )                               | LFl          |              |
| Group-flashing  | Fl(3)        |              |
| Composite group-flashing  | Fl(2+1)      |              |
| <b>Quick</b> ( <i>50 to 79 – usually either 50 or 60 – fl/min</i> )       |              |              |
| Continuous quick  | Q            |              |
| Group quick   | Q(3)         |              |
| Interrupted quick   | IQ           |              |
| <b>Very Quick</b> ( <i>80 to 159 – usually either 100 or 120 fl/min</i> ) |              |              |
| Continuous very quick   | VQ           |              |
| Group very quick  | VQ(3)        |              |
| Interrupted very quick  | IVQ          |              |
| <b>Ultra Quick</b> ( <i>160 or more – usually 240 to 300 fl/min</i> )     |              |              |
| Continuous ultra quick  | UQ           |              |
| Interrupted ultra quick   | IUQ          |              |
| <b>Morse Code</b>   | Mo(K)        |              |
| <b>Fixed and Flashing</b>   | FFI          |              |
| <b>Alternating</b>  | Al.WR        |              |

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