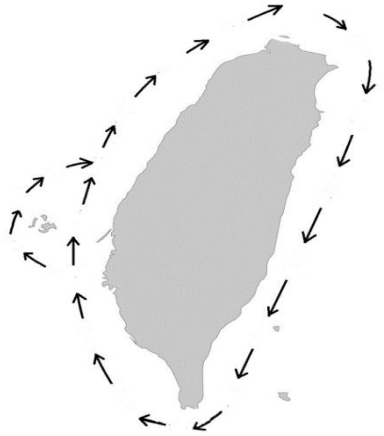
TECHNICAL SPECIFICATIONS REGARDING DEPLOYMENT OF AIDS TO NAVIGATION

Chapter I General Provisions

1. These Specifications are prescribed in accordance with Paragraph 5, Article 4 of the Aids to Navigation Act.
2. These Specifications are applicable to the aids to navigation in the waters and marine facilities of Taiwan.
3. Terms used in these Specifications are defined as follows:
   3.1 Beacon means a fixed artificial navigation mark for daytime without lights deployed in the sea, river, bay or harbor for assistance with short-distance navigation.
   3.2 Light Beacon means a beacon that carries short-distance signal lights.
   3.3 Buoy means a floating artificial navigation mark fitted with daytime marks deployed in the waters for assistance with short-distance navigation.
   3.4 Light Buoy means a buoy that carries short-distance signal lights.
   3.5 Light Characteristics means characteristics that the light fitted on navigation equipment such as the light house, light beacon, and light buoy shall have, including luminous intensity, color, frequency and other characteristics.



   3.6 Conventional Direction of Buoyage means the general direction taken by the mariners to determine whether the channel is starboard or port side relative to the vessel when the vessel is navigating along a coastal or estuary channel. When the vessel approaches the harbor, the conventional direction of buoyage is into the harbor from the sea; a vessel navigating along a coastal channel shall observe the buoy by the directions indicated

in the figure below:

3.7 Port Side of a Channel and Starboard Side of a Channel mean the port side and the starboard sides of the vessel respectively when the vessel navigates along the conventional direction of buoyage.

3.8 Preferred Channel means the main channel of the available navigable channels.

3.9 Buoy Shape means the shape characteristic of a buoy above the waterline as it appears in any direction in the horizontal plane.

3.10 Topmark means an object or a pair of objects of a certain size, shape and color carried on top of a marine navigation aid as a means of identification.

3.11 New Danger means a newly discovered obstacle not yet shown in any navigation information, such as a sandbank, a sunken wreck, or rocks which can be identified by the vessel by the (light) buoys. After the obstacle is marked in the nautical chart or navigation guidelines, the (light) buoys can be removed or replaced by isolated (light) buoys.

3.12 Offshore Wind Farm ("OWF") means a facility installed in offshore waters that can generate power by wind.

3.13 Individual Structure means an artificial structure other than a group structure on an OWF.

3.14 Group Structure consists of several artificial structures arranged regularly in a fixed area of an OWF and can be identified by vessels by sight or radar.

3.15 Significant Peripheral Structure ("SPS") means a structure on a corner or other significant point on the periphery of the group structures on an OWF.

3.16 Intermediate Peripheral Structure ("IPS") means a selected structure in the middle section of an SPS on the periphery of the group structures on an OWF.

3.17 Safety Zone means a designated area on the periphery of the structures on an OWF that general vessels are prohibited from entering in order to prevent contact between the vessels and the structures during navigation.

Chapter II Navigational Aids

4. Lighthouse means a fixed building or structure erected at a designated geographical location for identification in the daytime that provides long- or medium-range light for identification by night. The characteristics of the lighthouse are indicated in the table below:

Color/shape	The structure of the lighthouse can be of any color, shape and materials generally designed to provide a distinctive daymark.
Light Characteristics	White, red or green light. Any flashing light, isophase light, occulting light or other light to be readily identifiable in compliance with the standardizations set forth in Annex I.

5. Beacon/Light beacon

5.1 Beacon or Light Beacon is deployed in the waters and the highest high water level is the benchmark of its latitude.

5.2 The purpose of a (light) beacon deployed in the waters is identical to that of a buoy; its color, topmarks and light characteristics shall be consistent with those of the corresponding (light) buoy.

5.3 The characteristics of the (light) beacon are indicated in the table below:

Color	There are no special provisions; it is sufficient to be identifiable.
Shape	Appropriate shape
Topmarks if fitted	Appropriate shape
Light Characteristics	White, red or green light. There are no special provisions; it is sufficient to be identifiable and in compliance with the standardizations set forth in Annex I.

6. Lateral Buoy/Light Buoy

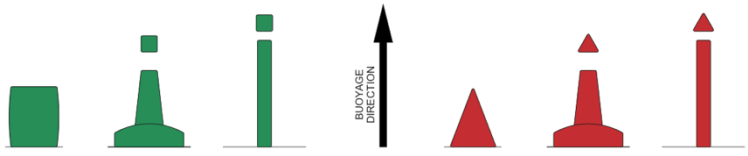
6.1 Lateral (light) buoys shall be deployed in accordance with the conventional direction of buoyage and mark either both sides of the channel, or the preferred channel or a specific channel.

6.2 Lateral (light) buoy includes the port hand (light) buoys, starboard hand (light) buoys, preferred channel to port (light) buoys, and preferred channel to starboard (light) buoys.

6.2.1 Port Hand (Light) Buoys and Starboard Hand (Light) Buoys

(1) Port hand (light) buoys and starboard hand (light) buoys shall be deployed port side and starboard side of a channel to mark the port line and starboard line of channel.

(2) During navigation, the port side and the starboard side of the vessel shall pass port hand (light) buoys and starboard hand (light) buoys respectively in accordance with the conventional direction of buoyage. Port hand (light) buoys and the starboard hand (light) buoys are shown in the figure below:



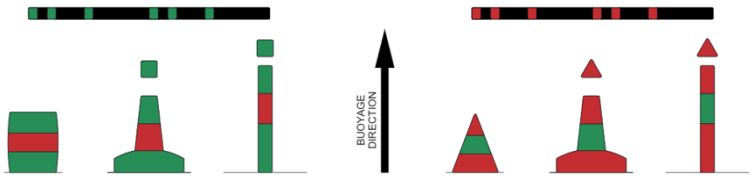
(3) The characteristics of port hand and the starboard hand (light) buoys are indicated in the table below:

	port hand (light) buoys	starboard hand (light) buoys
Color	green	red
Shape	cylindrical, pillar, or spar	conical, pillar, or spar
Topmarks if fitted	Single green cylinder	single red cone, point upward
Light Characteristics	green light any, other than the composite group flashing [2+1], in compliance with the standardizations set forth in Annex I.	red light any, other than the composite group flashing [2+1], in compliance with the standardizations set forth in Annex I.

6.2.2 Preferred Channel to Port (Light) Buoys and Preferred Channel to Starboard (Light) Buoys

(1) Preferred channel to port (light) buoys and preferred channel to starboard (light) buoys are deployed at the junction of more than two channels or in the specific channel to mark the primary or recommended channel.

(2) During navigation, the port side and the starboard side of the vessel shall pass the preferred channel to port (light) buoys and the preferred channel to starboard (light) buoys respectively in accordance with the conventional direction of buoyage, as shown in the figure below.



(3) The characteristics of preferred channel to port (light) buoys and preferred channel to starboard (light) buoys are indicated in the table below:

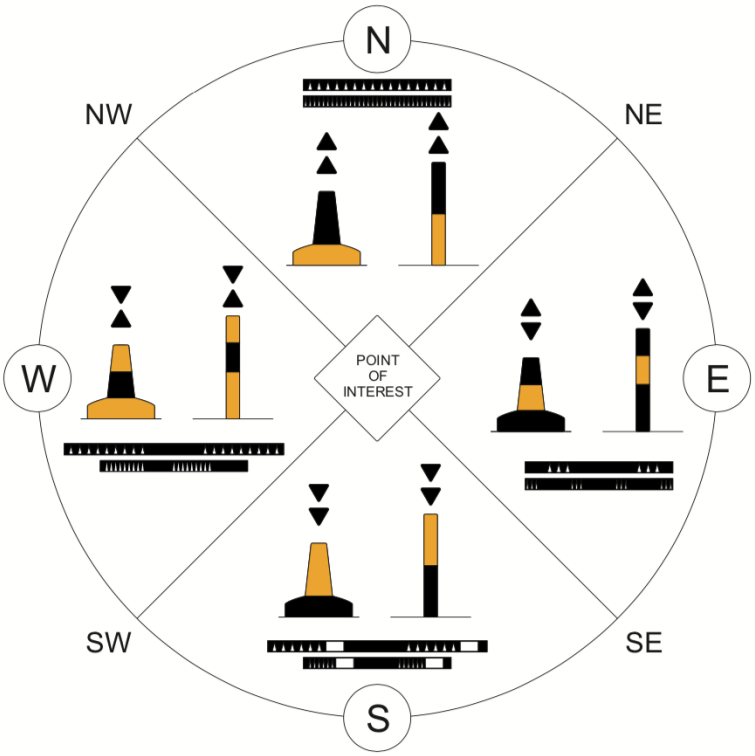
	preferred channel to port (light) buoys	preferred channel to starboard (light) buoys
Color	green with one red horizontal band	red with one green horizontal band
Shape	cylindrical, pillar, or spar	conical, pillar, or spar
Topmarks if fitted	single green cylinder	signal red cone, point upward
Light Characteris-tics	green light the composite group flashing [2+1] in compliance with the standardizations set forth in Annex I	red light the composite group flashing [2+1] in compliance with the standardizations set forth in Annex I.

7. Cardinal Buoy/Light Buoy

7.1 Cardinal (light) buoys are deployed in the north, east, south and west quadrants of a danger or a danger area and named the North cardinal, East cardinal, South cardinal and West cardinal respectively. They indicate the navigable waters on the named side of the (light) cardinal buoys.

7.2 Cardinal (light) buoys can also be deployed around or at the bend of the channel, the bifurcation, or the end of a shoal.

7.3 The North cardinal shall be deployed to the north of a danger or a danger area and the vessel shall pass to the north of this (light) buoy; the East cardinal shall be deployed to the east of a danger or a danger area and the vessel shall pass to the east of this (light) buoy; the South cardinal shall be deployed to the south of a danger or a danger area and the vessel shall pass to the south of this (light) buoy; the West cardinal shall be deployed to the west of a danger or a danger area and the vessel shall pass to the west of this (light) buoy. The cardinals are shown in the figure below:



7.4 The characteristics of cardinal (light) buoys are indicated in the table below:

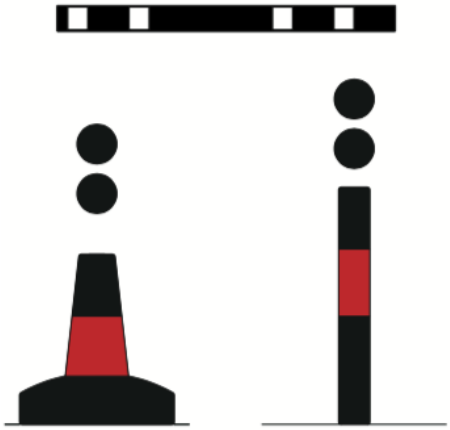
	North Cardinal	East Cardinal	South Cardinal	West Cardinal
Color	Black above yellow	black with a single broad horizontal yellow band	yellow above black	yellow with a single broad horizontal black band
Shape	pillar or spar	pillar or spar	pillar or spar	pillar or spar
Topmarks	two black cones, one above the other, points upward	two black cones, one above the other, base to base	two black cones, one above the other, points downward	two black cones, one above the other, point to point
Light Character-istics	white light successive very quick flashing (VQ) or successive quick flashing (Q) in compliance with the standardizations set forth in Annex I	white light group very quick flashing [3]-three times very quick flashing every 5 second (VQ[3]) or group quick flashing [3]-three times quick flashing every 10 second (Q[3]) in compliance with the standardizations set forth in Annex I	white light group very quick flashing [6]-six times very quick flashing and long flash every 10 second (VQ[6] + long flash) or group quick flashing [6]-six times quick flashing and long flash every 15 second (Q[6] + long flash) in compliance with the standardizations set forth in Annex I	white light group very quick flashing [9]-nine times very quick flashing every10 second (VQ[9]) or group quick flashing [9]-nine times quick flashing every 15 second (Q[9]), in compliance with the standardizations set forth in Annex I

8. Isolated Danger Buoy/Light Buoy

8.1 The isolated danger (light) buoys are erected on, moored on or near an isolated danger that is confined to a limited area and has navigable waters all round it to mark an isolated danger.

8.2 The vessel shall consult the chart and nautical publications to navigate away from isolated danger (light) buoys.

8.3 Isolated danger (light) buoys are shown in the figure below:



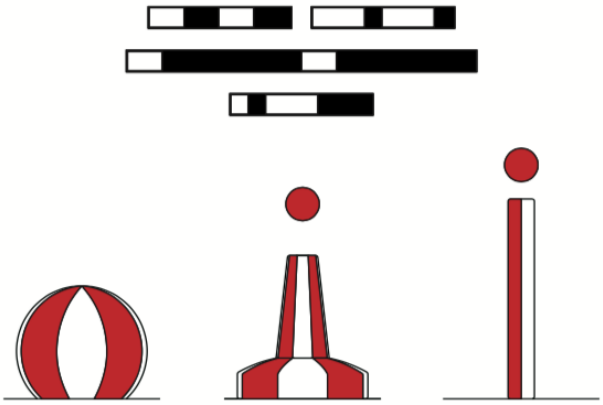
8.4 The characteristics of isolated danger (light) buoys are indicated in the table below:

Color	Black with one broad horizontal red band
Shape	pillar or spar preferred, but cannot conflict with the lateral marks
Topmarks	two black spheres, one above the other
Light Characteristics	white light group flashing [2] in compliance with the standardizations set forth in Annex I.

9. Safe Water Buoy/Light Buoy

9.1 The safe water (light) buoy is to indicate that there are navigable waters all around the mark and it can be a center line mark, mid-channel mark, channel entrance mark, port or estuary approach mark.

9.2 Safe water (light) buoys are shown in the figure below:



9.3 The characteristics of safe water (light) buoys are indicated in the table below:

Color	Red and white vertical strips
Shape	Spherical; pillar or spar, together with a spherical topmark
Topmarks if fitted	single red sphere
Light Characteristics	white light isophase light (Iso), occulting light (Oc), one long flash every ten second (LF 10S), or Morse code "A", in compliance with the standardizations set forth in Annex I.

10. Special Buoy/Light Buoy

10.1 The special (light) buoy is to indicate a special area or feature whose nature may be apparent from reference to a chart, sailing directions or notices to the mariners. It is not intended to mark channels or obstructions.

10.2 The special (light) buoy can be used for the following purposes:

10.2.1 To mark ocean data acquisition and detection facilities.

10.2.2 To mark traffic separation schemes where use of conventional channel

marking may cause confusion.

10.2.3 To mark spoil ground.

10.2.4 To mark military exercise zones.

10.2.5 To mark submarine cables or pipelines.

10.2.6 To mark recreation zone.

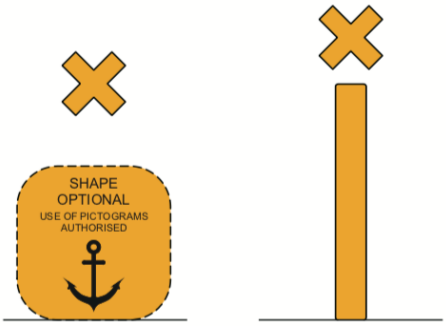
10.2.7 To mark boundaries of anchorage areas.

10.2.8 To mark structures such as offshore energy facilities.

10.2.9 To mark aquaculture areas.

10.3 The deployment of special (light) buoys shall be approved by the shipping administrative authority. In exceptional circumstances, if its purpose is beyond those set forth in Section 10.2 above, its light characteristics can be determined by the shipping administrative authority.

10.4 Special (light) buoys are shown in the figure below:



10.5 The characteristics of special (light) buoys are indicated in the table below:

Color	Yellow
Shape	optional, but not conflicting with lateral marks
Topmarks if fitted	single yellow "X" shape
Light Characteristics	yellow light optional, but not conflicting with other marks, in compliance with the standardizations set forth in Annex I.

11. New Danger Buoy/Light Buoy

11.1 A new danger can be marked by single or several lateral (light) buoy(s), cardinal (light) buoy(s) or isolated danger (light) buoy(s) as indicated below:

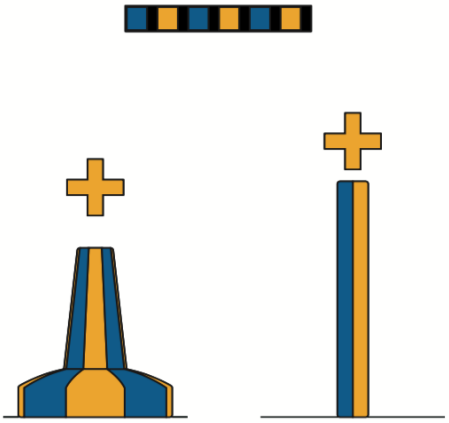
11.1.1 If the risk of a new danger to navigation is especially high, (light) buoys may be installed in duplicate and the duplicate installed (light) buoys must be detectable and observable by the radar.

11.1.2 If the new danger is marked by lateral light buoys, the buoys must exhibit successive very quick flashes (VQ) or successive quick flashes (Q).

11.1.3 The new danger may be marked by a racon Morse code “D.”

11.1.4 In addition, the new danger may be marked by automatic identification system aids to navigation (“AIS AtoN”) and virtual aids to navigation.

11.2. New danger (light) buoys may be removed when the shipping administrative authority is satisfied that the information concerning the new danger has been sufficiently promulgated or the danger has been resolved.



11.3 New danger (light) buoys are shown in the figure below:

11.4 The characteristics of new danger buoys are indicated in the table below:

Color	blue and yellow vertical strips in equal number dimensions (minimum 4 strips and maximum 8)
Shape	pillar or spar
Topmarks if fitted	perpendicular yellow cross
Light Characteristics	Yellow and blue alternating One second of blue light and one second of yellow light with 0.5 seconds of darkness between (no flashing), in compliance with the standardizations set forth in Annex I.

12. The colors of aids to navigation shall comply with the standardizations set forth in Annex II.

13. The mooring arrangement of buoys shall comply with the standardizations set forth in Annex III.

14. Aids to navigation shall be deployed in compliance with the guidelines set forth in Annex IV.

15. Radar Beacon (“Racon”)

15.1 For the purpose of navigation, racons may be installed on fixed structures or buoys moored at a fixed position.

15.2 If used or installed on another aid to navigation, the racon shall be deemed an independent aid to navigation.

15.3 When the radar of a vessel is in operation, the racon is a secondary aid to

navigation for the purpose of assistance with navigation. The technical requirements to install or replace an existing racon are as follows:

15.3.1The racon shall comply with the parameters set forth in Annex V.

15.3.2. Racons operating on both 9 GHz and 3GHz bands should normally be provided.

15.3.3 To avoid unnecessary radar screen clutter, racons shall be programmed with “OFF” periods, and the “ON” periods shall be no less than 15 seconds. To maintain an adequate update rate on the display, there should be at least one ON period every 60 seconds, unless there are special operating requirements.

15.3.4 Racons shall be fitted with side-lobe supersession.

15.3.5 Coding of racons shall be in accordance with the recommendations of the International Maritime Organization.

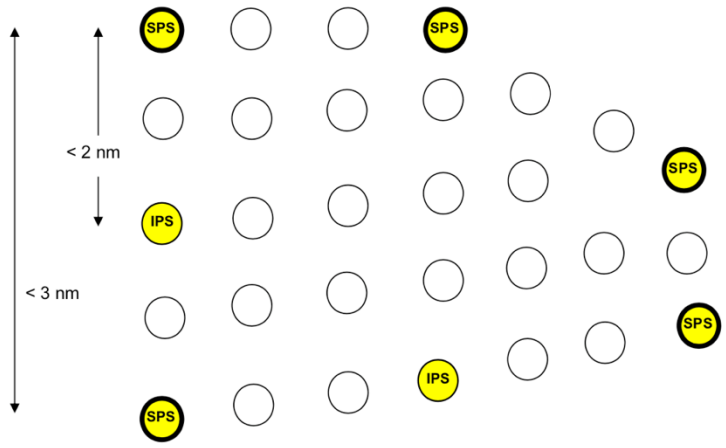
15.3.6 Racons shall emit microwave radiation and the personnel installing and servicing racons shall be properly trained for working with microwave equipment.

Chapter III OWF

16. Lateral Distance of Group Structures

16.1 The lateral distance between SPSs should not normally exceed 3 nautical miles, as indicated by the following figure:

16.2 The lateral distance between IPSs or to the nearest SPS should not normally exceed 2 nautical miles.



17. The Color of Structures

17.1 All structures on an OWF shall be painted yellow all around from the Highest Astronomical Tide level (“HAT”) up to 15 meters. The addition of retroreflective material is optional.

17.2 The color yellow refers to the Traffic Yellow Paint of RAL Color System 1023.

18. The Light Characteristics of Individual Structures
White light flashing Morse Code “U” at least every 15 seconds with a minimum nominal range of 10 nautical miles.

19. The Light Characteristics of Group Structures

19.1 An SPS shall be fitted with yellow lights flashing and has a minimum nominal range of 5 nautical miles. The flashing of the lights of all SPSs shall be synchronized.

19.2 An IPS shall be fitted with flashing yellow lights and has a minimum nominal range of 2 nautical miles. The flashing of the lights of all IPSs shall be synchronized.

19.3 Other structures shall be fitted with flashing yellow lights with a minimum nominal range of 2 nautical miles. The lights can be substituted with a coat of reflective materials or glowing paint on the tower.

20. The Location of the Lights of the Group Structures

20.1 All lights shall be fitted at the same height at more than 6 meters above the HAT and be lower than the lowest point of the blade arc during operation.

20.2 All lights shall be visible in all directions from the structure to the maximum nominal range.

20.3 The light shall be displayed from sunset to sunrise and be seen in low-visibility conditions.

21. The Characteristics of the Fog Signal of the Structures

21.1The IPSs and the SPSs on the corners of group structures shall be fitted with a fog signal more than 6 meters above the HAT.

21.2 The fog signal shall broadcast Morse Code “U” at 30-second intervals with the short beep lasting 0.75 seconds; the sound shall broadcast not less than 2 nautical miles.

21.3 The fog signal shall be equipped with a visibility detector, which shall make a sound automatically when visibility is 2 nautical miles or less.

22. Identification Panels

22.1 Each structure on an OWF shall display a yellow identification panel or the transition piece shall be painted yellow.

22.2 The black letters of the identification panel shall be 1 meter high and include the abbreviated name of the wind farm and the identification numbers of the structures.

22.3 The identification panel shall be easily visible in daylight as well as at night, either by using illumination or reflective materials.

22.4 If the identification panel cannot be installed on the structure, alternative appropriate markings can be used with the consent of the shipping administrative authority.

23. Racons and AIS AtoN

23.1 The shipping administrative authority may require that the structures on an OWF be fitted with racons or AIS AtoN for identification if it finds that the structures can significantly impact the safety of navigation.

23.2 The installation of the racons shall comport with Annex V; the responding Morse Code signal and interval shall be set by the shipping administrative authority.

23.3 The installation of the AIS AtoN shall comport with Annex VI.

24. Working Light

Working lights (spotlights) on ladders, access ways and platforms shall be down lighting and must not reduce the luminosity or function of the lights on the structures set forth in these Specifications.

25. Other Structures

25.1 Other structures on an OWF, including the substation, meteorological structure, and wind measurement structure, shall comport with the requirements of the group structure.

25.2 Other structures not on an OWF shall comport with the requirements of the individual structure.

26. Provisional Buoy/Light Buoy

26.1 Appropriate (light) buoys, such as special, lateral or cardinal (light) buoys, shall be fitted on the periphery of the working area during the period of construction and demolition. The light should have a minimum nominal range of 2 miles and be fitted with radar reflectors.

26.2 The entity in charge of construction and demolition shall specify its arrangement of the (light) buoys in its plan for the approval of the shipping administrative authority.

26.3 If the mark in the first paragraph cannot be fitted in the marine environment, the entity in charge of construction and demolition shall provide an alternative way in its plan for the approval of the shipping administrative authority.

27. Long-Term Buoy/Light Buoy

27.1 Lateral (light) buoys shall be installed on the boundaries of the OWFs if the wind farms are erected on both sides of a channel approved by the shipping administrative authority.

27.2 Cardinal (light) buoys shall be installed on the corners of the OWFs if the wind farms are erected adjacent to the channel and the locations affect navigation safety.

27.3 The color and the light characteristics of the (light) buoys shall comport with these Specifications and the nominal range cannot be less than 2 miles.

27.4 The above (light) buoy can be replaced by the virtual buoy, whose shape, location and quantity shall be approved by the shipping administrative authority.

28. The locations and quantities of the provisional and the long-term (light) buoys to be deployed shall be approved by the shipping administrative authority.

29. Floating Structure on an OWF
The structures on an OWF fixed by an anchor and floating with the tide shall comport with these Specifications.

30. Safety Zone
The safety zone of the group structures on an OWF shall be proposed by the entity erecting the structures and have the approval of the shipping administrative authority.

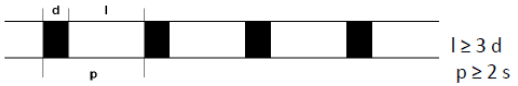
31. The designs of the marks of the aids to navigation and the structures on an OWF shall comply with these Specifications. The items to be specified in the proposal shall include those in Annex VII, and approval of the shipping administrative authority shall be secured if items need to be added, deleted, or changed.

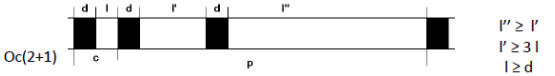
32. The shipping administrative authority shall announce by a notice to the mariners the locations, markers, and boundaries of the aids to navigation and the OWF.

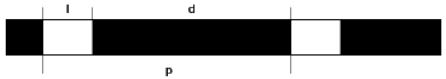
33. The shipping administrative authority can request other authorities to undertake the maintenance and management of the aids to navigation.

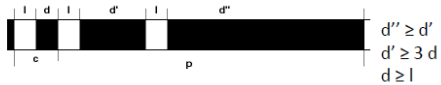
Annex I. The Light Characteristics of the Aid to Navigation in the Taiwanese Waters

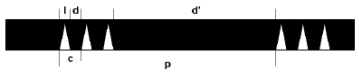
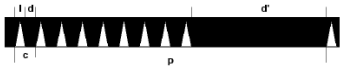
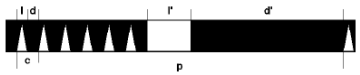
The Light Characteristics shall include the color and rhythm of the light. The specifications are indicated as the following table:

	Class	Abbreviation	IALA Specification	Particular Use
1	Fixed Light	F	A light shows continuously and steadily. A single fixed light should be used with care because it may not be recognized as a Marine Aid to Navigation light. 	
2	Occulting Light		A flash in a flashing light is regularly repeated. The total duration of light in a period is clearly longer than the total duration of darkness and all the eclipses are of equal duration.	
2.1	Single- occulting Light	Oc	An eclipse in an occulting light that is regularly repeated. The duration of an appearance of light should not be less than three times the duration of an eclipse. The period should not be less than 2s. It can be indicated as the figure below:  Example: l = 3 s; d = 1 s; p = 4 s	A single-occulting White light indicates a safe-water mark.
2.2	Group-occulting Light	Oc(#) e.g. Oc(2)	The appearances of light between the eclipses in a group are of equal duration, and this duration is clearly shorter than the duration of the appearance of light between successive groups.	A group-occulting Yellow light indicates a special mark.

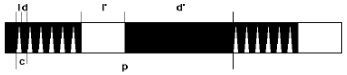
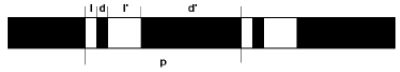
	Class	Abbreviation	IALA Specification	Particular Use
			The number of eclipses in a group should not be greater than four in general, and should be five only as an exception. The duration of an appearance of light within a group should not be less than the duration of an eclipse. The duration of an appearance of light between groups should not be less than three times the duration of an appearance of light within a group. In a group of two eclipses, the duration of an eclipse together with the duration of the appearance of light within a group should not be less than 1s. In a group of three or more eclipses, the duration of an eclipse together with the duration of an appearance of light within the group should not be less than 2s. It can be indicated as the figure below:  Example: l' = 6 s; l = 2 s; d = 1 s; c = 3 s; p = 10 s	
2.3	Composite Group-occulting Light	Oc(#+#) e.g. Oc(2+1)	A light is similar to a group-occulting light, except that successive groups in a period have different numbers of eclipses. It can be indicated as the figure below:  Example: l'' = 9 s; l' = 3 s; l = 1 s; d = 1 s; c = 2 s; p = 16 s	
3	Isophase Light	Iso	All the durations of flashes and darkness in a light are clearly equal. The period should never be less than 2s, but preferably it should not be less than 4s in order to reduce the risk of confusion with occulting or flashing lights. It can be indicated as the figure below:	An isophase White light indicates a safe-water mark.

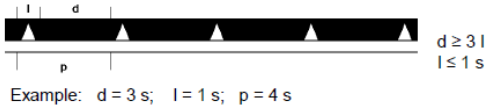
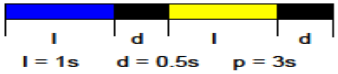
	Class	Abbreviation	IALA Specification	Particular Use
			 l = d p ≥ 2 s Example: l = d = 2 s; p = 4 s	
4	Flashing Light		A flash in a flashing light is regularly repeated. The total duration of light in a period is clearly shorter than the total duration of darkness and all the flashes are of equal duration.	
4.1	Single Flashing Light	Fl	The duration of the interval of darkness (eclipse) between two successive flashes should not be less than three times the duration of a flash. The period should not be less than 2s (or not less than 2.5s in those countries where a quick rate of 50 flashes per minute is used). It can be indicated as the figure below:  d ≥ 3 l p ≥ 2 s Example: d = 3 s; l = 1 s; p = 4 s	A single-flashing Yellow light indicates a special mark.
4.2	Long Flashing Light	LFl	An appearance of light in a single-flashing light is not less than 2s duration (long flash) and is regularly repeated. It can be indicated as the figure below:  d ≥ 3 l l ≥ 2 s Example: d = 8 s; l = 2 s; p = 10 s	A long-flashing White light with a period of 10s indicates a safe-water mark.
4.3	Group Flashing Light	Fl(#) e.g. Fl(2)	A group of flashes in a flashing light, specified in number, is regularly repeated. The eclipses between the flashes in a group are of equal duration, and this duration is clearly shorter than the duration of the eclipse between successive groups. The number of flashes in a group should not be greater than five in general, and should be six only as an exception.	A group-flashing White light with a group of two flashes, in a period of 5s or 10s, indicates an isolated-danger mark.

	Class	Abbreviation	IALA Specification	Particular Use
			The duration of an eclipse between groups should not be less than three times of duration of an eclipse within a group. In a group of two flashes, the duration of the eclipse between two flashes should not be less than 1s. In a group of three or more flashes, the duration of an eclipse between flashes should not be less than 2s. It can be indicated as the figure below: Fl(2)  d' ≥ 3 d d ≥ l c ≥ 1 s Example: d' = 6 s; d = 2 s; l = 1 s; c = 3 s; p = 10 s	A group-flashing Yellow light with a group of four, five or six flashes indicates a special mark.
4.4	Composite Group-flashing Light	Fl(#+#) e.g. Fl(2+1)	A light is similar to a group-flashing light except that successive groups in a period have different numbers of flashes. Light characters should be restricted to (2+1) in general, and should be (3+1) flashes only as an exception. It can be indicated as the figure below: Fl(2+1)  d'' ≥ d' d' ≥ 3 d d ≥ l c ≥ 1 s Example: d'' = 9 s; d' = 3 s; d = 1 s; l = 1 s; c = 2 s; p = 16 s	A composite group-flashing Red and Green light with a group of (2+1) flashes indicate a starboard hand and port hand marks respectively. A composite group-flashing Yellow light indicates a special mark.
5	Quick Light		A flash in a quick light is regularly repeated. The flashes per minute are repeated at the rate of not less than 50 but less than 80 flashes. The specification of IALA is that there are 60 flashes per minute.	

	Class	Abbreviation	IALA Specification	Particular Use
5.1	Continuous Quick Light	Q	A flash in a quick light is regularly repeated. It can be indicated as the figure below:  Example: l = d = 0.5 s; p = 1 s	A continuous quick White light indicates a north cardinal mark.
5.2	Group Quick Light	Q(#) e.g. Q(3) e.g. Q(9) e.g. Q(6)+LFl	A group quick light is composed of a specified group of flashes, which is regularly repeated. The number of flashes in a group should be three, nine or of exceptional light character, as indicated by the following figures Q(3), Q(9) or Q(6)+LF1. For example, (1) Q(3): A group quick White light with a group of three flashes, in a period of 10s, indicates an east cardinal mark. Q(3)  Example: d' = 7.5 s; l = d = 0.5 s; c = 1 s ; p = 10 s (2) Q(9): A group quick White light with a group of nine flashes, in a period of 15s, indicates a west cardinal mark. Q(9)  Example: d' = 6.5 s; l = d = 0.5 s; c = 1 s; p = 15 s (3) Q(6)+LF1: A group quick White light with a group of six flashes followed by a long flash of 2s duration, in a period of 15s, indicates a south cardinal mark. Q(6) +LF1  Example: d' = 7 s; l' = 2 s; l = d = 0.5 s; c = 1 s.; p = 15 s	

	Class	Abbreviation	IALA Specification	Particular Use
6	Very Quick Light		A flash in a very quick light is regularly repeated. The flashes per minute are repeated at the rate of not less than 80 but less than 160 flashes. The specification of IALA is that there are 120 flashes per minute.	
6.1	Continuous Very Quick Light	VQ	A flash in a very quick light is regularly repeated. It can be indicated as the figure below:  Example: l = d = 0.25 s; p = 0.5 s	A continuous very quick White light indicates a north cardinal mark.
6.2	Group Very Quick Light	VQ(#) e.g. VQ(3) e.g. VQ(9) e.g. VQ(6)+LFl	A group very quick light is composed of a specified group of flashes, which is regularly repeated. The number of flashes in a group should be three, nine or of exceptional light character, as indicated by the following figures VQ(3), VQ(9) or VQ(6)+LF1. For example, (1) VQ(3): A group very quick White light with a group of three flashes, in a period of 5s, indicates an east cardinal mark. VQ(3)  Example: d' = 3.75 s; l = d = 0.25 s; c = 0.5 s; p = 5 s (2) VQ(9): A group very quick White light with a group of nine flashes, in a period of 10s, indicates a west cardinal mark. VQ(9)  Example: d' = 5.75 s; l = d = 0.25 s; c = 0.5 s; p = 10 s (3) VQ(6)+LF1: A group very quick White light with a group of six flashes followed by a	

	Class	Abbreviation	IALA Specification	Particular Use
			long flash of 2s duration, in a period of 10s, indicates a south cardinal mark. VQ(6) +LFl  d' ≥ 1.5 l' l' ≥ 2 s d ≥ l 0.5 s ≤ c ≤ 0.6 s Example: d' = 5 s; l' = 2 s; l = d = 0.25 s; c = 0.5 s; p = 10 s	
7	Ultra Quick Light		The flashes per minute in an ultra quick light are repeated at the rate of not less than 160 but less than 300 flashes. The specification of IALA is that there are 240 flashes per minute.	
7.1	Continuous Ultra Quick Light	UQ	A flash in a ultra quick light is regularly repeated.	
8	Morse Code Light	Mo(#) e.g. Mo(A)	Appearances of light of two clearly different durations are grouped to represent a character in the Morse Code. The duration of a "dot" should be about 0.5s, and the duration of a "dash" should not be less than three times the duration of a "dot". It can be indicated as the figure below: Mo(A)  l' ≥ 3 l d ≥ l l = 0.5 s Example: l' = 1.5 s; l = 0.5 s; d = 0.5 s; d' = 4.5 s; p = 7 s	A Morse Code White light with the single character "A" indicates a safe-water mark. A Morse Code Yellow light, but not with either of the single characters "A" or "U", indicates a special mark.
9	Fixed and Flashing Light	F+ relevant character abbreviation,	A fixed and flashing light is a fixed light plus one or more flashes with higher illuminous intensity. It can be combinations of the above-mentioned light characteristics. FF1 can be indicated as the figure below:	

	Class	Abbreviation	IALA Specification	Particular Use
		e.g. FFl, Flso	 Example: d = 3 s; l = 1 s; p = 4 s	
10	Alternating Light	Al## e.g. AlWR	A light shows different colors alternately. For example, A1WR is used to remind the observer. To show the alternating light, efforts should be made to ensure that the different colors are visible.  Example: l = d = 2 s; p = 4 s	
11	Occulting Alternating Light	OcAl	A light shows different colors alternately. The duration of light in a period is longer than that of the ellipse and the durations of the darkness are of equal duration. It can be indicated as the figure below: 	An Occulting-Alternating Blue and Yellow light indicates an Emergency Wreck Marking Buoy mark.

Annex II Chromaticity of the Buoyage Colors

Table 1 German RAL Color (Ordinary Color)

No.	Color	ß
RAL 3028	Pure Red	>13%
RAL 6037	Pure Green	>15%
RAL 1023	Traffic Yellow	>50%
RAL 2008	Bright Red Orange	>25%
RAL 5019	Capri Blue	>7%
RAL 9016	Traffic White	>80%
RAL 9017	Traffic Black	<1%

ß：color brightness or luminosity coefficient

Table 2 German RAL Color (Luminous Color)

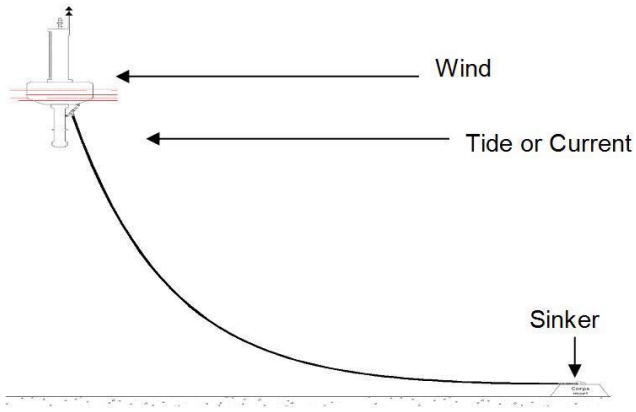
No.	Color	ß
RAL 302	Luminous Red	>25%
RAL 6038	Luminous Green	>25%

Table 3 Swedish Natural Color System (NCS)

NCS	Color	Corresponding RAL
S1085-Y80R	Red	
S2070-G10Y	Green	---
S1080-Y	Yellow	RAL 1023
S 0585-Y40R	Orange	RAL 2008
S4050-R90B	Blue	RAL 5019
S0500-N	White	RAL 9016
S9000-N	Black	RAL 9017

Annex III Mooring Arrangement of the Buoys

1. The transitional mooring is the ideal mooring state where the mooring chain catenary meets the seabed tangentially exactly at the sinker when there are the maximum wind and tide (or current) loads on the buoy.



2. The practical size of the chain can be ascertained by trying the strength and immersed weight of various sizes of commercially available chain in the following formulae:

   $R_c \geq 5(pgH + T_{ho})$

   R_c: The proof load of the chain in Newtons (N)

   P: The linear immersed mass of the chain (mass minus the buoyancy of the chain) in kilograms per meter (kg/m)

   H: The maximum water depth at the station. This should include wave height.

   T_{ho}: The horizontal load imposed by the buoy (N)

   G: the acceleration due to gravity (m/s^2)

3. The safety factor of 5 takes account of the continual cyclic load and wave effects that the chain is subjected to by the motion of the buoy.
4. The required length of the mooring chain for the transitional mooring is calculated from the following formulae:

$$L = \sqrt{H(H + \frac{2T_{ho}}{pg})}$$

5. If the speed of the current at the station is over 5 knots and the water depth is over 40 meters, the result calculated by the formulae above shall be adjusted appropriately.

Annex IV Layout of the Aids to Navigation in the Waters

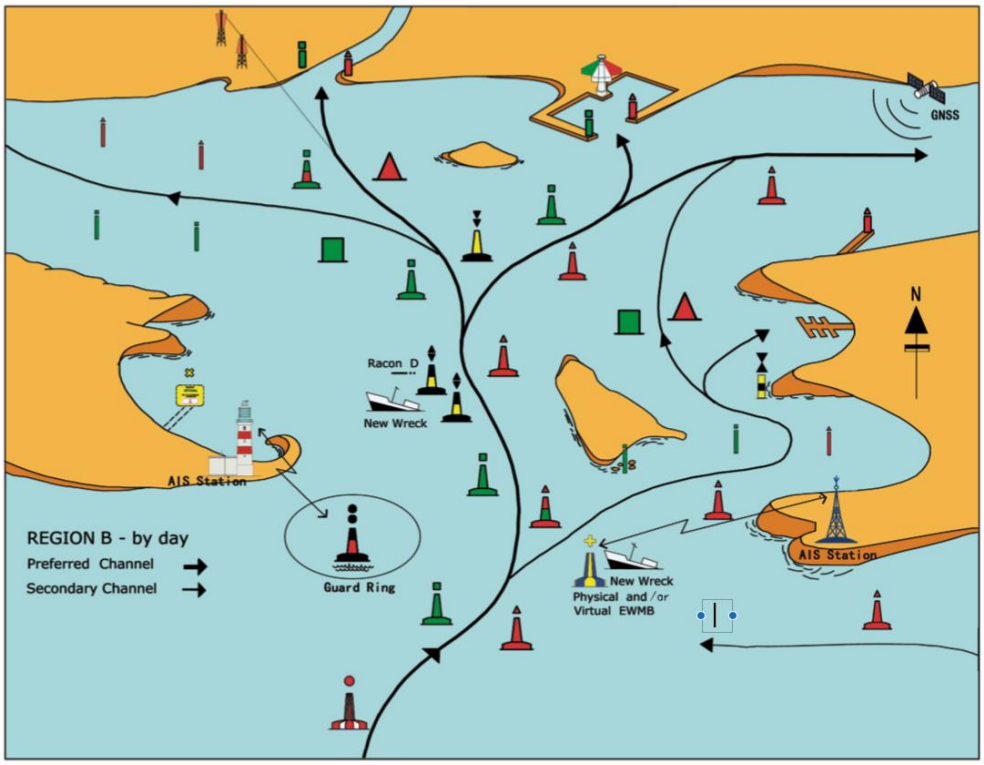


Figure A-1 the layout of the aids to navigation by day

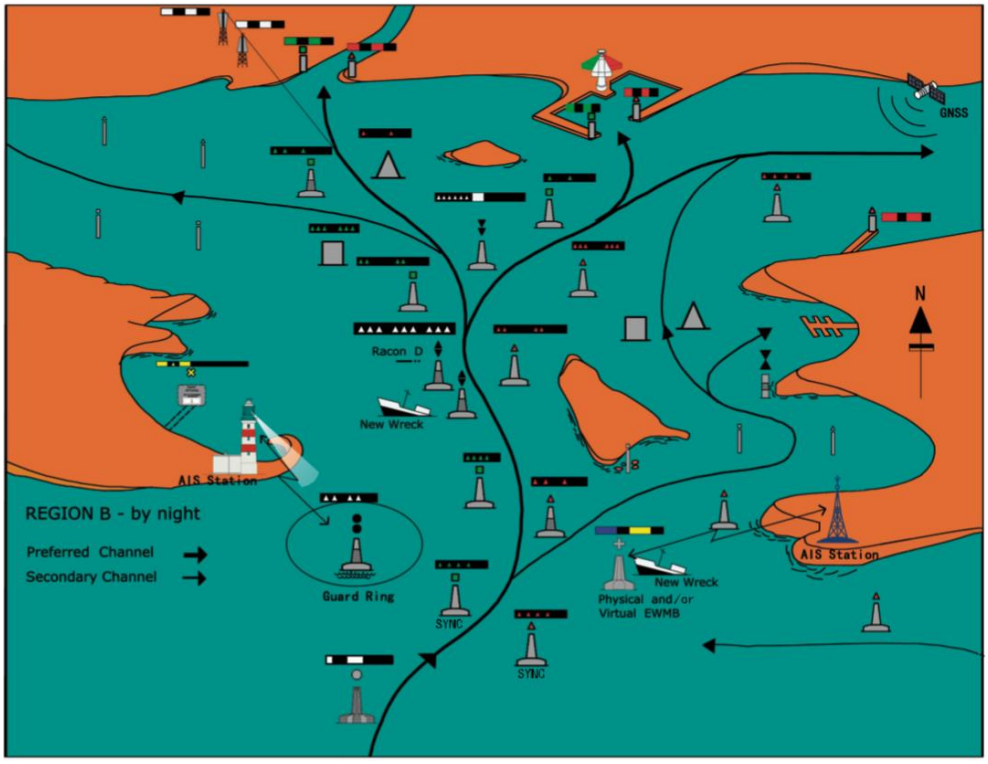


Figure A-2 the layout of the aids to navigation by night

Annex V Technical Parameters for a Maritime Radar Beacon (Racon)

Items		**Specifications**
1. Antenna	Polarization	In the 9 GHz band, suitable for responding to radars using horizontal polarization In the 3 GHz band, suitable for responding to radars using horizontal polarization and to radars using vertical polarization
2. Receiver	1. Frequency band 2. Blocking period 3. Primary radar pulse length 4. Gating	2900-3100 MHz and/or 9200-9500 MHz ≤ 100μs after end of response ≥ 0.05μs ≤ 2μs
3. Transmitter	Frequency	On the frequency of the interrogating signal with a frequency matching accuracy of ±3.5MHz for interrogating pulses with a duration of less than 0.2μs, or with a frequency matching accuracy of ±1.5MHz for pulses with a duration equal to or more than 0.2μs
4. Response	1. Delay after receipt of interrogation 2. Form of identification 3. Duration	Normally not more than 0.7μs Identification coding should normally be in the form of a Morse letter. The identification coding used should be described in appropriate navigational publications The identification coding should comprise the full length of the radar beacon response and, where a Morse letter is used, the response should be divided with a ratio of one dash equal to three dots and one dot equal to one space. The coding should normally commence with a dash. The duration of the response should be approximately 20% of the maximum range requirement of the particular radar beacon, or should not exceed 5 miles, whichever is the lower value. In certain cases, the duration of the response may be adjusted to suit the operational requirements for the particular radar beacon

Annex VI Specifications for AIS Aids to Navigation

1. The purpose of the AIS aids to navigation is to promote the navigation of the vessels in safe channels.
2. It is recommended to adopt the equipment certified by IEC62320-2 (Ed. 2.0, 2016) for AIS aids to navigation and have the functions of transmission and receipt.
3. MMSI for AIS aids to navigation shall be designated by the National Communications Commission and the equipment shall be set in accordance with the approved parameters after obtaining the approval of the shipping authority.
4. The design shall follow the IALA Recommendation A-126.

Annex VII Items which shall be stated in the Proposal of Aids to Navigation

1. The name of the entity doing the project and its address
2. The name of the responsible person
3. The name and the site of the project
4. Purpose and the contents of the project
5. Designation of the safety zone (applicable to the application of the marine facility only)
6. Descriptions of the aids to navigation

   6.1 Arrangement and the layout of the aids to navigation

   6.2 Timeframe of the establishment of the aids to navigation (construction or operation period), types, location, light characteristics and specifications
7. Maintenance and management of the aids to navigation