

A red and white helicopter with the registration PH-SHK is shown in flight, banking to the left. The helicopter has a red upper fuselage and white lower fuselage with blue stripes. The main rotor blades are blurred due to motion. Below the helicopter, a ship's deck is visible with a green helipad marked with a white 'H'. In the background, the blue sea and a red ship structure are visible under a clear blue sky.

GUIDE TO HELICOPTER/SHIP OPERATIONS

FOURTH EDITION



International Chamber of Shipping

4 GENERAL SHIP REQUIREMENTS

4.1 SHIP OPERATING AREAS

Note: When "D" is used in the following text, it represents the extent of the available operating area on or above the deck of the ship. Only helicopters whose maximum overall length with rotors turning is D or less (see Appendix A) may be used for operations to the ship in question.

4.1.1 Types of Operating Area

Ship operating areas fall into two distinct types:

- a. **Landing Area:** defined as an operating area suitable for landing helicopters. The landing area may consist of a purpose built structure located above the ship's deck (referred to as a "purpose built landing area") or a non purpose built area located on the ship's deck (referred to as a "non purpose built landing area"). The landing area may be located on or over the bow or stern of the ship, have an over-side or ship's side location, or occupy an area amidships - usually on or near to the ship's centreline. The landing area may also be used for winching operations provided that the winching criteria described in paragraph 4.1.3 below can be satisfied. However, where a landing area with adequate size and obstacle clearance for the helicopter in question is provided, landing is always the preferred option.
- b. **Winching Area:** defined as an operating area which may only be used for winching operations. The guidance in Sections 4.1 and 4.2 will assist ship operators when deciding upon the most suitable location for a landing or winching area on their ship. The optimum position for a landing or winching area will normally be determined by the availability of a suitable space on the ship. However, where there is more than one area identified and capable of accommodating the type of helicopter(s) expected to be used, the ship's master, in consultation with the helicopter operator, should assess the merits of each location, taking particular account of the size and position of obstacles and expected aerodynamic and ship motion effects (see Section 4.2).

4.1.2 Location and Size of Operating Area - Landing

4.1.2.1 Landing Area at the Ship's Side

A non purpose built landing area located on a ship's side should consist of a "clear zone" and a "manoeuvring zone" as shown in Figure 4.1.

The clear zone should be capable of containing a circle with a minimum diameter of $1 \times D$. No objects should be located within the clear zone except aids whose presence is essential for the safe operation of the helicopter, and then only up to a maximum height of 2.5 cm. Such objects should only be present if they do not represent a hazard to helicopters. Where there are immovable fixed objects located in the clear zone such as a "Butterworth lid", these should be marked conspicuously and annotated on the ship's operating area diagram (a document that provides visual references to the helicopter pilot and supplements other information provided by the ship prior to commencing operations - see Appendix F).

In addition, a "manoeuvring zone" should be established, where possible, on the main deck of the ship. The manoeuvring zone, intended to provide the helicopter with an additional degree of protection to account for rotor overhang beyond the clear zone, should extend beyond the clear zone by a minimum of $0.25 D$, at any point. The manoeuvring zone may only contain obstacles whose presence is essential for the safe operation of the helicopter, up to a maximum height of 25 cm.

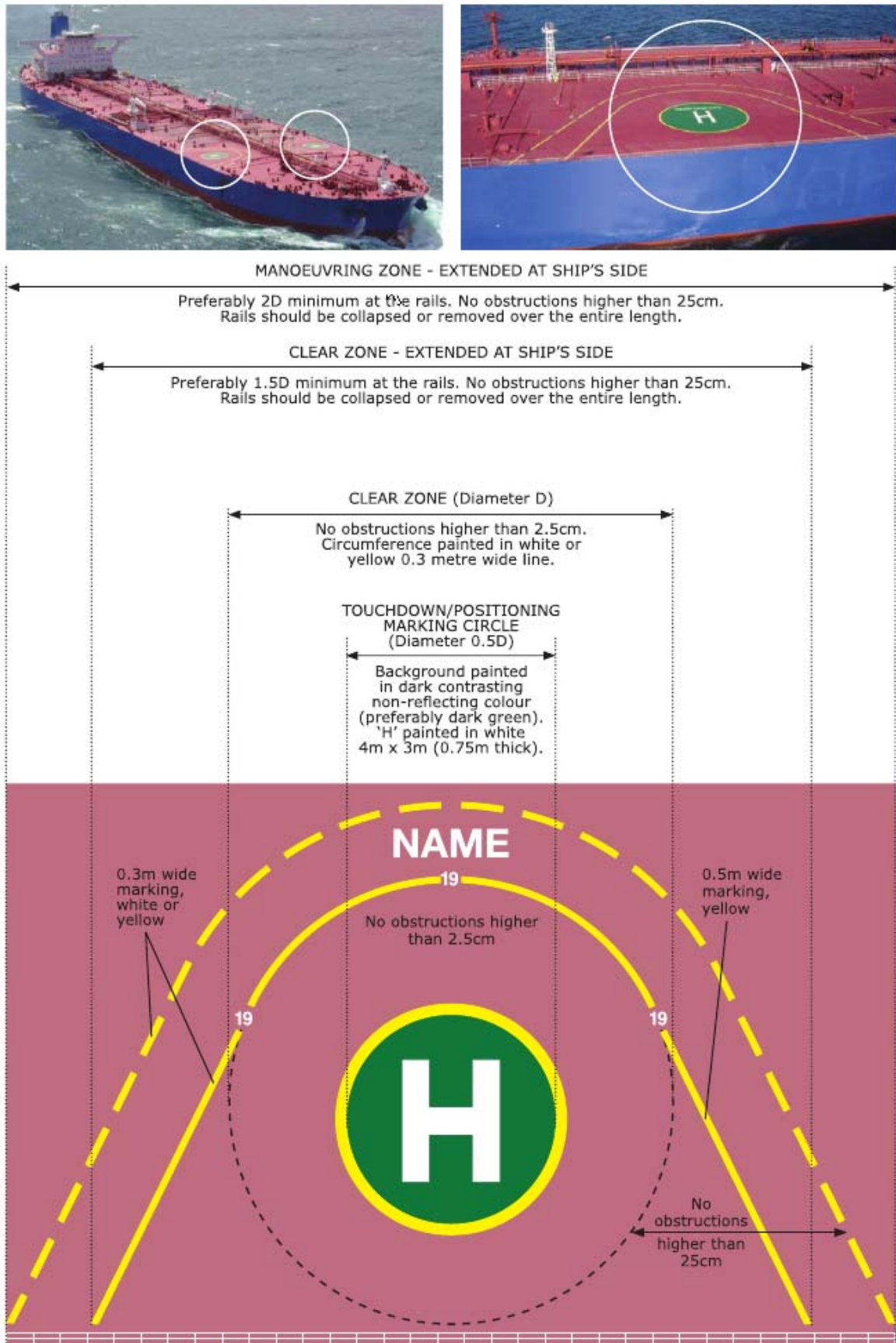
In order to improve operational safety, where the operating area is coincident with the ship's side, the clear zone should extend to a distance of $1.5 D$ at the ship's side while the manoeuvring zone should extend to a distance of $2 D$ measured at the ship's side. Within this manoeuvring zone, the only obstacles present should be those essential for the safe operation of the helicopter, with a maximum height of 25 cm (where there are immovable fixed objects such as tank cleaning lines they should be marked conspicuously and annotated on the ship's operating area diagram). Any railing located on the ship's side should be removed or collapsed along the entire length of the manoeuvring zone at the ship's side (i.e. over a distance of at least $2 D$). The general arrangements and markings for a non purpose built landing area on a ship's side are shown in Figure 4.1, while the markings themselves are described more fully in Section 4.3.2.

4.1.2.2 Amidships Centreline Landing Area (Purpose Built and Non Purpose Built)

For some vessels, where it is not possible to accommodate the ship's side arrangement, it may only be possible to provide a landing area located in an amidships position, usually on or near to the centreline of the ship. Where this is the case, the landing area should consist of a clear zone capable of containing a circle with a minimum diameter of $1 \times D$. No objects should be located within the clear zone except aids essential for the safe operation of the helicopter, and then only up to a maximum height of 2.5 cm. Such objects should only be present if they do not represent a hazard to the helicopter (where, for a non purpose built landing area, there are immovable fixed objects located in the clear zone such as a "Butterworth lid", these should be marked conspicuously and annotated on the ship's operating area diagram). Forward and aft on the centreline of the landing area should be two symmetrically located 150 degree limited obstacle sectors with apexes on the circumference of the D reference circle (shown as Reference Points on Figure 4.2). Within the area bounded by these two sectors, containing the airspace used by helicopters during the final stages of approach and/or departure and overshoot, and around the perimeter of the landing area D , there should be no obstructions above the level of the landing area except obstacles whose presence is essential for the safe operation of the helicopter, and then only up to a maximum height of 25 cm. To provide protection forward and aft from obstructions adjacent to the landing area, an obstacle protection surface should extend both fore and aft of the landing area to a distance of $1 \times D$ on a 1:5 gradient. The general arrangement and markings for an amidships centreline landing area are shown below in Figures 4.2 and 4.3 respectively. The markings are described more fully in Section 4.3.3.

Note: Where the requirements for the limited obstacle sector and obstacle free sector cannot be fully met - i.e. the 1:5 gradient is infringed or the "funnel of approach" is compromised due to the presence of obstacles greater than 25 cm above the level of the landing area, any infringements should be conspicuously marked and annotated on the ship's operating area diagram and assessed by the helicopter operator. The helicopter operator may need to impose appropriate restrictions and/or limitations to ensure that flight safety is not compromised. Where the nature of the infringement is significant, the use of the landing area may be severely limited or prohibited altogether and winching may be the only possibility (see Section 4.1.3).

Figure 4.1
Landing Area at the Ship's Side



Notes: The diameter in metres of the clear zone 'D' to be marked in white figures of 0.6m at each of the points shown, so as to be easily visible to the helicopter pilot. NB: The diameter (in metres) of the clear zone must be equal to or greater than the overall length of a visiting helicopter with rotors running.

Figure 4.2
Amidships Centreline Landing Area (Purpose Built and Non Purpose Built)

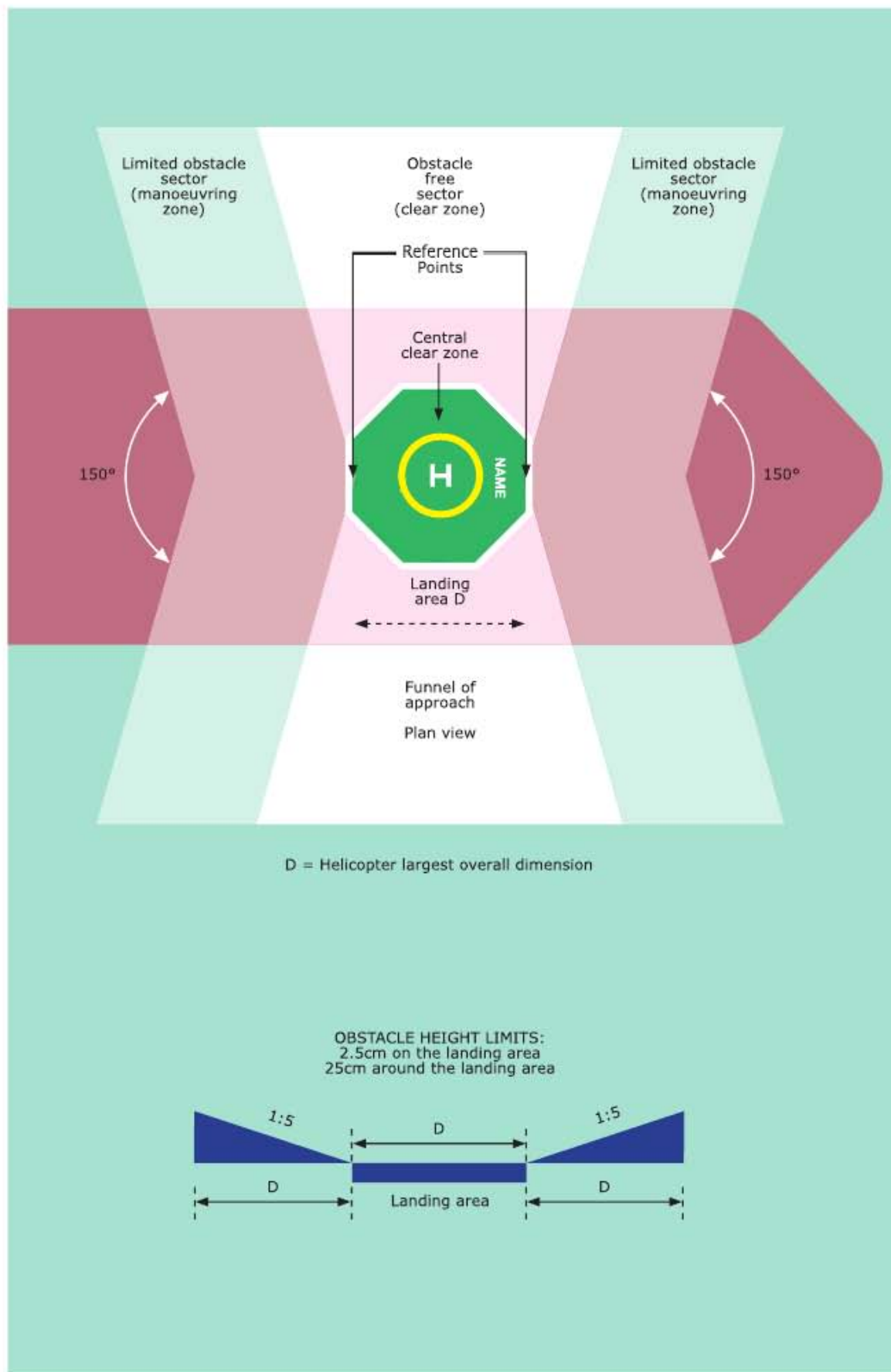


Figure 4.3
Markings for a Purpose Built Landing Area in an Amidships Centreline Location

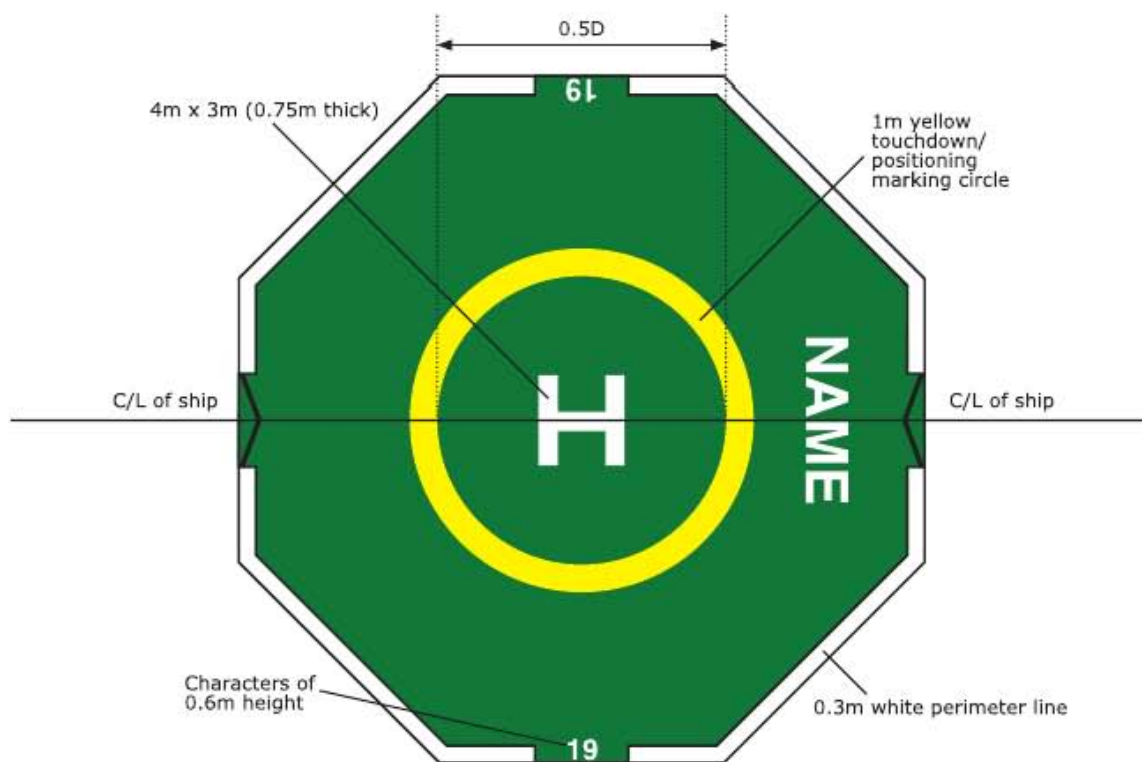
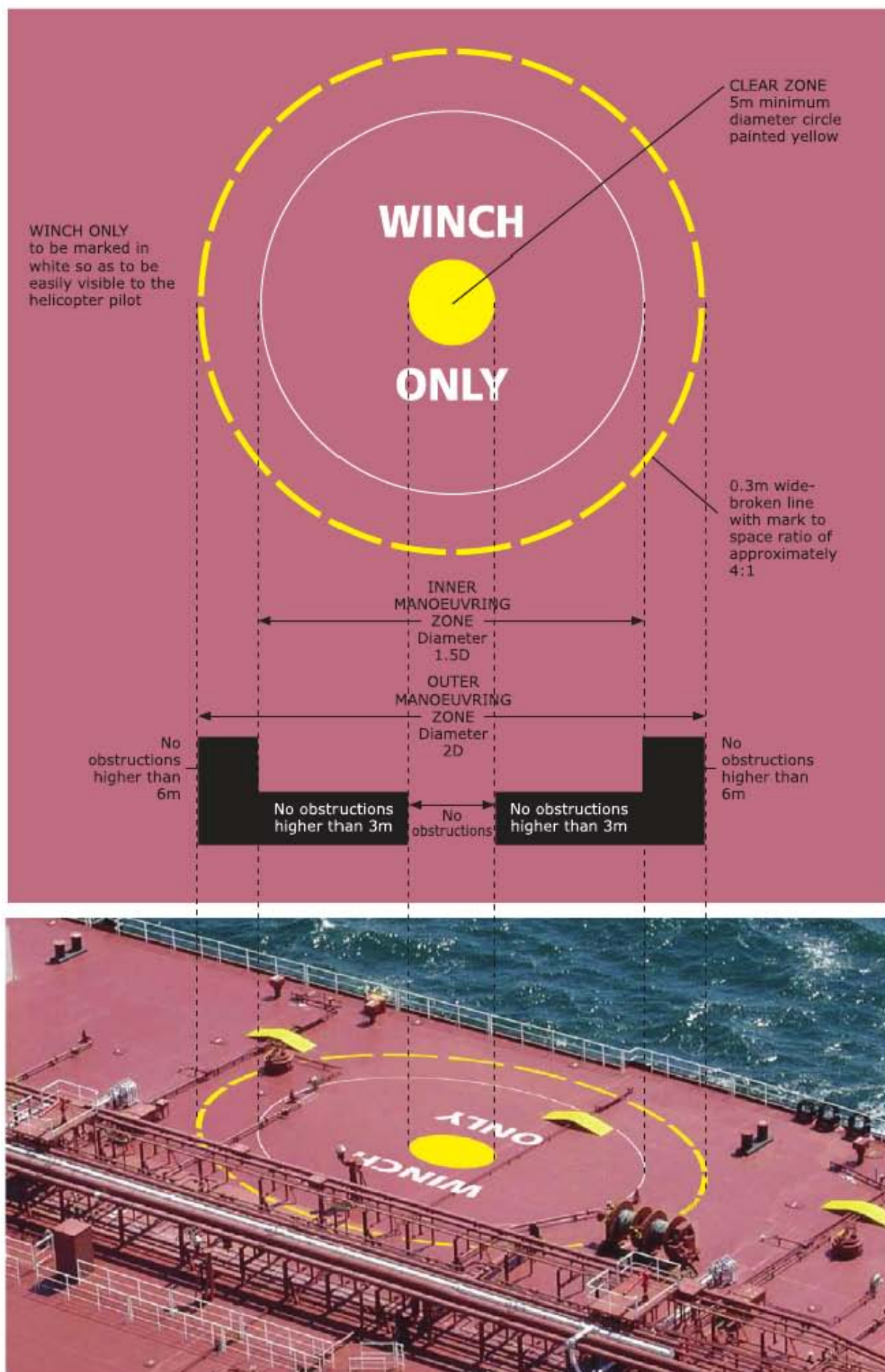


Figure 4.4
Winching Operations Area



4.1.3 Location and Size of Operating Area – Winching

Where it is impractical to provide a landing area for helicopters as described in Section 4.1.2 above, it may be possible to provide an operating area capable of supporting winching operations only. A winching area should consist of a clear zone and a manoeuvring zone. The clear zone should be at least 5 metres in diameter and should have a surface capable of accommodating personnel and/or stores during winching operations. In addition, the clear zone should be obstruction free. The manoeuvring zone, divided into an inner and outer portion, should extend beyond the clear zone, with a minimum overall diameter of 2 D. A portion of the manoeuvring zone may be located beyond the ship's side. Within the inner portion of the manoeuvring zone, extending to an overall diameter of 1.5 D, obstructions may be permitted up to an overall height above the level of the clear zone of 3 metres. Within the outer portion of the manoeuvring zone, obstructions may be permitted up to an overall height above the level of the clear zone of 6 metres. All obstructions should be clearly marked (see paragraph 4.5 (i)). The general arrangement for a winching area is shown in Figure 4.4, and further advice on positioning a winching area is provided in Section 4.4.1. The markings for a winching area are described in Section 4.4.3.

4.1.4 Poop Deck Platforms

Poop decks are generally subject to adverse aerodynamic effects and are susceptible to a greater influence from wave motions. A poop deck arrangement is therefore not recommended unless all other options have been exhausted.

Where a poop deck arrangement is specified, potential problems may be eased by adopting good design practices (see Sections 4.2.2 and 4.2.3). It may also help to manoeuvre the ship for helicopter operations so that the wind is within 35 degrees of the beam, preferably on the port side.

4.1.5 Structural Considerations

(Purpose Built and Non Purpose Built Landing Areas)

Where a purpose built structure is provided, the structural features of a purpose built landing area should take full account of the relevant applicable codes, whether from the ICAO Heliport Manual or IMO, ISO or CAP 437 requirements.

In the case of a non purpose built landing area, it must be established before marking that the selected area can withstand the dynamic loads of the types of helicopter for which it is intended.

4.2 ENVIRONMENTAL EFFECTS

4.2.1 General Considerations

When considering the location of a landing area or a winching area, due account should be taken of the potential effects on helicopter operations of both aerodynamic factors (see Section 4.2.2) and wave motion (see Section 4.2.3). It is unlikely that a location can be found that will be free of the influence of any aerodynamic and wave motion effects and in reality the objective should be to select an appropriate area that, as far as possible, minimises these effects. The principles and good practice in the following paragraphs will assist in this regard, always bearing in mind the need for clear access to the operating area and exit from it, preferably to the ship's side.

Note: For further information on relevant ship design considerations, readers are referred to UK Civil Aviation Authority (CAA) Paper 2008/03 Helideck Design Considerations - Environmental Effects, available from the Publications section of the website at www.caa.co.uk

4.2.2 Aerodynamic Effects

There are three principal aerodynamic effects to be considered:

- a. The flow of air around the hull, which has the potential to create areas of distorted and disturbed airflow.
- b. The flow of air around large items of the ship's superstructure, such as the accommodation block, which can create turbulence in their wake.
- c. Hot gas flows emanating from funnel or exhaust outlets, which can create turbulence and have thermal effects.

The impact of such turbulence and thermal effects can be reduced by a number of design considerations. For example:

- a. In the case of a landing area located above the ship's structure, an air gap separating the landing area from the structure below should be provided to promote beneficial wind flow over the landing area.
- b. The layout of the ship will usually include a number of tall, solid structures that rise above the level of the operating area. These structures can generate significant wake downwind of the source. The operating area should therefore ideally be located upwind of significant sources of turbulence, and any obstructions that have to be located upwind of the operating area should be as far away from it as possible.
- c. Increases in ambient air temperature are a potential hazard to the performance capability of helicopters and so the aim should be to minimise the occurrence of temperature changes over the operating area. This can be achieved by ensuring that, wherever possible the operating area is maintained upwind of significant thermal sources. Where significant thermal sources such as engine exhausts are located upwind of the operating area, they should be as far away as possible from the operating area and the helicopter flight path.
- d. Cold gas emissions, even in small concentrations, can have an adverse effect on helicopter engine performance and, where cold gas release points are present on a ship, they should be as remote as possible from the operating area and away from the helicopter flight path.

4.2.3 Wave Motion Effects

The dynamic motions on ships caused by ocean waves - pitch and sway, roll and surge, and heave and yaw - are a potential hazard to helicopter operations. Consideration should therefore be given to establishing motion limits acceptable for executing a safe landing or winching operation. These limits will depend on the following:

- The wave conditions and relative heading of the ship
- The size of the ship
- The motion characteristics of the ship
- Whether the ship is moored or underway
- Whether operations occur by day or night (see Section 4.6).

The principal factors in establishing motion limits for a safe helicopter landing are the vertical motions of the ship (i.e. rate of heave) in combination with its pitch and roll. The heave motions at the landing area depend largely on the location of the landing area and how the vessel's heave, roll and pitch motions combine at this location. The suitability of the landing area will therefore be influenced by its location on the ship both longitudinally and transversely. The pitching of a ship is such that the vertical (heave) motion experienced at the landing area will generally be greatest if the landing area is located on the bow or stern of the ship, and least for a landing area located amidships. Bow located landing areas can also be particularly vulnerable to damage from heavy seas unless mounted high above deck level. Landing areas located on or over a ship's side may experience large heave motions due to vessel roll, which will be more pronounced the further the landing area is cantilevered off the ship's side. Landing or winching areas located on the bow or stern of the ship often present special difficulties for visual positioning especially during night time operations (see also paragraph 4.5 (h) regarding visual estimates).

Motion monitoring equipment is available that is compatible with the requirements of civil aviation authorities and will detect, monitor, display and transmit motions experienced at the ship's helicopter operating area including heave, roll and pitch. It is strongly recommended that serious consideration is given to the fitting of such equipment, which by an automated means can also record and process climatic information (see paragraph 4.5 (g)) in order that objective data is available to support and inform operational decision making. Some authorities may also require systems for collection, retention and standard reporting of meteorological information by trained meteorological observers.

4.3 DETAILS OF LANDING AREA

4.3.1 General Guidance on Markings

Sections 4.3.2 and 4.3.3 provide guidance on the markings required for a helicopter landing area on the ship's side and amidships respectively. The recommended colours of the markings reflect current international standards and best practice. However, as the colour of the main deck may vary from ship to ship, there is some discretion in the selection of deck paint schemes, the objective always being to ensure that the markings are conspicuous against the surface of the ship and the operating background.

Note: Non-slip paint should be used for all markings.

4.3.2 Markings for a Landing Area Located at the Ship's Side

This section provides guidance on the markings applicable to a helicopter landing area on the ship's side, and should be read in conjunction with Section 4.1.2.1 and Figure 4.1.

A Touchdown/Positioning Marking (TD/PM) circle, denoting the touchdown point for the helicopter, should be located centrally within the clear zone. The diameter of the clear zone should be $1 \times D$ (D being the extent of the available operating area), while the inner diameter of the TD/PM circle should be $0.5 D$. The thickness of the TD/PM circle should be at least 0.5 m in width and painted yellow. The area enclosed by the TD/PM circle should be painted in a contrasting colour, preferably dark green. A white "H" should be painted in the centre of the circle, with the cross bar of the "H" running parallel to the ship's side. The "H" marking should be 4 m high x

3 m wide, the width of the marking itself being 0.75 m.

The boundary of the clear zone, capable of enclosing a circle with a minimum diameter of $1 \times D$ and extending to a total distance of $1.5 D$ at the ship's side, should be painted with a continuous 0.3 m wide yellow line. The actual D value, expressed in metres rounded down to the nearest whole number should also be marked in three locations around the perimeter of the clear zone in a contrasting colour, preferably white. The height of the numbers so marked should be 0.6 m, i.e. twice the width of the line itself.

The boundary of the manoeuvring zone, located beyond the clear zone, and extending to a total distance of $2 D$ at the ship's side, should be marked with a 0.3 m wide broken yellow line with a mark to space ratio of approximately 4:1. Where practical, the name of the ship should be painted in a contrasting colour (preferably white) on the inboard side of the manoeuvring zone in (minimum) 1.2 m high characters.

Some additional considerations are found in Section 4.5.

4.3.3 Markings for Amidships Centreline Landing Area with or without Restricted Access from the Ship's Side

This section provides guidance on the markings applicable to an amidships centreline landing area, and should be read in conjunction with Section 4.1.2.2 and Figures 4.2 and 4.3.

The landing area should be painted in a colour, preferably dark green, that contrasts clearly with the colour of the ship's deck. The perimeter of the landing area should be clearly marked with a 0.3 m wide continuous white line.

The D value of the landing area, expressed in metres rounded down to the nearest whole number, should be marked in port and starboard locations within the perimeter line in a contrasting colour (preferably white), the characters themselves having a height of 0.6 m.

A Touchdown/Positioning Marking (TD/PM) circle, with a thickness of 1.0 m painted yellow and with an inner diameter of $0.5 D$, should be centrally located within the landing area. A white "H" should be painted in the centre of the circle with the cross bar of the "H" running parallel to the centreline of the ship. The dimensions of the "H" marking should be 4 m high x 3 m wide, the width of the marking itself being 0.75 m.

Where practical, the name of the ship should be painted in a contrasting colour (preferably white) within the landing area, aligned across the centreline (see Figure 4.3). The minimum height of the painted characters should be 1.2 m.

Some additional considerations for helicopter operating areas are found in Section 4.5.

4.4 DETAILS OF WINCHING AREA

4.4.1 Positioning a Winching Area

With the increasing use of helicopters for routine operations to ships, it is strongly recommended that, where it is impractical to provide a designated landing area, a winching area is provided over which the helicopter can hover safely while winching personnel or stores to or from the ship. The location of the operating area should enable the pilot to adopt a position in the hover that allows an unimpeded view of the whole of the clear zone while also facilitating an unobstructed view of

the ship. The winching area should be located so as to minimise the aerodynamic and wave motion effects described in Sections 4.2.2 and 4.2.3. Generally, it is not recommended to locate the winching area near the bow of the ship. In addition, it should not be located on the bridge wing in the absence of a thorough risk assessment acceptable to the ship's master and the helicopter operator (see Section 4.4.2). The winching area should, if possible, be clear of accommodation spaces and provide adequate deck area adjacent to the manoeuvring zone where personnel can muster, and provide for safe access to the area from different directions. In selecting a winching area, the desirability of keeping the winching height to a minimum should also be borne in mind.

To reduce the risk of the winching hook and cable becoming fouled, all guard rails, awnings, stanchions, antennae and other obstructions in the vicinity of the manoeuvring zone should, as far as possible, be removed or retracted (see paragraph 4.5 (i) for marking of obstructions, paragraph 4.6 (d) for night operations and Figure 4.5 for obstruction lighting).

4.4.2 Winching Area on the Bridge Wing

The bridge wing will never be the ideal location for a winching area. However, there may be circumstances where there is no practical alternative to use of the bridge wing, and in such cases a thorough risk assessment of the operation must be conducted. Only if the results are acceptable to, and approved by, both the ship's master and the helicopter operator should winching to the ship's bridge wing be permitted.

4.4.2.1 Risk Assessment

Guidance on conducting a bridge wing risk assessment has been developed by a working group of marine and aviation experts established by ICS. The resulting document, "Bridge Wing Operations for Marine Pilot Transfer - A Risk Assessment", has been included at Appendix H. Further information regarding marine pilot transfer may be found in Appendix E.

The guidance in Appendix H contains a risk assessment for the transfer, by helicopter hoist, of marine pilots to the bridge wing (BW) of ships under conditions where the size of the operational site precludes the application of the advice in this ICS Guide and the ICAO standards. The assessment applies both to the helicopter and ship elements of BW operations. It represents a generic risk assessment of BW operations and does not make any assumptions about any specific national operational requirements, helicopter operator, type of helicopter, shipping line or ship. Threats and controls are discussed in the general text but are considered in greater detail in the Model Risk Assessment Matrix of Annex 1 of Appendix H.

BW operations can be conducted safely provided the controls, in the form of equipment, procedures and conditions, are applied as recommended. The risk assessment guidance document does not remove the necessity for individual risk assessments by ships and helicopter operators to ascertain whether such operations can meet the standard intended by their Safety Management Systems.

4.4.3 Marking a Winching Area

This section provides guidance on the markings applicable to winching areas, and should be read in conjunction with Section 4.1.3 and Figure 4.4.

The clear zone of the winching area, a central circle with a minimum diameter of 5 m, should be painted in a conspicuous colour, preferably yellow, to contrast with the surrounding paintwork of the ship. The perimeter of the outer portion of the manoeuvring zone should be marked with a conspicuous broken yellow line 0.3 m in width, the ratio of the solid line to spaces being approximately 4:1 (i.e. with 80% of the circle painted in - see Figure 4.4).

Within the inner portion of the manoeuvring zone, based on a circle of diameter 1.5 D but outside the clear zone, should be painted the words "WINCH ONLY" in suitably large and conspicuous lettering (ideally 2 m - 5 m white characters). The inner portion of the manoeuvring zone may be indicated by painting a thin white line no more than 0.1 m wide.

Note: Markings outside the clear zone could be obscured by temporary obstacles which should not exceed the height limits of Section 4.1.3 and Figure 4.4.

Some additional considerations are found in Section 4.5.

4.5 ADDITIONAL CONSIDERATIONS FOR HELICOPTER OPERATING AREAS

In addition to the marking arrangements described in Sections 4.3 and 4.4, the ship operator should ensure that:

- a. Provision is made to keep the landing or winching area free of contaminants, including surface water.
- b. An overall coating of a non-slip material is applied over the whole of the marked area for the benefit of helicopters and personnel.
- c. Where appropriate, safety nets for personnel protection are installed around the landing area. The outboard edge of the safety netting should not rise above the level of the landing area.
- d. If it is anticipated that the helicopter may shut down its engines, flush fitting or removable semi-recessed tie-down points should be considered, adequate to secure the largest helicopter for which the landing area is designed.
- e. If possible, a minimum of two access/egress routes to and from the landing area are available, to ensure that, in the event of an incident on the landing area, helicopter passengers and crew can escape upwind of the incident.
- f. Any handrails exceeding the height limitations set out in Section 4.1.2 are made retractable, collapsible or removable and do not impede access/egress routes. Such handrails should be painted in a contrasting colour scheme and procedures should be in place to retract, collapse or remove them prior to the arrival of the helicopter.
- g. The ship has a means of ascertaining, recording and reporting wind speed and direction, air temperature and pressure settings used by pilots, visibility, cloud base, present weather and sea state (see also Section 3.7).
- h. The ship has a means of obtaining accurate pitch, roll and heave measurements at the landing area. It is strongly recommended that the ship is equipped with motion sensing systems, which will produce accurate pitch, roll and heave information at the landing area (see also Section 4.2.3). The use of visual estimates is not recommended. (See also Section 3.7.)
- i. Obstructions close to or within the operating area, which may present a hazard to helicopter operations, need to be readily visible from the air and should be highlighted. Painting of obstructions should follow the scheme advised in Appendix F, Sections 4, 5 or 6 as appropriate.

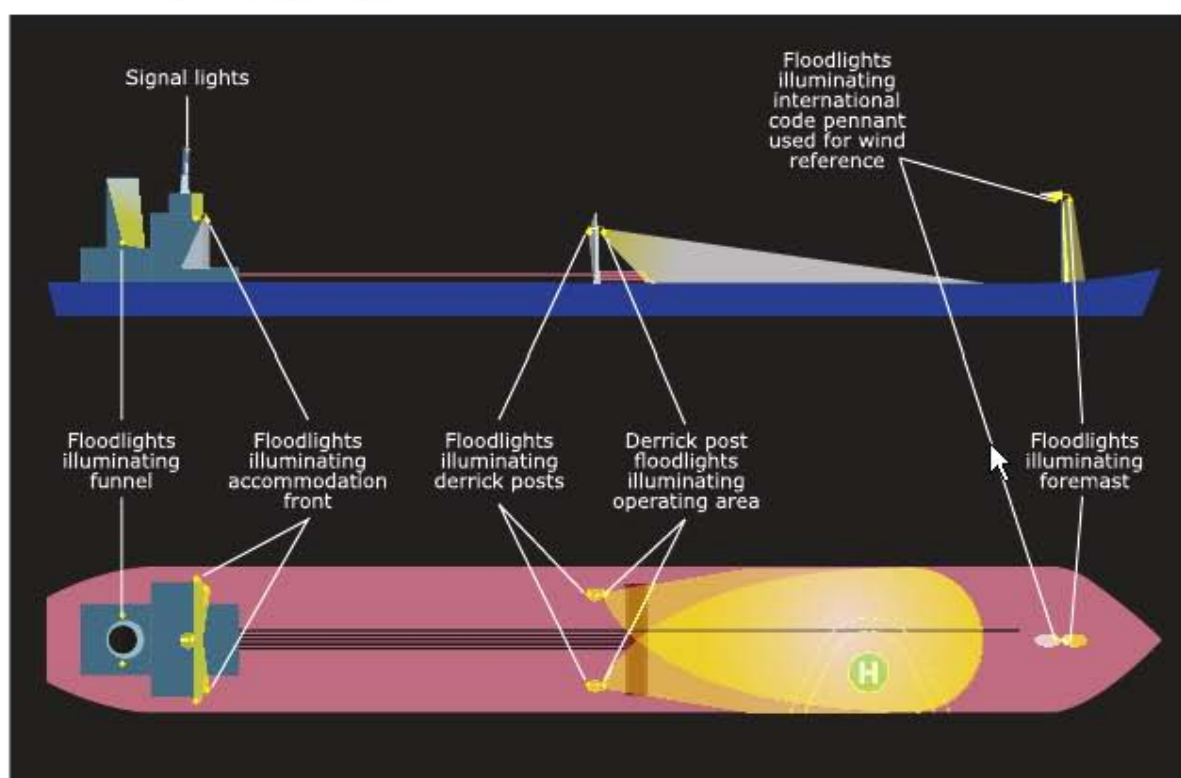
4.6 NIGHT OPERATIONS: LANDING AND WINCHING

AREA LIGHTING

The following points should be taken into account for night operations:

- The landing or winching area should be adequately lit for night operations. This can be achieved either by the use of flood lighting or by other appropriate lighting methods¹.
Note: Unless adequate lighting is provided, landing/winching operations should be confined to daylight only.
- A wind direction pennant should be provided to indicate the wind conditions at the operating area. The pennant should be illuminated for night operations. Some vessels may benefit from a second device to indicate when the wind over the operating area differs from that generally over the ship.
- The use of flash photography should be avoided during the landing or take off of helicopters and during winching operations to avoid distracting the flight crew.
- The ship's master should ensure that floodlights are arranged to illuminate the whole of the structure they are intended for, and are angled and shielded (as necessary) to ensure that they do not dazzle the pilot on his approach to or take off from the operating area. Figure 4.5 shows an example of an overall lighting scheme required for night helicopter operations.

Figure 4.5
Representative Landing Area Lighting Scheme



Note: Other appropriate lighting schemes may be used.

¹ Reference to: Annex 14 Volume II Chapter 5 of the ICAO Convention on International Civil Aviation and CAP 437 (Offshore Helicopter Landing Areas - Guidance on Standards) published by the United Kingdom CAA.

4.7 FIRE FIGHTING APPLIANCES AND

RESCUE EQUIPMENT

The fire fighting and rescue equipment recommendations shown in the table below are closely based on the requirements of SOLAS Chapter II-2 Regulation 18 which stipulates requirements for ships fitted with special facilities for helicopters. Such special facilities may include fixed helideck structures and refuelling and hangar facilities. Ships without such special facilities but with deck based landing or winching arrangements should also provide the following appliances and equipment.

Ships conducting bridge wing winching operations should give particular consideration to the provision of appropriate fire fighting appliances and rescue equipment in the vicinity of the winching operation and in light of the risk assessment conducted (see also Section 4.4.2.1).

Summary of Required Fire Fighting and Rescue Equipment			
In close proximity to the helicopter landing area, the following fire fighting appliances should be provided:			
Dry powder	One or two suitable extinguishers with a total capacity of not less than 45 kg.		
Carbon dioxide (CO ₂)	One or two extinguishers with a total capacity of not less than 18 kg.		
Foam system	An application system consisting of monitors or foam making branch pipes, capable of delivering foam to all parts of the helicopter operating area in all weather conditions in which helicopters can operate. The system should be capable of delivering a discharge rate as identified below for at least five minutes.		
	Category	Helicopter overall length	Discharge rate foam solution (litres/min)
	H 1	Up to but not including 15 m	250
	H 2	From 15 m up to but not including 24 m	500
	H 3	From 24 m up to but not including 35 m	800
Fire hoses	At least two nozzles of an approved dual purpose type (e.g. jet/spray) and hoses sufficient to reach any part of the helicopter operating area.		
Fire fighters' outfits	At least two complete fire fighters' outfits as required by the IMO Fire Safety Systems Code.		
Emergency tools/equipment	<p>As a minimum, the following equipment, ready for immediate use and stored in a manner that provides for protection from the elements:</p> <ul style="list-style-type: none"> - red emergency signalling lamp - large axe - crowbar - adjustable wrench - fire resistant blanket - 60 cm bolt/wire cutters - grab or salving hook - heavy duty hacksaw, complete with 6 spare blades - ladder - lifeline, 5 mm diameter x 15 m in length - side cutting pliers - set of assorted screwdrivers - harness knife complete with sheath - first aid kit. 		