Civil Aviation Directive (CAD)

Civil Aviation Directive – 1406 Vol. II

Helideck Standards and Requirements

HSR

Civil Aviation Authority of Malaysia

Issue 01
Revision 00 – 18th March 2026

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Introduction

In exercise of the power conferred by Section 24O of the Civil Aviation Act 1969 [*Act 3*], the Chief Executive Officer makes this Civil Aviation Directive 1406 Volume II – Helideck Standards & Requirements ("CAD 1406 Vol. II – HSR"), pursuant to Regulation 81 (2) of the Civil Aviation Regulations (CAR) 2016 and Regulation(s) 6, 9-15, 17, 19, 20, 22-24, 26, 27, 29-31, 33, 34, 37, 53-54, 64 and 65 of the Civil Aviation (Aerodrome Operations) Regulations (CAR [AO]) 2016.

This CAD contains the standards, requirements and procedures pertaining to the provisions of the helideck standards & requirement issued by CAAM. The standards and requirements in this CAD shall supplement to the standards contained in the CAD 14 Vol. II – Standards for Heliports.

This Civil Aviation Directives 1406 Volume II – Helideck Standards & Requirements ("CAD 1406 Vol. II – HSR") is published by the Chief Executive Officer under Section 24O of the Civil Aviation Act 1969 [*Act 3*] and come into operation on 18 March 2026.

Non-compliance with this CAD

Any person who contravenes any provision in this CAD commits an offence and shall on conviction be liable to the punishment under Section 24O (2) of the Civil Aviation Act 1969 [*Act 3*] and/or under Civil Aviation (Aerodrome Operations) Regulations 2016.

(Dato' Captain Norazman Bin Mahmud)
Chief Executive Officer
Civil Aviation Authority of Malaysia

Civil Aviation Directive Components and Editorial Practices

This Civil Aviation Directive is made up of the following components and are defined as follows:

Standards: Usually preceded by words such as *"shall"* or *"must"*, are any specification for physical characteristics, configuration, performance, personnel or procedure, where uniform application is necessary for the safety or regularity of air navigation and to which Operators must conform. In the event of impossibility of compliance, notification to CAAM is compulsory.

Recommended Practices: Usually preceded by the words such as "*should"* or "*may*", are any specification for physical characteristics, configuration, performance, personnel or procedure, where the uniform application is desirable in the interest of safety, regularity or efficiency of air navigation, and to which Operators will endeavour to conform.

Appendices: Material grouped separately for convenience but forms part of the Standards and Recommended Practices stipulated by CAAM.

Definitions: Terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

Tables and Figures: These add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

Notes: Included in the text, where appropriate, Notes give factual information or references bearing on the Standards or Recommended Practices in question but not constituting part of the Standards or Recommended Practices;

Attachments: Material supplementary to the Standards and Recommended Practices or included as a guide to their application.

It is to be noted that some Standards in this Civil Aviation Directive incorporates, by reference, other specifications having the status of Recommended Practices. In such cases, the text of the Recommended Practice becomes part of the Standard.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in CAD 5. Where CAD 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Throughout this Civil Aviation Directive, the use of the male gender should be understood to include male and female persons.

Record of Revisions

Revisions to this CAD shall be made by authorised personnel only. After inserting the revision, enter the required data in the revision sheet below.

ISS/REV No.	Revision Date	Revision Details

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Summary of Changes

ISS/REV no.	Item no.	Revision Details

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1 General

1.1 Citation

1.1.1 This Directive is the Civil Aviation Directive 1406 Volume II – Helideck Standards and Requirements (CAD 1406 Vol. II – HSR), Issue 01/Revision 00, and comes into operation on 18th March 2026.

1.1.2 This Directive will remain current until withdrawn or superseded.

1.2 Applicability

1.2.1 The Helideck Standards & Requirements in this CAD are applicable to Helideck Operators. In this publication, the term ‘helideck’ refers to all helicopter landing areas on fixed or floating offshore facilities used for mineral exploitation (for the exploration of oil and gas), research or construction.

1.2.2 This Directive also shall be read together with CAD 14 Vol. II – Heliports, that contains the Standards of Heliports. This Directive shall be applicable to standards that prescribe the physical characteristics and obstacle limitation surfaces to be provided for at helideck and at any matter related thereto, including certain facilities and technical services normally provided at an aerodrome.

1.3 Revocation

1.3.1 This CAD revokes the Civil Aviation Directive 1406 – Helidecks Standards and Requirements (CAD 1406), Issue 01/Revision 00, dated 15th May 2022.

1.4 Definitions, Abbreviations and Symbols

1.4.1 The CAD 14 Vol. I – Aerodrome Design and Operations, contains definitions for the terms which are used in both volumes. Those definitions are not reproduced in this CAD, with the exception of the following:

The following list contains definitions of terms that are used only in Volume II, with the meanings given below.

D means the largest overall dimension of the helicopter when rotor(s) are turning measured from the most forward position of the main rotor tip path plane to the most rearward position of the tail rotor tip path plane or helicopter structure.

Design D means the D of the design helicopter.

D-value means a limiting dimension, in terms of “D”, for a heliport, helideck or shipboard heliport, or for a defined area within.

Declared distances – heliports.

a) Take-off distance available (TODAH). The length of the FATO plus the length of helicopter clearway (if provided) declared available and suitable for helicopters to complete the take-off.

b) Rejected take-off distance available (RTODAH). The length of the FATO declared available and suitable for helicopters operated in performance class 1 to complete a rejected take-off.

c) Landing distance available (LDAH). The length of the FATO plus any additional area declared available and suitable for helicopters to complete the landing manoeuvre from a defined height.

Dynamic load-bearing surface means a surface capable of supporting the loads generated by a helicopter in motion.

Elevated heliport means a heliport located on a raised structure on land.

Falling gradient means a surface extending downwards on a gradient of 5:1 measured from the edge of the safety netting (or shelving) located around the TLOF below the elevation of the helideck or shipboard helideck to water level for an arc of not less than 180 degree which passes through the centre of the TLOF and outwards to a distance that will allow for safe clearance of obstacles below the TLOF in the event of an engine failure for the type of helicopter the helideck or shipboard helideck is intended to serve. Where high-performing helicopters are exclusively used, consideration may be given to relaxing the falling gradient from a 5:1 to a 3:1 slope.

Final approach and take-off area (FATO) mean a defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take off manoeuvre is commenced. Where the FATO is to be used by helicopters operated in performance class 1, the defined area includes the rejected take-off area available.

Helicopter clearway means a defined area on the ground or water, selected and/or prepared as a suitable area over which a helicopter operated in performance class 1 may accelerate and achieve a specific height.

Helicopter stand means an aircraft stands which provides for parking a helicopter and where ground taxi operations are completed or where the helicopter touches down and lifts off for air taxi operations.

Helicopter taxiway means a defined path on a heliport intended for the ground movement of helicopters and that may be combined with an air taxi-route to permit both ground and air taxiing.

Helicopter taxi-route means a defined path established for the movement of helicopters from one part of a heliport to another.

a) Air taxi-route. A marked taxi-route intended for air taxiing.

b) Ground taxi-route. A taxi-route centred on a taxiway.

Helideck means a heliport located on a fixed or floating offshore facility such as an exploration and/or production unit used for the exploitation of oil or gas.

Helideck Facilities and Equipment means facilities and equipment, inside or outside the boundaries of the helideck, that are constructed or installed, operated and maintained for the arrival, departure and surface movement of aircraft.

Helicopter landing officer means a designated person on duty at an off-shore installation responsible for supporting safe helicopter operations to the helideck and the daily supervision of the helideck.

Helideck Operations Manual means the manual that forms part of the application for Acceptance.

Helideck radio operator means a designated person responsible for ensuring effective radio communications between helicopter flight crew and the helideck.

Heliport means an aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Heliport elevation means the elevation of the highest point of the FATO.

Heliport reference point (HRP) means the designated location of a heliport or a landing location.

Normally Attended Installation (fixed helideck) typically refers to an offshore facility or platform that is regularly occupied by personnel. In the context of the oil and gas industry, this term is often used to distinguish between facilities that are continuously staffed with personnel and those that may only be temporarily or intermittently manned***.***

Normally Unattended Installation (fixed helideck**)** means an offshore installation designed to be primarily operated remotely, without the constant presence of personnel.

Obstacle means all fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

a) are located on an area intended for the surface movement of aircraft; or

b) extend above a defined surface intended to protect aircraft in flight; or

c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

Obstacle Free Sector means a sector, not less than 210 degrees, extending outwards to a distance that will allow for an unobstructed departure path appropriate to the helicopter the TLOF is intended to serve, within which no obstacles above the level of the TLOF are permitted. (For helicopters operated in PC1 or PC2 the horizontal extent of this distance will be compatible with the one-engine inoperative capability of the helicopter type to be used).

Point-in-space approach (PinS**)** means the Point-in-space approach is based on GNSS and is an approach procedure designed for helicopter only. It is aligned with a reference point located to permit subsequent flight manoeuvring or approach and landing using visual manoeuvring in adequate visual conditions to see and avoid obstacles.

Point-in-space (PinS) visual segment means the segment of a helicopter Pins approach procedure from the Map to the landing location for a PinS “proceed visually” procedure. This visual segment connects the Point-in-space (PinS) to the landing location.

Note. — The procedure design criteria for a PinS approach and the detailed design requirements for a visual segment are established in the ICAO Procedures for Air Navigation Services — Aircraft Operations, (PANS-OPS, Doc 8168).

Protection area means a defined area surrounding a stand intended to reduce the risk of damage from helicopters accidentally diverging from the stand.

QNH means altimeter sub-scale setting to obtain elevation when on the ground.

QFE means atmospheric pressure at aerodrome elevation (or at runway threshold).

Rejected take-off area means a defined area on a heliport suitable for helicopters operating in performance class 1 to complete a rejected take-off.

Runway-type FATO means a FATO having characteristics similar in shape to a runway.

Safety area means a defined area on a heliport surrounding the FATO which is free of obstacles, other than those required for air navigation purposes, and intended to reduce the risk of damage to helicopters accidentally diverging from the FATO.

Safety Management System (SMS) means A systematic approach to managing safety including the necessary organisational structure, accountabilities, policies and procedures.

SIGMETS means information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations.

Shipboard heliport means a heliport located on a ship that may be purpose or non- purpose-built. A purpose-built shipboard heliport is one designed specifically for helicopter operations. A non-purpose-built shipboard heliport is one that utilises an area of the ship that is capable of supporting a helicopter but not designed specifically for that task.

Static load-bearing surface means a surface capable of supporting the mass of a helicopter situated upon it.

Surface-level heliport means a heliport located on the ground or on a structure on the surface of the water.

Touchdown and lift-off area (TLOF) mean an area on which a helicopter may touch down or lift off.

Winching area means an area provided for the transfer by helicopter of personnel or stores to or from a ship.

1.4.2 Abbreviations and symbols used in this CAD are as follows:

1.4.2.1 Abbreviations

AIP	=	Aeronautical Information Publication
AMSL	=	Above mean sea level
AOC	=	Air Operator Certificate
APAPI	=	Abbreviated precision approach path indicator
ASPSL	=	Arrays of segmented point source Lighting
CAAM	=	Civil Aviation Authority of Malaysia
CAD	=	Civil Aviation Directive
CD	=	Candela
CFD	=	Computational Fluid Dynamics
CM	=	Centimeter
DIFFS	=	Deck Integrated Firefighting System
FAS	=	Fixed application system
FATO	=	Final approach and take off Area
FFAS	=	Fixed foam application system
FMS	=	Fixed monitor system
FPSO	=	Floating production storage offloading vessel
Ft	=	Foot
GNSS	=	Global Navigation Satellite System
HAPI	=	Helicopter Approach Path Indicator
HFM	=	Helicopter Flight Manual
HLL	=	Helideck Limitation List
HLO	=	Helicopter Landing Officer
HRO	=	Heliport Radio Operator
HSP	=	Helicopter Service Provider
Hz	=	Hertz
KG	=	Kilogram
KT	=	Knot
L	=	Liter
LFL	=	Lower flammable limit
Ib	=	Pounds
LDAH	=	Landing Distance Available
L/min	=	Liter per minute
LOA	=	Limited Obstacle Area
LOS	=	Limited Obstacle Sector
LP	=	Luminescent Panel
M	=	Meter
MAP	=	Missed approach point
MTOM	=	Maximum take-off mass
NVIS	=	Night Vision Imaging Systems
OFS	=	Obstacle- free sector
OLS	=	Obstacle limitation surface
OPITO	=	Offshore Petroleum Industry Training Organization

PAPI	=	Precision Approach Path Indicator
PFAS	=	Portable Foam Application System
PINS	=	Point-in-space
RAO	=	Response Amplitude Operator
RFF	=	Rescue and Firefighting
RFFS	=	Rescue and Firefighting service
R/T	=	Radiotelephony or radio communications
RTOD	=	Rejected take-off distance
RTODAH	=	Rejected take-off distance available
S	=	Second
SLS	=	Serviceability limit states
SA	=	Safety Assessment
Tonne	=	1000 kg
TDPC	=	Touchdown/positioning Circle
TDPM	=	Touchdown/positioning marking
TLOF	=	Touchdown and lift -off area
TODAH	=	Take-off distance available
UCW	=	Undercarriage width
ULS	=	Ultimate limit states
VASI	=	Visual Approach Slope Indicator
VSS	=	Visual Segment Surface
KM/H	=	Kilometre per hour
SYMBOLS	=	**°** Degree **=** Equals **%** Percentage **±** plus, or minus

1.5 References

1.5.1 Compliance with this CAD will ensure compliance with, CAR (AO) 2016 and conformance with the international standards of ICAO Annex 14, Volume II.

1.5.2 This CAD ensure the helideck operators meet the minimum requirements to determine the suitability of a helideck and its continued use and certification.

1.5.3 For land-based helicopter landing areas, reference should be made to CAD 14 Vol. II – Heliports.

1.5.4 The following references were used either wholly or partly, in the preparation and compilation of this CAD 1406 Vol. II – HSR:

a) CAR (AO) 2016;

b) CAP 437;

c) AMC – 71;

d) CAD 1406.

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2 Helideck Design & Operations

Note. – When designing a helideck, the critical design helicopter, having the largest set of dimensions and the greatest maximum take-off mass (MTOM) the helideck is intended to serve, would need to be considered.

It is to be noted that provisions for helicopter flight operations are contained in CAD 6, Part III.

2.1 Helideck Operations Manual

2.1.1 The Helideck Operations Manual (could be Document or Guide Procedures) is a fundamental requirement for the inspection, approval and certification of helideck.

2.1.2 The helideck owners/operator shall have an up-to-date Helideck Operations Manual.

2.1.3 The Helideck Operations Manual is a fundamental requirement of the regulatory process. It shall contain all the pertinent information concerning helideck landing area, facilities, services, equipment, operating procedures, organisation, standards, helideck limitations, conditions and the levels of services, emergency response and management including Safety Management System. The information presented in the Helideck Operations Manual shall demonstrate that the helideck conforms to regulation and that there are no apparent shortcomings that would adversely affect the safety of aircraft operations.

2.2 Helideck Limitation List (HLL)

2.2.1 The criteria for the design and placement of offshore helideck has been set to define safe operating boundaries for helicopters in the presence of known environmental hazards. Where these criteria cannot be met, a limitation or restriction is placed in the HLL. These entries are usually specific to particular combinations of wind speed and direction, either restrict helicopter mass (payload), operations suspension in certain conditions or as information.

2.2.2 The HLL is designed for the benefit of the offshore helicopter operators and shall ensure that landings on offshore helideck is properly controlled when adverse environmental effects or non-compliances are present. On poorly designed helideck, severe operational restrictions may result, leading to significant payload penalties for an installation operator or vessel owner. Well designed and ‘helicopter friendly’ platform topsides and helideck shall result in efficient and cost-effective operations for the installation operator.

2.2.3 HLL shall be documented as part of Helideck Operations Manual. It shall contain helideck name, single issuance date or the subsequent review date; statement of the non-compliances and the relevant mitigations, limitations or restrictions. The initial issuance and revisions shall be submitted to CAAM for assessment and approval.

2.2.4 Safety Assessment (SA) shall be carried out for the determination of hazards and the associated mitigations. The mitigations shall be in place, prior to insertion into the HLL. For helideck without assigned or specific Helicopter Service Provider (HSP) operations, the SRA shall be conducted by the helideck operator and assisted by the helideck inspectors. Any weight penalty or flight restriction shall be in general until reviewed by the HSP operating at the helideck.

Note. – Refer to CAD 19 – Safety Management System and CAGM 1404 – Guidance for Safety Assessments for Aerodromes for guidance on SRA.

2.2.5 HLL is the responsibility of Helideck Owner/Operator. It has to be issued, reviewed and distributed to HSP whenever there was change to the content.

2.2.6 HLL is only applicable to helideck designed before 1st January 2025. However, for helideck designed after 1st January 2025, any operational limitation and conditions is subject to CAAM assessment and approval.

2.2.7 The HLL shall only be applicable until 31st December 22029. After this date, no certificate will be issued for helidecks with HLL.

2.2.8 The updated list of HLL shall include but not limited to items can be referred to CAAM website www.caam.gov.my

3 Helicopter Performance Consideration

3.1 General Considerations

3.1.1 The criteria for helicopter landing areas on offshore installations and vessels result from the need to ensure that Malaysian registered helicopters are afforded sufficient space to be able to operate safely at all times in the varying conditions experienced offshore. The helicopter's performance requirements and handling techniques are contained in the Rotorcraft Flight Manual and/or the operator's Operations Manual.

3.1.2 Helicopter companies operating for commercial air transport are required to hold an Air Operator Certificate (AOC) which is neither granted nor allowed to remain in force unless they provide procedures for helicopter crews which safely combine.

3.2 Safety Philosophy

3.2.1 Aircraft performance data is scheduled in the Flight Manual and/or the Operations Manual which enables flight crew to accommodate the varying ambient conditions and operate in such a way that the helicopter has sufficient space and sufficient engine performance to approach, land on and take off from helideck in safety.

3.2.2 Additionally, Operations Manuals recognise the remote possibility of a single engine failure in flight and state the flying procedures and performance criteria which are designed to minimise the exposure time of the aircraft and its occupants during the short critical periods during the initial stage of take-off, or final stage of landing.

3.2.3 On any given day helicopter performance is a function of many factors including the actual all-up mass; ambient temperature; pressure altitude; effective wind speed component; and operating technique. Other factors, concerning the physical and airflow characteristics of the helideck and associated or adjacent structures, will also combine to affect the length of the exposure period referred to in paragraph 3.2.2. These factors are considered in the determination of specific and general limitations which may be imposed in order to ensure adequate performance and to ensure that the exposure period is kept to a minimum. In many circumstances the period will be zero. It shall be noted that, following a rare power unit failure, it may be necessary for the helicopter to descend below deck level to gain sufficient speed to safely fly away, or in extremely rare circumstances to land on the water. In certain circumstances, where exposure periods would otherwise be unacceptably long, it will probably be necessary to reduce helicopter mass (and therefore payload) or even to suspend flying operations.

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4 Helideck Design

4.1 General Requirements

4.1.1 This chapter provides criteria on the physical characteristics of helicopter landing area (helideck) on offshore installations and some vessels. Where a scheme of verification is required it shall state for each helicopter landing area the maximum size (overall length) of the helicopter authorised to use the landing area expressed in terms of D-value and the maximum allowable take-off mass (MTOM) of the helicopter for which that area is being authorised with regard to its structural limitations, expressed as a 't' value. Where criteria cannot be met in full for a particular type of helicopter it may be necessary to promulgate operational restrictions in order to compensate for deviations from these criteria. The helicopter operators are notified of any restrictions through the Helideck Limitations List (HLL).

4.1.2 The criteria which follow are based on helicopter overall length and mass. This data is summarised in Table 1 below. For any helicopter types not listed below, reference can be made to Doc 9261 – Heliport Manual.

Type	D-value (m)	Perimeter 'D' marking	Rotor diameter (m)	MTOM (kg)	't' value	Landing net size
Bolkow Bo 105D	12.00	12	9.90	2400	2.4t	Not recommended
EC135	12.20	12	10.20	2980	3.0t	Not recommended
AW109	13.05	13	11.93	2600	2.6t	Small
BK 117/ EC145	13.63	14	11.00	3800	3.8t	Not recommended
Dauphin AS365 N2	13.68	14	11.94	4250	4.3t	Small
Dauphin AS365 N3	13.68	14	11.94	4300	4.3t	Small
EC155	14.30	14	12.60	4920	4.9t	Medium
AW169	14.65	15	12.12	4800	4.8t	Medium
EC160	15.67	16	13.4	6050	6.0t	Medium
Sikorsky S76	16.00	16	13.40	5307	5.3t	Medium
AW139	16.62	17	13.80	7000	7.0t	Medium

AW189	17.60	18	14.60	8600	8.6t	Medium
EC175	18.06	18	14.80	7800	7.8t	Medium
Super Puma AS332L	18.70	19	15.60	8599	8.6t	Medium
Bell 214ST	18.95	19	15.85	7938	7.9t	Medium
Super Puma AS332L2	19.50	20	16.20	9300	9.3t	Medium
EC225	19.50	20	16.20	11000	11.0t	Medium
Sikorsky S92A+	20.88	21	17.17	12565	12.6t	Large
Sikorsky S61N	22.20	22	18.90	9298	9.3t	Large
AW101	22.80	23	18.60	15600	15.6t	Large

Table 1: D - value, "t" value and other helicopter type criteria

Note. – Where skid-fitted helicopters and/or a deck integrated fire-fighting system (DIFFS) are in use on a solid plate helideck, landing nets are not recommended and shall not be fitted.

4.2 Structural Design

4.2.1 The helicopter landing area and any parking area provided shall be of sufficient size and strength and laid out so as to accommodate the heaviest and largest helicopter requiring to use the facility (referred to as the design helicopter). The structure shall incorporate a load bearing area designed to resist dynamic loads without disproportionate consequences from the impact of an emergency landing anywhere within the area bounded by the TLOF perimeter markings. Consideration shall be given to the possibility of accommodating an unserviceable helicopter in a parking area (where provided) adjacent to the helideck to allow a relief helicopter to land.

Note — If the contingency is designed into the construction and operating philosophy of the installation or vessel, the helicopter operator shall be advised of any mass restrictions imposed on a relief helicopter due to the presence of an unserviceable helicopter; whether elsewhere on the landing area or removed to a parking area, where present.

4.2.2 The helicopter landing area and its supporting structure shall be fabricated from steel, aluminium alloy or other suitable materials designed and fabricated to applicable standards. Where differing materials are to be used in near contact, the detailing of the connections shall be such as to avoid the incidence of galvanic corrosion.

4.2.3 Both the ultimate limit states (ULS) and the serviceability limit states (SLS) shall be assessed. The structure shall be designed for the SLS and ULS conditions appropriate to the structural component being considered as follows:

a) for deck plate and stiffeners

1) ULS under all conditions;
2) SLS for permanent deflection following an emergency landing.

b) for helicopter landing area supporting structure

1) ULS under all conditions;
2) SLS.

4.2.4 The supporting structure, deck plates and stringers shall be designed to resist the effects of local wheel or skid actions acting in combination with other permanent, variable and environmental actions. Helicopters shall be assumed to be located within the TLOF perimeter markings in such positions that maximise the internal forces in the component being considered. Deck plates and stiffeners shall be designed to limit the permanent deflection (deformation) under helicopter emergency landing actions to no more than 2.5% of the clear width of the plates between supports. Webs of stiffeners shall be assessed locally under wheels or skids and at the supports, so as not to fail under landing gear actions due to emergency landings. Tubular structural components forming part of the supporting structure shall be checked for vortex-induced vibrations due to wind.

Note — For the purposes of the following sections it may be assumed that single main rotor helicopters will land on the wheel or wheels of two landing gear or on both skids, where skid fitted helicopters are in use. The resulting loads shall be distributed between two main undercarriages. Where advantageous a tyre contact area may be assumed within the manufacturer's specification

4.3 Loads

4.3.1 Helicopters Landing Situation

4.3.1.1 The helideck shall be designed to withstand all the forces likely to act when a helicopter land. The loads and load combination to be considered shall include:

a) **Dynamic load due to impact landing.** This shall cover both a heavy normal landing and an emergency landing. For the former, an impact load of 1.5 x MTOM of the design helicopter shall be used. This shall be treated as an imposed load, applied together with the combined effect of a) to g) in any position on the landing area so as to produce the most severe load on each structural element. For an emergency landing, an impact load of 2.5 x MTOM shall be applied in any position on the landing area together with the combined effects of b) to g) inclusive. Normally, the emergency landing case will govern the design of the structure.

b) **Sympathetic response of landing platform.** After considering the design of the helideck structure's supporting beams and columns and the characteristics of the designated helicopter, the dynamic load (see a) above) shall be increased by a suitable structural response factor depending upon the natural frequency of the helideck structure. It is recommended that a structural response factor of 1.3 shall be used unless further information derived from both the helideck manufacturer and the helicopter manufacturer will allow a lower factor to be calculated. Information required to do this will include the natural periods of vibration of the helideck and the dynamic characteristics of the design helicopter and its landing gear.

c) **Overall superimposed load on the landing platform.** To allow for any appendages that may be present on the deck surface (e.g. helideck net, "H" and circle lighting etc.) in addition to wheel loads, an allowance of 0.5 kilo Newtons per square metre (kN/m^2) shall be added over the whole area of the helideck.

d) **Lateral load on landing platform supports.** The landing platform and its supports shall be designed to resist concentrated horizontal imposed loads equivalent to 0.5 x MTOM of the helicopter, distributed between the undercarriages in proportion to the applied vertical loading in the direction which will produce the most severe loading on the element being considered.

e) **Dead load of structural members.** This is the normal gravity load on the element being considered.

f) **Environmental actions on the helideck**

1) Wind actions on the helideck structure shall be applied in the direction, which together with the horizontal impact actions, produce the most severe load case for the component considered. The wind speed to be considered shall be that restricting normal (non-emergency) helicopter operations at the landing area. Any vertical up and down action on the helideck structure due to the passage of wind over and under the helideck shall be considered.

2) Inertial actions due to platform motions – the effect of accelerations and dynamic amplification arising from the predicted motions of the fixed or floating platform in a storm condition with a 10-year return period shall be considered.

g) **Inertial actions due to platform motions for floating installations.** The effects of accelerations and dynamic amplification arising from the predicted motions of a floating platform in a storm condition with a 10-year return period shall be considered.

h) **Punching shear check (applicable to wooden or concrete structures).** A check shall be made for the punching shear from a wheel of the landing gear with a contact area of 65 x 103 mm^2 acting in any probable location. Particular attention to detailing shall be taken at the junction of the supports and the platform deck.

4.3.2 Helicopters at Rest Situation

4.3.2.1 The helideck shall be designed to withstand all the applied forces that could result from a helicopter at rest; the following loads shall be considered:

a) Imposed load from helicopter at rest. All areas of the helideck accessible to a helicopter, including any separate parking or run-off area, shall be designed to resist an imposed load equal to the MTOM of the design helicopter. This load shall be distributed between all the landing gear. It shall be applied in any position on the helideck so as to produce the most severe loading on each element considered.

b) Overall superimposed load. To allow for personnel, freight, refuelling equipment and other traffic, snow and ice, rotor downwash etc., an allowance of 2.0 kiloNewtons per square metre (kN/m^2) shall be added to the whole area of the helideck.

c) Dead load and wind load. The values for these loads are the same as given in paragraph 4.3.1.1 e) and f) and shall be considered to act simultaneously in combination with paragraph 4.3.2.1 a) and b). Consideration shall also be given to the additional wind loading from any parked or secured helicopter.

d) Acceleration forces and other dynamic amplification forces. The effect of these forces, arising from the predicted motions of mobile installations and vessels, in the appropriate environmental conditions corresponding to a 10-year return period, shall be considered.

4.4 Environmental Effects

Note. - In the following sections the term "helideck" is used throughout to denote a heliport on a fixed or floating facility such as an exploration and/or production unit used for the exploitation of oil and gas. Where helideck is located on ships it will be for the designer to assess whether each aspect of design is appropriate for the "shipboard helideck" under consideration. A stand-alone section (provision 4.8) is provided to address special considerations for floating facilities and ships which have particular applicability to all shipboard helidecks as well as to helideck located on floating off-shore facilities.

4.4.2 General Design Consideration

4.4.2.1 The location of a helideck is often a compromise between the conflicting demands of the basic design requirements, the space limitations on often cramped topsides of off-shore facilities and the need for the facility to provide for a variety of functions. It is almost inevitable that helideck installed on cramped topsides of off-shore structures will suffer to some degree from their proximity to tall and bulky structures, and to gas turbine exhausts or flares. The objective for designers becomes to create topside designs incorporating helideck that is safe and 'friendly' to helicopter operations by minimising adverse environmental effects (mainly aerodynamic, thermal and wave motion) which can affect helicopter operability.

Note. — Where statutory design parameters cannot be fully met it may be necessary for restrictions or limitations to be imposed upon helicopter operations which could, in severe cases, lead to a loss of payload when the wind is blowing through a turbulent sector.

4.4.2.2 Helideck is basically flat plates and so are relatively streamlined structures. In isolation they would present little disturbance to the wind flow, and helicopters would be able to operate safely to them in a more or less undisturbed airflow environment. Difficulties may arise however, when the wind has to deviate around the bulk of the off-shore installation causing large areas of flow distortion and turbulent wakes and/or because the producing facility itself is a source of hot or cold gas emissions. The effects fall into three main categories:

a) The flow around the bulk of the off-shore facility. Platforms in particular are slab-sided, non-streamlined assemblies (bluff bodies) which create regions of highly distorted and disturbed airflow in the vicinity

b) The flow around large items of superstructure such as cranes, drilling derricks and exhaust stacks, generates turbulence that can affect helicopter operations (provision 4.5). Like the platform itself, these are bluff bodies which encourage turbulent wake flows to form behind the bodies

c) Hot gas flows emanating from exhaust outlets and flare systems (provision 4.6) and/or cold faring (provision 4.7).

4.4.2.3 For a helideck on a fixed or floating off-shore facility it shall ideally be located at or above the highest point of the main structure. This will minimise the occurrence of turbulence downwind of adjacent structures. However, whilst this is a desirable feature it shall be appreciated that in many parts of the world, for a helideck much in excess of 60m above sea level the regularity of helicopter operations may be impacted by low cloud base conditions. Conversely low elevation helideck may also adversely affect helicopter operations where one-engine inoperative (dropdown) performance is an operational requirement for CAAM i.e. due to the insufficient drop-down between the landing area and the sea surface. Consequently, a trade-off may need to be struck between the height of the helideck above surrounding structures and its absolute height above mean sea level (AMSL).

4.4.2.4 A key driver for the location of the helideck is the need to provide a generous sector clear of physical obstructions for the approaching/departing helicopters and also sufficient vertical clearance for multi-engine helicopters to lose altitude after take-off in the event of an engine failure. This will entail a design incorporating a minimum 210-degree obstacle free sector with a falling gradient below the landing area over at least 180 degrees of this arc (Chapter 6). From an aerodynamic point of view the helideck shall be as far away as possible from the disturbed wind flow around the platform and in order to achieve this, in addition to providing the requisite obstruction free areas described above, it is recommended that the helideck be located on the corner of the facility with as large an overhang as possible.

4.4.2.5 In combination with locating the helideck at an appropriate elevation and, providing a vital air gap (provision 4.4.2.8), the overhang will encourage the disturbed airflow to pass under the helideck leaving a relatively clean 'horizontal' airflow above the deck. It is recommended that the overhang shall be such that the centre of the helideck is vertically above or outboard of the corner of the facility's superstructure.

4.4.2.6 When determining a preference for which corner of the facility the helideck shall overhang, a number of considerations shall be evaluated which are listed as follows:

a) The helideck location shall facilitate a direct approach whenever possible;

b) The helideck location shall provide for a clear overshoot;

c) The helideck location shall minimise the need for sideways or backwards manoeuvring;

d) The helideck location shall minimise the environmental impact due to turbulence, thermal effects etc.;

e) The helideck location shall allow, wherever possible, an approach to be conducted by the commander of the helicopter.

4.4.2.7 The relative weighting between these considerations will change depending on factors such as wind speed. However, generally the helideck shall be located such that winds from prevailing directions carry turbulent wakes and exhaust plumes away from the helicopter approach path. To assess if this is likely to be the case, for fixed facilities, it will usually be necessary for designers to overlay the prevailing wind direction sectors over the centre of the helideck to establish prevailing wind directions and wind speed combinations and to assess the likely impact on helicopter operations for a helideck if sited at a particular location.

4.4.2.8 The height of the helideck above mean sea level (AMSL) and the presence of an air gap between the helicopter landing area and a supporting module are the most important factors in determining wind flow characteristics in the helideck environment. In combination with an appropriate overhang, an air gap separating the helideck from superstructure beneath it will promote beneficial wind flow over the landing area. If no air gap is provided then wind conditions immediately above the landing area are likely to be severe, particularly if mounted on top of a large multi-storey accommodation block — it is the distortion of the wind flow that is the cause. However, by building in an air gap, typically of between 3m and 6m, this has the effect of 'smoothing out' distortions in the airflow immediately above the helideck. Helideck mounted on very tall accommodation blocks will require the largest clearance (typically 5-6m) while those on smaller blocks, and with a very large overhang, will tend to require smaller clearances (typically 3-4m). For shallow super-structures of three storeys or less, such as are often found on semi-submersible drilling facilities, a 1m air gap may be sufficient; but there is scope to increase the air gap as long as the size and presence of a more generous air gap does not have an adverse effect on the stability of a floating facility or the sea-keeping qualities of a ship.

Note — To avoid wave loading on the helideck, the air gap required by 4.4.2.8 is also provided to clear the maximum wave height that might be encountered during transportation and for operational conditions. For a shipboard helideck mounted on the deck of a floating vessel, the maximum vertical displacement due to vessel motion shall also be considered.

4.4.2.9 It is important that the air gap is preserved throughout the operational life of the facility, and care is taken to ensure that the gap between the underside of the helideck structure and the super-structure beneath does not become a storage area for bulky items that might otherwise hinder the free-flow of air through the gap.

4.4.2.10 Where it is likely that necessary limitations and/or restrictions would have a significant effect on helideck operability, being caused by issues that cannot easily be 'designed out', an option may exist for providing a second helideck which could be made available when the wind is blowing through the restricted sector for the primary helideck.

4.5 Effects of Structured – Induced Turbulence

4.5.1 It is almost inevitable that helideck installed on cramped topsides of off-shore structures will suffer to some degree from their proximity to tall and bulky structures such as drilling derricks, flare towers, cranes or gas turbine exhausts stacks; it is often impractical to site the helideck above every tall structure. So, any tall structure above and/or in the vicinity of the helideck may generate areas of turbulence or sheared flow downwind of the obstruction; and so potentially pose a hazard to the helicopter. The severity of the disturbance will be greater the bluffer the shape and the broader the obstruction to the flow. The effect reduces with increasing distance downwind from the source of turbulence.

4.5.2 An assessment of the optimum helideck position shall also consider the location and configuration of drilling derricks, which can vary in relative location during the field life. A fully clad derrick, being a tall and solid structure, may generate significant wake downwind of the obstacle. As the flow properties of the wake will be unstable, if the helideck is located downwind of a clad derrick it is likely to be subject to large and random variations in wind speed and direction. As a guide on wake decay from bluff bodies it shall be assumed that the wake effects will not fully decay for a downwind distance of some 10-20 structure widths (for a 10m wide clad derrick this corresponds to a decay distance of between 100-200m). Consequently, it is preferable that a helideck is not placed closer than 10 structure widths from a clad derrick.

4.5.3 However, few off-shore facilities will be large enough to facilitate such clearances in their design and any specification for a clad derrick has potential to result in operational limitations being applied when the derrick is upwind of the helideck. In contrast, unclad derricks are relatively porous and whilst a wake still exists, it will be of a much higher frequency and smaller scale due to the flow being broken up by the lattice element of the structure. Consequently, a helideck can be safely located closer to an unclad derrick than to its clad equivalent. As a rule of thumb separations of at least 5 derrick widths at helideck height shall be the design objective. Separations of significantly less than 5 structure widths, may lead to the imposition of operating restrictions in certain wind conditions.

4.5.4 Gas turbine and other exhausts, whether or not operating, may present a further source of structure-induced turbulence by forming a physical blockage to the air flow over the helideck and creating a turbulent wake (as well as presenting a potential hazard due to the hot exhaust). As a rule of thumb, to mitigate physical turbulence effects at the helideck, it is recommended that a minimum of 10 structure widths ideally be established between the obstruction and the helideck.

4.5.5 Other potential sources of turbulence may be present on off-shore facilities which could give rise to turbulence effects for example, large structures in close proximity to the helideck or a lay-down area in the vicinity of the helideck. In the latter case, bulky or tall items placed in lay-down areas close to the helideck could present a source of turbulence, and being only of a temporary nature, their presence may increase the hazard, since pilots otherwise familiar with a particular facility would not be expecting turbulence if the source is a temporary obstruction. Ideally, a platform design shall seek to ensure that any proposed lay-down areas are significantly below helideck level and/or are sufficiently remote from the helideck so as not to present a problem for helicopter operations.

4.6 Temperature Rise Due to Hot Exhausts

4.6.1 Increases in ambient temperature at the helideck are a potential hazard to helicopters as increased temperatures result in less rotor lift and less engine power margin. Rapid temperature changes are a significant hazard, as the rate of change of temperature in the plume has potential to cause engine compressor surge or stall (often associated with an audible 'pop'), which can result in loss of engine power, damage to engines and/or helicopter components and, ultimately, engine flame-out. It is therefore extremely important that helicopters avoid these conditions by ensuring occurrence of higher than ambient conditions are foreseen and mapped, and, where necessary, that steps are taken to reduce payload to maintain an appropriate performance margin.

4.6.2 Gas turbine power generation systems are often a significant source of hot exhaust gases on fixed off-shore facilities, while diesel propulsion or auxiliary power system exhausts occurring on some floating off-shore facilities may also need to be considered. For certain wind directions the hot gas plumes from the exhausts will be carried by the wind directly across the helideck. The hot gas plume then mixes with the ambient air to increase the size of the plume, at the same time reducing its temperature by dilution.

4.6.3 Appropriate modelling designed to evaluate likely temperature rise would indicate that for gas turbine exhausts, with not untypical release temperatures up to 500°C and flow rates of between 50-100kg/s, the minimum range at which the temperature rise in the plume drops to 2°C above ambient temperature would be in the range of 130-190m downwind of the source. Even where gas turbine generation systems incorporate waste heat recovery systems, resulting in lower gas temperatures of about 250°C, with the same flow rate assumptions the minimum distance before the temperature rise in the plume drops to 2°C above ambient is still in the range of 90-130m downwind of the source.

4.6.4 In consideration of 4.6.3, except for the very largest off-shore facilities, it implies regardless of design there will always be a wind condition where temperature rise above the helideck exceeds the 2°C threshold. Consequently, it may be impossible to design a helideck that is compliant with these criteria for all conditions. The design aim then becomes one of minimising the occurrence of high temperatures over the helideck rather than necessarily eliminating them completely. This can be achieved by ensuring that the facility layout and alignment directions are such that these conditions are only experienced rarely.

4.6.5 If it is necessary to locate power generation modules and exhausts close to the helideck, then this can be an acceptable location provided that the stacks are high enough to direct the exhaust gas plume clear of arriving/departing helicopters. It is also important to ensure that the design of the stacks does not compromise helideck obstacle protection surfaces or are so wide as to present a source of structure-induced turbulence.

4.6.6 The helideck shall be located so that winds from the prevailing wind direction(s) carry the plume away from the helicopter approach/departure paths. To minimise the effects for other wind directions, the exhausts shall be sufficiently high to ensure that the plumes are above all the likely helicopter approach/departure paths. To achieve this, it is recommended that exhaust outlets are no less than 20-30m above the helideck. The provision of downward-facing exhausts that initially direct hot exhaust gases towards the sea shall be avoided as experience has shown that hot plumes can rise from the sea surface and disperse in an unpredictable way, particularly in light and variable wind conditions.

4.6.7 In situations where it is difficult or impractical to reduce the potential interaction between the helicopter and the turbine exhaust plume to a sufficiently low level, consideration shall be given to installing a gas turbine exhaust plume visualisation system on facilities having a significant gas turbine exhaust plume problem, in order to highlight the hazard to pilots when operating by day, so minimising the potential effect of the plume by making it easier to see and avoid a plume encounter.

4.6.8 Helicopter performance may also be significantly impaired as a result of the combined radiated and convection heat effects from flare plumes under certain wind conditions. In moderate or strong winds, the radiated heat from a lit flare is rapidly dissipated and usually presents little problem for the helicopter, provided flight through the flare plume is avoided. However, in calm or light wind conditions, potential changes in air temperature in the vicinity of the helideck could be much greater and so have a marked effect on the performance of the helicopter. Therefore, designers shall exercise great care in the location and elevation of flare towers in relation to helicopter operations.

4.7 Cold Flaring and Rapid Blow-Down Systems

4.7.1 Hydrocarbon gas can be released as a result of the production process on the installation or from drilling facilities at various times. It is important to ensure that a helicopter does not fly into a cloud of hydrocarbon gas because even relatively low levels of concentration (typically above 10% lower flammable limit [LFL]) can cause a helicopter engine to surge or flame-out with a consequent risk to the helicopter. Also, in these conditions, the helicopter poses a risk to the off-shore facility because it is a potential ignition source for any hydrocarbon gas that may be present in the atmosphere. Consideration therefore needs to be given to ensuring that gas release points are as remote as possible from the helideck and from the helicopter flight path and that, in the event of any unforeseen gas release occurring during helicopter operations, the pilot of a helicopter is given sufficient warning so that, if necessary, he can break off his approach to the helideck. Planned gas releases shall only occur when helicopters are not in the area.

4.7.2 The blow-down system on a production facility depressurised the process system releasing hydrocarbon gas. It will normally be designed to reduce the pressure down to half its operating value in about 15 minutes. However, for a large facility this could feasibly require the release of 50 tonnes of gas, or more. Once down to the target pressure, in 15 minutes or less, the remainder of the gas will continue to be released from the system. A blow-down may be automatically triggered by the detection of a dangerous condition in the process or alternatively manually triggered.

4.7.3 The blow-down system shall have venting points that are as remote as possible from the helideck, and for prevailing winds, are downwind of the helideck. It is not uncommon to have this vent on the flare boom, and this will normally be a good location. However, it shall be borne in mind that dilution of the gas to acceptably low levels of concentration (to <10% LFL) may not occur until the plume is a considerable distance from the venting point. This distance may be anywhere between 200m and 500m depending on the size of the vent, the rate of venting and the prevailing wind speed.

4.7.4 Drilling facilities often have 'poor-boy degassers' which are used to release gas while circulating a well, but, except for a sudden major crisis such as a blow-out on a drilling facility, are unlikely to release significant quantities of gas without warning. As with production facilities, it is not likely to be possible to locate the helideck sufficiently distant from the potential source of gas to always guarantee low levels of concentration at the helideck or in the helicopter flight path, and so the drilling facility may need to curtail helicopter flights when well circulation activity is going on, or when problems are experienced down the well.

4.8 Special Conditions for Floating Facilities and Ships

4.8.1 As well as experiencing the aerodynamic effects and potential hazards highlighted, floating installations and ships experience dynamic motions due to ocean waves. These motions are a potential hazard to helicopter operations, and motion limits for executing a safe landing will need to be established in order to avoid unsafe conditions. The recording and reporting of deck motions for the safe landing of helicopters is discussed in more detail in Chapter 15.

4.8.2 The setting of helideck performance/motion limitations due to floating installation and ship dynamic motions is usually the responsibility of the helicopter operator and will be influenced by the type of facility or ship to which they are operating, the types of helicopters being operated, the operating conditions (e.g. whether day or night) and the location of the helideck (a helicopter operator may, for example, discuss landing limits with the Ship's Master). Limitations typically apply both to vertical linear motions in heave and to angular motions expressed as pitch and roll. Some operators may consider additional parameters such as helideck inclination.

4.8.3 The angle of pitch and roll is the same for all points on a facility or ship but the amount of heave, sway or surge motion experienced will vary considerably depending on the precise location of the helideck. The severity of helideck motions will depend on:

a) The wave environment

b) The size of the floating facility or ship (a smaller facility/ship generally tends to exhibit larger and faster wave induced motions than a large facility/ship where the Response Amplitude Operator (RAO) is lower.

c) The characteristics of the floating facility or ship (certain hull forms exhibit larger wave induced motions than others, or are sensitive to particular sea conditions)

d) Whether the floating facility or ship is moored, underway or under tow

e) The location of the helideck on a ship (vertical motions tend to be greater at the bow or stern of a ship than at the amidships location, and sway motions due to roll tend to increase with helideck height)

4.8.4 Sea states are usually characterised in terms of a significant wave height, an associated wave period and a wave energy spectrum. The motions of a ship or floating facility generally become larger as the significant wave height and period increase, but can be especially severe at certain wave periods (e.g. at natural roll or pitch periods) and may be sensitive to the range in frequency content of the wave spectrum experienced. The motion characteristics of a floating facility or ship may be reliably predicted by recourse to well-established computer models or to physical model testing. Helideck downtime will occur whenever the motions of the floating facility or ship exceed the derived criteria.

4.8.5 The operability of a helicopter landing area depends on its location on a floating facility or ship, both longitudinally and transversely. For ships and ship-shaped floating facilities, such as FPSOs, the pitching motion is such that the vertical heave motion experienced at the helideck on the bow or stern will generally be much greater than if the helideck is located amidships. Bow mounted helideck can be particularly vulnerable to damage from green seas spilling over the superstructure of the ship, unless mounted high above deck level. Helideck located off the vessel centreline, and cantilevered over the side (which usually provides the benefit of an unobstructed falling gradient over at least 180 degrees) may experience downtime due to heave motions caused by roll; although generally downtime for a helideck located amidships will be less than for a helideck located at the bow or stern of a ship or ship-shaped facility.

Note 1 — The location of the helideck particularly on drilling facilities is generally determined by factors other than the need to minimise heave motions, and it maybe that the central area of an FPSO or drillship, for example, is otherwise occupied by processing or drilling equipment. A helideck located at the bow or stern may be more accessible to the temporary refuge and/or accommodation on board the facility which is another factor to consider particularly where the helideck is designated to be a primary means of escape in the event of an incident occurring.

Note 2 — Some thrusters-assisted FPSOs and dynamically positioned facilities or ships have the ability to turn to a desired heading which can be used operationally to minimise helideck downtime due to wave motions and aerodynamic effects. Where dynamic positioning (DP) systems are used to maintain heading control, it is important to ensure that the heading control system has adequate integrity (operability and redundancy) to maintain heading control at all times during helicopter operations.

4.9 Environmental Criteria

4.9.1 The design criteria given in the following paragraphs represent the current best information available and may be applied to new fixed or floating facilities or ships, and to significant modifications to existing facilities or ships and/or where operational experience has highlighted potential issues. When considering the volume of airspace to which the following criteria apply, designers shall consider the airspace up to a height above helideck level which takes into consideration the requirement to accommodate helicopter landing and take-off decision points (or Committal Point). This is considered to be a height above the helideck corresponding to 9.14m (30 feet) plus wheels-to-rotor height plus one rotor diameter. For the Sikorsky S92, for example, this equates to a column of air approximately 31m (or 102 feet) above helideck surface level. The formula is clearly type specific being predicated on two of the dimensional aspects of the design helicopter which are specific to type.

4.9.2 As a general rule, in respect to turbulence, a limit on the standard deviation of the vertical airflow velocity of 1.75m/s shall not be exceeded. Where these criteria are significantly exceeded (i.e. where the limit exceeds 2.4m/s), there is the possibility that operational restrictions will be necessary. Fixed or floating facilities or ships where there is a likelihood of exceeding the criteria shall be subjected to appropriate testing e.g. a scale model in a wind tunnel or by Computational Fluid Dynamics (CFD) analysis, to establish the wind environment in which helicopters will be expected to operate.

4.9.3 Unless there are no significant heat sources on the facility or ship, designers shall commission a survey of ambient temperature rise based on a Gaussian Dispersion model and supported by wind tunnel testing or CFD analysis. Where the results of such modelling and/or testing indicate there may be a rise of air temperature of more than 2 degrees Celsius averaged over a 3-second time interval, there is the possibility that operational limitations and/or restrictions may need to be applied.

4.9.4 For permanent multiple platform configurations, normally consisting of two or more bridge-linked modules in close proximity to each other, the environmental effects of hazards emanating from all constituent modules shall be considered on helideck operations. This is particularly appropriate for the case of hot or cold gas exhausts where there will always be a wind direction which carries any exhaust plumes from a bridge-linked module in the direction of the helideck.

4.9.5 For temporary combined operations where typically one or more mobile facilities and/or ships are operated in close proximity to another (usually fixed) facility, the environmental effects emanating from one facility or ship shall be fully considered for all facilities located together in temporary combined operations.

4.10 Helideck Access Points

4.10.1 General

4.10.1.1 Helideck access points shall be located at two or preferably three locations around the landing area to give passengers embarking or disembarking direct access to and from the helicopter without a need to pass around the tail rotor or under the main rotor of those helicopters with a low main rotor profile. The need to preserve, as far as possible, an unobstructed falling gradient over at least 180° shall be carefully weighed against the size and design of the access platform in needing to accommodate vital helideck safety equipment (e.g. fire-fighting equipment) plus access stairs and signage so that any infringement to the falling gradient is the smallest possible, and preferably not at all.

4.10.1.2 When deciding the normal access and emergency escape routes to and from the helideck, a safe and efficient route shall be provided for passengers between the helideck and arrival / departure areas.

4.10.1.3 The helideck normal access and emergency escape routes design analysis shall consider the following:

a) Limiting the steepness of access-ways to assist safe personnel passage

b) Providing the most direct route for the primary access from the helideck

c) Being able to secure the helideck properly from unauthorised or inadvertent access during helideck operations, etc.

d) Provision of efficient passenger controls

e) Sufficient space for, and ease of laying fire hoses

f) Easy and unrestricted access to rescue equipment

g) Easy stretcher access

h) Easy access for freight handling

i) Easy access for baggage handling

j) Separation of passenger movement from refuelling operations

k) Provision of good clearances from helicopter tail rotor position for deck crew and passengers

l) The need to accommodate aircraft positioning in various wind directions

4.10.2 Emergency access points

4.10.2.1 There shall be a minimum of two primary access points from the helideck, preferably three.

4.10.2.2 Access points shall be of a suitable size to enable quick and efficient movement of the maximum number of personnel who may require to use them, and to facilitate easy manoeuvring of fire-fighting equipment and use of stretchers.

4.10.2.3 Typical minimum requirement for dimensions for width of access points would be 1.2m for main escape routes and 0.7m for secondary escape routes, with consideration given to areas for manoeuvring a stretcher.

4.10.2.4 Access points shall be at least 90-degrees to each other; they shall not be sited together.

Note - Preferred option is for access points to be positioned opposite each other.

4.10.2.5 Access points shall consider fire monitor positioning and the likely effect of water blast impeding passenger escape.

4.10.2.6 Access points shall be positioned so as not to impede rescue operations.

4.10.2.7 Fire-fighting equipment and rescue equipment shall be positioned close to exits.

4.10.2.8 Where foam monitors are selected for fire-fighting and collocated on an access platform, care shall be taken to ensure that the presence of a monitor does not impede or cause injury to escaping personnel due to the operation of the monitor in an emergency situation.

4.10.2.9 Access points shall be designed to direct passengers immediately away from the helicopter, in particular the tail rotor area.

4.10.2.10 Access points shall provide easy access and quick arrival at a place of safety below helideck level.

4.10.2.11 Fire-fighters and helideck crew escape from fixed monitor platforms shall access to the fire-fighting pumping switch.

4.10.2.12 Vessels with helideck on the foredeck may be unable to provide a tertiary escape other than via a hatch system to below deck. The designer shall provide alternative options for the tertiary access points, shall a stricken helicopter hinder the use of the hatchway.

4.10.2.13 Vessels with foredeck helideck will sometimes offer a very good access points to protected areas behind the bridge. The designer shall take advantage of this option.

4.10.2.14 Where handrails associated with helideck access/escape points exceed the limitations outlined in 5.1.14, they shall be retractable, collapsible or removable. When retracted, collapsed or removed the rails shall not impede access/egress or lead to gaps which could result in a potential fall from height. Handrails which are retractable, collapsible and removable shall be painted in a contrasting colour scheme.

4.10.2.15 Access which is not being used during helicopter operations shall have ‘no-entry’ sign or plastic chain or procedure to position helideck crew to guard.

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5 Helideck Physical Characteristic

Note 1. – In respect to D and D-value referenced in the following sections, it shall be noted that this corresponds to the largest overall dimension of a single main rotor helicopter when rotors are turning, being measured, and expressed in metres, from the most forward position of the main rotor tip path plane to the most rearward position of the tail rotor tip path plane or the helicopter structure.

Note 2. – Were the criteria cannot be met in full for a particular type of helicopter, it may be necessary to promulgate operational restrictions in order to compensate for deviations from these criteria. Helicopter operators are to be notified of any restrictions through the Helideck Limitations List (HLL).

Note 3. – For helideck that has a 1 D or larger FATO it is presumed that the FATO and the TLOF will always occupy the same space and have the same load bearing characteristics so as to be coincidental.

Note 4. – For helideck that is less than 1 D, the reduction in size is only applied to the TLOF which is a load bearing area. In this case, the FATO remains at 1 D but the portion extending beyond the TLOF perimeter need not be load bearing for helicopters. The TLOF and the FATO may be assumed to be collocated but are not coincidental.

5.1 Final Approach and Take-Off Areas (FATO) And Touchdown and Lift-Off Areas (TLOF)

5.1.1 A helideck shall be provided with one FATO and one coincident or collocated TLOF.

5.1.2 A FATO may be any shape but shall be of sufficient size to contain an area within which can be accommodated a circle of diameter of not less than 1 D of the largest helicopter the helideck is intended to serve.

5.1.3 A TLOF may be any shape but shall be of sufficient size to contain:

a) for helicopters with an MTOM of more than 3,175 kg, an area within which can be accommodated a circle of diameter not less than 1 D of the largest helicopter the helideck is intended to serve; and

b) for helicopters with an MTOM of 3,175 kg or less, an area within which can be accommodated a circle of diameter not less than 0.83 D of the largest helicopter the helideck is intended to serve.

Note. – For recommendation and safety purposes, helicopters with a MTOM of 3,175 kg or less, the TLOF shall be of sufficient size to contain an area within which can be accommodated a circle of diameter of not less than 1 D of the largest helicopter the helideck is intended to serve.

5.1.4 A helideck shall be arranged to ensure that a sufficient and unobstructed air-gap is provided which encompasses the full dimensions of the FATO, refer to Chapter 4.

5.1.5 The FATO shall be located so as to avoid, as far as is practicable, the influence of environmental effects, including turbulence, over the FATO, which could have an adverse impact on helicopter operations.

5.1.6 The TLOF shall be dynamic load-bearing.

5.1.7 The TLOF shall provide ground effect.

5.1.8 No fixed object shall be permitted around the edge of the TLOF except for frangible objects, which, because of their function, must be located thereon.

5.1.9 For any TLOF 1D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 25 cm.

5.1.10 For new built helideck completed on or after 10th November 2018 and for refurbished helideck, any TLOF 1D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF shall be as low as possible and in any case not exceed a height of 15 cm.

5.1.11 For any TLOF designed for use by helicopters having a D-value of 16.0 m or less, and any TLOF having dimensions of less than 1D, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF, shall not exceed a height of 5 cm.

Note. — Lighting that is mounted at a height of less than 25 cm is typically assessed for adequacy of visual cues before and after installation.

5.1.12 Objects whose function requires them to be located within the TLOF (such as lighting or nets) shall not exceed a height of 2.5 cm. Such objects shall only be present if they do not represent a hazard to helicopters.

Note. — Examples of potential hazards include nets or raised fittings on the deck that might induce dynamic rollover for helicopters equipped with skids.

5.1.13 The surface of the TLOF shall be skid-resistant to both helicopters and persons and be sloped to prevent pooling of water.

5.1.14 From any point on the periphery of the above-mentioned D-circle an obstacle-free approach and take-off sector shall be provided which totally encompasses the landing area (and D-circle) and which extends over a sector of at least 210°. Within this sector obstacle accountability shall be considered out to a distance from the periphery of the landing area that will allow for an unobstructed departure path appropriate to the helicopter the helideck is intended to serve. For helicopters operated in Performance Class 1 or 2 the horizontal extent of this distance from the helideck will be based upon the one-engine inoperative capability of the helicopter type to be used. In consideration of the above, the items essential for safe helideck operations may exceed the height of the landing area, but shall not do so by more than 25 centimetres. For new build helideck completed on or after 10 November 2018 and for refurbishments, the height of essential items around the helideck shall not exceed 15 cm for any helideck where the D-value is greater than 16.01 m. For helideck, where the D-value is 16.00 m or less the height of essential items around the helideck shall not exceed 5 cm. Essential items whose function requires to be located around the edge of the helideck are as follows but not limited to:

a) Guttering or raised kerb;

b) Lightings;

c) Foam monitors;

d) Handrails;

e) Landing net tie-down points; and

f) Flame/heat and gas detectors.

5.1.15 It is essential the TLOF provides sufficient space for the landing gear configuration and sufficient surface area to promote helpful "ground cushion" effect from rotor downwash. The area provided shall also allow adequate room for passengers and crew to alight or embark the helicopter and to transit to and from the operating area safely. In addition, space consideration needs to be given to allow essential on-deck operations, such as baggage handling, tying down the helicopter or helicopter refuelling, to occur safely and efficiently, and, in the event of an incident or accident occurring, for rescue and fire-fighting teams to always have good access to the landing area from an upwind location.

5.1.16 The design shall allow for sufficient clearance from the main rotor and tail rotor of the helicopter to essential objects permitted to be around the perimeter of the TLOF, including obstacles that may be present in the limited obstacle sector. It shall be clearly understood that a FATO of 1D is the minimum dimension sufficient for containment of the helicopter; in this case, where a precise landing is completed, the main and tail rotors will a-but the edge of the 1D circle. For this reason, it is important that the yellow touchdown/positioning marking circle is accurately and clearly marked and is used by aircrew every time for positioning the helicopter during the touchdown manoeuvre.

5.1.17 Sufficient margins to allow for touchdown/positioning inaccuracies as a result of normal variations or handling difficulties, for example due to challenging meteorological conditions, aerodynamic effects and/or dynamic motions due to ocean waves, shall be allowed for in the design. The helideck and environs shall provide adequate visual cues and references for aircrew to use throughout the approach to touchdown manoeuvre from initial helideck location and identification (acquisition) through final approach to hover and to landing. In addition, adequate visual references shall be available for the lift-off and hover into forward flight.

5.1.18 In consequence of the considerations stated in provision 5.1.15 until 5.1.17 except where an Aeronautical Study is able to demonstrate otherwise, the minimum size for the new-build design of a TLOF for single main rotor helicopters is deemed to be an area which can accommodate a circle whose dimension is no less than 1.0x the overall length including rotors of the largest helicopter that the helideck is intended to serve. For helicopters with a MTOM of 3175kg or less, it is permitted, on the basis of a risk assessment to shrink the overall size of the TLOF so that it is less than 1D, but is not less than 0.83D.

5.1.19 A FATO of 1D provides full containment of the helicopter where touchdown markings are used correctly and precisely. For a helideck that has a dynamic load bearing surface (TLOF) of less than 1D, elements of the helicopter will inevitably extend beyond the edge of the TLOF. For this reason, the TLOF is surrounded by a circle with a diameter of 1D — which is obstacle free with the exception of the permitted obstacles. In essence this obstacle free area represents the standard 1D FATO from which the limited obstacle sector extends. To ensure obstacle clearance, it is important that the diameter of the touchdown/positioning marking circle is 0.5 of the notional FATO (not of the smaller landing surface (TLOF) and is located at the centre of the FATO.

6 Helideck Surface

6.1 General

6.1.1 The landing area shall present a non-slip surface for helicopter operations. The installation operator shall ensure that the helideck is kept free from oil, grease, ice, snow, excessive surface water or any other contaminant (particularly guano) that could degrade the surface friction. Assurance shall be provided to the helicopter operator that procedures are in place for elimination and removal of contaminants prior to helicopter movements.

6.2 Objects

6.2.1 Objects which due to their function are required to be located on the surface of the TLOF, such as helideck nets and helideck touchdown marking lighting systems, where provided, shall not exceed a height above surface level prior to installation of more than 2.5cm and may only be present if they do not represent a hazard to helicopter operations. It shall be appreciated that the presence of raised fittings on a helideck has potential to induce dynamic roll over for helicopters fitted with skids and extra care shall be taken when incorporating deck-mounted fittings to helideck intended for use by skid-fitted helicopters. As a consequence, because of the possible adverse effects of skid tips becoming enmeshed in helideck surface netting, it is recommended that skid fitted helicopters not operate to helideck while a net is present. In addition, because of the concerns of dynamic rollover, helicopters shall only operate to helideck fitted with deck mounted touchdown marking lighting systems where the system components are suitably finished, and the installed height of the system does not exceed 2.5cm. This would include proper arrangements for the chamfering of components (e.g. panels) and the maintenance of suitable friction surface finishes for each element of the system.

6.3 Slopes

6.3.1 The surface of the landing area shall be sloped to prevent the pooling of water. To this end the landing area shall be provided with a suitable drainage system capable of directing rainwater, seawater, fire-fighting media and fuel spills away from the helideck to a safe place. To ensure adequate drainage of a helideck located on a fixed facility, the surface of the helideck shall be laid to a fall or cambered to prevent any liquids accumulating on the landing area. Such falls or cambers shall be approximately 1:100 and shall be designed to drain liquids away from the main structure. A system of guttering, and/or slightly raised kerb, shall be provided around the perimeter of the TLOF to prevent spilled fuel falling onto other parts of the facility whilst directing any spillages to a safe storage or disposal area, which may include the sea surface (where permitted). The capacity of the drainage system shall be adequate to contain the maximum likely spillage of fuel on the helideck taking account the design helicopter and its fuel capacity, typical fuel loads and uplifts. The design of the drainage system shall preclude blockage by debris. Any deflection of the helideck surface, in service, due to static loads imposed by the helicopter while stationary shall not modify the surface to the extent that it encourages pooled liquids to remain on the helideck.

6.4 Friction

6.4.1 The surface of the landing area shall be prepared so as to be skid-resistant to both helicopters and personnel using the TLOF. This entails that all essential markings on the surface shall have a coating of non-slip material.

Note — It is recognised that some designs of aluminium helideck has holes in the topside construction for the purpose of the rapid drainage of fluids including fuel spills which could occur, for example, if a helicopter's fuel system is ruptured by the impact of a crash. In these cases, particular care shall be taken to assess the qualities of skid-resistance prior to the helideck going into service. In addition, it is also important to ensure that the pattern, and especially the size of any holes, does not have a detrimental effect on helicopter operations in-so-far as the surface arrangement shall not promote the breakdown of a helpful ground cushion beneath the helicopter to reduce beneficial ground effect.

6.4.2 The helideck surface shall be rendered so as to meet the minimum friction coefficient.

6.4.3 The minimum average surface friction values that shall be achieved are detailed in Table 2. The average surface friction values shall be confirmed using a test method acceptable to the CAAM – see provision 6.4.4 until 6.4.6.

Table 2: Friction Requirements

Section of Helideck	Fixed Helideck	Mobile Helideck
Inside TDPC	0.6	0.65
TDPC and H painted markings	0.6	0.65
Outside TDPC	0.5	0.5

Note. - Unless fixed to the sea bed (e.g. a jack-up on station), the helideck on any installation requiring a helideck motion system shall be regarded as a mobile (moving) helideck.

6.4.4 For flat helideck with a micro-texture finish (e.g. non-slip paint or grit- blasted finish), the helideck friction test method shall normally comprise the following:

a) a survey of the entire helideck surface in two orthogonal directions to a resolution of not less than $1m^2$;

b) use of a tester employing the braked wheel technique and a tyre made of the same material as helicopter tyres;

c) testing in the wet condition using a tester that is capable of controlling the wetness of the deck during testing, and;

d) use of a tester which provides electronic data collection, storage and processing; and

e) Where TD/PM circle and 'H' lighting is installed, testing of the TD/PM circle and 'H' painted markings is not required.

6.4.5 The test of the friction of a helideck shall be re-tested annually, or when condition of the helideck suggests more frequent testing is appropriate.

6.4.6 Full scale testing is not required provided that the helideck has been provided with a micro-texture finish (e.g. grit blasting or friction paint). Such helideck shall be subject to in-service monitoring using the protocol specified in provision 6.4.4. The friction tester readings shall not be scaled.

6.4.7 For the area outside the TDPC, an inadequate surface friction value (i.e. < 0.5) may be rectified by grit blasting or by applying a suitable non-slip paint coating. For the area inside the TDPC (< 0.6 for fixed helideck, < 0.65 for mobile helideck), removal of the profiling prior to grit blasting or painting is recommended or, alternatively, the fitment of a helideck net.

Note. – Refer to Table 3 – Helideck Surface Friction and Wind Limitation.

Table 3: Helideck Surface Friction and Wind Limitation

FRICTION LEVELS	MITIGATION				REMARKS
	Fixed Installation		Mobile Installation		
	Inside TDPC	Outside TDPC	Inside TDPC	Outside TDPC	
Mμ ≥ 0.65	Acceptable	Acceptable	Acceptable	Acceptable	HLL is not required
0.60 = Mμ < 0.65	Acceptable	Acceptable	Acceptable with landing net*	Acceptable	*No wind limit required.
0.50 = Mμ < 0.60	Acceptable with net OR Max 15 knots crosswind	Acceptable	Acceptable with landing net*	Acceptable	*No wind limit required.
0.36 = Mμ < 0.50	Acceptable with landing net AND Max 15 knots crosswind	Max 25 knots wind, any direction	Acceptable with landing net AND Max 10 knots crosswind	Max 20 knots wind, any directions	
Mμ < 0.36	Not Acceptable	Not Acceptable	Not Acceptable	Not Acceptable	

6.4.8 For the area that encompasses the TDPC only, a helideck net may be used to mitigate for insufficient surface friction provided that the average surface friction value is at least 0.36. The net shall be installed and tensioned in accordance with the manufacturer's instructions and shall have the following properties:

a) the mesh size shall be such as to present an area of between 400 and 900 cm^2;

b) the net shall be secured at intervals approximately 1.5 metres between the lashing points around the landing area perimeter;

c) the breaking strain of the rope/webbing from which the net is constructed, and the load capacity of the net anchoring points shall be at least 10 kN;

d) the size of the net shall such as to ensure coverage of the TDPC area but shall not cover the helideck identification marking (name) or 't' value markings.

6.4.9 It shall be borne in mind when selecting a helideck net that the height of the netting (i.e. the thickness of the installed net including knots) shall not exceed a height of 2.5 cm.

6.4.10 The helideck net may be any shape but shall cover the whole of the TDPC, but not be so large as to obscure other essential markings e.g. helideck name marking, maximum allowable mass marking. The net shall be constructed from durable materials not prone to flaking due to prolonged exposure to the weather (e.g. UV light), or to the elements (e.g. salt water).

6.4.11 If a helideck net is to be fitted, measures shall be taken to ensure that:

a) the performance of TDPC and ‘H’ lighting is not impaired. This will be especially evident at low angles (i.e. less than 6 degrees) of elevation;

b) the net does not impair the operation of automatic fire-fighting system ‘pop-up’ nozzles, where fitted, or otherwise compromise the firefighting facilities.

6.4.12 Every landing area shall be equipped with adequate surface drainage arrangements and a free-flowing collection system that will quickly and safely direct any rainwater and/or fuel spillage and/or firefighting media away from the helideck surface to a safe place. Any distortion of the helideck surface on an installation due to, for example, loads from a helicopter at rest shall not modify the landing area drainage system to the extent of allowing spilled fuel to remain on the deck. A system of guttering or slightly raised kerb shall be provided around the perimeter to prevent the spilled fuel falling onto the other parts of the installation. The capacity of the drainage system shall be sufficient to contain the maximum likely spillage of fuel on the helideck. The design of the drainage system shall preclude blockage by debris which is best achieved by use of a mesh type filtration system able to strain out smaller items of debris. The helideck area shall be properly sealed so that spillage will only route into the drainage system.

6.5 Tie-Down Points

6.5.1 Sufficient tie-down points, flush fitting to obviate damage to tyres or skids, shall be provided for securing the design helicopter. Tie-downs shall be located, and be of such construction, so as to secure the helicopter in severe weather conditions. Construction shall take account of the inertial forces resulting from any movement of a floating facility. Tie down points shall be compatible with the dimensions of tie down strop attachments.

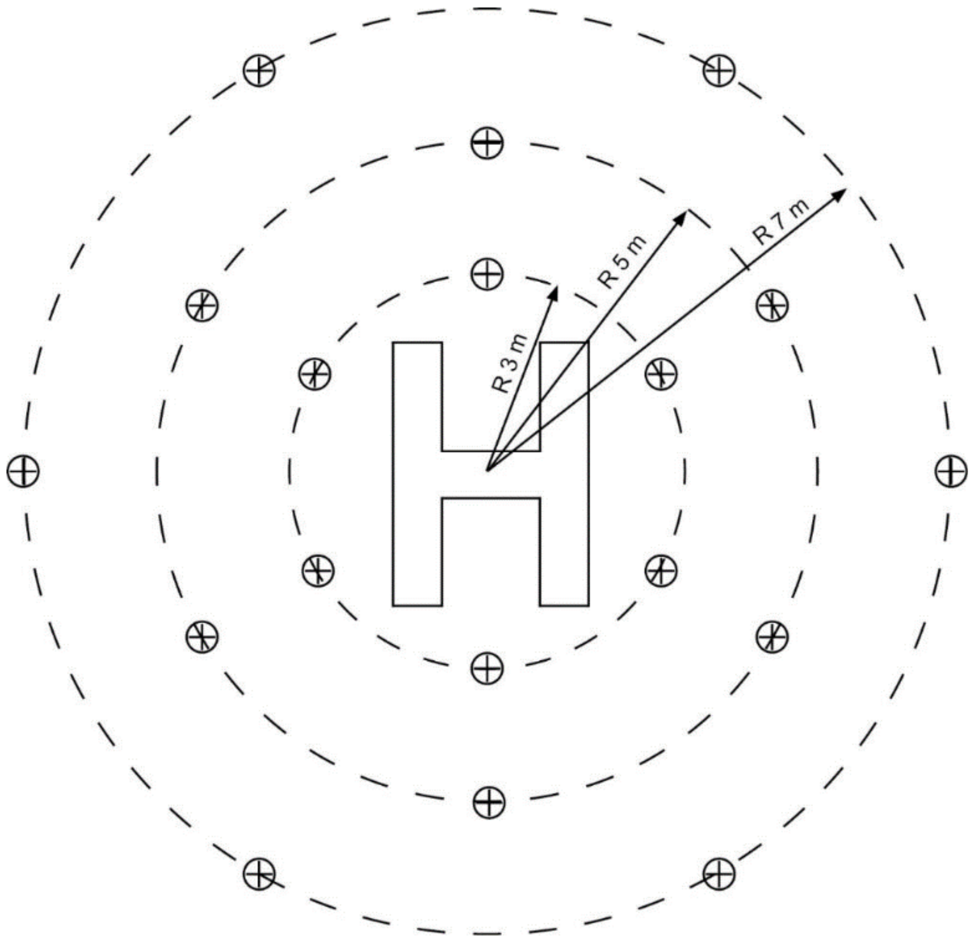

Figure 6-1: Aircraft Tie-Down Configuration

6.5.2 The maximum bar diameter of the tie-down point shall be 22 mm in order to match the strop hook dimension of typical tie-down strops. A safe working load requirement for strop/ring arrangements is 3 to 5 tonnes.

6.5.3 A tie-down configuration shall be radius R2.5 to R3.0 metres for inner circle, R5.0 metres for middle circle and R7.0 metres for outer circle. The tie-down configuration shall be based on the centre of the TDPC and shall not be painted or marked with another colour. The outer circle is not required for D-values of less than 22.2 m.

6.6 Perimeter Safety Nets

6.6.1 Safety nets for personnel protection shall be installed around the landing area except where adequate structural protection against a fall exists. The netting used shall be of a flexible nature, with the inboard edge fastened just below the edge of the helicopter landing deck. The net itself shall extend at least 1.5 metres, but no more than 2.0 metres, in the horizontal plane and be arranged so that the outboard edge does not exceed the level of the landing area and angled so that it has an upward and outward slope of approximately 10°.

6.6.2 A safety net designed to meet these criteria shall 'contain' personnel falling into it and not act as a trampoline. Where lateral or longitudinal centre bars are provided to strengthen the net structure, they shall be arranged and constructed to avoid causing serious injury to persons falling on to them. The ideal design shall produce a 'hammock' effect which shall securely contain a body falling, rolling or jumping into it, without serious injury. When considering the securing of the net to the structure and the materials used, care shall be taken that each segment will be fit for purpose. The load test by dropping a 125kg load from one meter or an equivalent pull test or tensile test shall be conducted every 2 years. Test to be conducted at minimum of 4 sections which 90 degrees apart.

Note1. – perimeter nets may incorporate a hinge arrangement to facilitate the removal of sacrificial panels for testing

Note 2. – perimeter nets that extend up to 2.0 m in the horizontal plane, measured from the edge of the landing area, will not normally attract operational limitations.

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7 Obstacle Environments

Note 1 – The objectives of the specifications in this chapter are to define the airspace around helideck to be maintained free from obstacles so as to permit the intended helicopter operations at the helideck to be conducted safely and to prevent the helideck becoming unusable by the growth of obstacles around them. This is achieved by establishing a series of obstacle limitation surfaces that define the limits to which objects may project into the airspace

7.1 Obstacle-Free Sector (OFS)

7.1.1 Description

7.1.1.1 A complex surface originating at and extending from a reference point on the edge of the FATO of a helideck. In the case of a TLOF of less than 1 D, the reference point shall be located not less than 0.5 D from the centre of the TLOF.

7.1.2 Characteristics

7.1.2.1 An obstacle-free sector/surface shall subtend an arc of specified angle.

7.1.2.2 A helideck obstacle-free sector shall comprise two components, one above and one below helideck level (see Figure 7-1):

a) Above helideck level. The surface shall be a horizontal plane level with the elevation of the helideck surface that subtends an arc of at least 210 degrees with the apex located on the periphery of the D circle extending outwards to a distance that will allow for an unobstructed departure path appropriate to the helicopter the helideck is intended to serve.

b) Below helideck level. Within the (minimum) 210-degree arc, the surface shall additionally extend downward from the edge of the safety net or shelving below the elevation of the helideck to water level for an arc of not less than 180 degrees that passes through the centre of the FATO and outwards to a distance that will allow for safe clearance from the obstacles below the helideck in the event of an engine failure for the type of helicopter the helideck is intended to serve.

Note — For both the above obstacle-free sectors for helicopters operated in Performance Class 1 or 2, the horizontal extent of these distances from the helideck will be compatible with the one-engine-inoperative capability of the helicopter type to be used.

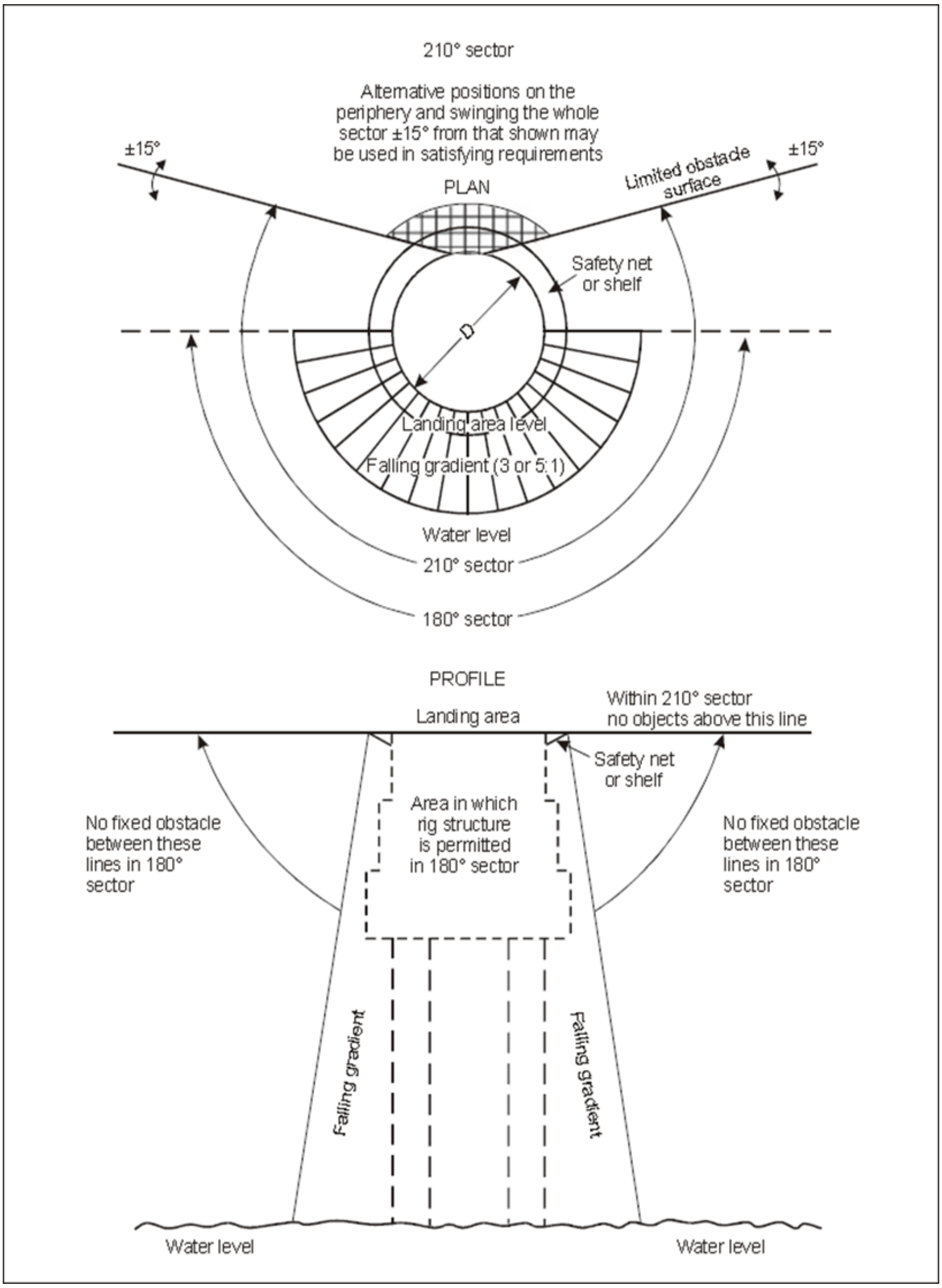

Figure 7-1: Helideck Obstacle-Free Sector

7.2 Limited Obstacle Sector (LOS)

Note — Where obstacles are necessarily located on the structure, a helideck may have a limited obstacle sector (LOS).

7.2.1 Description

7.2.1.1 A complex surface originating at the reference point for the obstacle-free sector and extending over the arc not covered by the obstacle-free sector within which the height of obstacles above the level of the TLOF will be prescribed.

7.2.2 Characteristics

7.2.2.1 A limited obstacle sector shall not subtend an arc greater than 150 degrees. Its dimensions and location shall be as indicated in Figure 7-2 for a 1 D FATO with coincidental TLOF and Figure 7-3 for a 0.83 D TLOF.

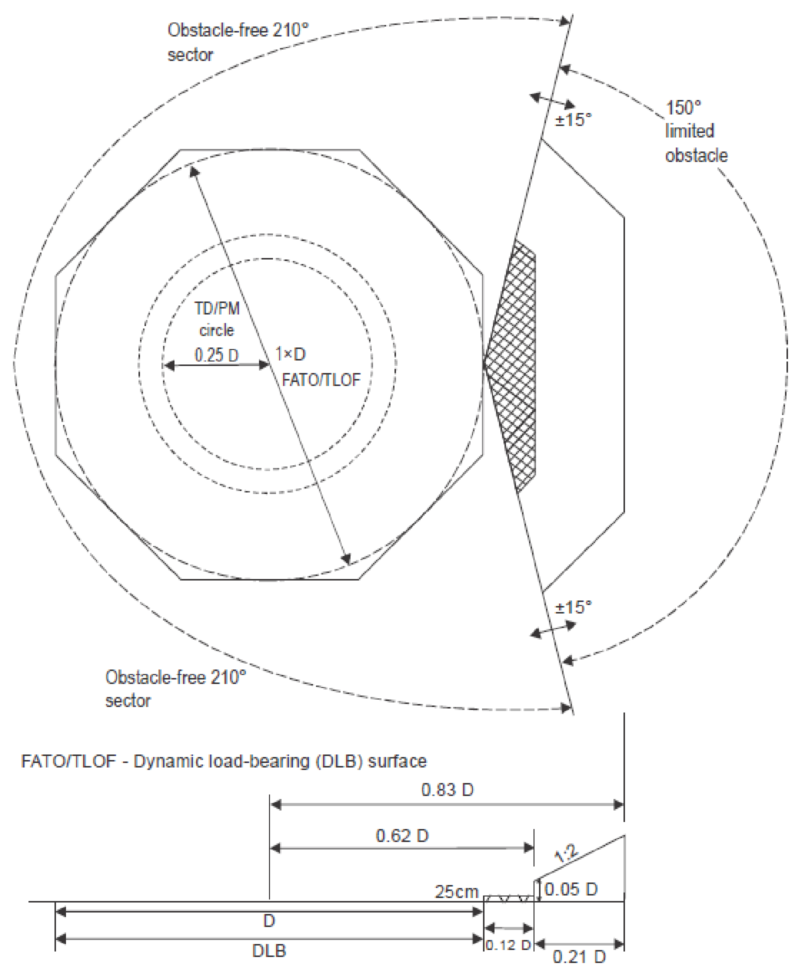

Figure 7-2: Helideck obstacle limitation sectors and surface for a FATO and coincidental TLOF of 1 D and larger

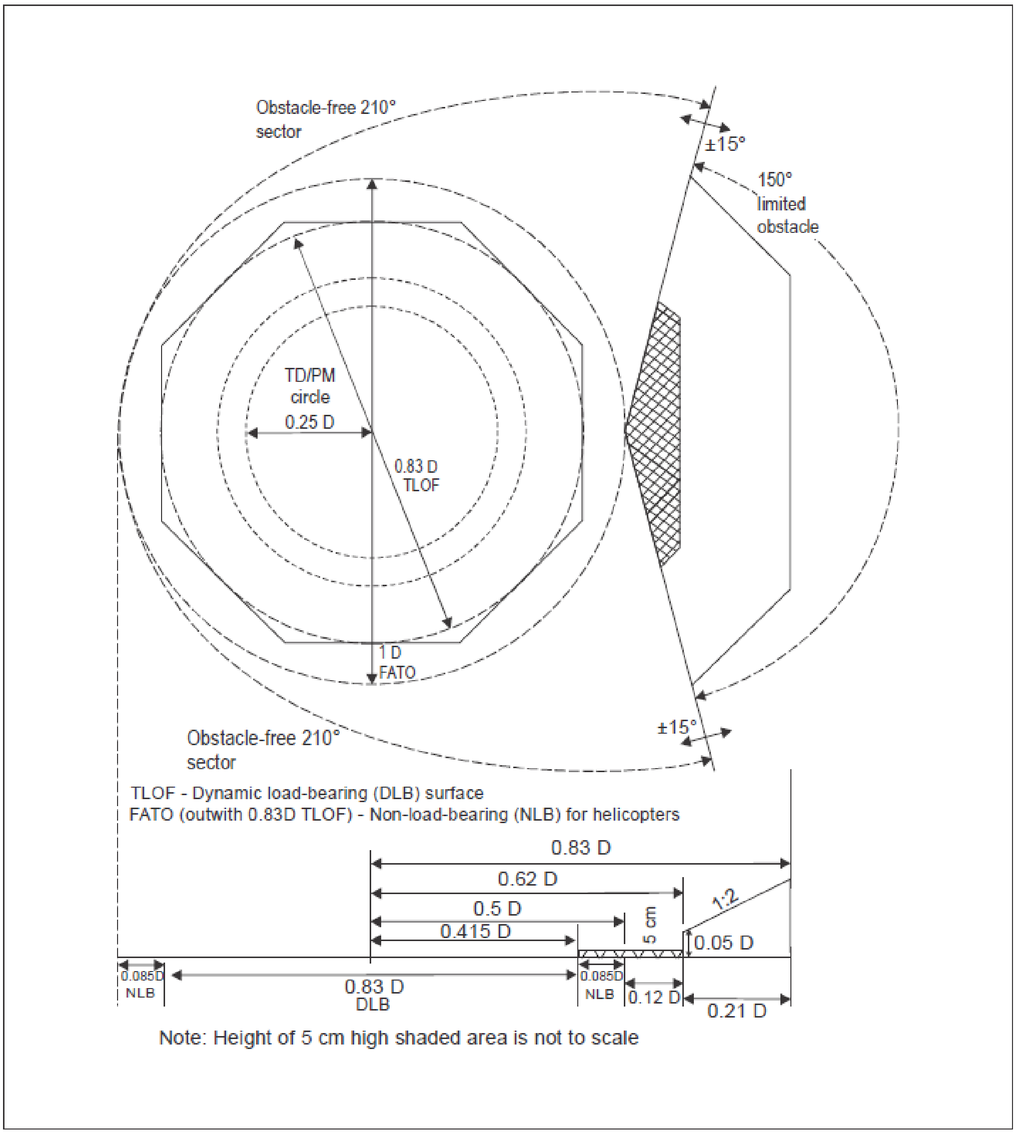

Figure 7-3: Helideck obstacle limitation sectors and surfaces for a TLOF of 0.83 D and larger

7.3 Obstacle Limitation Requirements

7.3.1 A helideck shall have an obstacle-free sector.

Note — A helideck may have a limited obstacle sector (LOS).

7.3.2 There shall be no fixed obstacles within the obstacle-free sector above the obstacle free surface.

7.3.3 In the immediate vicinity of the helideck, obstacle protection for helicopters shall be provided below the helideck level. This protection shall extend over an arc of at least 180 degrees with the origin at the centre of the FATO, with a descending gradient having a ratio of one unit horizontally to five units (5:1) vertically from the edges of the safety net within the 180-degree sector. This descending gradient may be reduced to a ratio of one unit horizontally to three units (3:1) vertically within the 180-degree sector for multi-engine helicopters operated in Performance Class 1 or 2 (see Figure 7-1).

Note - Where there is a requirement to position, at sea surface level, off-shore support vessels (e.g. a Standby Vessel or tanker) essential to the operation of a fixed or floating off-shore facility, but located within the proximity of the fixed or floating off-shore facility's obstacle free sector (OFS), any off-shore support vessels would need to be positioned at a distance from the helideck based on the one-engine-inoperative capability of the helicopter type to be used.

7.3.4 To account for the loss in height of a helicopter following an engine failure occurring during the early stages of the take-off manoeuvre, it is required that a clear zone be provided below landing area level covering a sector of at least 180 degrees with its origin based at the centre of the D-circle. The falling gradient is measured downwards to the sea surface from the edge of the safety netting or safety shelving on a vertical gradient. The surface shall extend outwards for a distance that will allow for safe clearance from obstacles below the landing area in the event of an engine failure based on the least well performing helicopter that is serviced by the FATO. For helicopters operated in Performance Class 1 or 2, the horizontal extent of this distance from the landing area will be based on the one-engine inoperative capability of the helicopter type in use. All objects that are underneath the final approach and take-off paths will need to be assessed.

7.3.5 For a TLOF of 1 D and larger, within the 150-degree limited obstacle surface/sector out to a distance of 0.12 D measured from the point of origin of the limited obstacle sector, objects shall not exceed a height of 25 cm above the TLOF. Beyond that arc, out to an overall distance of a further 0.21 D measured from the end of the first sector, the limited obstacle surface rises at a rate of one unit vertically for each two units horizontally originating at a height 0.05 D above the level of the TLOF. (See Figure 7-2).

7.3.6 For a TLOF less than 1 D within the 150-degree limited obstacle surface/sector out to a distance of 0.62 D and commencing from a distance 0.5 D, both measured from the centre of the TLOF, objects shall not exceed a height of 5 cm above the TLOF. Beyond that arc, out to an overall distance of 0.83 D from the centre of the TLOF, the limited obstacle surface rises at a rate of one unit vertically for each two units horizontally originating at a height 0.05 D above the level of the TLOF. (See Figure 7-3).

7.3.7 Where the area enclosed by the TLOF perimeter marking is a shape other than circular, the extent of the LOS segments is represented as lines parallel to the perimeter of the TLOF rather than arcs. Figures 7-2 and 7-3 has been constructed on the assumption that an octagonal helideck arrangement is provided.

7.3.8 For circular helideck or shipboard helideck, the segments and sectors represented by straight lines are replaced using sectors shaped in an arc. Figures 7-4 to 7-7 provide examples.

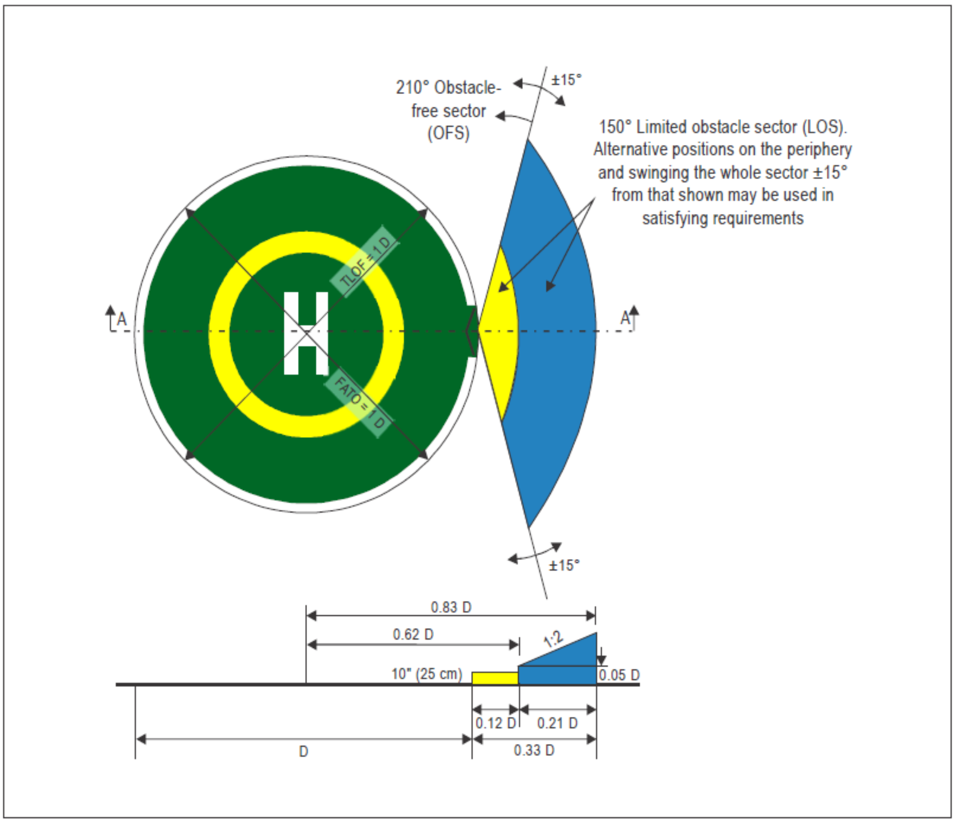

Figure 7-4: Circular obstacle limitation sectors and surfaces for 1D FATO and coincidental TLOF

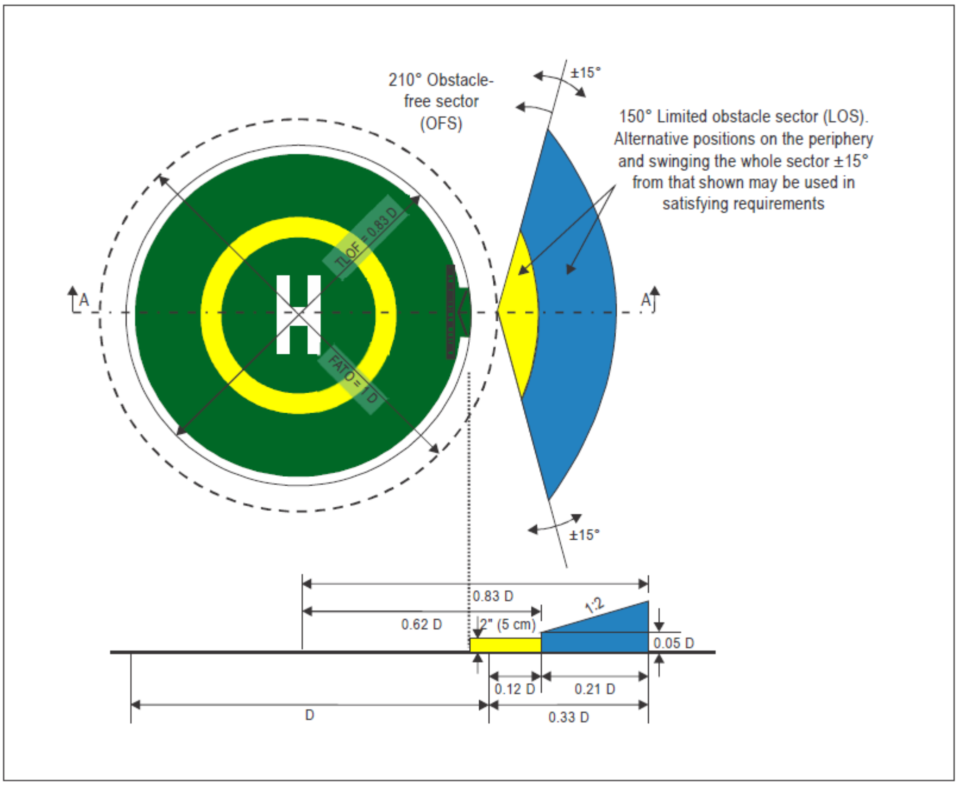

Figure 7-5: Circular obstacle limitation sectors and surfaces for 0.83D TLOF with collocated 1D TLOF

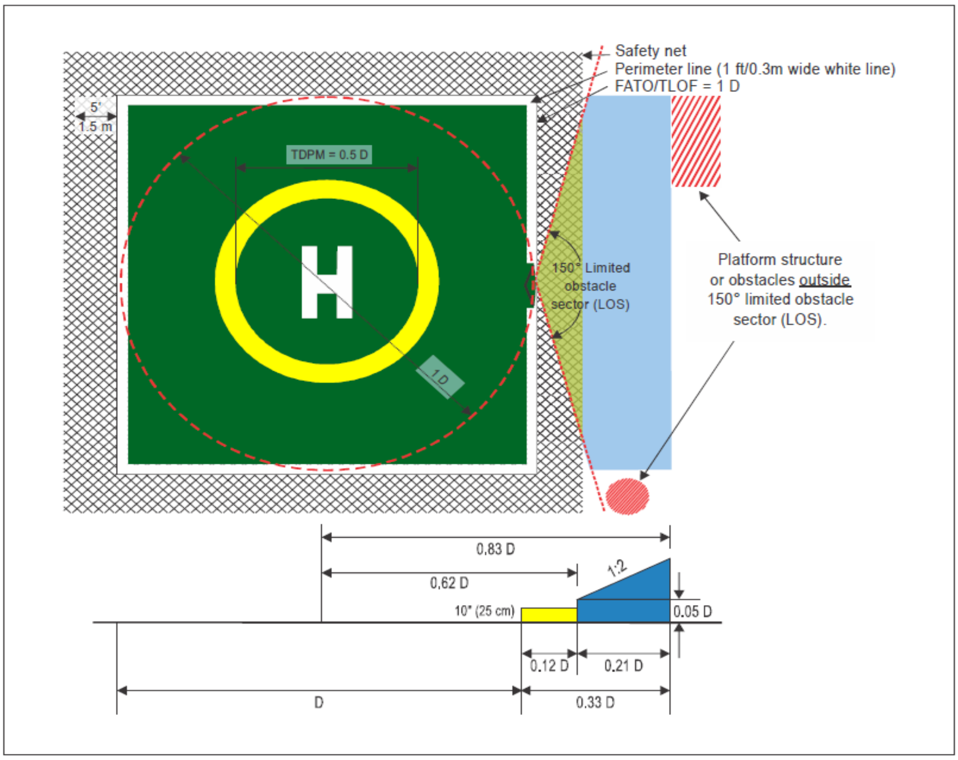

Figure 7-6: Square obstacle limitation sectors and surfaces for 1D FATO and coincidental TLOF

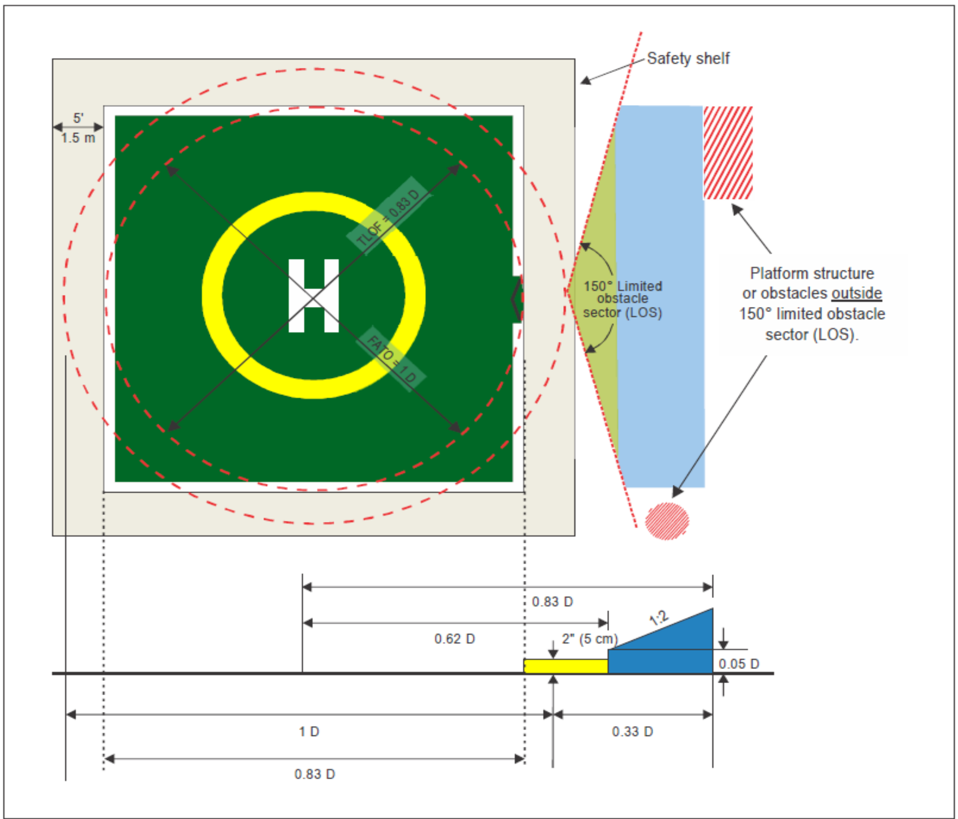

Figure 7-7: Square obstacle limitation sectors and surfaces for 0.83D TLOF with collocated 1D TLOF

7.4 Obstacle Controls

7.4.1 Obstacles that penetrate the LOS shall be removed or so modified that they no longer constitute an infringement. Where an immovable object penetrates the LOS, whether in the first and/or second segment (an example could be the leg of a self-elevating jack-up facility which is situated in the LOS and which cannot be moved or modified), it may be possible to mitigate the effects of the penetration by applying a Prohibited Landing Sector (PLS) marking which ensures that a helicopter cannot land with the tail towards the obstacle, where the obstacle is not within the pilot's field of view. The benefit of a PLS marking may be maximised by applying it in conjunction with an offset touchdown/positioning marking. The application of a PLS, with or without an offset TD/PM, shall not be used as a 'quick fix' to justify the presence of unwanted obstructions; it is always preferable, where practical, to remove, to relocate or to modify an obstacle which would otherwise penetrate through the surface of the LOS.

7.4.2 Experience suggests there can be a pressure to accommodate obstacles close to the extended boundary of the OFS, but outside the second segment on the limited obstacle side, where there are no specific obstacle restrictions/limitations. For the presence of a large solid object, whether a new permanent feature or a temporary one, this location so close to the helideck, has potential to promote turbulence over the helideck in some wind conditions and shall be avoided. For the avoidance of doubt, any proposed siting near to the helideck shall be subjected to appropriate modelling before it is introduced. Equally, locating a non-rigid (flexible) structure, such as a long whip aerial, in the area immediately adjacent to the helideck, can have an impact on the safety of helicopter operations if the whip aerial shall bend into the OFS under the force of an approaching helicopter's rotor downwash. It is therefore recommended that flexible objects, such as whip aerials are not sited right at the edge of the OFS, where they could bend into the protected area.

7.5 Temporary Combined Operations

7.5.1 Temporary Combined Operations are essentially arrangements where two or more off-shore facilities, whether fixed or floating, are in close proximity 'alongside' or 'pulled away' from one another. They may be in place for a matter of hours, days or for up to several years. On occasions, combined operations may include vessels working alongside one or more fixed and/or mobile facilities. The close proximity of facilities and/or vessels to one another is likely to entail that one or more of the helideck/shipboard helideck is operationally restricted due to one or more of the obstacles protected surfaces being compromised and/or due to adverse environmental effects of one installation on the landing area of another.

7.5.2 For example, the facility pictured in the centre of Figure 7-8 has obstacle protected sectors and surfaces (extended OFS as well as the falling gradient) that are severely compromised by the proximity of the other two facilities. In these circumstances a landing prohibited marker (a yellow cross on a red background) is in place on the drilling facility (centre) to prevent operations to the helideck.

7.5.3 Where temporary combined operations are planned, prior to helicopter operations an assessment shall be completed to assess the physical, as well as the environmental, impact of the arrangements and to assess any flight restrictions or limitations, including prohibitions, which might need to be disseminated to air crew (usually a temporary instruction). Helideck (or shipboard helideck) which are determined to be unavailable shall display the relevant landing prohibited marker by day while, at night, all aeronautical lights shall be extinguished.

7.5.4 Often, combined operations will involve both facilities and/or vessels being in close proximity 'alongside' one another (Figure 7-8), where the effect of one facility on the helideck obstacle protected surfaces of another is immediately obvious. However, during the life of a combined arrangement there may also be periods when mobile facilities and/or vessels are 'pulled-away' to a stand-off position, which could be some distance apart. It will be necessary for operators to re-appraise the situation for a combined operation now in the 'stand-off' configuration. With one or more installations or vessels 'pulled-away' there may be opportunity to relax or remove limitations imposed for the 'alongside' configuration. This is normally an assessment for the helicopter operator to make.

Figure 7-8: Temporary combined operation showing relative position of each helideck 210° sector

7.6 Multiplatform Configurations / Location of Standby Vessels

7.6.1 Where two or more fixed structures are permanently bridge linked the overall design shall ensure that the sectors and surfaces provided for the helideck are not compromised by other modules which may form part of a multiple platform configuration. It is also important to assess the environmental impact of all modules on the flying environment around the helideck.

7.6.2 Where there is an intention to add new modules to an existing platform arrangement it is important to make an assessment on the potential impact that additional platforms might have on helideck operations. This will include an assessment of the sectors and surfaces for the helideck which shall not be compromised due to the location of a new platform, or modification to an existing platform. This will include a detailed analysis of the environmental impact on the flying environment around the helideck which is addressed in further detail in.

7.6.3 The presence of a Standby Vessel in the vicinity of a 'live' helideck operation is a legal requirement in many off-shore sectors. The location of the Standby Vessel, and any other vessel present on the sea surface, shall not compromise the safety of the helicopter operation.

7.7 Control of Crane Movement in the Vicinity of Landing Areas

7.7.1 The 210° obstacle- free sector of the helideck shall not be infringed upon by any cranes or parts thereof during helicopter movements.

7.7.2 All cranes in the vicinity of the FATO which may, during their operation, encroach into the 210° sector or the 150° limited obstacle sector must cease movement during helicopter operations.

7.7.3 When helicopter movements take place (±10 minutes) crane work ceases and jibs, 'A' frames, etc. are positioned clear of the obstacle protected surfaces and flight paths.

7.7.4 The HLO shall be responsible for the control of cranes in preparation for and during helicopter operations

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8 Visual Aids

Note – For a non-purpose-built helideck located on a ship's side the surface colour of the main deck can vary from ship to ship and therefore some discretion may need to be exercised in the colour selection of helideck paint schemes; the objective being to ensure that the markings are conspicuous against the surface of the ship and the operating background.

8.1 Helideck Identification Marking ("H")

8.1.1 Application

8.1.1.1 Helideck identification markings shall be provided at a helideck.

8.1.2 Location

8.1.2.1 A helideck identification marking shall be located at or near the centre of the FATO.

8.1.2.2 A helideck identification marking shall be located in the centre of the FATO except where the results of an aeronautical survey indicate that an offset marking may be beneficial to helicopter operations and still allow for the safe movement of personnel around the helicopter; in which case the centre of the "H" may be offset by up to 0.1D towards the outboard edge of the FATO.

8.1.2.3 An example of where this measure may be used could be for an over-sized helideck — one that exceeds the minimum 1D dimensional requirement — but that also has immovable obstructions close to the inboard perimeter, in the LOS. In this case moving the touchdown marking location away from the centre of the FATO towards the outboard edge will improve clearances from dominant obstacles, while, in theory, still facilitating adequate on-deck clearance around the helicopter for the safe movement of passengers and for the efficiency of helideck operations, such as refuelling.

8.1.2.4 If the touchdown/positioning marking is offset on a helideck, the helideck identification marking is established in the centre of the touchdown/positioning marking.

8.1.3 Characteristics

8.1.3.1 A helideck identification marking shall consist of a letter H, white in colour.

8.1.3.2 On a helideck the cross arm shall be on or parallel to the bisector of the obstacle-free sector. For a non-purpose-built shipboard helideck located on a ship's side, the cross arm shall be parallel with the side of the ship, Figure 8-1.

8.1.3.3 Where it is necessary for the obstacle-free sector (chevron) marking to be swung for a helideck (e.g. to clear an obstacle which might otherwise penetrate the 210° sector), it will be necessary to swing the "H" marking by the corresponding angle. The maximum swung sector shall not exceed +/-15 degrees from the normal for the OFS. A 'swung' helideck identification "H" marking is illustrated in Figure 8.1.

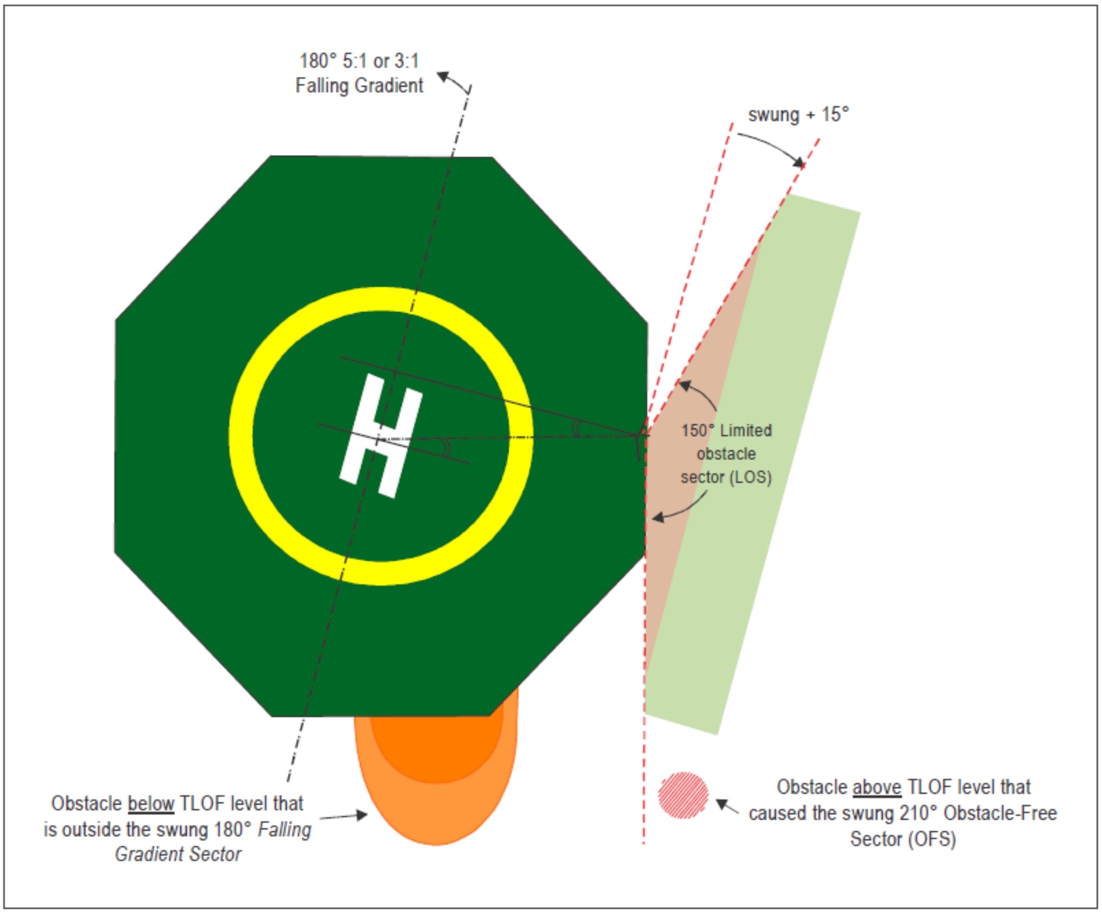

Figure 8-1: Helideck identification marking reflecting a swung obstacle free sector (in this case the OFS is swung by 15 degrees in a clockwise direction to avoid an obstacle)

Note — The bisector of the 210° Obstacle Free Sector (OFS) shall normally pass through the Centre of the D-circle. The sector may be 'swung' by up to 15° in either direction from the normal. (A 15° clockwise swing is illustrated). If the 210° OFS is swung, then it would be normal practice (but not mandatory) to swing the 180° falling 5:1 gradient by a corresponding amount to indicate, and align with, the swung OFS.

8.1.3.4 On a helideck and or a shipboard helideck where the D value is 16.0 m or larger, the size of the helideck identification H marking shall have a height of 4 m with an overall width not exceeding 3 m and a stroke width not exceeding 0.75 m. Where the D value is less than 16.0 m, the size of the helideck identification H marking shall have a height of 3 m with an overall width not exceeding 2.25 m and a stroke width not exceeding 0.5 m.

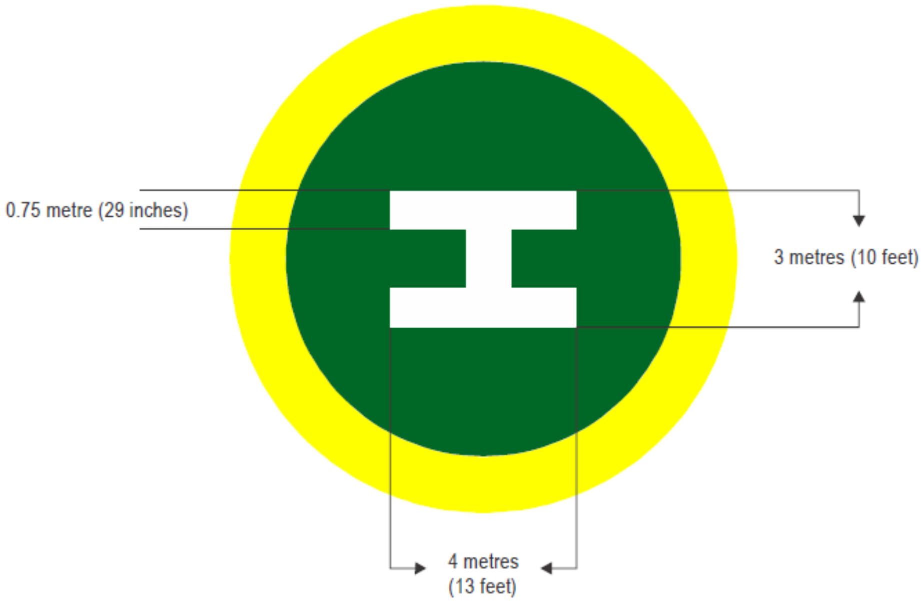

Figure 8-2: Dimension of the Helideck Identification Marking "H"

8.2 D-Value Marking

8.2.1 Location

8.2.1.1 D-value markings shall be displayed within the broken white TLOF perimeter line at three locations presented in Figure 8-7 or Figure 8-8 so that at least one marking is readable from the final approach direction. For a purpose-built shipboard helideck in an amidships location, having a chevron at either end (see Figure 8-3), two D-value markings are required to be displayed — one on the portside of the helideck and the other starboard side.

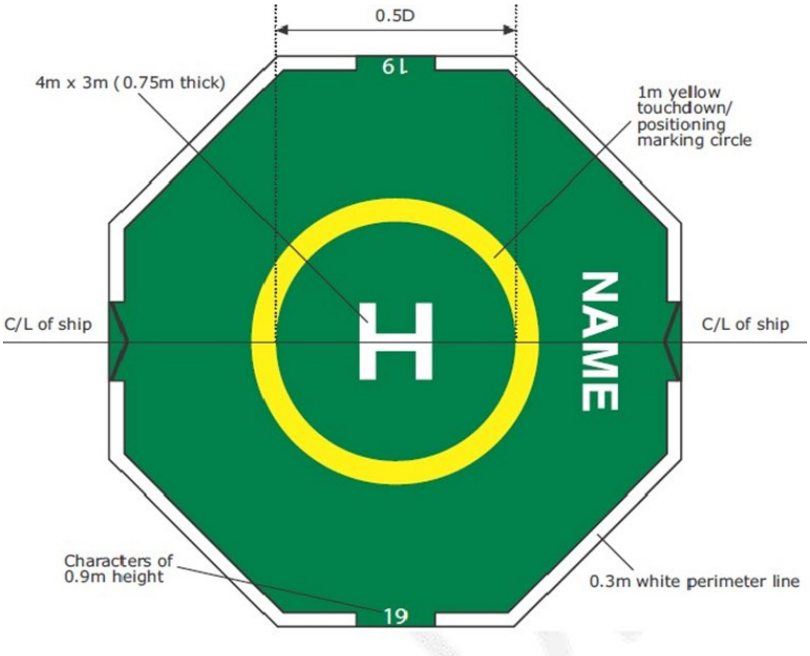

Figure 8-3: D- value markings for a purpose-built shipboard helideck in an amidships location

8.2.2 Characteristics

8.2.2.1 For the characteristic requirements of the D-Value markings refer to CAD 14 Vol II – Heliports, Paragraph 5.2.3.

Figure 8-4: (for examples refer to CAD 14 Vol II - Heliports)

8.3 Touchdown and Lift-Off Area (TLOF) Perimeter Marking

8.3.1 Characteristics

8.3.1.1 The TLOF perimeter line shall follow the physical shape of the helideck or shipboard helideck, such that where the deck shape is octagonal or hexagonal, the shape of the painted white TLOF marking will correspond to an octagon or hexagon. A TLOF marking shall only be circular where the physical shape of the helideck or shipboard helideck is also circular.

8.4 Touchdown / Positioning Circle TDPC Marking

8.4.1 Location

8.4.1.1 A touchdown/positioning marking shall be located so that when the pilot's seat is over the marking, the whole of the undercarriage will be within the TLOF and all parts of the helicopter will be clear of any obstacle by a safe margin.

8.4.1.2 For helideck which is less than 1D it is not recommended that an offset marking be utilised.

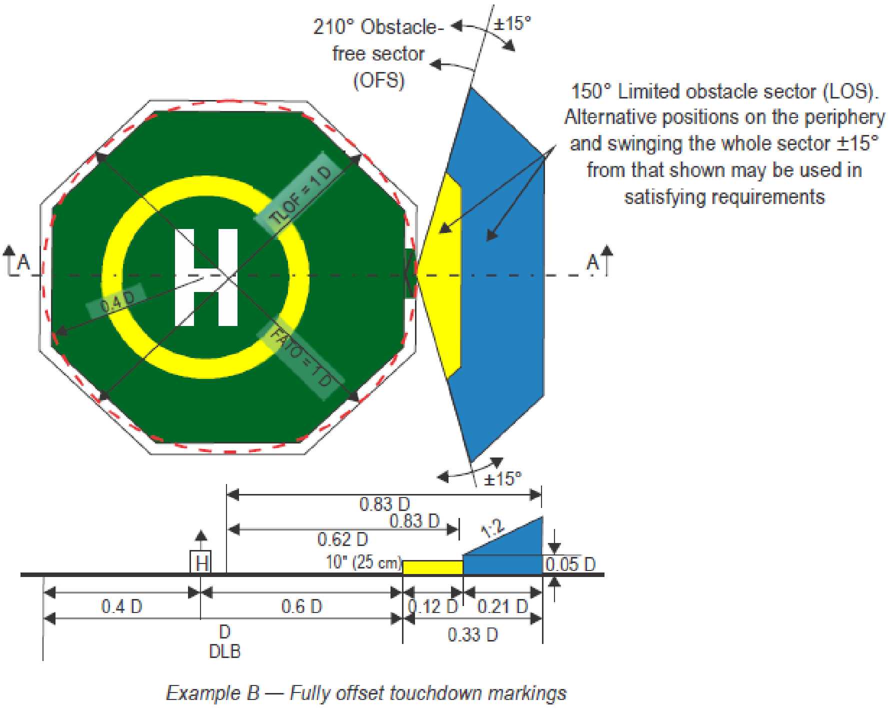

Figure 8-5: Location of offset touchdown marking

8.4.2 Characteristics

8.4.2.1 For a helideck or a purpose-built shipboard helideck with a D value of 16.0 m or larger, the line width shall be at least 1 m.

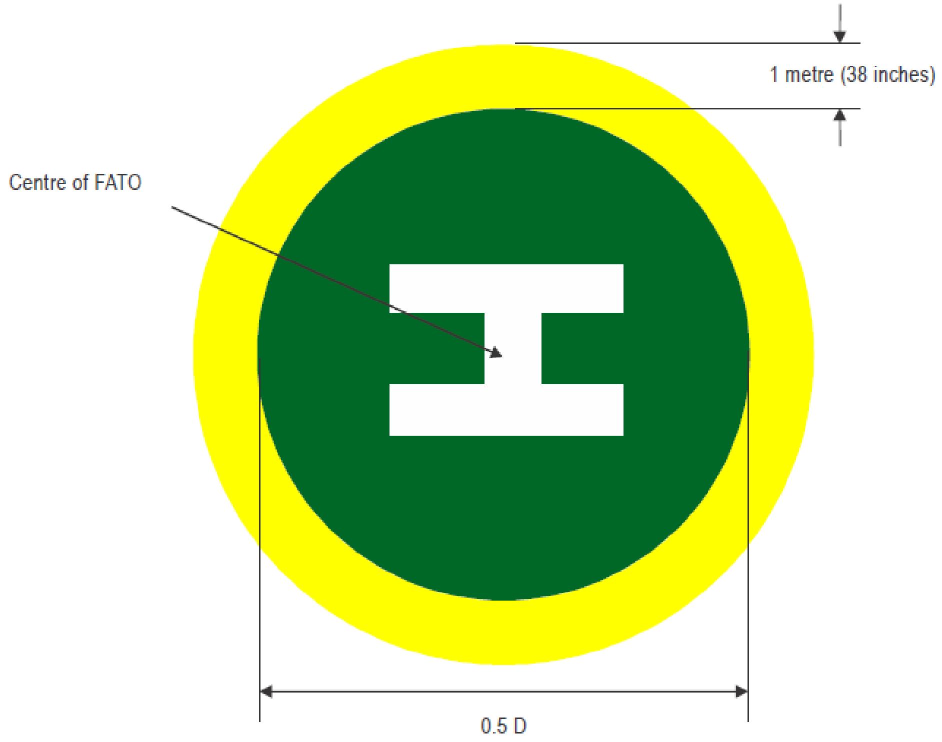

Figure 8-6: Touchdown/positioning marking

8.5 Helideck Name Marking

8.5.1 Location

8.5.1.1 The helideck name marking shall be displayed on the helideck so as to be visible, as far as practicable, at all angles above the horizontal. Where an obstacle sector exists on a helideck the marking shall be located on the obstacle side of the helideck identification marking. For a non-purpose-built helideck located on a ship's side the marking shall be located on the inboard side of the helideck identification marking in the area between the TLOF perimeter marking and the boundary of the LOS.

8.5.2 Characteristics

8.5.2.1 To allow for recognition of the facility or vessel further up the approach manoeuvre, the character height of the helideck name marking shall be as follows:

a) Helideck less than 16.0 m – not less than 1.2 m in height; or

b) Helideck more than 16. 0 m – not less than 1.5 m in height.

Note. – Where the character is 15 m, the character widths and stroke widths shall be in accordance with Figure 8-3. The character widths and stroke widths of nominal 1.2 m characters shall be 80% of those prescribed by Figure 8-3. Where the helideck name marking consists of more than one word it is *recommended that the space between words be approximately 50% of character height.*

8.5.2.2 Some types of floating facilities and vessels may benefit from a second name marking diametrically opposite the first marking, with the characters facing the opposite direction (so that the feet of characters are located adjacent to the outboard edge of the touchdown/positioning marking circle. Having a name marking either end of the touchdown/positioning marking circle will ensure that one marking is always readable the right way up for aircrew on approach e.g. for a bow mounted helideck on a vessel that is steaming into wind, a second name marking oriented towards the main vessel structure (aft) and located between the outer edge of the circle and the outboard edge of the helideck, will be more easy to process for aircrew approaching into wind than will a helideck name marking located in the normal location. In this case aircrew would be required to process a marking which is upside down.

8.6 Helideck Obstacle-Free Sector (CHEVRON) Marking

8.6.1 Characteristics

8.6.1.1 The origin of the obstacle-free sector shall be marked on the helideck or shipboard helideck by a black chevron, each leg being 79 cm long and 10 cm wide forming the angle of the obstacle free sector in the manner shown in Figure 8-7. Where the OFS is swung (by up to +/-15 degrees) then the chevron is correspondingly swung. Where there is insufficient space to accommodate the chevron precisely, the chevron marking, but not the point of origin of the OFS, may be displaced by up to 30 cm towards the centre of the TLOF.

8.6.1.2 The purpose of the chevron is widely misunderstood to provide a form of visual indication to the aircrew that the obstacle free sector is clear of obstructions. However, the marking is too small for the purposes of aircrew and instead is intended as a visual ‘tool’ for a Helideck Landing Officer (an HLO who has charge of the helideck operation ‘on the ground’) so that he can ensure that the 210-degree OFS is clear of any obstructions, fixed or mobile, before giving a helicopter clearance to land. The black chevron may be painted on top of the white TLOF perimeter line to achieve maximum clarity for helideck crew.

8.6.1.3 Adjacent to and where practical inboard of the chevron, the certified/actual D-value of the helideck is painted in 10 cm alphanumeric characters. The D-value of the helideck shall be expressed in metres to two decimal places (e.g. “D= 16.05 m”).

8.6.1.4 For a TLOF which is less than 1D, but not less than 0.83D, the chevron is positioned at 0.5D from the centre of the FATO which will take the point of origin outside the TLOF. If practical this is where the black chevron marking shall be painted. If impractical to paint the chevron at this location, then the chevron shall be relocated to the TLOF perimeter on the bisector of the OFS. In this case the distance and direction of displacement along with the words “WARNING DISPLACED CHEVRON” are marked in a box beneath the chevron in black characters not less than 10 cm high. An example of the arrangement for a sub-1D helideck is shown in Figure 8-8.

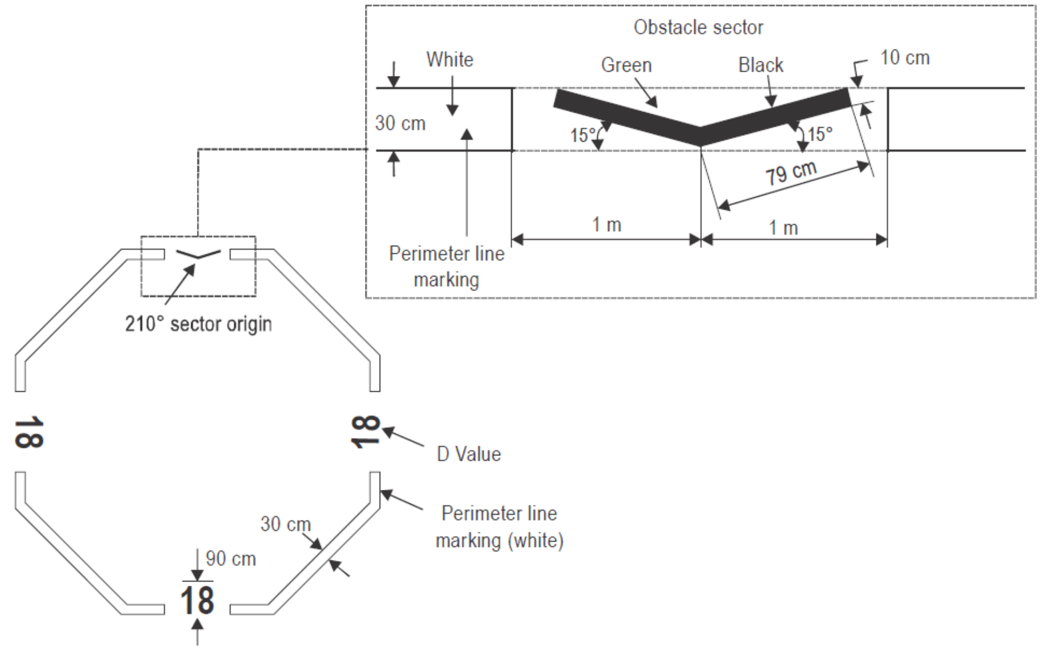

Figure 8-7: Chevron for a 1D helideck and helideck D-value markings

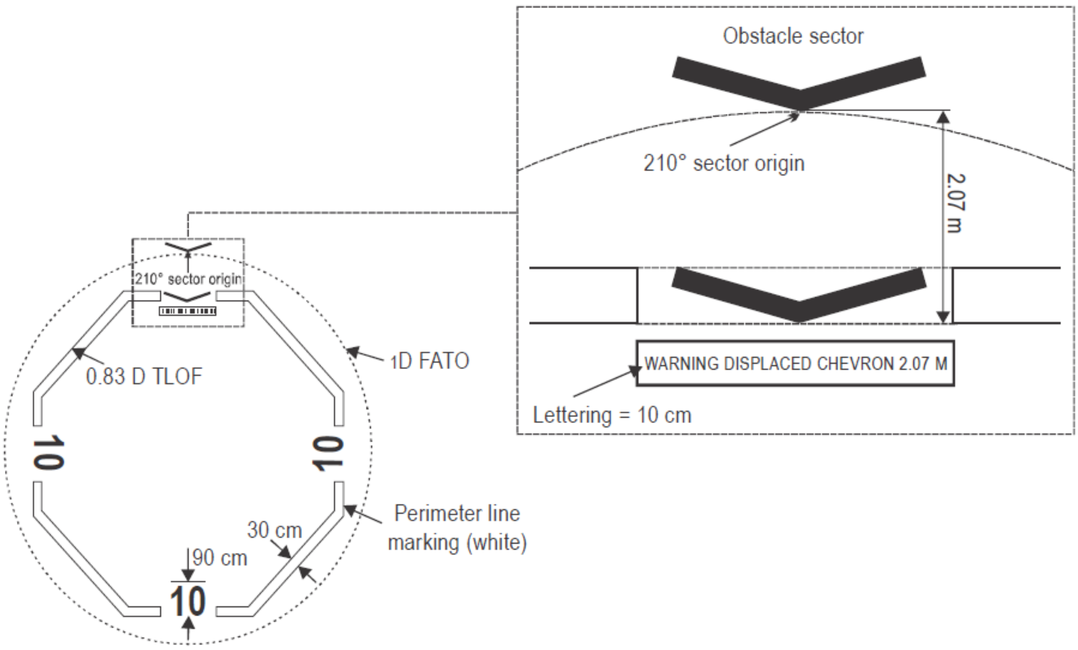

Figure 8-8: Chevron for a 0.83D helideck

8.7 Helideck and Shipboard Helideck Surface Marking

8.7.1 Application

8.7.1.1 The purpose is to protect the helicopter from landing or manoeuvring in close proximity to limiting obstructions which, being of an immovable nature, may compromise the sectors and surfaces established for the helideck (an example might be a jack-up leg penetrating the 150-degree limited obstacle sector or a crane on the edge of the LOS).

8.8 Helideck Prohibited Landing Sector Markings

8.8.1 Application

8.8.1.1 Helideck prohibited landing sector markings shall be provided where it is necessary to prevent the helicopter from landing within specified headings.

8.8.1.2 The colour of the helideck shall be dark green or natural grey colour of aluminium.

8.8.2 Location

8.8.2.1 The prohibited landing sector markings shall be located on the touchdown/positioning marking to the edge of the TLOF, within the relevant headings.

8.8.3 Characteristics

8.8.3.1 The prohibited landing sector markings shall be indicated by white and red hatched markings as shown in Figure 8-9.

Note — Prohibited landing sector markings, where deemed necessary, are applied to indicate a range of helicopter headings that are not to be used by a helicopter when landing. This is to ensure that the nose of the helicopter is kept clear of the hatched markings during the manoeuvre to land.

8.8.3.2 The arc of coverage shall be sufficient to ensure that the tail rotor system will be positioned clear of the obstruction when hovering above, and touching down on, the yellow circle at any location beyond the prohibited landing sector marking. As a guide it is recommended that the prohibited landing sector marking extends by a minimum 10 to 15 degrees either side of the edge of the obstacle (this implies that even for a simple whip aerial infringement' the prohibited landing sector arc applied will be an arc no less than 20-30 degrees of coverage).

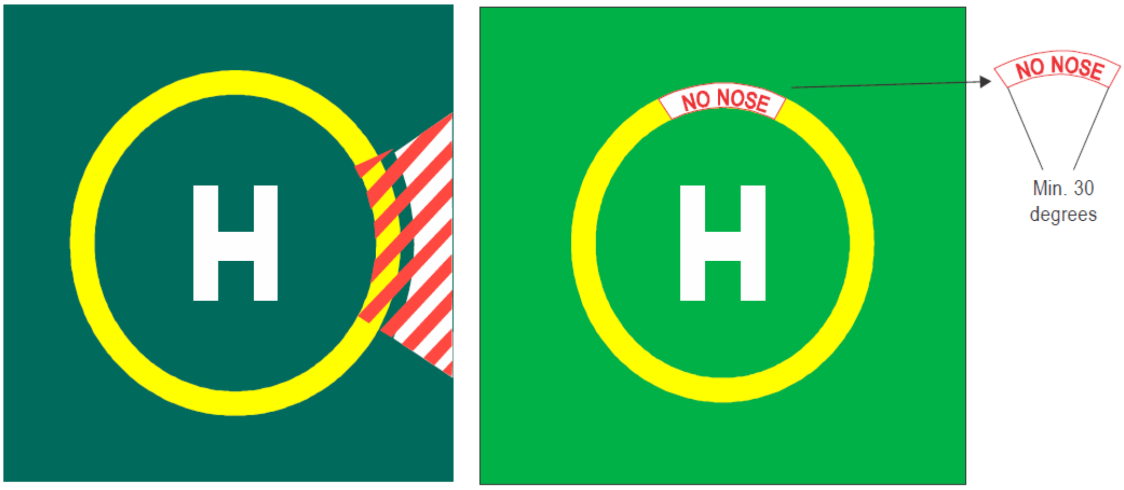

Figure 8-9: Example of an alternative prohibited landing sector marking

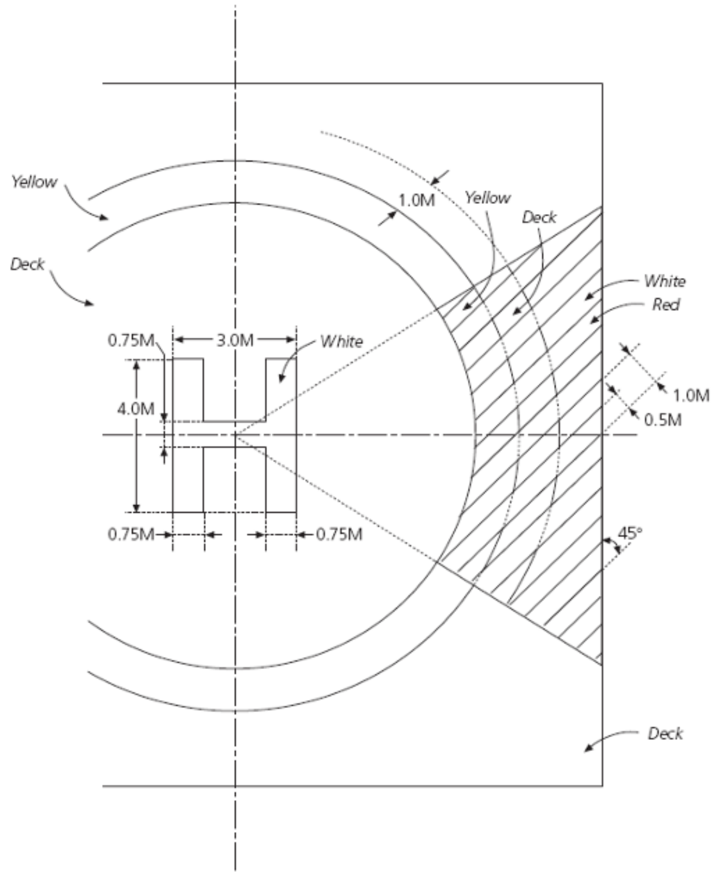

Figure 8-10: Examples of an alternative prohibited landing sector making

8.8.3.3 The sector of the TDPC, opposite from the personnel access point, shall be bordered in red with the words "No Nose" clearly marked in red on a white background as shown in Figure 8-9. When positioning over the touchdown/positioning marking circle, helicopters shall be manoeuvred so as to keep the aircraft nose clear of the "No Nose" marked sector of the TDPC at all times. The minimum prohibited "NO NOSE" marking shall cover an arc of at least 30 degrees.

8.9 Visual Aids for Denoting Obstacles

8.9.1 Fixed obstacles which present a hazard to helicopters shall be readily visible from the air. If a paint scheme is necessary to enhance identification by day, alternate black and white, black and yellow, or red and white bands are recommended, not less than 0.5 metres, or more than six metres wide. The colour shall be chosen to contrast with the background to the maximum extent.

8.9.2 Obstacles to be marked in these contrasting colours include any lattice tower structures and crane booms which are close to the helideck or to the LOS boundary. Similarly, parts of the leg (or legs) of a self-elevating jack-up unit that are adjacent to the helideck and which extend, or can extend above it, shall also be marked in the same manner.

8.10 Installation Closed Marking

8.10.1 Application

8.10.1.1 A closed marking shall be displayed on an installation which is permanently closed to the use of all helicopters.

8.10.2 Characteristics

8.10.2.1 The white closed marking shall be of the form as detailed in Figure 8-11, the size of the marking shall be adjusted to cover the letter 'H' inside the TD/PM.

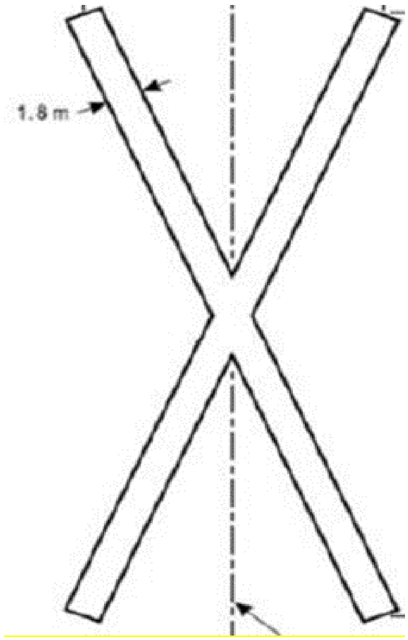

Figure 8-11: Helideck closed marking

8.11 Prohibition of Landing Marker

8.11.1 Application

8.11.1.1 A prohibition of landing marking shall be displayed when landings are prohibited and when the prohibition is likely to be prolonged.

8.11.2 Characteristics

8.11.2.1 The marking shall be of the form as detailed in Figure 8-12, the size of the marking shall be adjusted to cover the letter 'H' inside the TD/PM.

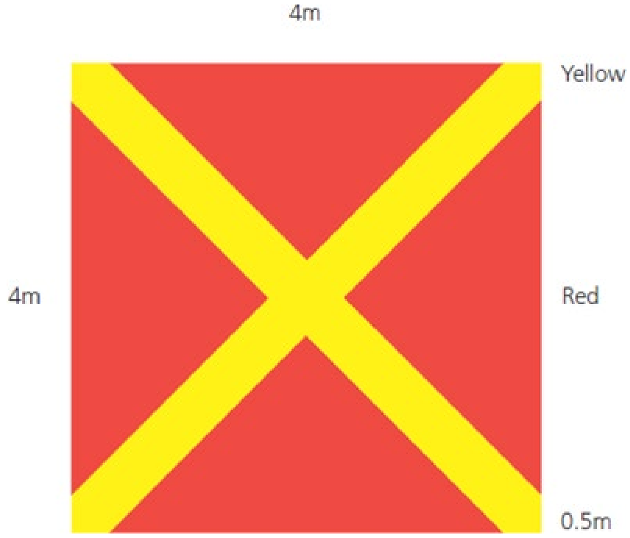

Figure 8-12: Prohibition of landing marker

8.12 Side Panel Identification

8.12.1 Side identification panels shall be provided at a helideck where pilots are required to obtain a final pre-landing confirmation that the correct helideck is being approached. It shall bear the helideck name.

8.12.2 Side identification panel shall be installed and clearly displayed in such positions on the installation so that it can be readily identified from the air and sea form all normal angles and directions of approach.

8.12.3 Side panels intended for use at night or during conditions of poor visibility shall be illuminated, either internally or externally or by helicopter landing lights.

8.13 D-value marking in relation to chevron marking

8.13.1 For an existing helideck that has been accepted but does not meet minimum OFS requirements of 210°, the black chevron shall represent the angle which has been accepted and this value shall be marked inboard of the chevron.

8.13.2 Actual D-value of the helideck, in metres, shall be marked adjacent to, and where practicable inboard of, the chevron in alphanumeric symbols of 10 cm height 10cm height in black or white. These D-value shall be located within 0.5 m from the chevron.

8.13.3 D-value shall also be marked around the perimeter of the helideck as in Figure 8-13, these D-value markings shall be in metres and expressed to the nearest whole number. The height of characters shall not be less than:

a) 90 cm for helideck with D-value more than 15.0 m; or

b) 60 cm for helideck with D-value less than 15. 0 m.

8.13.4 D-value marking shall be white. For unpainted aluminium surface helideck, the D-value markings shall be white displayed against a black background.

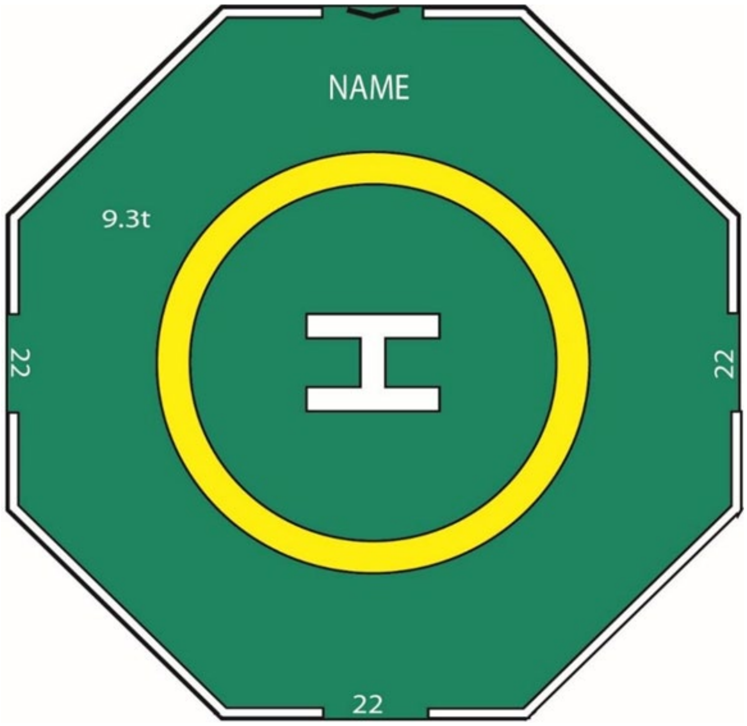

Figure 8-13: Chevron and D-value

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9 Aeronautical Lights

Note 1. – Helideck located near navigable waters, consideration needs to be given to ensuring that aeronautical ground lights do not cause confusion to mariners.

Note 2. – The specification for the TLOF lighting system assumes that the performance of the lighting will not be diminished due to the relative intensity, configuration or colour of other lighting sources present on a fixed or floating facility or on a vessel. Where other non-aeronautical lighting has potential to cause confusion, or to diminish or prevent the clear interpretation of aeronautical ground lights, it will be necessary for the facility or vessel operator to extinguish, screen, or otherwise modify, non-aeronautical light sources to ensure the effectiveness of helideck or shipboard helideck lighting systems are not compromised. To achieve this, operators shall consider shielding any high intensity light sources from approaching helicopters by fitting screens or louvers

9.1 Touchdown and Lift-Off Area (TLOF) Lighting System

9.1.1 Application

9.1.1.1 TDPM, H lightings and perimeter lights shall be installed on the helideck, intended to be used for night operation. In absence of these lightings, flight can only be conducted during the day in Visual Meteorological Condition (Day VMC).

Note — At helideck, surface texture cues within the TLOF are essential for helicopter positioning during the final approach and landing. Such cues can be provided using various forms of lighting (ASPSL, LP) in addition to perimeter lights. Best results have been demonstrated by the combination of perimeter lights and ASPSL in the form of encapsulated strips of light emitting diodes (LEDs) to identify the touchdown and helideck identification markings.

9.1.2 Location

9.1.2.1 To avoid lights creating a trip hazard at points of access and egress it may be necessary to provide sources that are flush-mounted (i.e. recessed) into the surface. The pattern of lights shall be formed using regular spacing. However, to avoid potential trip hazards, blocking foam dispensing nozzles, etc., it may be desirable to move lights to one side. In this case TLOF perimeter lights may be relocated by up to +/- 0.5 m such that the maximum gap between two adjacent TLOF perimeter lights is no more than 3.5 m and the minimum no less than 2.5m.

9.1.2.2 The TLOF perimeter lights shall be installed at a fixed helideck such that the pattern cannot be seen by the pilot from below the elevation of the TLOF.

9.1.2.3 The TLOF perimeter lights shall be installed at a floating helideck, such that the pattern cannot be seen by the pilot from below the elevation of the TLOF when the helideck is level.

9.1.2.4 When Luminescent Panels are used on a helideck to enhance surface texture cues, the panels shall not be placed adjacent to the perimeter lights. They shall be placed around a touchdown marking where it is provided.

9.1.3 Characteristics

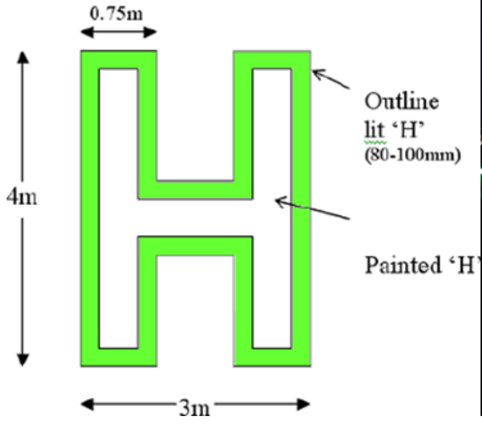
9.1.3.1 The height of the installed TLOF perimeter lights and floodlights shall not exceed 25 cm above the level of the TLOF for helideck which is 1D or greater and/or have a D-value greater than 16.00 m, and 5 cm for helideck which is sub-1D, but not less than 0.83D, and/or have a D-value of 16.0 m or less.

9.1.3.2 The design of the perimeter lights shall be such that the luminance of the perimeter lights is equal to or greater than that of the TD/PM Circle segments.

9.1.3.3 The perimeter lighting and touchdown/position marking lighting is considered serviceable provided that at least 90% of the lights are serviceable, and providing that any unserviceable lights are not adjacent to each other. A light shall be deemed to be unserviceable when the main beam average intensity is less than 50 per cent of the value.

9.1.3.4 The lit TDPC and the lit helideck identification marking (‘H’) scheme has been developed by the UK CAA to be compatible with helicopters having wheeled undercarriages. Although the design specification ensures segments and sub-sections are compliant with the maximum height for obstacles on the TLOF surface (2.5 cm), and are likely to be able to withstand the point loading presented by typically lighter skidded helicopters, due to the potential for raised fittings to induce dynamic rollover, it is important to establish compatibility with skid-fitted helicopter operations before lighting is installed on helideck and shipboard helideck used by skid-fitted helicopters.

9.1.3.5 If used, the lit Helideck Identification Marking (‘H’) shall be superimposed on the 4m x 3m white painted ‘H’ (limb width 0.75m). The lit ‘H’ shall be 3.9 to 4.1m high, 2.9 to 3.1m wide and have a stroke width of 0.7 to 0.8m. The lit ‘H’ may be offset in any direction by up to 10cm in order to facilitate installation (e.g. avoid a weld line on the helideck surface). The limbs shall be lit in outline form as shown in Figure 9-2. An outline lit ‘H’ shall comprise sub-sections of between 80mm and 100mm wide around the outer edge of the painted ‘H’. There are no restrictions on the length of the sub-sections, but the gaps between them shall not be greater than 10cm. The mechanical housing shall be coloured white



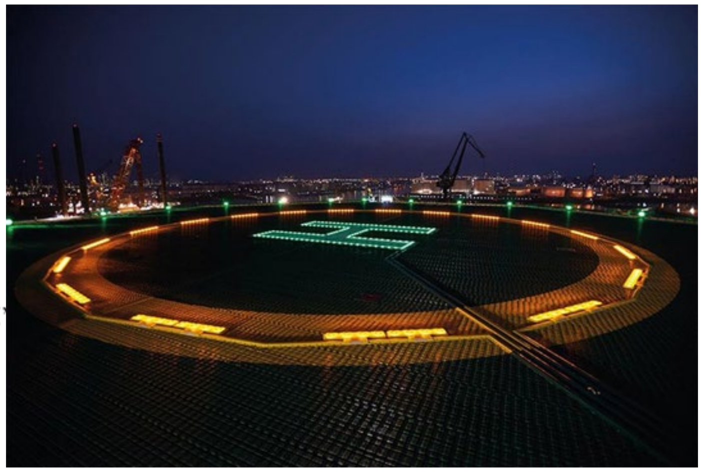


Figure 9-1: Configuration and example of a normal dimension helideck identification marking "H"

9.2 Helideck Status Light System

9.2.1 Application

9.2.1.1 If it is deemed that a hazard or potentially hazardous condition exists for the helicopter or its occupants, a visual warning system shall be installed. The system (Status Lights) shall be a flashing red light (or lights), visible to the pilot from any direction of approach and on any landing heading.

9.2.1.2 The aeronautical meaning of a flashing red light is either "do not land, aerodrome not available for landing" or "move clear of landing area". The necessity for the installation of a Status Light system shall be the results of a safety assessment, accepted by the accountable organisation.

9.2.1.3 The system shall be automatically initiated at the appropriate hazard level (e.g. gas release) as well as being capable of manual activation by the HLO. It shall be visible at a range in excess of the distance at which the helicopter may be endangered or may be commencing a visual approach.

9.2.1.4 The following specification shall be applied:

a) Where required, the helideck status signalling system shall be installed either on or adjacent to the helideck. Additional lights may be installed in other locations on the platform where this is necessary to meet the requirement that the signal be visible from all approach directions, i.e. 3600 in azimuth.

b) The effective intensity shall be a minimum of 700 cd between 20 and 100 above the horizontal and at least 176 cd at all other angles of elevation.

c) The system shall be provided with a facility to enable the output of the lights (if and when activated) to be dimmed to an intensity not exceeding 60 cd while the helicopter is landed on the helideck.

d) The signal shall be visible from all possible approach directions and while the helicopter is landed on the helideck, regardless of heading, with a vertical beam spread as shown in b) above.

e) The colour of the status light(s) shall be red.

f) The light system as seen by the pilot at any point during the approach shall flash at a rate of 120 flashes per minute. Where two or more lights are needed to meet this requirement, they shall be synchronised to ensure an equal time gap (to within 10%) between flashes. While landed on the helideck, a flash rate of 60 flashes per minute is acceptable. The maximum duty cycle shall be no greater than 50%.

g) The light system shall be integrated with platform safety systems such that it is activated automatically in the event of a process upset.

h) Facilities shall be provided for the HLO to manually switch on the system and/or override automatic activation of the system.

i) The light system shall have a response time to the full intensity specified not exceeding three seconds at all times.

j) Facilities shall be provided for resetting the system which, in the case of NUIs, do not require a helicopter to land on the helideck.

k) The system shall be designed so that no single failure will prevent the system operating effectively. In the event that more than one light unit is used to meet the flash rate requirement, a reduced flash frequency of at least 60 flashes per minute is considered acceptable in the failed condition for a limited period.

l) The system and its constituent components shall comply with all regulations relevant to the installation.

m) Where the system and its constituent components are mounted in the 210° OFS or in the first segment of the LOS, the height of the installed system shall not exceed 25 cm above deck level (or exceed 5 cm for any helideck where the D-value is 16.00 m or less).

n) Where supplementary 'repeater' lights are employed for the purposes of achieving the 'on deck' 360° coverage in azimuth, these shall have a minimum intensity of 16 cd and a maximum intensity of 60 cd for all angles of azimuth and elevation.

9.2.1.5 All components of the status light system shall be tested by an independent test house to ensure verification with the specification. The photometrical and colour measurements performed in the optical department of the test house shall be accredited.

9.2.1.6 Manufacturers are reminded that the minimum intensity specification stated above is considered acceptable to meet the current operational requirements, which specify a minimum meteorological visibility of 1400 m (0.75 NM). Development of offshore approach aids which permit lower minima (e.g. differential GPS) will require a higher intensity.

9.2.1.7 Where helideck status light systems installed on normally unattended installations (NUIs) malfunction, whether the outcome is light(s) permanently flashing or disabled/depowered, in these cases, in order to allow them to be manually reset at the platform, a duty-holder may present a case-specific risk assessment to the accountable organisation, who if satisfied with the risk assessment, may provide acceptance to permit flights against operating status lights or black platforms to occur.

9.3 Floodlighting of Obstacles

9.3.1 Characteristics

9.3.1.1 Omni-directional low intensity steady red obstruction lights having a minimum intensity of 10 candelas for angles of elevation between 0 degrees and 30 degrees shall be fitted at suitable locations to provide the helicopter pilot with visual information on the proximity and height of objects which are higher than the landing area and which are close to it, or to the LOS boundary. This shall apply, in particular, to all crane booms on an off-shore facility or vessel. Objects which are more than 15 metres higher than the landing area shall be fitted with intermediate low intensity steady red obstruction lights of the same intensity spaced at 10 metre intervals down to the level of the landing area (except where such lights would be obscured by other objects). It is often preferable for some structures such as flare booms and towers to be illuminated by floodlights as an alternative to fitting intermediate steady red lights, provided that the lights are arranged such that they will illuminate the whole of the structure and not dazzle a helicopter pilot. Facilities may, where appropriate, consider alternative equivalent technologies to highlight dominant obstacles in the vicinity of the helideck.

9.3.1.2 An omni-directional low intensity steady red obstruction light shall be fitted to the highest point of the installation. The light shall have a minimum intensity of 50 candelas for angles of elevation between 0 and 15 degrees, and a minimum intensity of 200 candelas between 5 and 8 degrees. Where it is not practicable to fit a light to the highest point of the installation (e.g. on top of flare towers) the light shall be fitted as near to the extremity as possible.

9.3.1.3 In the particular case of jack-up units, it is recommended that when the tops of the legs are the highest points on the facility, they shall be fitted with omni-directional low intensity steady red lights of the same intensity and characteristics as described in 9.3.1.1. In addition, the leg (or legs) adjacent to the helideck shall be fitted with intermediate low intensity steady red lights of the same intensity and characteristics as described in 9.3.1.2 at 10 metre intervals down to the level of the landing area. As an alternative the legs may be floodlit providing the helicopter pilot is not dazzled.

9.3.1.4 Any ancillary structure within one kilometre of the helideck, and which is significantly higher than it, shall be similarly fitted with red lights.

9.3.1.5 Red lights shall be arranged so that the locations of the objects which they delineate are visible from all directions of approach above the landing area.

9.3.1.6 Facility/vessel emergency power supply design shall include all forms of obstruction lighting. Any failures or outages shall be reported immediately to the helicopter operator. The lighting shall be fed from a UPS system.

9.3.1.7 For some helideck, especially those that are on Normally Unattended installations (NUI), it may be beneficial to improve depth perception by deploying floodlighting to illuminate the main structure (or legs) of the platform. This can help to address the visual illusion that a helideck appears to be ‘floating in space’.

9.4 Emergency Power Supply

9.4.1 Installation/vessel emergency power supply design shall include the entire landing area lighting system, including the wind direction indicator. Any failures or outages shall be reported immediately to the helicopter operator. The lighting shall be fed from an Uninterruptible Power Supply (UPS) system or second generator.

10 Normally Unattended Installations (NUI)

10.1 Bird control

10.1.1 A procedure shall be implemented and consist of:

a) On board the first arriving helicopter is a Helicopter Landing Officer (HLO).

b) The HLO is to comprehensively brief his team before take-off of the actions required upon landing at the NUI and of the emergency actions in the event of a helicopter crash/fire situation on landing.

c) The HLO is to analyse the state of the deck, and coordinate the deck arrival in terms of safety. The HRO is to analyse the weather.

d) On landing the HLO is to secure the chocks, check the deck, call the on-shore base to confirm safe arrival if applicable and manage the disembarkation – fire-fighter first.

e) There shall be at least one additional fully trained fire person on board.

f) On landing, the crew shall undertake a visual inspection, test the safety equipment and check the deck surface for any obstructions and maintenance issues. These inspections and tests shall be recorded.

g) For embarkation the luggage/equipment; always goes on first. The HLO is to allow one passenger to board the helicopter at a time, holding back the next person in line.

h) Once the passenger is seated and strapped the passenger shall provide the “thumbs-up” sign and the HLO then allows the next passenger to board.

i) Once all the passengers and luggage/equipment are on board the HLO shall indicate to the pilot all is loaded and ready.

j) The HLO shall conduct a final visual inspection of the flight direction and surrounding area give the “thumbs up” to the pilot and aboard the helicopter.

10.2 Rescue and Fire-Fighting Facilities

10.2.1 In the case of new–build NUI’s, serious consideration shall be given to the selection and provision of foam fire extinguishing systems integrated into helideck.

10.2.2 For installations which are at times unattended the effective delivery of foam to the whole of the landing area is probably best achieved by means of a DIFF System.

10.2.3 For NUIs, may also consider other ‘combination solutions’ where these can be demonstrated to be effective in dealing with a running fuel fire. This may permit, for example, the selection of a seawater-only DIFFS used in tandem with a passive fire-retarding system demonstrated to be capable of removing significant quantities of unburned fuel from the surface of the helideck in the event of a fuel spill from a ruptured aircraft tank.

10.2.4 DIFFS on NUI's shall be integrated with platform safety systems so that pop-up/non-pop-up nozzles are activated automatically in the event of an impact of a helicopter on the helideck where a Post-Crash Fire is a probable outcome.

10.2.5 The overall design of a DIFFS shall incorporate a method of fire detection and be configured to avoid false activation/alarms. It shall be capable of manual over-ride by the HLO and from the main installation or control room.

10.2.6 Similar to a DIFFS provided for a Normally Attended Installation or mobile, a DIFFS provided on a NUI needs to consider the eventuality that one or more nozzles may be rendered ineffective by, for example, a crash. The basic performance assumptions stated in the rule shall also apply for a DIFFS located on a NUI.

10.3 Rescue and Fire-Fighting Facilities (Without DIFFS)

10.3.1 Where no automatic fire detection/protection system is provided then the operator shall conduct a Safety Assessment and detail the equipment and method of fire-fighting for the arrival of the first helicopter and the departing of the last helicopter.

10.3.2 Where DIFFS are not part of the installation then the following equipment shall be supplied:

a) 90 litres Foam.

b) Dry powder:

1) 23 kg of dry powder – delivered from one or two extinguishers for helideck up to and including 16.0 m; or
2) 45 kg of dry powder – delivered from one or two extinguishers for helideck above 16.0 m and up to 24.0 m; or
3) 90 kg of dry powder – delivered from two, three or four extinguishers for helideck above 24.0 m.

c) Gaseous agent (with extendable applicator for high engine access)

1) 9 kg of CO_2 – delivered from one or two extinguishers for helideck up to and including 16.0 m; or
2) 18 kg of CO_2 - delivered from one or two extinguishers for helideck above 16.0 m and up to 24.0 m; or
3) 36 kg of CO_2 delivered from one or two extinguishers for helideck above 24.0 m.

d) Rescue equipment

e) 2 x full sets of fire-fighting PPE

f) 2 breathing apparatus sets with spare cylinders

10.3.3 Helideck operators shall consider the use of a cameras in order that an assessment of the conditions of the helideck can be monitored before a flight takes place.

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11 Personnel Requirements

11.1 General

11.1.1 The organisation's Safety Management System (SMS) is one of the keys to assuring safe and efficient off-shore helideck operations. Supervision of helicopter operations shall be fully integrated into the SMS.

11.1.2 The responsibilities and authority assigned to individuals for controlling all activities related to helideck operations (in all weather conditions) shall be set down in a clearly defined structure and hierarchy. They shall be widely promulgated, on-shore and off-shore, to ensure full and proper understanding by all. The interfaces with other disciplines and those activities that may impact safe and efficient helideck operations shall be identified and built into operating procedures.

11.1.3 Irrespective of the volume of helicopter traffic, the level of preparedness and effectiveness of both personnel and equipment involved in helicopter operations requires to be of a single satisfactory standard.

11.1.4 On facilities with infrequent helicopter operations, this may involve a significant commitment to ensure there are enough adequately trained personnel available for helideck duties. Such operations will require routine monitoring and testing to ensure proper standards are maintained.

11.2 Dangerous Goods

11.2.1 Personnel involved with dangerous goods shall hold a certificate of training, appropriate to the role and responsibility of the individual.

11.3 Helideck Preparation

11.3.1 Prior to helicopter landings taking place on an installation or vessel, all support facilities shall be properly prepared for use. Preparation shall be carried out in a systematic manner; following set procedures/checklists this is to ensure all equipment is serviceable, in the correct position and ready for immediate use. Completion of helideck and support equipment preparation shall be formally documented by the Helicopter Landing Officer (HLO) and all records retained for auditing purposes.

11.4 Installation Manager / Vessel Master

11.4.1 With respect to helicopter operations, the Installation Manager or Master of a vessel is responsible for:

a) appointing a competent person to be responsible for the control of helicopter operations in relation to the installations, to be known as the Helicopter Landing Officer (HLO)

b) ensuring that all persons engaged on helicopter operations, or who are in or near any helicopter landing area, are under the immediate and effective control of the HLO

c) ensuring that all helideck personnel are appropriately trained for normal and emergency helicopter operations

d) ensuring that the helideck and associated operational and emergency equipment is provided and maintained in good working condition

e) ensuring that all helideck personnel are provided with appropriate personal protective equipment (PPE)

f) ensuring that the appointed Helicopter Landing Officer carries out his duties as described by the Safety Management System.

11.4.2 All personnel including contractors shall wear hi-visibility clothing, safety shoes and hearing protection muffs.

11.5 Helideck Personnel Composition

11.5.1 Helideck operators shall appoint a competent person to establish and effectively manage all aspects of fire-fighting and rescue, staffing, equipment and response.

11.5.2 Sufficient competent personnel shall be readily available to respond and operate the helideck equipment and emergency facilitates at maximum capacity. These personnel shall be deployed in a way that ensures that response objectives shall be achieved and that continuous agent application at the appropriate rate(s) shall be fully maintained.

11.5.3 An organisation shall appoint a trained and certified Helideck Landing Officer (HLO) and ‘sufficient’ emergency personnel when undertaking helicopter operations on an off-shore Installation or vessels.

11.5.4 The precise composition of helideck crews required for off-shore helideck operations is a matter for the installation/vessel owner/operator to decide. The primary objective is to ensure the safety of the helicopter passengers and crew.

11.5.5 To establish the optimum number of helideck personnel for a particular off-shore operation, the installation owner/operator shall carry out a thorough assessment (Task and Resource Analysis).

11.5.6 When conducting this assessment, the following shall be considered:

a) The types and size of helicopters using the helideck;

b) Type, design, capacity and discharge rate of a fire-fighting equipment;

c) Need for the rescue of helicopter occupants;

d) Need to operate ladders, breathing apparatus, fire extinguishers, hand-lines, and rescue equipment;

e) Availability of additional emergency support personnel; and

f) Training and Competency levels of helideck personnel.

11.5.7 The helideck owner / operator shall formulate a selection and recruitment process that identifies the ideal candidate to undertaken such duties.

11.5.8 As a minimum the helideck team comprising of an HLO to supervise the helideck operations plus a minimum of three Helideck Assistances (HDA) (in effect a fire-fighting monitor/hand-line operator plus one person to affect any rescue/evacuation operation).

11.5.9 Members of the flight crew shall not be considered as part of the helideck crew.

11.5.10 In addition to 11.5.8, the helideck team shall comprise of a Helideck Radio Operator, with an acceptable level of English to confirm the helideck is available and ready to accept the helicopter and to monitor and respond to any emergency calls.

Table 4: Example of Minimum Staffing Levels

ROLE	NORMALLY ATTENDED INSTALLATION	RIGS AND BARGES
HLO	**1**	**1**
HDA (Fire-fighting team)	**3**	**3**
HRO (Helideck Radio Operator)	**1**	**1**
Refueller (if required)	**3***	**1**

** For safe refuelling operations, a minimum of 3 personnel is required. One to be at the aircraft (handling the nozzle), one at the dispenser and another at the pump area.*

11.5.11 If they are to effectively utilise the equipment provided, all personnel assigned to fire-fighting duties on the helideck shall undergo HERT training to carry out their duties to ensure competence in role and task.

11.5.12 In addition, regular training in the use of all fire and support equipment, helicopter familiarisation and rescue tactics and techniques shall be carried out. All such training shall be formally recorded and retained for at least 5-years.

11.6 Responsibilities of the Helicopter Landing Officer (HLO)

11.6.1 The Helicopter Landing Officer (HLO) is responsible for the day-to-day management of the helideck, associated helideck operations and supervision of the Helideck Assistants and support staff.

11.6.2 The HLO shall exercise immediate and effective control of all persons who are engaged in helicopter operations, or who are on or near the helicopter landing area.

11.6.3 The HLO shall immediately report any form of deviation on the helicopter deck to his immediate superior/installation manager, so that the helicopter operator may be informed of the situation.

11.6.4 The HLO shall be positioned to be able to observe as best as possible, and closely monitor, landing and take-off. The HLO shall immediately inform the pilot via radio or visually if any abnormal situation occurs.

11.6.5 The HLO's responsibilities shall include, but are not necessarily limited to:

a) Overall charge (e.g. supervision) of the helideck and helideck crew.

b) Ensuring pre-operational and post-operational helideck checks are carried out.

c) Ensuring that on receipt of radio information regarding helicopter arrivals, helideck facilities are ready to receive the aircraft.

d) Ensuring the safe movement of passengers, baggage, freight and correct loading of the aircraft.

e) Ensuring correct manifest procedures are used.

f) Initiating fire-fighting and rescue procedures on the helideck, and ensuring that members of the helideck crew carry out their duties as described in the SMS.

g) Ensuring that Dangerous goods item(s) are handled by trained and certified personnel

Note. – The HLO may also be responsible for leading the initial response to a helicopter emergency on an off-shore fixed, mobile, floating installation or vessel and leading the HDA helideck emergency response team during any emergency.

h) Liaison with the installation/vessel fire teams and ensuring that backup fire-fighting and rescue procedures are implemented to assist after the initial stage of an emergency.

i) Briefing the helideck crew on helideck handling and other relevant tasks.

j) Ensuring the installation/vessel management, are kept aware of aircraft movements and that cranes in particular have ceased movement whilst aircraft operations are in progress.

k) Ensuring that the 210° OFS is clear of obstructions before giving a helicopter clearance to land.

l) Ensuring that the floodlighting controls (and Status Lights if installed) are accessible to and controlled by the HLO (or Radio Operator).

m) Ensuring that the refuelling procedures are implemented.

n) Carrying out on-the-job training for trainee Helideck Assistants in accordance with their SMS.

o) The HLO shall also ensure that:

   1) Necessary steps are taken to deny unauthorised persons access to the helicopter deck prior to take-off and landing.
   2) The deck is cleared of loose objects, inflammable substances etc.
   3) Necessary personnel are present and at a state of readiness.
   4) All equipment and instruments are in place and in full working order.
   5) Passengers are held in the safe zone during landing/take off and that they are given guidance during disembarkation and embarkation.

11.7 HLO Identification on PPE Clothing

11.7.1 The HLO shall wear identification on his outer PPE clothing to clearly show he is the responsible person during helideck operations. Either purpose made reflective markings wearing of a tabard will achieve this.

11.7.2 The tabard shall be marked on the front and back with the letters HLO in a reflective material, and shall be clearly visible from a distance. Because of the potential for static electricity hazards during helideck operations, clothing made from nylon shall not be worn by helideck crew members.

11.8 Responsibilities of The Helideck Assistant (HDA)

11.8.1 As the HLO is required to be present on the helideck during helicopter arrivals and departures, the helideck operator shall appoint a 'Helideck Assistant' (HDA) to assist the HLO with administration of passengers and freight.

11.8.2 The responsibilities of the HDA shall include but not be limited to:

a) Assisting the HLO in the operation of the helideck.

b) Directing passengers to and from the aircraft.

c) Loading and unloading freight and baggage from the aircraft.

d) Operation of fire-fighting and rescue equipment under the direction of the HLO and assisting the HLO in checking fire-fighting and rescue equipment.

e) Undertaking other duties around the helideck area as required by the HLO.

f) Passenger and freight control before departure and on arrival.

g) Production of complete and accurate passenger and cargo manifests.

h) Support in the preparation of Dangerous Goods manifests.

i) Liaison with the HLO, Radio Operator on helicopter movements and requirements

11.9 Responsibilities of the Helideck Radio Operator (HRO)

11.9.1 Continuous two-way radio communications shall be available between the helicopter pilot and the helideck operator or an appropriate agent. While not always possible, it is highly desirable to have a three-way communications link between the helicopter pilot, the off-shore facility, and a land-based facility.

11.9.2 Radio Operators shall be aware of helicopter operations within the vicinity of the helideck and shall be prepared to pass on relevant information to the pilots.

11.9.3 Although these will vary amongst operations, the following shall be a guide to Radio Operator procedures:

a) The provision of information and advice for the purpose of assisting the safe and efficient operation of aircraft. This shall include:

1) information when available on other known traffic,
2) weather information,
3) information regarding radio and navigational aids,
4) landing area conditions and associated facilities,
5) alerting service, and
6) any other information likely to affect safety.

b) Coordination is required with other agencies as required, including:

1) other ATS and AFIS units,
2) meteorological services providers,
3) operators of aircraft and landing platforms,
4) rescue and fire-fighting emergency services,
5) search and rescue authorities, and

6) Malaysian armed forces.

c) Local processes may include passing Weather Status Reports to the helicopter operator, estimated times of arrival, and revisions, to the HLO, confirmation that the deck is ready for arriving helicopters, sending arrival messages, and obtaining flight plan and load details, etcetera.

d) All procedures require to be documented.

11.9.3.1 Each HRO shall have an Emergency Procedures Checklist which clearly displays Alerting Service actions involving overdue or missing aircraft.

11.9.3.2 On most facilities, fixed and floating, the HRO is the initial and final point of contact between flight crew and the facility. However, as final approach to the landing area is established, personnel (e.g. HLOs and HDAs) with portable aeronautical headsets, may be available for guidance to the pilot as to the status of the landing area. When such personnel are utilised, the use of this equipment requires that they shall be suitably trained.

11.9.3.3 A major advantage of having a radio-equipped person on the helideck is that they can maintain visual as well as radio communication during the circuit, final approach and landing, so assisting the helicopter crew with further positive identification of the facility and thereby reducing the incidence for a landing on an incorrect deck. A radio-equipped person is also in a good position to warn of any developing issues while the helicopter is ‘on deck’.

11.9.3.4 In order to avoid misunderstandings, hand-over and general R/T procedures employed shall consist of standard R/T phrases and vocabulary only. Transmissions shall be restricted to aviation-related matters only, and radio discipline strictly maintained. Communications shall be kept brief, avoiding any unnecessary ‘chatter’ on the selected aeronautical frequency and shall be confined to essential dialogue.

11.9.3.5 Off-shore fixed and floating facilities which have aeronautical radio equipment and/or aeronautical Non-Directional Beacons (NDBs) on them, shall ensure the systems are maintained by competent people. All Aeronautical Frequencies employed shall be allocated and authorised by the Malaysian Communications and Multimedia Commission (MCMC).

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12 Rescue and Fire-Fighting Facilities (NAI or Vessel)

12.1 General

12.1.1 The principal objective of a rescue and fire-fighting response is to save lives. For this reason, the provision of a means of dealing with a helicopter accident or incident occurring at or in the immediate vicinity of the landing area assumes primary importance because it is within this area that there are the greatest opportunities for saving lives. This shall assume at all times the possibility of, and need for, bring under control and then extinguishing a fire which may occur either immediately following a helicopter accident or incident (e.g. crash and burn) or at any time during rescue operations.

12.1.2 The most important factors having a bearing on effective rescue in a survivable helicopter accident are the speed of initiating a response and the effectiveness of that response. Requirements to protect accommodation beneath or in the vicinity of the landing area, a fuel installation (where provided) or the support structure of the off-shore helideck is not considered in this chapter, nor is any additional considerations that may arise from the presence of a second helicopter located in a parking area.

12.1.3 Due to the nature of off-shore operations, usually taking place over large areas of open sea, an assessment will need to be carried out to determine if specialist rescue services and fire-fighting equipment is needed to mitigate the additional risks and specific hazards of operating over open sea areas. These considerations will form a part of the helideck emergency plan.

12.1.4 The operational objective of fire-fighting team / crew shall be to achieve a response to any helicopter incident on the helideck within 1-minute.

12.1.5 Personnel designated to respond to a helicopter incident on the helideck shall be dressed in full fire-fighting PPE and be readily available to respond during the take-off and landing of the helicopter.

12.2 Principle Fire-Fighting Agent (FOAM)

12.2.1 A key aspect in the successful design for providing an efficient, integrated helideck rescue and fire-fighting facility is a complete understanding of the circumstances in which it may be expected to operate. A helicopter accident, which results in a fuel spillage with wreckage and/or fire and smoke, has the capability to render some of the fixed fire-fighting equipment unusable or prevent the use of some passenger escape routes.

12.2.2 Delivery of fire-fighting media to the landing area at the appropriate application rate shall be achieved in the quickest possible time.

12.2.3 A delay of less than 15 seconds, measured from the time the system is activated to actual production at the required application rate, shall be the objective. The operational objective shall ensure that the system is able to bring under control a helideck fire associated with a crashed helicopter within 30 seconds measured from the time the system is producing foam at the required application rate in all weather conditions.

Note. – A fire is deemed to be 'under control' at the point when it becomes possible for the occupants of the helicopter to be effectively rescued by trained fire-fighters.

12.2.4 Foam-making equipment shall be of acceptable performance and be suitably located to ensure an effective application of foam to any part of the landing area irrespective of the wind strength/direction or accident location when all components of the system are operating in accordance with the manufacturer's technical specifications.

12.2.5 However, for a Fixed Monitor System (FMS), consideration shall also be given to the loss of a downwind foam monitor either due to limiting weather conditions or a crash situation occurring. The design specification for an FMS shall ensure remaining monitors are capable of delivering finished foam to the landing area equal to or above the minimum application rate. For areas of the helideck which, for any reason, may be otherwise inaccessible to an FMS, it is necessary to provide additional hand-controlled foam lines and branches.

12.2.6 Consideration shall be given to the effects of the weather on static equipment. All equipment forming part of the facility shall be designed to withstand protracted exposure from the weather conditions expected. Where protection is the chosen option, it shall not prevent the equipment being brought into use quickly and effectively.

12.2.7 The minimum capacity of the foam production system will depend on the D-value of the helideck, the foam application rate, discharge rates of installed equipment and the expected duration of application. It is important to ensure that the capacity of the main helideck fire pump is sufficient to guarantee that finished foam can be applied at the appropriate induction ratio and application rate and for the minimum duration to the whole of the landing area when all helideck monitors are being discharged simultaneously.

12.2.8 The foam concentrates compatible with seawater and meeting at least performance level 'B' is used. Level B foams shall be applied at a minimum application rate of 5.5 litres per square metre per minute. Certificate of conformity shall be provided for each batch of foam.

Calculation of Application Rate:

Example for a D-value 22.2 metre helideck.

Application rate = 5.5 x Πr^2

(5.5 x 3.142 x 11.1 x 11.1) = 2130 litres per minute.

12.2.9 Given the remote location of helideck the overall capacity of the foam system shall exceed that necessary for initial extinction of any fire. A "five (5) minute" discharge capability is strongly advised.

12.2.10 Calculation of Minimum Operational Stocks:

Using the 22.2 metre example as shown: -

a) A 1% foam solution discharged over five minutes at the minimum application rate will require 2130 x 1% x 5 = 107 litres of foam concentrate.

b) A 3% foam solution discharged over five minutes at the minimum application rate will require 2130 x 3% x 5 = 320 litres of foam concentrate.

c) A 6% foam solution discharged over five minutes at the minimum application rate will require 2130 x 6% x 5 = 639 litres of foam concentrate.

12.2.11 100% reserve foam stocks to allow for replenishment as a result of operation of the system during an incident or following training or testing, shall be provided.

12.2.12 Wherever non-aspirated foam equipment is selected during design, additional equipment capable of producing aspirated foam for post-fire security/control shall be provided.

12.2.13 Not all fires are capable of being accessed by monitors and on some occasions the use of monitors may endanger passengers. Therefore, in addition to a fixed foam system monitor, there shall be the ability to deploy at least two deliveries with hand-controlled foam branches for the application of aspirated foam at a minimum rate of 225-250 litres/min through each hose line.

12.2.14 A single hose line, capable of delivering aspirated foam at a minimum application rate of 225-250 litres/min, may be acceptable where it is demonstrated that the hose line is of sufficient length, and the hydrant system of sufficient operating pressure, to ensure the effective application of foam to any part of the landing area irrespective of wind strength or direction. The hose line(s) provided shall be capable of being fitted with a branch pipe capable of applying water in the form of a jet or spray pattern for cooling, or for specific fire-fighting tactics.

12.2.15 As an effective alternative to a Foam Monitor System (FMS), off-shore operators are strongly encouraged to consider the provision of a DIFFS. These systems typically consist of a series of 'pop-up' nozzles, with both a horizontal and vertical component, designed to provide an effective spray distribution of foam to the whole of the landing area and protection for the helicopter for the range of weather conditions. A DIFFS shall be capable of supplying performance level B or level C foam solution to bring under control a fire associated with a crashed helicopter within the time stated above.

12.2.16 Achieving an average (theoretical) application rate over the entire landing area (based on the D-circle) of 5.5 litres per square metre per minute for level B foams or 3.75 litres per square metre per minute for level C foams, for a duration which at least meets the minimum requirements stated above.

12.2.17 The precise number and layout of pop-up/non pop-up nozzles will be dependent on the specific helideck design, particularly the dimensions of the critical area. However, nozzles shall not be located adjacent to helideck egress points as this may hamper quick access to the helideck by trained rescue crews and/or impede occupants of the helicopter escaping to a safe place beyond the helideck.

12.2.18 Notwithstanding this, the number and layout of nozzles shall be sufficient to provide an effective spray distribution of foam over the entire landing area with a suitable overlap of the horizontal element of the spray pattern from each nozzle assuming calm wind conditions. It is recognised in meeting the objective for the average (theoretical) application rate specified above for performance level B or C foams that there may be some areas of the helideck, particularly where the spray patterns of nozzles significantly overlap, where the average (theoretical) application rate is exceeded in practice.

12.2.19 Conversely for other areas of the helideck the application rate in practice may fall below the average (theoretical) application rate specified. This is acceptable provided that the actual application rate achieved for any portion of the landing area does not fall below two-thirds of the rates specified for the critical area calculation.

Note. – Where a DIFFS is used in tandem with a passive fire-retarding system demonstrated to be capable of removing significant quantities of unburned fuel from the surface of the helideck in the event of a fuel spill from a ruptured aircraft tank, it is permitted to select a seawater-only DIFFS to deal with any residual fuel burn. A seawater-only DIFFS shall meet the same application rate and duration as specified for a performance level B foam DIFFS.

12.2.20 In a similar way to where a Foam Monitor System (FMS) is provided, the performance specification for a DIFFS needs to consider the likelihood that one or more of the pop-up/non pop-up nozzles may be rendered ineffective by the impact of a helicopter on the helideck. Any local damage to the helideck, nozzles and distribution system caused by a helicopter crash shall not unduly hinder the system's ability to deal effectively with a fire situation. To this end a DIFFS supplier shall be able to verify that the system remains fit for purpose, in being able to bring a helideck fire associated with a crashed helicopter "under control" within 30 seconds measured from the time the system is producing foam at the required application rate for the range of weather conditions.

12.2.21 If life-saving opportunities are to be maximised it is essential that all equipment shall be ready for immediate use on, or in the immediate vicinity of, the helideck whenever helicopter operations are being conducted.

12.2.22 All equipment shall be located at points having immediate access to the landing area. The location of the storage facilities shall be clearly indicated.

12.2.23 Where a Deck Integrated Fire Fighting System (DIFFS) capable of delivering foam and/or seawater in a spray pattern to the whole of the landing area. The provision of additional hand-controlled foam branches may not be necessary to address any residual fire situation. Instead any residual fire may be tackled with the use of hand-held extinguishers.

12.2.24 At facilities where DIFFS are fitted, the provision of hand-held fire-fighting equipment shall be assessed for the rapid intervention for helicopter engine fires, rotor head fires and cabin fires.

12.3 Use and Maintenance of Foam Equipment

12.3.1 Mixing of different concentrates in the same tank, i.e. different either in make or strength, is unacceptable. Many different strengths of concentrate are available. Any decision regarding selection shall take account of the design characteristics of the foam system. It is important to ensure that foam containers and tanks are correctly labelled.

12.3.2 Induction equipment ensures that water and foam concentrate are mixed in the correct proportions. Settings of adjustable inductors, if installed, shall correspond with strength of concentrate in use.

12.3.3 All parts of the foam production system, including the finished foam, shall be tested by a competent person on commissioning and annually thereafter. The tests shall assess the performance of the system against original design expectations while ensuring compliance with any relevant pollution regulations.

12.3.3.1 Testing and Inspection

12.3.3.1.1 Foam systems need to be tested in two ways, firstly by ensuring the system is in working order and secondly by analysing samples of foam concentrate and finished foam. The discharge of significant quantities of finished foam to the sea has potential to pollute the environment. Therefore, the methodology for testing foam and equipment performance shall be carried out with a view to minimising the potential for pollution.

Note – Finished foam samples are not required to be tested on helidecks fitted with DIFFS and a passive fire retarding surface.

12.3.3.2 System Installation Testing

12.3.3.2.1 Systems shall be tested and quality assured to ensure that foam (particularly if 1% foam is used) meets its performance parameters of the design. This would normally be done onshore, with the finished foam contained and suitably treated. A performance report shall be received from the testing authority.

12.3.3.3 Periodic Testing

12.3.3.3.1 Routine periodic testing of performance in the off-shore environment shall be achieved by operating the equipment initially using water only and subsequently confirming by production of a limited amount of finished foam captured for testing. Testing of this finished foam and a sample of the foam concentrate shall be conducted by a trained and competent person. Records of all testing and certificates of foam conformity shall be retained for all tests.

12.3.3.4 Testing Procedures for Foam Systems

12.3.3.4.1 There are two tests for the systems, a performance test when commissioned and an in-service (annual) test.

12.3.3.5 Foam Production Performance Test

12.3.3.5.1 In order to ensure that foam production is of an acceptable standard a Foam Equipment Performance Test shall be conducted to confirm the system meets or exceeds design (Acceptance Test):

12.3.3.5.2 When the equipment is installed on a deck.

12.3.3.5.3 When significant maintenance, refurbishment or component replacement has been undertaken that could affect a change in the foam quality or production performance of the foam-making System. This includes a change of foam-making branches, nozzles or monitors. Only those parts of the system that could have been affected by the work undertaken or the component change need to be tested.

12.3.3.5.4 The Foam Equipment Performance Test shall confirm the following:

a) The induction percentage for all foam-making devices.

b) The jet range of the monitor/s.

c) The spray pattern of the main monitor/s.

12.3.3.6 In-Service Test NFPA Foam Test Procedures

12.3.3.6.1 In-Service (annual) test shall be conducted to ensure the quality of the foam concentrate and the performance of the equipment. Samples of foam concentrate shall be representative of the parent stock. Foam drum shall be rolled or agitated to produce a consistent mix before drawing a sample from the top of the drum.

12.3.3.6.2 For bulk foam storage tanks circulate the contents to produce a consistent mix before taking a sample. Alternatively draw samples from the top, middle and base. Use a hollow tube to take a sample from the middle. For the base sample use a side-exiting outlet pipe or alternatively run-off about 25 litres of foam first to remove any accumulated sediment. This run-off may be returned to the top of the tank. Several samples may be mixed equally to produce a single composite sample of 500ml.

12.3.3.6.3 A small amount of finished foam shall also be collected by placing a sample collector in the discharge area. Sufficient finished foam shall be collected to provide a 500ml sample of foam. This sample shall be used to check the percentage concentration in the finished foam.

12.3.3.6.4 Samples shall be clearly labelled as concentrate or finished foam, origin, foam type, and recommended induction rate.

12.3.3.6.5 The tests shall confirm that the system produces foam, within permitted tolerances, to the original technical specifications.

12.3.3.6.6 The foam production equipment shall be activated using water only to confirm the jet range and spray pattern of the system.

12.4 Complementary Media

12.4.1 While foam is considered the principal fire-fighting agent for dealing with fires involving fuel spillages, the wide variety of fire incidents likely to be encountered during helicopter operations – e.g. engine, avionic bays, transmission areas, hydraulics – may require the provision of more than one type of complementary agent.

12.4.2 Dry powder and gaseous agents are generally considered acceptable for this task. Systems shall be capable of delivering the agents through equipment which will ensure effective application.

12.4.3 The dry powder shall be provided as the primary complementary agent. For helideck up to and including 16.0m the minimum total capacity shall be 23kg delivered from one or two extinguishers. For helideck above 16.0m and up to 24.0m, the minimum total capacity shall be 45kg delivered from one or two extinguishers. For helideck above 24.0m the minimum total capacity shall be 90kg delivered from two, three or four extinguishers. The dry powder system shall have the capacity to deliver the agent anywhere on the landing area and the discharge rate of the agent shall be selected for optimum effectiveness of the agent. Containers of sufficient capacity to allow continuous and sufficient application of the agent shall be provided.

12.4.4 The use of a gaseous agent, preferably carbon dioxide or equivalent in addition to the use of dry powder as the primary complementary agent. Therefore, in addition to dry powder specified, a quantity of gaseous agent shall be provided with a suitable applicator for use on engine fires. The appropriate minimum quantity delivered from one or two extinguishers is 9 kg for helideck up to and including 16.0m, 18 kg for helideck above 16.0m and up to 24.0m, and 36 kg for helideck above 24.0m. The discharge rate shall be selected for optimum effectiveness of the agent.

12.4.5 All applicators are to be fitted with a mechanism which allows them to be hand controlled. Consideration needs to be given to the height of helicopter fire access panels and engine intakes when selecting fire-extinguisher applicators.

12.4.6 Dry chemical powder shall be of the ‘foam compatible’ type.

12.4.7 The complementary agent extinguishers shall be sited so that they are readily available at all times.

12.4.8 100% reserve stocks of complementary media to allow for replenishment as a result of activation of the system during an incident, or following training or testing, shall be held.

12.4.9 Complementary agents shall be subject to annual visual inspection by a competent person and pressure testing in accordance with manufacturers’ recommendations.

12.4.10 All fire extinguishers shall be tested and inspected.

12.5 The Management of Extinguishing Media Stocks

12.5.1 Consignments of extinguishing media shall be used in delivery order to prevent deterioration in quality by prolonged storage.

12.5.2 For delivery of foam or complementary media a certificate of conformity shall be provided and retained for auditing purposes.

12.5.3 The mixing of different types of foam concentrate may cause serious sludging and possible malfunctioning of foam production systems. Unless evidence to the contrary is available it shall be assumed that different types are incompatible. In these circumstances it is essential that the tank(s), pipework and pump (if fitted) are thoroughly cleaned and flushed prior to the new concentrate being introduced.

12.5.4 Consideration shall be given to the provision of reserve stocks for use in training, testing and recovery from emergency use.

12.6 Rescue Equipment

12.6.1 In some circumstances, lives may be lost if simple ancillary rescue equipment is not readily available.

12.6.2 As a minimum, the provision of the equipment listed in Table 5 shall be provided at each facility.

Table 5: Rescue equipment - Crash box with breakable tie on the lid

EQUIPMENT	QUANTITY
Adjustable wrench	1
Rescue axe, large (non-wedge or aircraft type)	1
Cutters, bolt	1
Crowbar, large	1
Hook, grab or salving	1
Hacksaw (heavy duty) and six spare blades	1
Blanket, fire resistant	1
Ladder (two-piece)*	1
Life lines (50 mm circumference x 15 m in length) plus rescue harness	1
Pliers, side cutting (tin snips)	1
Set of assorted screwdrivers	1
Harness knife and sheath or harness cutters**	**
Man-Made Mineral Fibre (MMMF) filter masks**	**
Gloves, fire resistant**	**

** For access to causalities in an aircraft on its side.*

*** The equipment is required for each helideck crew member*

12.6.3 Sizes of equipment are not detailed in the Table 5 above, but shall be appropriate for the types of helicopter expected to use the facility.

12.6.4 Rescue equipment shall be stored in clearly marked and secure watertight cabinets or chests. An inventory checklist of equipment shall be held inside each equipment cabinet/chest.

12.6.5 A responsible person shall be appointed to ensure that the rescue equipment is checked and maintained regularly.

12.6.6 Rescue equipment shall be inspected, maintained regularly and records kept throughout the life of the equipment.

12.6.7 Rescue personnel shall be given every opportunity to familiarise/train themselves with this equipment. Records of this type of training shall be retained for each individual.

12.7 Personal Protective Equipment (PPE)

12.7.1 All responding rescue and fire-fighting personnel shall be provided with appropriate PPE to allow them to carry out their duties in an effective manner.

12.7.2 Sufficient personnel to operate the RFF equipment effectively shall be dressed in protective clothing prior to helicopter movements taking place.

12.7.3 For the selection requires element of PPE to be suitable and safe for intended use, maintained in a safe condition and inspected to ensure it remains fit for purpose. In addition, equipment shall only be used by personnel who have received adequate information, instruction and training. PPE shall be accompanied by suitable safety measures (e.g. Protective devices, markings and warnings). Appropriate PPE shall be determined through a process of risk assessment.

12.7.4 Facilities shall be provided for the cleaning, drying and storage of PPE when crews are off duty. These facilities shall be well ventilated, and secure. The drying of PPE shall not be by direct sunlight exposure.

12.7.5 A responsible person(s) shall be made accountable to ensure that all PPE is installed, stored, used, checked and maintained in accordance with the manufacturer's instructions.

12.7.6 The specifications for PPE shall meet one of the standards in Table 6:

Table 6: Specification for PPE

	EN	BS
Helmet with Visor	EN 443	BS EN 443
Gloves	EN 659	BS EN 659
Boots (Footwear)	EN ISO 20345	EN ISO 20345
Tunic & Trousers	EN 469	BS EN ISO 14116
Flash-Hood	EN 13911	BS EN 13911

12.8 Respiratory Protective Equipment Breathing Apparatus (BA)

12.8.1 Helideck Emergency Team members attending a helicopter crash/fire may require Respiratory Protective Equipment (RPE). Fire-fighters required to enter a smoke-filled cabin shall be provided with RPE of an approved design for the anticipated hazardous environment. In selecting RPE careful consideration shall be given into the design, function, duration, servicing, and repairs and testing of the equipment.

12.8.2 Further consideration shall be given to the manufacturer's instructions for use and the need to achieve an adequate facemask seal. Those persons required to enter and work in a toxic atmosphere will need to have a facemask fit assessment carried out to ensure positive pressure within the facemask can be achieved.

12.8.3 A process of command and control of those persons nominated to wear breathing apparatus during training or operational incident shall be formulated and implemented on each occasion.

12.8.4 Fire-fighters required to wear BA must maintain the area of the seal free from hair (facial or head). Failure to do so will impair the efficiency of the seal and an avoidable safety hazard to the BA wearer.

12.8.5 It is essential that a high level of competency in the use of breathing apparatus equipment is achieved and maintained by those fire-fighters nominated to wear breathing apparatus.

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13 Helideck Emergency Response Manual (ERM)

13.1 General

Note. — Helideck emergency planning is the process of preparing a helideck to cope with an emergency that takes place at the helideck or in its vicinity. Examples of emergencies include crashes on or off the helideck, medical emergencies, dangerous goods occurrences, fires and natural disasters.

The purpose of helideck emergency planning is to minimise the impact of an emergency by saving lives and maintaining helicopter operations.

The Helideck Emergency Response Manual (ERM) sets out the procedures for coordinating the response of helideck agencies or services (i.e. air traffic services unit, firefighting services, helideck administration, Helicopter Emergency Medical Services (HEMS), Search and Rescue (SAR), helicopter operators, security services and police), that could be of assistance in responding to the emergency.

13.1.1 The Helideck Emergency Response Manual for off-shore installations and vessels shall set out the emergency duties and responses for the management of the HLO, helideck and fire-fighting teams, the requirements for emergency drills and exercises, and the training and assessment of personnel.

13.1.2 A Helideck Emergency Response Manual shall be established commensurate with the helicopter operations and other activities conducted at the helideck.

13.1.3 The ERM shall identify agencies which could be of assistance in responding to an emergency at the helideck or in its vicinity.

13.1.4 All agencies identified in the ERM shall be consulted about their role for an emergency response.

13.1.5 The ERM shall provide for the coordination of the actions to be taken in the event of an emergency occurring at a helideck or in its vicinity.

13.1.6 The ERM shall include, as a minimum, the following information:

a) the types of emergencies planned for;

b) how to initiate the plan for each emergency specified;

c) the name of agencies on and off the helideck to contact for each type of emergency with telephone numbers or other contact information;

d) the role of each agency for each type of emergency;

e) a list of pertinent on-helideck services available with telephone numbers or other contact information;

f) copies of any written agreements with other agencies for mutual aid and the provision of emergency services; and

g) location and references to installation(s).

13.1.7 The ERM shall contain procedures for all emergency scenarios where helicopters may be involved. Procedures can range from dealing with major accident events and precautionary situations that occur on the installation and vessel to providing helicopter support for emergencies arising elsewhere.

13.1.8 Scenarios to consider are:

13.1.8.1 The following events that may occur on the installation or vessel but not limited to:

a) Helicopter crash on the helideck (with or without fire and fuel spillage).

b) Engine fire on helicopter.

c) Fire in the helicopter cabin.

d) Off-shore Installation or vessel on fire.

e) Fire during helicopter refuelling operations.

f) Aviation refuelling fire.

g) An emergency or precautionary landing.

h) An attempted wheels-up landing.

i) Evacuation and emergency movement (e.g. Medevac) by helicopters.

j) Helicopter use for man over-board.

13.1.9 The following events that may occur near the installation or vessel but not limited to:

a) Helicopter ditching near to off-shore Installation or vessel.

b) Inter-installation/vessel emergency support.

c) Search and Rescue (SAR) duties and contingencies.

13.1.10 In addition, the following events shall also be considered for inclusion in the ERM, in so far as they may severely impact flight safety or the use of helicopters in the event of an emergency response (e.g. an evacuation) but not limited to:

a) Obstructed helideck.

b) Wrong deck landing.

c) Installation, MODU or vessel status changes with helicopter on deck.

13.1.11 Personnel assigned to off-shore helideck activities and the related emergency duties shall receive appropriate training and their competence assessed with reference to provision 14.2.

13.1.11.1 The ERM shall be reviewed and the information in it updated at least yearly or, if deemed necessary, after an actual emergency, so as to correct any deficiency found during actual emergency.

13.2 Helideck Emergency Procedure

13.2.1 Procedures shall be developed for a variety of helideck fire-fighting, evacuation and rescue scenarios, and shall be included in the ERM.

13.2.2 The procedures shall be written to encourage the full use of available fire-fighting appliances, rescue equipment and resources to best advantage. The ERM shall include all elements for both on and off-shore co-ordination and support. The aerodrome manager shall have measures in place to ensure compliance to procedures laid down.

13.2.3 Crash on Helideck

13.2.3.1 In the event a crash on the helideck, the HLO shall:

a) Raise the alarm.

b) Direct first response helideck fire-fighting and rescue activities. On some installations and vessels, the arrival on scene of an appointed emergency coordinator may signal handover of responsibilities after the initial response.

c) Contact the installation/vessel operator at the earliest opportunity.

d) Establish and maintain contact with the radio room, Central Control Room (CCR) or incident room throughout any subsequent fire-fighting and rescue operations.

e) Report incident to the CAAM.

13.2.4 Crash on Helideck, Major Spillage with No Fire

13.2.4.1 In the event of a crash on helideck with a major spillage but no fire, the HLO shall:

a) Raise the alarm.

b) Direct helideck Fire Team to lay a foam blanket around and under the aircraft.

c) Direct/manage the evacuation of the helicopter.

d) Establish and maintain contact with the radio room/CCR/incident room as required.

e) Contact the installation/vessel operator at the earliest opportunity.

f) Ensure fire team safety and support is provided.

g) Report incident to the CAAM.

13.2.5 Significant Fuel Spillage, Rotors Turning (Hot Fuelling)

13.2.5.1 In the event of a significant fuel spillage with rotors turning, the HLO shall:

a) Immediately ensure that no further fuel is delivered to the aircraft.

b) Inform the pilot of the circumstances. The pilot will decide whether to shut down or take-off.

c) Once the aircraft has taken off or shut down, direct the hosing down of the helideck with water to wash away the fuel prior to any further operations. Such actions the HLO shall consider the environmental impact. Conditions shall be provided to contain all spilled fuel.

d) If the aircraft remains on deck, care must be taken not to spray the aircraft with foam/salt water.

e) Report incident to the CAAM.

13.2.6 Emergency Evacuation by Helicopter

13.2.6.1 In the event of evacuation by helicopter, the HLO shall:

a) Prepare the helideck to receive incoming aircraft.

b) Establish pay-loads as each aircraft approaches and inform administration of the number of passengers required on deck.

c) As each aircraft departs, report to administration the number of evacuees lifted off.

d) Report incident to the CAAM.

13.2.7 Man Over-board

13.2.7.1 In the event of a man overboard, the HLO shall:

a) If there is a helicopter available on deck equipped for winching or required for search activities, be prepared for it to take off when requested.

b) If the helideck is not in use, prepare the helideck for operations and stand by to receive an incoming SAR aircraft if it is diverted to the installation, MODU or vessel.

c) Inform vessels standing by of anticipated helicopter movements.

d) Maintain communication with the radio room/CCR/incident room.

13.2.8 Emergency or Precautionary Landing

13.2.8.1 In the event of an emergency or precautionary landing, the HLO shall:

a) Contact the installation operator at the earliest opportunity

b) Instruct any aircraft on deck to take off, and hold off any incoming aircraft.

c) Instruct cranes to lay down loads, and move jibs to a safe position.

d) Confirm that the approach and overshoot areas are clear and in the case of vessels, if possible, turn the vessel onto appropriate heading for an optimum approach by helicopter.

e) Ensure that rescue and fire-fighting (RFF) equipment is ready for instant use.

f) Ensure fire-fighting and rescue teams are standing by and are correctly dressed for the fire-fighting/rescue response actions.

g) Ensure complementary fire-fighting media are also to hand.

h) Inform the radio room that the deck is clear and ready to receive the aircraft, maintain contact with the radio room.

i) Report incident to the CAAM

13.2.9 Helicopter Incident on Landing

13.2.9.1 In the event of a helicopter incident on landing, the HLO shall:

a) Hold the helicopter on deck and advise the pilot of his observations.

b) Inform the helicopter operator of the nature of the incident.

c) Contact and inform the installation/vessel operator at the earliest opportunity.

d) The helicopter operator and pilot will decide if the flight is to proceed.

e) Report incident to the CAAM.

13.2.10 Dangerous Goods Spill/Release

13.2.10.1 In the event a Dangerous Goods Spill/Release the HLO shall:

a) Raise the alarm.

b) Direct first response helideck emergency crews to contain the spillage if possible – wearing appropriate PPE.

c) Evacuate the helideck and surrounding area, taking into account wind direction and surface slope.

d) Contact the installation/vessel operator at the earliest opportunity.

e) Establish and maintain contact with the radio room, CCR or incident room throughout.

f) Seek further information on the hazardous substance.

g) Ensure limited contamination.

h) Ensure area is fully cleaned once the spillage/release is contained.

i) Ensure all affected personnel are not contaminated, decontamination may be required.

j) Ensure all affected equipment remains/is fit for purpose.

k) Report the incident to the CAAM

14 Training

14.1 General

14.1.1 If they are to effectively utilise the equipment provided, all personnel assigned to operational duties on a helideck shall be trained to carry out their duties to ensure competence in role and task.

14.1.2 All Aerodrome Managers, helideck crew and HRO shall fulfil the training syllabus and maintain validity of the training required.

Note. – The guidance for the training syllabus can be referred to CAD 1406 Vol IV - HATO.

14.1.3 For foreign mobile installations/vessels entering Malaysian waters, their helideck crew training shall meet industry standards such as OPITO. All personnel shall undergo training as per CAD 1406 Vol IV - HATO, within 2 months after issued CoA.

Note. – The crew's training records must be provided to the Helideck Inspection Company (HIC) for verification and surveillance.

14.1.4 In addition to 14.1.2, all personnel assigned to operational duties on a helideck shall be required to attend Dangerous Goods (DG) training.

Note. – The training syllabus for DG can be referred to CAGM 1881 - CBTA – DG

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15 Meteorological Equipment Provision

15.1 General

15.1.1 Accurate, timely and complete meteorological observations are necessary to support safe and efficient helicopter operations. It is recommended that manned fixed and floating facilities and vessels are provided with an automated means of ascertaining the following meteorological information at all times:

a) wind speed and direction (including variations in direction);

b) air temperature and dew point temperature;

c) atmospheric pressure (QNH and, where applicable, QFE);

d) cloud amount and height of cloud base (above mean sea level (AMSL));

e) visibility and;

f) present weather.

15.1.2 Where a fixed manned facility is in close proximity to another fixed manned facility, it may not be deemed necessary for every facility to provide the above equipment, providing that those facilities which are so equipped make their information routinely available to the others. For these ‘other’ facilities, a manual means of verifying and updating the reported elements of an observation, i.e. cloud amount and height of base, visibility and present weather, may be used. For Normally Unattended installations (NUI), it may be acceptable just to provide the basic elements of wind, pressure, air temperature and dew point temperature information.

Note 1. – close proximity is defined as two or more forms that are linked together by bridge(s).

15.1.3 Contingency meteorological observing equipment providing manual measurements of air and dew point temperatures, wind speed direction and pressure is recommended to be provided in case of the failure or unavailability of the automated sensors. It is recommended that personnel who carry out meteorological observations undergo appropriate training for the role and complete periodic refresher training to maintain competency.

15.1.4 Where required, for example for those helicopters which have remained overnight, access to meteorological forecasts, special observations, weather warnings and SIGMETS shall be available.

15.1.6 Calibration shall take place according to the instrument manufacturer's recommendation. In the absence of manufacturer’s recommendation on calibration frequency, calibration has to be carried out annually.

15.1.7 All primary and contingency sensors shall be maintained as per manufacturer's recommendation

16 Deck Motion Reporting and Recording

Note. – All primary and back-up sensors shall be serviced by an engineer on at least an annual basis. Calibration shall take place according to the instrument manufacturer's recommendation. Cleaning and routine maintenance shall take place according to the instrument manufacturer's guidance; however, due to the harsh offshore environment, cleaning routines may have to be increased in certain conditions.

16.1 Guidance Material

16.1.1 Floating facilities and vessels experience dynamic motions due to wave action which represent a potential hazard to helicopter operations. Although the ability of a floating facility or vessel to sometimes manoeuvre may be helpful in providing an acceptable wind direction in relation to the helideck/shipboard helideck location, it is likely that floating facilities and vessels will still suffer downtime due to excessive deck motions. Downtime can be minimised by careful consideration of the location of the landing area at the design stage. However, to a greater or lesser degree floating facilities and vessels remain subject to movement at the helideck in pitch and roll, in deck inclination and in heave (usually measured as rate of heave).

16.1.2 It is necessary for these motions to be recorded by the use of an electronic Helideck Motion System (HMS) and reported as part of the overall off-shore weather report (refer to Chapter 15), prior to landing and during helicopter movements. An HMS shall be equipped with a colour-coded display which allows a trained operative to easily determine whether the landing area is 'in-limits', or is 'out of limits'; or is moving towards a condition where it may soon be 'out-of-limits'. Motions at the helideck shall be reported to the helicopter operator to an accuracy of one decimal place. The helicopter pilot, in order to make vital safety decisions, is concerned with the amount of 'slope' on and the rate of movement of the helideck surface. It is therefore important that reported values are only related to the true vertical and do not relate to any false datum created, for example, by a 'list' created by anchor patterns or displacement.

16.1.3 Ongoing research indicates that the likelihood of a helicopter tipping or sliding whilst touched down on a helideck or shipboard helideck (especially with rotors running 'turning and burning' on the landing area) is directly related to helideck accelerations and to the prevailing wind conditions. Ideally a Helideck Motion System shall incorporate additional software which allows for 'on-deck' Motion Severity and Wind Severity Index limits to be recorded and communicated to aircrew; in a similar way that pre-landing limits are disseminated to a pilot.

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17 Helicopter Operations Support Equipment

17.1 General

17.1.1 Provision shall be made for equipment needed for use in connection with helicopter operations including:

a) chocks and tie-down strops/ropes (strops are preferable);

b) weighing scale for passenger baggage and freight weighing with minimum 150kg capacities, annually calibrated at certified service provider; a suitable power source for starting helicopters if helicopter shut-down is seen as an operational requirement;

c) spill kit; and

d) equipment for clearing the helicopter landing area of snow and ice and other contaminants.

17.1.2 Chocks shall be compatible with helicopter undercarriage/wheel configurations. Helicopter operating experience offshore has shown that the most effective chock for use on helideck is the ‘NATO sandbag’ type. Alternatively, ‘rubber triangular’ or ‘single piece fore and aft’ type chocks may be used as long as they are suited to all helicopters likely to operate to the helideck. The ‘rubber triangular’ chock is generally only effective on decks without nets.

17.1.3 For securing helicopters to the helideck it is recommended that adjustable tie-down strops are used in preference to ropes. Specifications for tiedowns shall be agreed with the helicopter operators.

17.2 Communication

17.2.1 VHF radio shall be made available in the radio room for the purpose of communication between the helicopter flight crew and Helideck Radio Operator (HRO). Radio log shall be administered accordingly and kept for at least 3 months.

Note. – if the system in place is unable to maintain 3 months of the radio log, alternate means shall be present to CAAM for approval.

17.2.2 Helicopter Landing Officer (HLO) shall be equipped with portable VHF and appropriate head set tuned to the local frequency for the Installation.

17.2.3 Any person who operate VHF radio and in communication with helicopter in flight shall be suitably trained and must be able to demonstrate competence when conducting aeronautical VHF communications.

17.2.4 Note. - Under no circumstances shall the HLO or HRO assume the role or authority of an air traffic controller. They may only act in an advisory capacity.

17.3 Aeronautical telecommunication facilities

17.3.1 Aeronautical radio equipment and/or aeronautical Non-Directional Radio Beacon (NDBs) installation at offshore fixed installations, mobile installations and vessels shall obtain prior approval from CAAM.

17.3.2 Verification flight on NDB shall be conducted annually by the helicopter operator.

Note. – Provision of NDB on fixed installations, mobile installations and vessels is not mandatory. The need to have such facility are to be discussed with the helicopter operators.

17.4 Helicopter operations to helideck that is Sub-1D

17.4.1 An aeronautical study or risk assessment shall be conducted by, or on behalf of, an offshore helicopter operator when intending to service helideck using helicopters with Design-D greater than the D-Value of the helideck

17.4.2 Risk assessment for sub-1D operations may be considered only in the following circumstances and/or conditions:

17.4.2.1 Applicable only for multi-engine helicopters operating to performance class 1 or class 1 equivalent, or to performance class 2 when taking into account drop down and deck edge miss during the take-off and landing phase.

17.4.2.2 Helideck provide a load bearing surface, represented by the TLOF, of between 0.83D and 1D, where:

a) a minimum 1D circle, representing the FATO, is assured for the containment of the helicopter.

b) LOS extends from the periphery of the FATO, not the TLOF

c) non-load-bearing area between the TLOF perimeter and the FATO perimeter is entirely free of ‘non-permitted’ obstacles

d) any object essential for the operation located on or around the TLOF perimeter shall not exceed obstacle height limitations set out in provision 17.4.5.

17.4.2.3 The size of the landing area shall not be less than minimum dimensions prescribed in the approved rotorcraft flight manual supplement.

17.4.2.4 Helideck on a fixed offshore installation whether a normally attended installation (NAI) or normally unattended installation (NUI). An installation or vessel that is subject to dynamic motions exceeding stable deck criteria in pitch, roll and heave are not be considered.

17.4.2.5 Not to be considered for helideck below 0.83D or mobile helideck below 1D.

17.5 Helicopter operations with lower structural capacity of helideck

17.5.1 A compatibility study including helicopter performance, structural integrity and safety assessment (SA) shall be conducted by, or on behalf of, an offshore helicopter operator when intending to operate with lower structural capacity of helideck.

17.5.2 Compatibility assessment for lower structural capacity operations may be considered only in the following circumstances and/or conditions:

17.5.2.1 Applicable only for multi-engine helicopters operating to performance class 1 or class 1 equivalent, when considering high impact operation during take-off and landing phase.

17.5.2.2 Helideck provide a load bearing surface, represented by the TLOF and FATO.

17.5.2.3 The size of the landing area shall not be less than minimum dimensions prescribed in the approved rotorcraft flight manual supplement.

17.5.2.4 Helideck on a fixed offshore installation whether a normally attended installation (NAI) or normally unattended installation (NUI). An installation or vessel that is subject to dynamic motions exceeding stable deck criteria in pitch, roll and heave are not be considered.

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18 Helicopter Refuelling Operations

18.1 General

18.1.1 It is essential to ensure at all times that aviation fuel delivered to helicopters from off-shore facilities and vessels is of the highest quality. A major contributor towards ensuring that fuel quality is maintained, and contamination prevented, is to provide clear unambiguous product identification on all system components and pipelines denoting the fuel type (e.g. Jet A-1) following the standard aviation convention for markings and colour code. Markings shall be applied initially during systems manufacture and routinely checked for clarity during subsequent maintenance inspections.

18.1.2 It shall be noted that an off-shore fuelling system may vary according to the particular application for which it was designed. Nevertheless, the elements of all off-shore fuelling systems are basically the same and will include:

a) storage tanks;

b) static storage facilities, and if installed, a sample reclaim tank;

c) a pumping system; and

d) a delivery system

18.1.3 When preparing a lay-out design for aviation fuelling systems on off-shore facilities and vessels it is important to make provisions for suitable segregation and bunding of the areas set aside for the tankage and delivery system. Facilities for containing possible fuel leakage and providing fire control shall be given full and proper consideration, along with adequate protection from potential dropped objects. The design of the elements of an off-shore fuelling system is not addressed in detail in the Heliport Design and Services Manual.

18.1.4 Fuel storage, handling and quality control are key elements for ensuring, at all times, the safety of aircraft in flight. For this reason, personnel assigned refuelling responsibilities shall be certified as properly trained and competent to undertake systems maintenance, inspection and fuelling of helicopters.

18.1.5 Throughout the critical processes of aviation fuel system maintenance and fuelling operations, routine fuel sampling is required to ensure delivered fuel is scrupulously clean and free from contamination that may otherwise enter helicopter fuel tanks and could ultimately result in engine malfunctions.

18.1.6 Fuel samples drawn from transit/static storage tanks and the fuel delivery system shall be retained in appropriate containers for a specified period. The containers shall be kept in a secure light-excluding store and kept away from sunlight until they are disposed of.

18.1.7 The refuelling system shall be subject to daily and weekly checks by competent offshore fuelling personnel to ensure sustained operability and satisfactory fuel quality.

18.1.8 The refuelling system shall normally be inspected every three months by an authorised Service Engineer on behalf of a Refuelling System Service Provider, contracted by the offshore asset owner or duty holder to inspect and certify the system is fit for uplifting fuel by the helicopter operator.

Note 1. – Inspection in this context is not to be confused with Auditing. It is physical intervention / trades supervision by a fully trained and competent engineer for determining condition and replacement of key system components, prior to certifying the system is fit for purpose.

Note 2. – An authorised Service Engineer is defined as an individual that is independent from the HIC, who's employing company can demonstrate that the individual is technically qualified, competent and has relevant experience on the offshore refuelling systems, components and equipment subjected to examination and verification.

Note 3. – On some installations, Aerodrome manager may require specific work activities to be undertaken by an on-board maintenance team member (e.g. an electrician or mechanic) as part of the maintenance management plan. In such cases, the work undertaken by the Aerodrome manager shall not include activities for breaking into system fuel containment, without receipt of written approval from the authorised / certifying Refuelling System Service Provider. Any work done may additionally require inspection and verification following completion

18.1.9 The function of refuelling system inspection is twofold; firstly, it allows necessary scheduled invasive and specialist work-scopes to be carried out by an approved Service Engineer, and secondly, it provides system certification on completion of a successful inspection.

18.1.10 No system shall exceed four months between successive inspections and certification may be withdrawn if the system is not maintained in accordance with the requirements.