AERODROME STANDARDS GUIDELINE 904 [ASG 904]

STANDARDS FOR HELIDECKS

Updated: 13 March 2020
Table of Content

Glossary of terms and abbreviations........................................................................................................... 4

1. Introduction ................................................................................................................................................... 8

2. Applicability .................................................................................................................................................. 8

3. Rules .............................................................................................................................................................. 8


5. Helicopter Performance Considerations ................................................................................................... 9

5.1 General Considerations ............................................................................................................................ 9

5.2 Safety philosophy ..................................................................................................................................... 10

6. Helicopter Landing Areas – Physical Characteristic .............................................................................. 11

6.1 General....................................................................................................................................................... 11

Table 1: D-value, 't' Value and Other Helicopter Type Criteria ........................................................................ 12

7. Helideck Design Considerations – Environmental Effects .................................................................... 13

7.1 Introduction ............................................................................................................................................... 13

7.2 Structural Design .................................................................................................................................... 14

7.3 Loads .......................................................................................................................................................... 14

7.3.1 Helicopters Landing .............................................................................................................................. 14

7.3.2 Helicopters at Rest ............................................................................................................................... 16

7.4 Size and Obstacle Protected Surfaces ................................................................................................... 17

Figure 1: Obstacle Limitation (single main rotor and side by side main rotor helicopters) showing position of touchdown/positioning marking circle ............................................................................. 19

Figure 2: Obstacle free areas - Below landing area level (for all types of helicopters) ................................. 22

8. Temporary Combined Operations .............................................................................................................. 23

9. Multiple Platform Configurations/Location of Standby Vessels ............................................................... 24

10. Surface .......................................................................................................................................................... 25

Table 2: Friction Requirements ...................................................................................................................... 25

Table 3: Helideck Surface Friction & Wind Limitation .................................................................................. 27

11. Helicopter Tie-Down Points ....................................................................................................................... 29

Figure 3: Example of Suitable Tie-Down Configuration .............................................................................. 29

12. Perimeter Safety Net .................................................................................................................................. 30

13. Access Points .............................................................................................................................................. 30

14. Normally Unmanned Installations (NUIs) ................................................................................................. 32

15. Visual Aids .................................................................................................................................................... 32

15.1 General ...................................................................................................................................................... 32
Appendix B

15.2 Helideck Landing Area Markings

**Figure 4:** Markings (Single Main Rotor Helicopters)

**Figure 5:** Helideck D-value and Obstacle-Free Marking

**Figure 6:** Touchdown/Positioning Marking Circle (TD/PM Circle to be painted Yellow)

**Figure 7:** Dimensions of Heliport Identification Marking 'H' (‘H’ to be Painted White)

**Figure 9:** Example of Prohibited Landing Heading Marking

**Figure 10:** Landing Prohibited Marker

16. Lighting

16.1 Perimeter Lighting

16.2 TD/PM Circle and ‘H’ Lightings

16.3 Helideck Status Light System

16.4 UPS requirement

17. Obstacles – Marking and Lighting

18. Helideck Rescue and Firefighting Facilities

18.1 Introduction

18.2 Key design characteristics – Principal agent

19. Complementary Media & Normally Unmanned Installations

**Table 4:** Foam and Complementary Agents

20. Rescue Equipment

21. Personnel Levels

22. Personal Protective Equipment (PPE)

23. Training

24. Emergency Procedures

25. Miscellaneous Operational Standards

25.1 Collection and Retention of Meteorological Information

25.2 Calibration of meteorological equipment sensors

26. Location in Respect to Other Landing Areas in the Vicinity

27. Control of Crane Movement in the Vicinity of Landing Areas

28. Helicopter Operation Support Equipment

29. Helicopter Operations to Helidecks in the Malaysia Water which are Sub-1D

**Figure 11:** Obstacle Limitation Surface and Sectors for a 0.83D TLOF

Non-compliance with ICAO standards/considerations/mitigations to account for compromise

Appendix A HELIDECK OPERATIONS MANUAL

Appendix B HELIDECK DESIGN GUIDANCE
# Glossary of terms and abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMSL</td>
<td>Above Mean Sea Level</td>
</tr>
<tr>
<td>AOC</td>
<td>Air Operator’s Certificate</td>
</tr>
<tr>
<td>CAAM</td>
<td>Civil Aviation Authority of Malaysia</td>
</tr>
<tr>
<td>CAAi</td>
<td>UK Civil Aviation Authority International</td>
</tr>
<tr>
<td>CAFS</td>
<td>Compressed Air Foam System</td>
</tr>
<tr>
<td>CFD</td>
<td>Computational Fluid Dynamics</td>
</tr>
<tr>
<td>D-circle</td>
<td>A circle, usually hypothetical unless the helideck itself is circular, the diameter of which is the D-value of the largest helicopter the helideck is intended to serve.</td>
</tr>
<tr>
<td>D-value</td>
<td>The largest overall dimension of the helicopter when rotors are turning. This dimension will normally be 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 the most rearward extension of the fuselage in the case of Fenestron or Notar tails).</td>
</tr>
<tr>
<td>DIFFS</td>
<td>Deck Integrated Fire Fighting System(s)</td>
</tr>
<tr>
<td>DSV</td>
<td>Diving Support Vessel</td>
</tr>
<tr>
<td>Essential objects permitted</td>
<td>a) around the TLOF as Para 7.4.2 b) on the TLOF: helideck net, aircraft tie down point and helideck touchdown marking (“H” and “circle”) lighting c) in the area between the TLOF perimeter and the FATO perimeter, helideck safety netting is present.</td>
</tr>
<tr>
<td>Falling 5:1 gradient</td>
<td>A surface extending downwards on a gradient of 5:1 measured from the edge of the safety netting located around the landing area below the elevation of the helideck to water level for an arc of not less than 180° that passes through the centre of the landing area and outwards to a distance of 1000m that will allow for safe clearance from obstacles below the helideck in the event of an engine failure for the type of helicopter the helideck is intended to serve.</td>
</tr>
<tr>
<td>FATO</td>
<td>Final approach and take-off area – A defined area over which the final phase of an approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced.</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>FATO/TLOF</td>
<td>For helidecks of ≥ 1D, the FATO and TLOF are always coincidental and therefore occupy the same space and have the same load bearing characteristics. For helidecks which are &lt; 1D, but no less than 0.83D, it is the TLOF only that is permitted to reduce, the FATO remains as 1D. In this case the TLOF and the FATO are assumed to be collocated.</td>
</tr>
<tr>
<td>FMS</td>
<td>Fixed Monitor System</td>
</tr>
<tr>
<td>FOD</td>
<td>Foreign Object Debris/Damage</td>
</tr>
<tr>
<td>FPSO</td>
<td>Floating Production Storage and Offloading units</td>
</tr>
<tr>
<td>FSO</td>
<td>Floating Storage and Offloading Unit</td>
</tr>
<tr>
<td>H-ATO</td>
<td>Helideck - Approved Training Organisation</td>
</tr>
<tr>
<td>HOIT</td>
<td>Helideck Operation Initial Training (OPITO)</td>
</tr>
<tr>
<td>HCC</td>
<td>Helideck Certification Committee. The HCC is a committee under CAAM that reviews and advises CAAM in all technical matters in the process of certifying all helidecks and shipboard heliports on offshore installations and vessels operating in Malaysia waters to the standards laid down in ASG 904.</td>
</tr>
<tr>
<td>HDWG</td>
<td>Heliport Design Working Group (of ICAO Aerodromes panel)</td>
</tr>
<tr>
<td>Helideck</td>
<td>A helicopter landing area located on a fixed or floating offshore facility.</td>
</tr>
<tr>
<td>HDA</td>
<td>Helideck Assistant</td>
</tr>
<tr>
<td>HERT</td>
<td>Helideck Emergency Response Team</td>
</tr>
<tr>
<td>HLL</td>
<td>Helideck Limitations List. Published and distributed by the CAAM.</td>
</tr>
<tr>
<td>HLO</td>
<td>Helicopter Landing Officer</td>
</tr>
<tr>
<td>HMS</td>
<td>Helideck Motion System</td>
</tr>
<tr>
<td>HSE</td>
<td>Health and Safety Executive</td>
</tr>
<tr>
<td>IATA</td>
<td>International Air Transport Association</td>
</tr>
<tr>
<td>ICAO</td>
<td>International Civil Aviation Organization</td>
</tr>
<tr>
<td>ICS</td>
<td>International Chamber of Shipping</td>
</tr>
<tr>
<td>IMC</td>
<td>Instrument Meteorological Conditions</td>
</tr>
<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
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<td>------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Landing area</td>
<td>A generic term referring to the load-bearing area primarily intended for the landing and take-off of aircraft. The area, sometimes referred to as the Final Approach and Take-Off area (FATO), is bounded by the perimeter line and perimeter lighting.</td>
</tr>
<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>LFL</td>
<td>Lower Flammable Limit</td>
</tr>
<tr>
<td>LOS</td>
<td>Limited Obstacle Sector(s). The 150° within which obstacles may be permitted, provided the height of the obstacles is limited.</td>
</tr>
<tr>
<td>MSI</td>
<td>Motion Severity Index</td>
</tr>
<tr>
<td>MTOM</td>
<td>Maximum Certificated Take-Off Mass</td>
</tr>
<tr>
<td>NDB</td>
<td>Non-Directional Beacon</td>
</tr>
<tr>
<td>NM</td>
<td>Nautical Mile(s)</td>
</tr>
<tr>
<td>NMI</td>
<td>Normally Manned Installation (fixed helideck)</td>
</tr>
<tr>
<td>NUI</td>
<td>Normally Unmanned Installation (fixed helideck)</td>
</tr>
<tr>
<td>OFS</td>
<td>Obstacle Free Sector. The 210° sector, extending outwards to a distance of 1000 m that will allow for an unobstructed departure path appropriate to the helicopter the helideck is intended to serve, within which no obstacles above helideck level are permitted. For helicopters operated in Performance Class 1 or 2 the horizontal extent of this distance will be compatible with the one-engine inoperative capability of the helicopter type to be used.</td>
</tr>
<tr>
<td>PCF</td>
<td>Post-Crash Fire</td>
</tr>
<tr>
<td>Perimeter D marking</td>
<td>The marking located in the perimeter line in whole numbers; i.e. the D-value (see above) rounded up or down to the nearest whole number.</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>RD</td>
<td>Rotor Diameter</td>
</tr>
<tr>
<td>RFF</td>
<td>Rescue and Fire Fighting</td>
</tr>
<tr>
<td>RFFS</td>
<td>Rescue and Fire-Fighting Services</td>
</tr>
<tr>
<td>RMS</td>
<td>Ring-Main System (as an alternative to DIFFS or FMS on an existing installation)</td>
</tr>
<tr>
<td>Run-off area</td>
<td>An extension to the Landing Area designed to accommodate a parked helicopter; sometimes referred to as the Parking Area.</td>
</tr>
<tr>
<td>Shipboard heliport</td>
<td>A heliport located on a vessel which may be purpose-built or non-purpose-built.</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SHR</td>
<td>Significant Heave Rate</td>
</tr>
<tr>
<td>SMS</td>
<td>Safety Management System</td>
</tr>
<tr>
<td>TD/PM Circle</td>
<td>Touchdown/Positioning Marking Circle. Described as the Aiming Circle in earlier editions of ASG 904, the TD/PM Circle is the aiming point for a normal touchdown (landing) so located that when the pilot’s seat is over the marking, the whole of the undercarriage will be within the landing area and all parts of the helicopter will be clear of any obstacles by a safe margin.<strong>NOTE:</strong> It shall be noted that only correct positioning over the TD/PM Circle will ensure proper clearance with respect to physical obstacles and provision of ground effect and provision of adequate passenger access/egress.</td>
</tr>
<tr>
<td>TLOF</td>
<td>Touchdown and lift-off area – A dynamic load bearing area on which a helicopter may touchdown and lift-off.</td>
</tr>
<tr>
<td>UPS</td>
<td>Uninterruptable Power Supply</td>
</tr>
<tr>
<td>VMC</td>
<td>Visual Meteorological Conditions</td>
</tr>
<tr>
<td>WSI</td>
<td>Wind Severity Index</td>
</tr>
<tr>
<td>WTG</td>
<td>Wind Turbine Generator</td>
</tr>
</tbody>
</table>
1. Introduction

This Aerodrome Standards Guideline (ASG) 904 contains specific requirement prescribed for the physical characteristics, surface condition and markings, obstacle clearance limitation, facilities and equipment, technical services and personnel competency that shall be provided at helidecks operating in Malaysia.

2. Applicability

All offshore helidecks and mobile helidecks operating in Malaysia intended for Commercial Air Transport use shall obtain Certificate of Aerodrome from the Civil Aviation Authority of Malaysia. The helideck operator is to ensure the Certificate of Aerodrome is obtained prior to helicopter operations. The certificate is to ensure that the helideck area is in compliance with the Civil Aviation Authority of Malaysia Directives and safe for helicopter operations.

3. Rules

3.1 The specification in this Directive shall apply to the design, approval, inspection, and certification of helidecks.

3.2 The helideck operator shall have the necessary competence and experience to operate and maintain the helideck, before being granted a Certificate of Aerodrome. Helideck operator shall also ensure the helideck is maintained to comply with all aviation regulations and industrial standards.

3.3 The helideck operator shall employ adequate number of qualified, trained and skilled personnel who possess valid certificates for helideck and helicopter operations.

3.4 The certification inspection shall be conducted to satisfy the Helideck Operations Manual, the Helideck Emergency Plan and other documentations submitted by the applicant.

3.5 The helideck operator shall arrange for an inspection of the helideck, its facilities and equipment. The Helideck Inspection Report shall be retained until the next Certification. CAAM Certificate of Aerodrome is valid for two years and re-inspection shall be carried out prior to the renewal of certificate.
3.6 The helicopter operators as holders of Air Operators Certificates (AOC) are to ensure that the landing area meets minimum safety requirements for their helicopter’s operation. If major non-compliance and deficiencies in the facilities existed, the helicopter operators may decide not to land at the helideck.


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

4.2 The maximum helicopter mass and D-value for which the deck has been designed and the maximum size and weight of helicopter for which the installation is certified shall be included in the Helideck Operations Manual. The extent of the obstacle-free area shall also be stated, and reference made to any helideck operating limitation imposed by helicopter operators as a result of any non-compliance. Non-compliances shall also be listed.

4.3 All helidecks shall have Helideck Operations Manual detailing operational procedures, hazards, organization, Safety Management System (SMS) and an emergency response for each helideck. This manual shall include but not limited to items as per Appendix A.

5. Helicopter Performance Considerations

5.1 General Considerations

5.1.1 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.

5.1.2 Helicopter companies operating for commercial air transport are required to hold an AOC which is neither granted nor allowed to remain in force unless they provide procedures for helicopter crews which safely combine
the space and performance requirements mentioned above.

5.2 Safety philosophy

5.2.1 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 helidecks in safety.

5.2.2 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.

5.2.3 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 5.2.2 These factors are taken into account 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.
6. Helicopter Landing Areas – Physical Characteristic

6.1 General

6.1.1 This chapter provides criteria on the physical characteristics of helicopter landing areas (helidecks) 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).

6.1.2 The criteria which follow are based on helicopter overall length and mass. This data is summarised in Table 1 below.
Table 1: D-value, 't' Value and Other Helicopter Type Criteria

<table>
<thead>
<tr>
<th>Type</th>
<th>D-value (m)</th>
<th>Perimeter 'D' Marking</th>
<th>Rotor Diameter (m)</th>
<th>Max Weight (kg)</th>
<th>'t' Value</th>
<th>Landing Net Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dauphin AS365 N2</td>
<td>13.68</td>
<td>14</td>
<td>11.93</td>
<td>4250</td>
<td>4.3</td>
<td>Small</td>
</tr>
<tr>
<td>Dauphin AS365 N3</td>
<td>13.73</td>
<td>14</td>
<td>11.94</td>
<td>4300</td>
<td>4.3</td>
<td>Small</td>
</tr>
<tr>
<td>Sikorsky S76</td>
<td>16.00</td>
<td>16</td>
<td>13.40</td>
<td>5307</td>
<td>5.3</td>
<td>Medium</td>
</tr>
<tr>
<td>Leonardo AW 169</td>
<td>14.65</td>
<td>15</td>
<td>12.12</td>
<td>4800</td>
<td>4.8</td>
<td>Medium</td>
</tr>
<tr>
<td>Leonardo AW 139</td>
<td>16.63</td>
<td>17</td>
<td>13.80</td>
<td>6800</td>
<td>6.8</td>
<td>Medium</td>
</tr>
<tr>
<td>Leonardo AW 189</td>
<td>17.60</td>
<td>18</td>
<td>14.60</td>
<td>8600</td>
<td>8.6</td>
<td>Medium</td>
</tr>
<tr>
<td>Airbus H175</td>
<td>18.06</td>
<td>18</td>
<td>14.80</td>
<td>7500</td>
<td>7.5</td>
<td>Medium</td>
</tr>
<tr>
<td>Airbus H145</td>
<td>13.64</td>
<td>14</td>
<td>11.00</td>
<td>3800</td>
<td>3.8</td>
<td>Small</td>
</tr>
<tr>
<td>Super Puma AS332L2</td>
<td>19.50</td>
<td>20</td>
<td>16.20</td>
<td>9300</td>
<td>9.3</td>
<td>Medium</td>
</tr>
<tr>
<td>EC 225 (H225)</td>
<td>19.50</td>
<td>20</td>
<td>16.20</td>
<td>11000</td>
<td>11.0</td>
<td>Medium</td>
</tr>
<tr>
<td>Sikorsky S92A</td>
<td>20.88</td>
<td>21</td>
<td>17.17</td>
<td>12565</td>
<td>12.6</td>
<td>Large</td>
</tr>
<tr>
<td>Sikorsky S61N</td>
<td>22.20</td>
<td>22</td>
<td>18.90</td>
<td>9298</td>
<td>9.3</td>
<td>Large</td>
</tr>
<tr>
<td>Leonardo AW101</td>
<td>22.80</td>
<td>23</td>
<td>18.90</td>
<td>14600</td>
<td>14.6</td>
<td>Large</td>
</tr>
</tbody>
</table>

**NOTE:** Where skid-fitted helicopters and/or a deck integrated firefighting system (DIFFS) are in use landing nets shall not be fitted.
7. Helideck Design Considerations – Environmental Effects

7.1 Introduction

7.1.1 The safety of helicopter flight operations can be seriously degraded by environmental effects that may be present around installations or vessels and their helidecks. The term “environmental effects” is used here to represent the effects of the installation or vessel and/or its systems and/or processes on the surrounding environment, which result in a degraded local environment in which the helicopter is expected to operate. These environmental effects are typified by structure-induced turbulence, turbulence and thermal effects caused by gas turbine exhausts, thermal effects of flares and diesel exhaust emissions, and unburnt hydrocarbon gas emissions from cold flaring or, more particularly, emergency blow-down systems. It is almost inevitable that helidecks installed on the cramped topsides of offshore installations will suffer to some degree from one or more of these environmental effects, and controls in the form of operational restrictions may be necessary in some cases. Such restrictions can be minimised by careful attention to the design and layout of the installation topsides and, in particular, the location of the helideck. All newly built helideck shall be subjected to complete plume studies or CFD. Any source of heat within 30 metres from helideck centre or any source of heat outside the 30 m area but reported by pilots to have effects on helicopter operations shall be subjected to same studies.

7.1.2 Advice on the design and placement of offshore helidecks is as Appendix B. The criteria have been set to define safe operating boundaries for helicopters in the presence of known environmental hazards. Where these criteria cannot be met, a limitation is placed in the HLL. These entries are usually specific to particular combinations of wind speed and direction, and either restrict helicopter mass (payload), or prevent flying altogether in certain conditions.

7.1.3 The HLL program is designed for the benefit of the offshore helicopter operators and shall ensure that landings on offshore helidecks are properly controlled when adverse environmental effects are present. On poorly designed helidecks, severe operational restrictions may result, leading to significant commercial penalties for an installation operator or vessel owner. Well designed and ‘helicopter friendly’ platform topsides and helidecks shall result in efficient operations and cost savings for the installation operator.
7.2 Structural Design

7.2.1 The take-off and landing area shall be designed for the heaviest and largest helicopter anticipated to use the facility (see Table 1). Helideck structures shall be designed in accordance with relevant International Organization for Standardization (ISO) codes for offshore structures and for floating installations. The maximum size and mass of helicopters for which the helideck has been designed shall be stated in the Installation Operations Manual and Verification and/or Classification document. For structural design requirements for helicopter landing areas located on vessels (i.e. non-installations), reference may be made to appropriate Class Society rules.

7.2.2 Optimal operational flexibility may be gained from considering the potential life and usage of the facility along with likely future developments in helicopter design and technology.

7.2.3 Consideration shall also be given in the design to other types of loading such as personnel, other traffic, freight, refuelling equipment, rotor downwash etc. as stated in the relevant ISO codes or Class Society rules. It may be assumed that single main rotor helicopters will land on the wheel or wheels of two landing gears (or both skids if fitted). The resulting loads shall be distributed between two main undercarriages. Where advantageous a tyre contact area may be assumed in accordance with the manufacturer’s specification. Working stress design or ultimate limit state (ULS) methods may be used for the design of the helideck structure, including girders, trusses, pillars, columns, plating and stiffeners. A serviceability limit check shall also be performed to confirm that the maximum deflection of the helideck under maximum load is within code limits. This check is intended to reduce the likelihood of the helideck structure being so damaged during an emergency incident as to prevent other helicopters from landing.

7.3 Loads

7.3.1 Helicopters Landing

The helideck shall be designed to withstand all the forces likely to act when a helicopter land. The loads and load combinations to be considered shall include:
1) **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, distributed as described in paragraph 7.2.3 This shall be treated as an imposed load, applied together with the combined effect of 1) to 7) 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 2) to 7) inclusive. Normally, the emergency landing case will govern the design of the structure.

2) **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 1) 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.

3) **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/m²) shall be added over the whole area of the helideck.

4) **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.

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

6) **Wind loading.** Wind loading shall be allowed for in the design of
the platform. The helideck normal restricting wind conditions (i.e. 60 knots equivalent to 31 m/s) shall be applied in the direction which, together with the imposed lateral loading, will produce the most severe loading condition on each structural element.

7) **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.

8) **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 mm² acting in any probable location. Particular attention to detailing shall be taken at the junction of the supports and the platform deck.

7.3.2 Helicopters at Rest

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

1) **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.

2) **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/m²) shall be added to the whole area of the helideck.

3) **Dead load and wind load.** The values for these loads are the same as given in paragraph 7.3.1 5) and 6) and shall be considered to act simultaneously in combination with paragraph 7.3.2 1) and 2). Consideration shall also be given to the additional wind loading from any parked or secured helicopter.
4) **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.

7.4 **Size and Obstacle Protected Surfaces**

7.4.1 For any particular type of single main rotor helicopter, the helideck shall be sufficiently large to contain a circle of diameter D equal to the largest dimension of the helicopter when the rotors are turning. This D-circle shall be totally unobstructed (see Table 1 for D values). Due to the actual shape of most offshore helidecks the D-circle will be ‘hypothetical’ but the helideck shape shall be capable of accommodating such a circle within its physical boundaries.

7.4.2 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, only the following items essential for safe helideck operations may exceed the height of the landing area but shall not do so by more than 25 centimetres. The height of essential items around the helideck shall not exceed 25 cm above helideck level. For new build helidecks completed on and after 10 November 2018 and for refurbishments, the height of essential items around the helideck should not exceed 15cm for any helideck where the D-value is greater than 16.00 m. for helidecks, 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 include:

- Guttering or raised kerb;
- Lightings as per ASG 904 Section 16;
- Foam monitors;
- Handrails;
- Perimeter net edge;
- Landing net tie-down points. However, for all newly built helideck
after 1 January 2020 the tie down point design to be flushed; and

- Flame detector

7.4.3 Objects whose function requires that they be located on the surface of the helideck such as landing nets, tie-down points, and “circle” and “H” lighting systems shall not exceed a height of 25 mm. Such objects shall only be present above the surface of the touchdown area provided they do not cause a hazard to helicopter operations.
Figure 1: Obstacle Limitation (single main rotor and side by side main rotor helicopters) showing position of touchdown/positioning marking circle

**NOTE:** Where the D-value is 16.00 m or less, objects in the first segment of the LOS are restricted to 5 cm.
7.4.4 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° as illustrated in Figure 1. Acceptance of the ‘swung’ criteria will only be applicable to existing installations. When the 210° OFS is swung, the 180° falling 5:1 gradient also shall be swung by a corresponding amount to indicate, and align with, the swung OFS.

7.4.5 The diagram at Figure 1 shows the extent of the two segments of the 150° Limited Obstacle Sector (LOS) and how these are measured from the centre of the (hypothetical) D-circle and from the perimeter of the landing area. This diagram assumes, since most helidecks are designed to the minimum requirement of accommodating a 1 D-circle, that the D-circle perimeter and landing area perimeter are coincidental. No objects above 25 cm (or 5 cm where the D-value of the helideck is 16.00 m or less) are permitted in the first (hatched area in Figure 1) segment of the LOS. The first segment extends out to 0.62D from the centre of the D-circle, or 0.12D from the landing area perimeter marking. The second segment of the LOS, in which no obstacles are permitted to penetrate, is a rising 1:2 slope originating at a height of 0.05D above the helideck surface and extending out to 0.83D from the centre of the D-circle (i.e. a further 0.21D from the edge of the first segment of the LOS). The exact point of origin of the LOS is at the periphery of the D-circle.

7.4.6 Some helidecks are able to accommodate a landing area which covers a larger area than the declared D-value; a simple example being a rectangular deck with the minor dimension able to contain the D-circle. In such cases it is important to ensure that the origin of the LOS (and OFS) is at the perimeter of the landing area as marked by the perimeter line. Any landing area perimeter shall guarantee the obstacle protection afforded by both segments of the LOS. The respective measurements of 0.12D from the landing area perimeter line plus a further 0.21D are to be applied. On these larger decks there is thus some flexibility in deciding the position of the perimeter line and landing area in order to meet the LOS requirements and when considering the position and height of fixed obstacles. Separating the origin of the LOS from the perimeter of the D-circle in Figure 1 and moving it to the right of the page will demonstrate how this might apply on a rectangular-shaped landing area.

7.4.7 The extent of the LOS segments will, in all cases, be lines parallel to the landing area perimeter line and follow the boundaries of the landing area perimeter (see Figure 1). Only in cases where the perimeter of the landing area is circular will the extent of the LOS be in the form of arcs to the D-
circle. However, taking the example of an octagonal landing area as drawn at Figure 1, it would be possible to replace the angled corners of the two LOS segments with arcs of 0.12D and 0.33D centred on the two adjacent corners of the landing area, thus cutting off the angled corners of the LOS segments. If these arcs are applied, they shall not extend beyond the two corners of each LOS segment so that minimum clearances of 0.12D and 0.33D from the corners of the landing area are maintained. Similar geometric construction may be made to a square or rectangular landing area, but care shall be taken to ensure that the LOS protected surfaces minima can be satisfied from all points on the inboard perimeter of the landing area.

7.4.8 For new build helideck designs the minimum landing area size shall accommodate a circle encompassed by the outer edge of perimeter marking of at least 1D (see paragraph 7.4.5). However, from time-to-time new helicopter types may be introduced to the Malaysia operation which are not in operational use when an existing helideck was designed. In this case there is a mechanism to review operations by larger (and usually heavier) helicopters than were specified in the original design for the helideck, when subject to a thorough risk assessment. The framework for a risk assessment process for helicopter operations to helidecks on the Malaysia water, which are sub-1D, is reproduced and may be used by a helicopter operator to present a case for sub-1D operations to the CAAM. Example; AW 139 was approved to operate at S76 designed helideck (Sub-1D operation).
Figure 2: Obstacle free areas - Below landing area level (for all types of helicopters)
7.4.9 Whilst application of the criteria in paragraph 7.4.2 will ensure that no unacceptable obstructions exist above the helicopter landing area level over the whole 210° sector, it is necessary to consider the possibility of helicopter loss of height due to a power unit failure during the latter stages of the approach or early stages of take-off. Accordingly, a clear zone shall be provided below landing area level on all fixed and mobile installations between the helideck and the sea. The falling 5:1 gradient shall be at least 180° with an origin at the centre of the D-circle and ideally it should cover the whole of the 210° OFS. It shall extend outwards for a distance that will allow for safe clearance from obstacles below the helideck in the event of an engine failure for the type of 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 or the minimum distance of 1000m. All objects that are underneath anticipated final approach and take-off paths shall be assessed. The falling obstacle limitation surface is defined from points on the outboard edge of the helideck perimeter safety netting supports (not less than 1.5 metres from deck edge). Minor infringements of the surface by foam monitor platforms or access/escape routes as they are essential to the safe operation of the helideck but may also attract helicopter operational limitations.

8. Temporary Combined Operations

8.1 Temporary Combined Operations are essentially arrangements where two or more offshore installations, 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, months or for up to several years. On occasions, combined operations may include vessels working alongside one or more fixed and/or floating installations. The close proximity of installations and/or vessels one to another is likely to entail that one or more of the landing areas becomes operationally restricted due to obstacle protected surfaces being compromised and/or due to adverse environmental effects.

8.2 If the installation has obstacle protected sectors and surfaces that are severely compromised by the proximity of the other installations, a Landing Prohibited Marker shall be placed on the facility to prevent operations to the helideck. Where temporary combined operations are planned, a helicopter operator assessment shall be completed to review the physical, as well as the environmental, impact of the arrangements and to assess whether any
flight restrictions or limitations, including prohibitions, shall be disseminated to air crews. All helicopter landing areas which are determined to be ‘unavailable’ shall display the relevant landing prohibited marker by day while, by day and night, the perimeter lights shall be displayed but all other helideck lighting systems (circle/H lighting and/or helideck floodlights) shall be extinguished.

8.3 Combined operations usually involve both installations and/or vessels being in close proximity ‘alongside’ one another, where the effect of one facility on the obstacle protected surfaces of another is immediately obvious. However, during the life of a combined arrangement there may also be periods when mobile installations and/or vessels are ‘pulled-away’ to a stand-off position, which could entail them being some distance apart. It is necessary for helicopter operators to re-appraise the situation for combined operations now in the ‘stand-off’ configuration as with one or more installations or vessels ‘pulled-away’ there may then be opportunity to relax or remove limitations otherwise imposed for the ‘alongside’ configuration.

9. Multiple Platform Configurations/Location of Standby Vessels

9.1 Where two or more fixed structures are permanently bridge-linked the overall design shall ensure that the sectors and surfaces provided for the helicopter landing area(s) are not compromised by other modules which may form part of the multiple platform configurations. It is also important to assess the environmental effect of each module on the flying environment around the helideck.

9.2 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 modules may 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 module, or modification to an existing module. This will include a detailed analysis of the environmental impact on the flying environment around the helideck (e.g. using CFD).

9.3 Where there is a requirement to position, at sea surface level, offshore support vessels (e.g. a Standby Vessel or tanker) essential to the operation of a fixed or floating offshore installation located within the proximity of the fixed or floating installation’s obstacle free sector (OFS), but below helideck level, care shall be taken to ensure offshore support vessels are not
positioned to compromise the safety of helicopter operations during take-off, departure and approach to landing.

10. Surface

10.1 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.

10.2 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 paragraphs 10.3, 10.4 and 10.5.

**Table 2: Friction Requirements**

<table>
<thead>
<tr>
<th>Section of Helideck</th>
<th>Fixed Helideck</th>
<th>Mobile Helideck</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside TD/PM circle</td>
<td>0.6</td>
<td>0.65</td>
</tr>
<tr>
<td>TD/PM circle and H painted markings</td>
<td>0.6</td>
<td>0.65</td>
</tr>
<tr>
<td>Outside TD/PM circle</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**NOTE:** Unless fixed to the sea bed (e.g. a jack-up on station), the helideck on any installation requiring a helideck monitoring system (see paragraph 6.7) shall be regarded as a mobile (moving) helideck.

10.3 For flat helidecks 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 survey of the entire helideck surface in two orthogonal directions to a resolution of not less than 1 m²;
- use of a tester employing the braked wheel technique and a tyre made of the same material as helicopter tyres;
- testing in the wet condition using a tester that is capable of controlling the wetness of the deck during testing, and
- use of a tester which provides electronic data collection, storage
and processing.

Where TD/PM circle and ‘H’ lighting is installed, testing of the TD/PM circle and ‘H’ painted markings is not required.

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

10.5 For profiled helideck surfaces, typically constructed from extruded aluminium planks, new helidecks (i.e. helidecks commissioned on or after 01 January 2018), and a specimen shall be submitted to a suitably qualified and independent test facility for testing at full scale. The testing shall comprise the following:

- use of a representative helicopter wheel and tyre with a tyre contact area of at least 200 cm²;
- testing at a vertical load to produce a tyre contact pressure of at least 0.95 N/mm² and ideally 1 N/mm², and also within the normal range of loads and tyre pressures for the aircraft wheel being used for the testing;
- testing in the wet condition;
- testing in all four permutations of wheel and surface profiling directions, i.e. wheel in rolling (R) and non-rolling (N) directions, along, i.e. longitudinal (L), and across, i.e. transverse (T), the ridges of the profiling to give the four test conditions of RL, RT, NL and NT;
- at least three test runs to be performed for each test condition;
- the result for each test run shall be the average surface friction value for the run, excluding the initial peak due to static friction;
- the result for each test condition shall be the average of the (at least three) test runs for that condition;
- the overall result for the helideck specimen shall be the lowest of the results for the four conditions.

10.6 Helidecks commissioned before 01 January 2018: 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 helidecks shall be subject to in-service monitoring using the protocol specified in paragraph 10.3. The friction tester readings shall not be scaled.

10.7 For the area outside the TD/PM Circle, 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 TD/PM Circle (< 0.6 for fixed
helidecks, < 0.65 for mobile helidecks), removal of the profiling prior to grit blasting or painting is recommended or, alternatively, the fitment of a helideck net.

10.8 Landing net and wind limitation may be used as alternatives to grit blasting or anti slip painting, when the friction value for the area inside or outside of TD/PM Circle is not achieved.

**Table 3: Helideck Surface Friction & Wind Limitation**

<table>
<thead>
<tr>
<th>FRICTION LEVELS</th>
<th>MITIGATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed Installation</td>
<td>Mobile Installation</td>
</tr>
<tr>
<td></td>
<td>Inside TD/PM Circle</td>
<td>Outside TD/PM Circle</td>
</tr>
<tr>
<td>Mµ ≥ 0.65</td>
<td>Acceptable</td>
<td>Acceptable</td>
</tr>
<tr>
<td>0.6 &lt; Mµ &lt; 0.65</td>
<td>Acceptable</td>
<td>Acceptable</td>
</tr>
<tr>
<td>0.50 = Mµ &lt; 0.60</td>
<td>Acceptable</td>
<td>Acceptable</td>
</tr>
<tr>
<td>0.36 = Mµ &lt; 0.50</td>
<td>Acceptable with net OR Max 15 knots crosswind</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Mµ &lt; 0.36</td>
<td>Not Acceptable</td>
<td>Not Acceptable</td>
</tr>
</tbody>
</table>

10.9 For the area that encompasses the TD/PM Circle only, a helideck net may be used to mitigate for insufficient surface friction provided that the average surface friction value is at least 0.5. The net shall be installed and tensioned in accordance with the manufacturer’s instructions and shall have the following properties:

- the mesh size shall be such as to present an area of between 400 and 900 cm²;
- the net shall be secured at intervals approximately 1.5 metres between the lashing points around the landing area perimeter;
• 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;
• the size of the net shall such as to ensure coverage of the TD/PM Circle area but shall not cover the helideck identification marking (name) or ‘t’ value markings.

10.10 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 25 mm.

10.11 The helideck net may be any shape but shall cover the whole of the TD/PM circle, 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).

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

• the performance of TD/PM Circle and ‘H’ lighting is not impaired. This will be especially evident at low angles (i.e. less than 6 degrees) of elevation;
• the net does not impair the operation of automatic fire-fighting system ‘pop-up’ nozzles, where fitted, or otherwise compromise the firefighting facilities.

10.13 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.
11. Helicopter Tie-Down Points

11.1 Sufficient flush fitting (when not in use) tie-down points shall be provided for securing the maximum sized helicopter for which the helideck is designed.

![Diagram of Tie-Down Points]

**Figure 3: Example of Suitable Tie-Down Configuration**

**NOTE:** They shall be so located and be of such strength and construction to secure the helicopter when subjected to weather conditions pertinent to the installation design considerations. They shall also consider, where significant, the inertial forces resulting from the movement of floating units.

11.2 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.

11.3 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 TD/PM Circle and shall not...
be painted or marked with other colour. The outer circle is not required for D-values of less than 22.2 m.

12. Perimeter Safety Net

12.1 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 from edge of SLA, in the horizontal plane and be arranged so that the outboard edge does not exceed the level of the landing area more than 25 cm and angled so that it has an upward and outward slope of approximately 10°. The distance from edge of SLA to the net frame shall not be more than 0.5m, which include the gap from edge of the helideck to the net frame which shall not be more than 0.2m.

12.2 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 shall be conducted every 2 years.

13. Access Points

13.1 For reasons of safety it is necessary to ensure that embarking and disembarking passengers are not required to pass around the helicopter tail rotor, or around the nose of helicopters having a low-profile main rotor, when a ‘rotors-running turn-round’ is conducted (in accordance with normal offshore operating procedures). Many helicopters have passenger access on one side only and helicopter landing orientation in relation to landing area access points is therefore very important. Safety notice shall be displayed at the access point as reminder of the hazards of rotor blade, unauthorised entry, FOD, head gear, PPE, etc.
13.2 There shall be a minimum of two access / egress routes to the helideck. The arrangements shall be optimised to ensure that, in the event of an accident or incident on the helideck, personnel will be able to escape upwind of the landing area. Adequacy of the emergency escape arrangements from the helideck shall be included in any evacuation, escape and rescue analysis for the installation, and may require a third escape route to be provided.

13.3 The need to preserve, in so far as possible, an unobstructed falling 5:1 gradient (see paragraph 7.4.9 and Figure 2) and the provision of up to three helideck access/escape routes, with associated platforms, may present a conflict of requirements. A compromise may therefore be required between the size of the platform commensurate with its effectiveness and the need to retain the protection of an unobstructed falling 5:1 gradient. In practice, the 5:1 gradient is taken from the outboard edge of the helideck perimeter safety net supports. Emergency access points which extend outboard from the perimeter safety net constitute a compromise in relation to an unobstructed falling 5:1 gradient which may lead, in some instances, to the imposition of helicopter operating limitations. It is therefore important to construct access point platforms in such a manner as to infringe the falling 5:1 gradient by the smallest possible amount but preferably not at all. Suitable positioning of two major access points clear of the requirements of the protection of the falling 5:1 gradient shall be possible. However, the third access referred to at paragraph 13.2 will probably lie within the falling 5:1 sector and where this is the case it should be constructed within the dimensions of the helideck perimeter safety net supports (i.e. contained within a horizontal distance of 1.5 - 2.0 m measured from the edge of the landing area).

13.4 Where foam monitors are co-located with access points, care shall be taken to ensure that no monitor is so close to an access point as to cause injury to escaping personnel by operation of the monitor in an emergency situation.

13.5 Where handrails associated with helideck access/escape points exceed the 25 cm height limitations, 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.

13.6 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.
14. Normally Unmanned Installations (NUIs)

14.1 Guano and associated bird debris are a major problem for NUIs. Associated problems concern the health hazard on board; degradation of visual aids (markings and lighting) and friction surfaces; and the potential for Foreign Object Debris/Damage (FOD). Helicopter operators shall continuously monitor the condition of NUI helidecks and advise the owner/operator before marking and lighting degradation becomes a safety concern. NUIs shall be monitored continuously for signs of degradation of visual cues and flights shall not be undertaken to helidecks where essential visual cues for landing are insufficient.

15. Visual Aids

15.1 General

15.1.1 The name of the installation shall be clearly displayed in such positions on the installation so that it can be readily identified from the air and sea from all normal angles and directions of approach. For identification from the air the helideck name and the side identification panels are used. The names on both identification markings shall be identical, simple and unique and facilitate unambiguous communication via radio. The installation identification panels shall be highly visible in all light conditions and from all directions of approach. To assist identification and safe operations, helicopter operator shall produce the Helideck Chart as reference. Sample of the chart as Appendix C.

15.1.2 Helideck markings (specifically the installation identification marking) and side identification panels are used by pilots to obtain a final pre-landing confirmation that the correct helideck is being approached. It is therefore vital that the helideck markings and side identification panels are maintained in the best possible condition, regularly re-painted and kept free of all visibility-reducing contaminants. Helideck operators shall ensure that specific inspection and re-painting maintenance procedures and schedules for helideck markings and side identification panels take account of the importance of their purpose. Side identification panels shall be kept free of any obscuring paraphernalia (draped hoses etc.) and be as high as possible on the structure. Helideck Technical Drawing shall be updated when changes made to the markings.
15.1.3 The installation identification shall be marked in white characters on the helideck surface between the origin of the OFS and the TD/PM Circle in symbols not less than 1.2 metres where a helideck is below 16.0m. For all helidecks 16.0m and greater, whether new builds or at the next scheduled repaint, the character height shall be increased to 1.5m in white which contrasts with the helideck surface. The name shall not be obscured by the deck net (where fitted). For an unpainted aluminium surface, the installation identification (in white characters) shall be displayed against a black background.

15.1.4 Helideck perimeter line marking and lighting serves to identify the limits of the SLA for day and night operations respectively.

15.1.5 A wind direction indicator (windsock) shall be provided and located so as to indicate the free stream wind conditions at the installation/vessel location. It is often inappropriate to locate the primary windsock as close to the helideck as possible where it may compromise obstacle protected surfaces, create its own dominant obstacle or be subjected to the effects of turbulence from structures resulting in an unclear wind indication. The windsock shall be illuminated for night operations. Some installations may benefit from a second windsock to indicate a specific difference between the local wind over the helideck and the free stream wind. One spare wind sock shall be available on board.

**Windsock Size**

A wind direction indicator should be a truncated cone made of lightweight fabric and should have the following minimum dimensions:

<table>
<thead>
<tr>
<th></th>
<th>Elevated Heliports &amp; Helidecks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>1.2m</td>
</tr>
<tr>
<td>Diameter (larger end)</td>
<td>0.3m</td>
</tr>
<tr>
<td>Diameter (smaller end)</td>
<td>0.15m</td>
</tr>
</tbody>
</table>

**Windsock Visibility**

i. The colour of the wind direction indicator should be selected as to make it clearly visible and understandable from a height of at least 200 m (650 ft) above the heliport, having regard to background.
ii. Where practicable, a single colour, preferably white or orange, should be used. Where a combination of two colours is required to give adequate conspicuity against changing backgrounds, they should preferably be orange and white, red and white, or black and white, and should be arranged in five alternate bands the first and last band being the darker colour.

15.1.6 For character marking dimensions, use 15% of character height with 10% of character height between characters (extreme right-hand edge of one character to extreme left-hand edge of next character) and approximately 50% of character height between words.

15.2 Helideck Landing Area Markings

15.2.1 The colour of the helideck shall be dark green or natural grey colour of aluminium. The cleanliness and the condition of the surface shall be maintained and clear from debris, guano, corrosion and flaking. The perimeter of the landing area shall be clearly marked with a white painted line 30 cm wide (see Figure 4). Non-slip materials shall be used. For natural grey aluminium, the conspicuity of the helideck markings need to be enhanced by overlaying white markings on a painted black background. Additionally, conspicuity of the yellow TD/PM Circle shall be enhanced by outlining the deck marking with a 10 cm thin black line.
15.2.2 The origin of the 210° OFS for approach and take-off shall be marked on the helideck by a black chevron, each leg being 79 cm long and 10 cm wide forming the angle in the manner shown in Figure 5. On minimum sized helidecks where there is no room to place the chevron where indicated, the chevron marking, but not the point of origin, may be displaced towards the D-circle centre. Where the OFS is swung, it shall be reflected in the alignment of the chevron. The purpose of the chevron is to provide visual guidance to the HLO so that he can ensure that the 210° OFS is clear of obstructions before giving a helicopter clearance to land. The black chevron shall be painted on top of the (continuous) white perimeter line to achieve maximum clarity for the helideck crew.
15.2.3 The actual D-value of the helideck shall be painted in black or white on the helideck inboard or outboard of within 0.5 meter from the chevron in alphanumeric symbols 10 cm high. It shall be written in metres, with two decimals place; i.e. D=20.25m. Where, for an existing installation, a helideck has been accepted which does not meet the normal minimum OFS requirements of 210°, the black chevron shall represent the angle which has been accepted and this value shall be marked a similar manner to the certificated D-value.

15.2.4 The helideck D-value shall also be marked around the perimeter of the helideck in white characters no less than 90 cm high, in the manner shown in Figures 3 and 4. The D-value shall be expressed to the nearest whole number with 0.5 rounded down. For an unpainted aluminium surface helideck D-value(s) (in white characters) shall be displayed against a black background.

15.2.5 A maximum allowable mass marking shall be marked on the helideck in a position which is readable from the preferred final approach direction, i.e. towards the OFS origin. The marking shall consist of a two- or three- digit
number expressed to one decimal place rounded to the nearest 100 kg and followed by the letter ‘t’ to indicate the allowable helicopter mass in tonnes (1000 kg). The height of the figures shall be 90 cm with a line width of approximately 12 cm and shall be white. For an unpainted aluminium surface, a maximum allowable mass marking (in white characters) shall be displayed against a black background. For helidecks which were designed for Sikorsky S76 and S61 and approved for the operations of Leonardo AW 139 (6.8t); and Sikorsky S92A and Airbus H225 respectively, the marking shall remain as original value.

15.2.6 A Touchdown/Positioning Marking (TD/PM) shall be provided (see Figures 6 and 7). The marking shall be a yellow circle with an inner diameter of 0.5 of the certificated D-value of the helideck and a line width of 1 metre (for helidecks below 16m the line width may be reduced to 0.5m). The centre of the marking shall be concentric with the centre of the D-circle.

![Diagram of a Touchdown/Positioning Marking Circle](image)

**Figure 6:** Touchdown/Positioning Marking Circle (TD/PM Circle to be painted Yellow)

15.2.7 On a helideck the centre of the TD/PM Circle will normally be located at the centre of the landing area, except that the marking may be offset away from the origin of the OFS by no more than 0.1D where an aeronautical
study indicates such offsetting to be beneficial, provided that the offset marking does not adversely affect the safety of flight operations or ground handling issues.

15.2.8 A white heliport identification marking ‘H’ marking shall be marked collocated with the TD/PM with the cross bar of the ‘H’ lying along the bisector of the OFS. Its dimensions are 4m x 3m x 0.75m. For helidecks having a D-value below 16.0m, the dimensions of the 'H' marking may be reduced to 3m x 2m x 0.5m.

![Diagram](image)

**Figure 7**: Dimensions of Heliport Identification Marking 'H' ('H' to be Painted White)

15.2.9 Where the OFS has been swung, the positioning of the TD/PM and ‘H’ shall comply with the normal unswung criteria. However, the ‘H’ shall be orientated so that the bar is parallel to the bisector of the swung sector.

15.2.10 Prohibited landing heading sector (PLHS) shall be marked where it is necessary to protect the tail of the helicopter from landing or manoeuvring in close proximity to limiting obstructions which, for example, infringe the
150° LOS protected surfaces, or blocking the single access. The prohibited sectors are to be shown by red hatching of the TD/PM, with white and red hatching extending from the red hatching out to the edge of the landing area as shown in Figures 8 and 9. When positioning over the TD/PM, helicopters shall be manoeuvred so as to keep the aircraft nose clear of the hatched prohibited sector(s) at all times.

**Figure 8:** Specification for the Layout of PLHS on Helidecks
15.2.11 For certain operational or technical reasons, an installation may have to prohibit helicopter operations. In such circumstances, where the helideck cannot be used, the ‘closed’ state of the helideck shall be indicated by use of the signal shown in Figure 10. This signal is the standard ‘landing prohibited’ signal given in the Rules of the Air and Air Traffic Control Regulations, except that it has been altered in size to just cover the letter ‘H’ inside the TD/PM.

**Figure 9**: Example of Prohibited Landing Heading Marking

**Figure 10**: Landing Prohibited Marker

**Note**: Marker covers ‘H’ inside TD/PM.
15.2.12 Colours shall conform to the following BS 381C (1996) standard or the equivalent BS 4800 colour. White shall conform to the RAL charts.

- **RED BS 381C: 537 / RAL 3001** (Signal Red) BS 4800: 04.E.53 / RAL 2002 (Poppy)

- **YELLOW BS 381C: 309 / RAL1018** (Canary Yellow) BS 4800: 10.E.53 / RAL1023 (Sunflower Yellow)

- **DARK GREEN BS 381C: 267 / RAL 6020** (Deep Chrome Green) BS 4800: 14.C.39 (Holly Green)

- **WHITE RAL 9010** (Pure White) RAL 9003 (Signal White)

16. Lighting

16.1 Perimeter Lighting

16.1.1 The periphery of the landing area shall be described by omni-directional green LED perimeter lights visible from on or above the landing area; however, the pattern formed by the lights shall not be visible to the pilot from below the elevation of the landing area. Perimeter lights shall be mounted above the level of the helideck but shall not exceed the height limitations. The lights shall be equally spaced at intervals of not more than three (3) metres around the perimeter of the landing area, coincident to or adjacent with the white line delineating the perimeter (see paragraph 15.2.1 above). In the case of square or rectangular decks there shall be a minimum of four lights along each side including a light at each corner of the landing area. Recessed helideck perimeter lights may be used at the inboard (150° LOS origin) edge of the landing area where an operational need exists to move large items of equipment to and from the landing area, e.g. where a run-off area is provided there may be a need to move the helicopter itself to and from the landing area onto the adjacent run-off (parking) area. When perimeter lightings installed at certain part of helideck are not coincide with the white perimeter marking, or some sectors of the helidecks is temporarily unsafe, red perimeter lighting shall be installed to delineate such sectors. The lightings controls shall be accessible to, and controlled by, the HLO or Radio Operator.

16.1.2 Where the declared D-value of the helideck is less than the physical
helideck area, the perimeter lights shall be coincidental with the white perimeter marking and black chevron and delineate the limit of the useable landing area so that, in unusual circumstances where a helicopter touches down inboard of the TD/PM Circle, it can land safely by reference to the perimeter lights on the 150° LOS ‘inboard’ side of the helideck without risk of the main rotor striking obstructions in this sector. By applying the LOS clearances from the perimeter marking and coincident lighting, adequate main rotor to obstruction separation shall be achieved for the worst-case helicopter intended to operate to the helideck.

16.2 TD/PM Circle and ‘H’ Lightings

16.2.1 A new lighting scheme comprising a lit TD/PM Circle and a lit heliport identification 'H' marking has therefore been developed and is effectively mandated for operations taking place at night or IMC in Malaysia water from 1 April 2018. This scheme has been clearly demonstrated to provide the visual cues required by the pilot earlier on in the approach, and much more effectively than floodlighting and without the disadvantages associated with floodlights such as glare. The CAAM has therefore replaced the traditional floodlighting systems with the new offshore helideck lighting scheme. All helidecks to operate on day and night and IMC operation shall install TDPM lighting otherwise will be restricted to day VMC operation only.

16.2.2 The new lighting scheme is compatible with helicopters having wheeled undercarriages. The lighting system, segments and subsections containing lighting elements shall compliant with maximum obstacle height of 25 mm. When the landing net is installed together, the maximum obstacle height of 30 mm shall be complied. The TD/PM Circle lighting shall be in yellow with minimum of 16 segments and superimposed on centre of the aiming circle, whilst the heliport identification 'H' lighting shall be in green and outlined the ‘H’ marking. A minimum of 90 % of the lights shall be serviceable for night and IMC Operations. The helideck operator shall ensure the condition of the lens is satisfactory to ensure the required brightness is available. Beginning 1 April 2019, all newly installed lighting type shall be approved by the CAAM with a technical data endorsed or certified by UK CAAi.

16.2.3 Although no longer recommended for the provision of primary visual cueing, floodlighting systems may be retained for the purpose of providing a source of illumination for on-deck operations such as refuelling and
passenger handling and, where required, for lighting the installation name on the helideck surface or as a back-up to the new lighting. Unless otherwise instructed by the aircrew the floodlights shall be switched off during the acquisition, approach to hover, landing and take-off phases. In addition, particular care shall be taken to maintain correct alignment to ensure that floodlights do not cause dazzle or glare to pilots while either in-flight or landed on the helideck. All floodlights shall be capable of being switched on and off at the pilot’s request. The TD/PM Circle and H lighting; and floodlighting controls shall be accessible to, and controlled by, the HLO or Radio Operator.

16.3 Helideck Status Light System

16.3.1 For NUI, a visual warning system shall be installed as a condition can exist on an installation which may be hazardous for the helicopter or its occupants. 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. 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 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. A specification for a status light system is as below:

- 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. 360° in azimuth.
- The effective intensity shall be a minimum of 700 cd between 2° and 10° above the horizontal and at least 176 cd at all other angles of elevation.
- 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.
- 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 the second bullet point above.
- The colour of the status light(s) shall be red, colours for
aeronautical ground lights. 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%.

- The light system shall be integrated with platform safety systems such that it is activated automatically in the event of a process upset.
- Facilities shall be provided for the HLO to manually switch on the system and/or override automatic activation of the system.
- The light system shall have a response time to the full intensity specified not exceeding three seconds at all times.
- Facilities shall be provided for resetting the system which, in the case of NUJs, do not require a helicopter to land on the helideck.
- 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.
- The system and its constituent components shall comply with all regulations relevant to the installation.
- 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).
- 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.

16.3.2 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).

16.3.3 Where helideck status light systems installed on NUI malfunction, whether the outcome is light(s) permanently flashing or disabled/depowered, in these cases, to allow them to be manually reset at the platform, a duty-holder may present a case-specific risk assessment to the helicopter operator, who if satisfied with the duty-holder's risk assessment, may raise
a dispensation request to CAAM that, where accepted, would permit flights against operating status lights or black platforms to occur.

16.4 UPS requirement

16.4.1 Installation/vessel emergency power supply design shall include the entire landing area lighting system. Any failures or outages shall be reported immediately to the helicopter operator. The lighting shall be fed from an Uninterruptable Power Supply (UPS) system.

17. Obstacles – Marking and Lighting

17.1 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 nor more than six metres wide. The use of 'Day-Glo' orange may also be acceptable. The colour shall be chosen to contrast with the background to the maximum extent.

17.2 Obstacles to be marked in these contrasting colours include any lattice tower structures and crane booms, in addition to obstacles which are close to the helideck or the LOS boundary. Similarly, parts of the leg or legs of jack-up units adjacent to the landing area which extend, or can extend, above it shall also be marked in the same manner. Lattice towers shall be painted in their entirety.

17.3 Omnidirectional low intensity steady red obstruction lights conforming to the specifications for low intensity obstacle (Group A) 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 the installation 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 the helicopter pilot. Such arrangements shall be discussed with the helicopter operator. Offshore duty holders may, where appropriate, consider alternative equivalent technologies to highlight dominant obstacles in the vicinity of the helideck.

17.4 An omni-directional low intensity steady red obstruction light shall be fitted to the highest point of the installation. The light shall conform to the specifications for a low intensity obstacle (Group B) light, having a minimum intensity of 50 candela for angles of elevation between 0 and 15 degrees, and a minimum intensity of 200 candela 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.

17.5 In the particular case of jack-up units, it is recommended that when the tops of the legs are the highest points on the installation, they shall be fitted with omni-directional low intensity steady red lights. In addition, the leg or legs adjacent to the helideck shall be fitted with intermediate low intensity steady red lights 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. Any ancillary structure within one kilometre of the landing area, and which is 10m or more above helideck height, shall be similarly fitted with red lights.

17.6 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.

17.7 Installation/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.

18. Helideck Rescue and Firefighting Facilities

18.1 Introduction

18.1.1 This Chapter sets out the requirements regarding provision of equipment, extinguishing media, personnel, training, and emergency procedures for offshore helidecks on installations and vessels.
18.2 Key design characteristics – Principal agent

18.2.1 A key aspect in the successful design for providing an efficient, integrated helideck rescue and firefighting 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 equipment inventory unusable or preclude the use of some passenger escape routes.

18.2.2 Delivery of firefighting media to the landing area at the appropriate application rate shall be achieved in the quickest possible time. A delay shall be 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 for the range of weather conditions prevalent for the Malaysia operations. 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.

18.2.3 Foam-making equipment shall be of adequate 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 for the equipment. 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 foam to the landing area at or above the minimum application rate. For areas of the helideck or its appendages which, for any reason, may be otherwise inaccessible to an FMS, it is necessary to provide additional hand-controlled foam branches.

18.2.4 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 to the elements or be protected from them. Where protection is the chosen option, it shall not prevent the equipment being brought into use quickly and effectively. The effects of condensation on stored equipment shall be considered.
18.2.5 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.

18.2.6 The application rate is dependent on the types of foam concentrate in use and the types of foam application equipment selected. For fires involving aviation kerosene, ICAO has produced a performance test which assesses and categorises the foam concentrate. Most foam concentrate manufacturers will be able to advise on the performance of their concentrate against this test. The Conformity test shall be carried out annually and certified passed or satisfactory. The certificate of conformity minimum requirements shall be referred to CAAM HCC. The CAAM mandates that 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 6.0 litres per square metre per minute.

18.2.7 **Calculation of Application Rate:** Example for a D-value 22.2 metre helideck (Level B foams)

\[
\text{Application rate} = 6.0 \times \pi \times r^2 (6.0 \times 3.142 \times 11.1 \times 11.1) = 2322 \text{ litres per minute.}
\]

It is established that the application rate for foam meeting performance level C may be reduced to 3.75 litres per square metre per minute and in the calculation in lieu of 6.0 litres.

**Calculation of Application Rate:** Example for a D-value 22.2 metre helideck (Level C foams)

\[
\text{Application rate} = 3.75 \times \pi \times r^2 (3.75 \times 3.142 \times 11.1 \times 11.1) = 1452 \text{ litres per minute.}
\]

18.2.8 Given the remote location of helidecks the overall capacity of the foam system shall exceed that necessary for initial extinction of any fire. Five minutes discharge capability is generally considered by the CAAM to be reasonable.
18.2.9 **Calculation of Minimum Operational Stocks:** Using the 22.2 metre example as shown in paragraph 18.2.7, a 1% foam solution discharged over five minutes at the minimum application rate will require $2322 \times 1\% \times 5 = 116$ litres of foam concentrate. A 3% foam solution discharged over five minutes at the minimum application rate will require $2322 \times 3\% \times 5 = 348$ litres of foam concentrate.

18.2.10 Sufficient reserve foam of a minimum operational stocks to allow for replenishment as a result of operation of the system during an incident, or following training or testing, will also need to be held in a separate container. The tank and reserve container shall be marked of type of foam.

18.2.11 Low expansion foam concentrates can generally be applied in either aspirated or unaspirated form. It shall be recognised that whilst unaspirated foam may provide a quick knockdown of any fuel fire, aspiration, i.e. induction of air into the foam solution by monitor or by hand-controlled foam branch (see below), gives enhanced protection after extinguishment. Wherever non-aspirated foam equipment is selected during design, additional equipment capable of producing aspirated foam for post-fire security/control shall be provided.

18.2.12 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 litres/min through each hose line. A single hose line, capable of delivering aspirated foam at a minimum application rate of 225 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 firefighting tactics. The provision of additional hand-controlled foam branches is necessary to address any residual fire situation. However, any residual fire may also be tackled with the use of portable foam extinguishers or twin agent hoses.

18.2.13 As an effective alternative to an FMS, offshore duty holders are strongly encouraged to consider the provision of 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 prevalent on Malaysia water. 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 constraints stated in paragraph 18.2.2, achieving an average (theoretical) application rate over the entire landing area (based on the D-circle) of 6.0 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 in paragraph 18.2.7

18.2.14 The precise number and layout of 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. 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 in paragraph 18.2.7 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. Conversely for other areas of the helideck the application rate in practice may fall below the average (theoretical) application rate specified in paragraph 18.2.7. 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 in paragraph 18.2.7 for the critical area calculation.

18.2.15 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.
19. Complementary Media & Normally Unmanned Installations

19.1 The basic concept for the scheme is to allow the option of limiting exposure to the risk of a post-crash fire as an alternative to reducing the associated probability or mitigating the consequences. In view of the wide range of potential causes, achieving an adequate reduction in the probability of a post-crash fire event is considered to be unrealistic. Mitigation through the provision of fire-fighting equipment is possible but may be uneconomic for some installations.

19.2 Table below is predicated on a helicopter with an overall length of 15.0 m up to, but not including, 24.0 m, having an assumed average fuselage length of 14.5 m and an average fuselage width of 2 m. The complementary agents’ requirement are also applicable for NMI. Reserve stocks of complementary media to allow for replenishment due to activation of the system following an incident or a testing or training, shall be held.

<table>
<thead>
<tr>
<th>Foam Meeting Performance Level B</th>
<th>Complementary Agents</th>
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<tbody>
<tr>
<td>Foam (litres)</td>
<td>Dry Chemical Powder</td>
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<td>45</td>
</tr>
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<td></td>
<td>and CO₂ (kg)</td>
</tr>
<tr>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

Table 4: Foam and Complementary Agents

20. Rescue Equipment

20.1 One set of rescue equipment as Appendix D shall be made available. Sizes of the equipment are not detailed but shall be appropriate to the types of helicopter expected to use the helideck.

20.2 HLO shall ensure that the rescue equipment is checked and maintained monthly. Rescue equipment shall be stored in clearly marked and secure watertight cabinets or boxes. An inventory checklist of equipment shall be held inside each cabinet/chest.
21. Personnel Levels

21.1 The facility shall have sufficient trained firefighting personnel immediately available whenever aircraft movements are taking place. They shall be deployed in such a way as to allow the appropriate firefighting and rescue systems to be operated efficiently and to maximum advantage so that any helideck incident can be managed effectively. The HLO shall be readily identifiable to the helicopter crew as the person in charge of helideck operations. The preferred method of identification is a brightly coloured ‘HLO’ tabard. The helideck crew composition shall be minimum of 1 x HLO and 2 x HDA. For NUI, one HLO is the minimum composition. All helideck crew shall be HERT trained.

22. Personal Protective Equipment (PPE)

22.1 All responding rescue and firefighting personnel shall be provided with appropriate PPE to allow them to carry out their duties in an effective manner.

22.2 Sufficient Helideck Emergency Response trained personnel to operate the RFF equipment effectively shall be dressed in protective clothing prior to helicopter movements taking place.

22.3 For the selection of appropriate PPE account shall be taken of the Provision and Use of Work Equipment Regulations (PUWER) and the Personal Protective Equipment at Work Regulations (PPEWR), which require equipment to be suitable and safe for intended use, maintained in a safe condition and (where appropriate) 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.

22.4 A responsible person(s) shall be appointed to ensure that all PPE is installed, stored in sufficiently sized storage with drying facilities, used, checked and maintained in accordance with the manufacturer’s instructions.
23. Training

23.1 All HLO and HDA initial training and renewal shall be carried out at CAAM H-ATO with Helicopter Familiarization Module prior to certificate issuance. OPITO certified HLO and HDA course are acceptable with additional attendance of the relevant Helicopter Familiarization Module prior to mobilization. Certification by the installation owner after HOIT is required after the crew have completed all the required training as required by OPITO standard framework. The validity is two (2) years.

23.2 HERT training shall be carried out at training facilities equipped with mock up helicopter and helideck, or at the installation itself. The pre-requisite for any helideck crew to attend HERT course is attended HLO/HDA courses and certified. The validity is two (2) years. By 1 January 2020 all helideck crew shall be trained as HERT at HCC approved ATO or OPITO.

23.3 Radio Operator training shall be carried out at CAAM H-ATO. The validity is two (2) years. However, mobile installation and vessel operators are given up to three (3) months from the date of inspection for certification or the day they start operations in Malaysia, whichever comes first, to ensure their Radio Operators obtain certificate from CAAM H-ATO. This deferment shall be notified through Helideck Limitations List (HLL).

23.4 All Aerodrome Managers shall attend Helideck Standards Course (HSC) once throughout the position appointment.

24. Emergency Procedures

24.1 The installation or vessel emergency procedures manual shall specify the actions to be taken in the event of an emergency involving a helicopter on or near the installation or vessel. Exercises designed specifically to test these procedures and the effectiveness of the firefighting teams shall take place at regular intervals with a minimum of once a year.

24.2 Helicopter Emergency Diagram which displays danger area during embarkation and disembarkation and emergency escape exits shall be displayed in the briefing room or helideck access.
25. Miscellaneous Operational Standards

25.1 Collection and Retention of Meteorological Information

25.1.1 Records of all meteorological reports that are issued are required to be retained for a period of at least 28 days.

25.2 Calibration of meteorological equipment sensors

25.2.1 Calibration of primary and back-up meteorological equipment sensors used to provide the data shall be carried out annually. The helideck monitoring system which able to carry out self-calibration is accepted as long the data and reading are commensurate with actual conditions and confirmed by pilots during helicopter operations on helideck.

25.2.1 Calibration of the electronic pitch, roll, and heave measuring equipment shall be carried out annually. The conventional equipment does not require calibration but shall be checked for fit for purpose.

25.2.2 If available, AWOS, which normally self-calibrated is accepted as long the data and reading is commensurate with actual conditions and confirmed by pilots during helicopter operations on helideck.

26. Location in Respect to Other Landing Areas in the Vicinity

26.1 Mobile installations and support vessels with helidecks may be positioned adjacent to other installations so that mutual interference/overlap of obstacle protected surfaces occur. Also, on some installations there may be more than one helideck which may result in a confliction of obstacle protected surfaces.

26.2 Where there is confliction as mentioned above, within the OFS and/or falling gradient out to a distance that will allow for both an unobstructed departure path and safe clearance for obstacles below the helideck in the event of an engine failure for the type of helicopter the helideck is intended to serve (Note: 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), simultaneous operation of two helicopter landing areas is not to take place without prior consultation with the helicopter operator. It is possible, depending upon the
distance between landing areas and the operational conditions which may pertain, that simultaneous operations can be permitted but suitable arrangements for notification of helicopter crews and other safety precautions will need to be established. In this context, ‘flotels’ will be regarded in the same way as any other mobile installation which may cause mutual interference with the parent installation approach and take-off sector.

27. Control of Crane Movement in the Vicinity of Landing Areas

27.1 Cranes can adversely distract pilots’ attention during helicopter approach and take-off from the helideck as well as infringe fixed obstacle protected surfaces. Therefore, it is essential that when helicopter movements take place (±10 minutes), all the crane work within 500 m from helideck shall ceases operation and positioned clear of the obstacle protected surfaces and flight paths.

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

28. Helicopter Operation Support Equipment

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

- chocks; ‘NATO sandbag’ type for helideck with landing net.
- tie-down strops; 3000 kg to 5000 kg, unless carried by helicopter.
- heavy-duty minimum 150 kg, annually calibrated, accurate scales for passenger baggage and freight weighing;
- equipment for showing passenger briefing

28.2 The VHF radio for the purpose of communicating with aircraft shall be made available in the Radio Room. The radio log shall be administered accordingly and kept for at least 28 days. HLO shall be equipped with one portable VHF with appropriate head set. Radio Operators, HLOs, Helideck Assistants and other persons who operate VHF aeronautical radio equipment and in communication with helicopter in flight are required to hold an HRO Certificate of Competence.

28.3 Offshore fixed installations, mobile installations and vessels which have
28.4 The refuelling system maintenance, inspection and calibration shall be conducted as per OEM’s requirement. The inspection report shall be made available during helideck certification. Prior to refuelling operation, the system shall be inspected and accepted by the helicopter operator, thereafter annual acceptance shall be carried out.

29. Helicopter Operations to Helidecks in the Malaysia Water which are Sub-1D

29.1 The following table shall form the basis of an aeronautical study (risk assessment) conducted by, or on behalf of, an offshore helicopter operator when intending to service helidecks using helicopters with an overall length (D) greater than the design D of the helideck (referred to in this document as a sub-1D operation). The assumption is made that sub-1D operations will only be considered in the following circumstances and/or conditions:

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.

2. For a helideck that provides a load bearing surface (represented by the Touchdown and lift-off area - the TLOF) of between 0.83D and 1D, it shall be ensured that a minimum 1D circle (representing the Final approach and take-off area – the FATO) is assured for the containment of the helicopter. From the periphery of the FATO (not the TLOF) the LOS extends; the non-load-bearing area between the TLOF perimeter and the FATO perimeter shall be entirely free of ‘non-permitted’ obstacles while ensuring that any objects essential for the operation located on or around the TLOF (load bearing) perimeter shall not exceed the revised obstruction height criteria set out in paragraph 5 below.
(3) This assessment may be considered for any helideck on a fixed offshore installation whether an NMI or NUI. An installation or vessel that is subject to dynamic motions exceeding stable deck criteria in pitch, roll and heave, shall not be considered for alleviation from the ASG 904 1D Standard.

(4) This assessment when applied to helidecks permitting the outboard edge of the (approximately) 1.5 m helideck perimeter netting to extend above the level of the landing area by no more than 25 cm (i.e. no structural modification of deck edge netting supports is mandated by Annex 14 where the 25 cm height limitation is not exceeded for older installations). However, for installations completed on or after 1 January 2012 it is expected that the height of the helideck safety net be no greater than the adjacent helideck load-bearing surface.

(5) For helidecks that are minimum size (0.83D), ICAO Annex 14 Volume II prescribes the height limit for permitted objects around the edge of the TLOF, and in the 1st segment of the LOS, to be 5 cm. For helidecks which are =>1D (and also have a D-value >16.00 m) a 25 cm limitation is currently applied. This risk assessment is content to permit for existing helidecks with a TLOF between the 0.83D minimum and the 1D (standard) a rising scale for the treatment of essential objects around of the TLOF perimeter and for the 1st segment of the LOS. “Essential objects” permitted around the edge of the TLOF are notified in ASG 904, and include helideck guttering and raised kerb, helideck lighting, foam monitors (or ring-main system) where provided and, helideck perimeter netting for helidecks completed on or before 1 January 2012. For sub-1D operations the following limits may apply between the TLOF and FATO boundary and in the LOS 1st segment: For a TLOF: >0.83D = 5 cm ADL, >0.92D = 15 cm ADL, 1D> = not more than 25 cm ADL. For helidecks completed after 14 November 2013 where the TLOF is 16.00 m or less all essential objects around the TLOF shall be limited to 5 cm. Figure 11 illustrates a 0.83D minimum size TLOF. The inner circle bounded by the octagonal-shaped helideck represents the sub-1D TLOF (in the illustration a 0.83D load bearing surface). The outer circle illustrates the 1D FATO which provides containment of the helicopter and from which is derived the origin of the LOS. The chevron denoting the origin shall be physically marked at the periphery of the FATO. The diameter of the TLOF is the declared D, marked at the chevron.
(6) Operations to sub-1D fixed helidecks shall not be considered below 0.83D. Operations to mobile helidecks shall not be considered below 1D.

(7) The size of the landing area shall not be less than minimum dimensions prescribed in the approved Rotorcraft Flight Manual Supplement.
Figure 11: Obstacle Limitation Surface and Sectors for a 0.83D TLOF
Non-compliance with ICAO standards/considerations/mitigations to account for compromise

|   | Potential for a reduction in the distance from helideck (TLOF) centre to the limited obstacle sector (LOS) (denoting the origin of the 1st and 2nd segments). Annex 14 Volume II (4th Edition), Section 4.2.16 and Figure 4-9 | It is essential that clearance from obstacles in the LOS is maintained; for this reason, the sub-1D load bearing (landing) surface (the TLOF) should be surrounded by a 1D circle (the FATO) that is, with the exception of permitted objects, free of any obstacles. This will reflect the obstacle clearances provided for a 1D helideck (but see also the provision of 6). To ensure that obstacle clearances are maintained for the helicopter, the touchdown and positioning marking circle should be 0.5 of the notional 1D FATO (not of the landing surface (the TLOF)). The TD/PM circle requires repainting if the difference in the inner diameter of the circle is significant i.e. >0.5m (or if the obstacle environment is already compromised). The TD/PM circle is located at the centre of the TLOF; and never offset (Annex 14, Volume II, 5.2.10.4, ASG 904 and CAP 437 Glossary of Terms for TD/PM circle refer). E.g.: For a helicopter with a D=17.50m operating to a 16.00m diameter load bearing TLOF, the inner diameter of the TD/PM circle, located on helideck (TLOF) centre, should be 17.50 x 0.5 = 8.75m. The FATO minimum diameter should be 17.50m. |
|   | Reduction in suitable and sufficient visual references required for the pilot during all flight phases. | Adequate visual cues provided for aircrew are essential for the conduct of safe operations to helidecks. On a sub-1D helideck it is likely these will to some extent be compromised. An aeronautical study shall ensure that visual cues, within their field of view are adequate for aircrew to perform the following visual tasks:
- Identification of helideck location early on in the approach
- Visual cues to help maintain the sight picture during approach
- Visual cues on final approach to hover position
- Visual cues for landing
- Visual references on lift-off and hover

It is important that the helideck visual cues (in the form of effective markings and lighting) are in accordance with ASG 904 and that markings and deck mounted lighting remain uncontaminated at all times (e.g. deposits of guano on the surface of a helideck may compromise markings and/or deck-mounted lighting). A wind sock shall be provided to facilitate an accurate indication of wind direction and strength over the helideck. For night operations lighting systems shall include effective obstruction lighting in addition to helideck lighting (consisting of perimeter lights and “H” and circle lighting) and an illuminated windsock. |
<p>|   | ICAO Heliport Manual, Chapter 5 |   |
| 3 | Reduction in the space available for passengers and crew to safely alight and embark the helicopter and to transit to and from the operating area safely. | The reduction in available load-bearing surface (area) means that clearances between passengers/crew moving around the helideck and the rotor systems of the helicopter are reduced. It is essential that this is fully considered on a helicopter type specific basis. It shall be ensured that sufficient access points are available to avoid the situation of passengers and crew having to pass close to helicopter ‘no-go’ areas (e.g. in relation to main and tail rotor systems). Where, to avoid these issues, personnel are required to transit close to the deck edge, an operating (wind) limit may need to be considered to assure the safe movement of passengers. Additional lighting may be required to ensure safe movements are maintained at night. | ICAO Heliport Manual, Section 2.3.1.3 |</p>
<table>
<thead>
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<th>4</th>
<th>Reduction in the space available for securing helicopters, for the conduct of safe and efficient refuelling operations (where provided) and for post-crash teams to provide effective fire and rescue intervention in the event of an incident or accident occurring. ICAO Heliport Manual, Section 2.3.1.3 and Section 6.8.1</th>
<th>The surface area available shall be able to comfortably accommodate a sufficient tie-down pattern arrangement to allow the most critical helicopter(s) to be tied-down (as required). Where refuelling operations are conducted the space available around the helicopter shall allow this to occur safely and efficiently at all times. Sufficient access points shall be provided to allow fire and rescue teams to move to the scene of a helideck incident or accident from an upwind location and to allow passengers to escape downwind to safety.</th>
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<tr>
<td>5</td>
<td>Elements of the helicopter will be over permitted obstacles at the edge of the load bearing landing surface. ICAO Annex 14 Volume II, Section 3.3.4, 3.3.12 and 3.3.13</td>
<td>Commencing at the 3rd Edition of Annex 14 Volume II, the permitted height for essential objects located around the TLOF in the 210° obstacle free sector and in the 1st segment of the 150° limited obstacle sector reduced from 25 cm (10’) for a 1D helideck to 5 cm (2’) for a TLOF which is less than 1D and/or 16.00m or less. For new builds this is regarded as adequate mitigation for the reduction in the dimension of the load bearing area to address the presence of objects which because of their function are required to be located immediately around the TLOF. For existing installations where a TLOF is provided which is larger than the minimum (0.83D), but &lt;=1D, the maximum height of essential objects around the perimeter may be relaxed [on an ascending scale] in accordance with H.1 Condition 5.</td>
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<tr>
<td>6</td>
<td>Reduction in the margin built-in to allow for touchdown / positioning inaccuracies during landing. ICAO Annex 14 Volume II, Section 5.2.10.1 and 5.2.10.2</td>
<td>It shall be assumed that even amongst experienced, well trained aircrew there will inevitably be some degree of variability in the actual point of touchdown within the landing area. The touchdown/postioning marking circle provides an effective visual reference to guide the handling pilot to the point of touchdown (See ASG 904 Glossary of Terms, including Note, for the TD/PM circle) but scatter has potential to occur, particularly where external factors beyond a pilot’s control come into play. This may include the influences of prevailing meteorological conditions at the time of landing (e.g. wind, precipitation etc.), and/or any helideck environmental effects encountered (e.g. turbulence, thermal effects). There is also the unplanned incidence of a sudden partial power loss (an engine malfunction) to consider at a critical stage of the approach to land or take-off. ASG 904</td>
</tr>
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<td></td>
<td>addresses environmental effects in detail and where these cannot be fully ‘designed out’, it may be necessary to apply operating restrictions to ensure flights only occur in acceptable conditions. To mitigate for touchdown /positioning inaccuracies in challenging Meteorological conditions it may be necessary to impose additional restrictions e.g. limits applied for a combination of wind speed and direction. It is essential that a good visual means of assessing wind strength and direction is always provided for the pilot by day and by night. Markings shall be kept free of contamination which may reduce a pilot's ability to touchdown accurately. The TD/PM circle and “H” shall be lit for night operations.</td>
<td></td>
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<tr>
<td>7</td>
<td>Reduction in ‘helpful ground cushion’ effect from rotor downwash.</td>
<td></td>
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<tr>
<td></td>
<td>It is a condition of Annex 14 Volume II, Section 3.3.9 that the TLOF shall provide ground effect. The reduction in the load bearing area (TLOF) for sub-1D operations means that the beneficial effect of ground cushion will likely suffer some reduction. The reduction in helpful ground cushion needs to be considered for each helicopter on a case-by-case basis, particularly when operating to a sub-1D helideck with a perforated surface i.e. some modern helideck designs incorporate a passive fire-retarding feature which allows unburned fuel to drain away through specially manufactured holes consisting in a drain-hole pattern over the surface of the load bearing area.</td>
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</table>
Appendix A   HELIDECK OPERATIONS MANUAL

Helideck Operations Manual is mandatory for Helideck Certification and shall be formulated to include but not limited to the following:

1. INTRODUCTION/GENERAL

1.1 General information, including the following
   1.1.1 name of helideck operator, and address and telephone number[s] at which the operator can always be contacted;
   1.1.2 name of Aerodrome Manager
   1.1.3 Purpose and scope of the Helideck Operation Manual
   1.1.3 the condition for use of the helideck, including operational limitation and restriction;

2. PARTICULARS OF THE HELIDECK
   (The detailed information of individual helideck could de describe at Appendix A to the Helideck Operation Manual; and shall include location; size and tonnage; helideck height, limitation, etc)

3. ROLES, RESPONSIBILITIES AND COMPETENCY REQUIREMENTS.

4. HELICOPTER AND HELIDECK OPERATIONS
   4.1 Introduction
   4.2 Helideck Manning Level
   4.3 Communication Equipment
   4.4 Navigation Equipment
   4.5 Flight Flow
   4.6 Communication Procedures
   4.7 Radio Silence Procedures
   4.8 Crane operations
   4.9 Passengers Management
   4.10 Cargo Management

5. HELIDECK REGULATIONS
   5.1 Physical Aspects
   5.2 Visual Aids
   5.3 Fire-Fighting and Rescue Facilities
   5.4 Personal Protective Equipment (PPE)
6. HELIDECK LIMITATION LIST
   6.1 Content
   6.2 Non-compliance (with photo if possible)
   6.3 Mitigation
   6.4 Restriction or penalty

7. EMERGENCY RESPONSE PROCEDURE
   7.1 Action during Emergency
   7.2 Guidance on Emergency Actions
   7.3 Crash on the Helideck
   7.4 Crash on the Helideck, Major Spillage with No Fire
   7.5 Significant Fuel spillage, Rotor Turning
   7.6 Evacuation by Helicopter
   7.7 Man Overboard
   7.8 Emergency or Precautionary Landing
   7.9 Inadvertent Wheel-up Landing
   7.10 Helicopter Incident on Landing
   7.11 Wrong Deck Landing
   7.12 Fire on the Helideck/in the Helicopter
   7.13 Helicopter Crash into the Water
   7.14 Emergency Landing

8. INSPECTION AND MAINTENANCE OF HELIDECK AREA
   8.1 Particulars of procedures for the inspection and maintenance of helideck area
      8.1.1 arrangements for routine maintenance and inspection;
      8.1.2 maintenance of surface areas, markings and drainage;
      8.1.3 details of inspection intervals and times;
      8.1.4 inspection checklist and logbook; and
      8.1.5 reporting of inspection findings and correction actions;

9. HELIDECK ADMINISTRATION
   9.1 Particulars of the helideck administration, including:
      9.1.1 the helideck organizational chart showing the name and position of key personnel
      9.1.2 the duty-list and responsibilities of key personnel, Aerodrome Manager which normally is the Offshore Installation Manager (OIM/PIC/Master)
      9.1.3 Helideck Landing Officer (HLO), Helideck Inspector, Medic and Helideck Radio Operator (HRO)
9.1.4 the name and telephone number of the Aerodrome Manager

10. SAFETY MANAGEMENT SYSTEM (SMS)

10.1 SMS Elements

This Para shall describe all aspects of the Aerodrome Operator SMS and its contents shall include the following four (4) components and twelve (12) elements:

1. Safety Policy and Objectives
   a. Management commitment
   b. Safety accountability and responsibilities
   c. Appointment of key safety personnel
   d. Coordination of emergency response planning
   e. SMS documentation

2. Safety Risk Management
   a. Hazard identification
   b. Safety risk assessment and mitigation

3. Safety Assurance
   a. Safety performance monitoring and measurement
   b. The management of change
   c. Continuous improvement of the SMS

4. Safety Promotion
   a. Training and education
   b. Safety communication

Note: Risk Management

The Aerodrome Operator shall develop and maintain a formal risk management process that ensures the analysis, assessment and control of risks to an acceptable level. The risks in each hazard identified shall be analysed in terms of probability and severity of occurrence, and assessment for their tolerability via the hazard identification processes.

The organization shall define the levels of management with Authority to make safety risk tolerability decisions. The organization shall define safety controls for each risk assessed as intolerable.

Detailed CAAM SMS requirement can be referred to ASG 105 Safety Management System.
Sample of risk assessment matrix is as follows:

### Probability of Occurrences

<table>
<thead>
<tr>
<th>Qualitative Definition</th>
<th>Meaning</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent</td>
<td>Likely to occur many times (Has occurred frequently)</td>
<td>5</td>
</tr>
<tr>
<td>Occasional</td>
<td>Likely to occur some times (Has occurred infrequently)</td>
<td>4</td>
</tr>
<tr>
<td>Remote</td>
<td>Unlikely, but possible to occur (Has occurred rarely)</td>
<td>3</td>
</tr>
<tr>
<td>Improbable</td>
<td>Very unlikely to occur (Not known has occurred)</td>
<td>2</td>
</tr>
<tr>
<td>Extremely Improbable</td>
<td>Almost inconceivable that the event will occur</td>
<td>1</td>
</tr>
</tbody>
</table>

### Severity of Occurrences

<table>
<thead>
<tr>
<th>Qualitative Definition</th>
<th>Meaning</th>
<th>Value</th>
</tr>
</thead>
</table>
| Catastrophic           | • Equipment destroyed  
                        | • Multiple deaths | A     |
| Hazardous              | • A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely.  
                        | • Serious injury or death to a number of people.  
                        | • Major equipment damage | B     |
| Major                  | • A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of increase in workload, or as a result of conditions impairing their efficiency.  
                        | • Serious incident.  
                        | • Injury to persons. | C     |
| Minor                  | • Nuisance.  
                        | • Operating limitations.  
                        | • Use of emergency procedures.  
                        | • Minor incident. | D     |
| Negligible             | Little consequences | E     |

<table>
<thead>
<tr>
<th>Risk Probability</th>
<th>Risk Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Catastrophic</td>
</tr>
<tr>
<td>5 – Frequent</td>
<td>5A</td>
</tr>
<tr>
<td>4 – Occasional</td>
<td>4A</td>
</tr>
<tr>
<td>3 – Remote</td>
<td>3A</td>
</tr>
<tr>
<td>2 – Improbable</td>
<td>2A</td>
</tr>
<tr>
<td>1 – Extremely improbable</td>
<td>1A</td>
</tr>
</tbody>
</table>
Appendix B HELIDECK DESIGN GUIDANCE

1. A review of offshore helideck environmental issues (see CAA Paper 99004) concluded that many of the decisions leading to poor helideck operability had been made in the very early stages of design and recommended that it would be easier for designers to avoid these pitfalls if comprehensive helideck design guidance was made available to run in parallel with CAP 437. As part of the subsequent research programme, material covering environmental effects on offshore helideck operations was commissioned by the HSE and the CAA. This material is now presented in CAA Paper 2008/03: “Helideck Design Considerations – Environmental Effects” and is available on the Publications section of the CAA website at www.caa.co.uk/publications. It is strongly recommended that platform designers and offshore duty holders consult CAA Paper 2008/03 at the earliest possible stage of the design process.

2. The objective of CAA Paper 2008/03 is to help platform designers to create offshore installation topside designs and helideck locations that are safe and ‘friendly’ to helicopter operations by minimising exposure to environmental effects. It is hoped that, if used from ‘day one’ of the offshore installation design process when facilities are first being laid out, this manual will prevent or minimise many helideck environmental problems at little or no extra cost to the design or construction of the installation.

DESIGN CRITERIA

1. The design criteria given in the following paragraphs represent the current best information available and shall be applied to new installations, to significant modifications to existing installations, and to combined operations (where a mobile platform or vessel is operating in close proximity to another installation). In the case of multiple platform configurations, the design criteria shall be applied to the arrangement as a whole.

Note:
When considering the volume of airspace to which the following criteria apply, installation 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 points. This is deemed to be up to a height above the helideck corresponding to 30 ft plus wheels-to-rotor height plus, one rotor diameter.
2. All new-build offshore helidecks, modifications to existing topside arrangements which could potentially have an effect on the environmental conditions around an existing helideck, or helidecks where operational experience has highlighted potential airflow problems shall be subject to appropriate wind tunnel testing or Computational Fluid Dynamics (CFD) studies to establish the wind environment in which helicopters will be expected to operate. As a general rule, a limit on the standard deviation of the vertical airflow velocity of 1.75 m/s shall not be exceeded. The helicopter operator shall be informed at the earliest opportunity of any wind conditions for which this criterion is not met. Operational restrictions may be necessary.

Note:
2.1 Following completion of the validation exercise, the provisional limit on the standard deviation of the vertical airflow velocity of 2.4 m/s specified in CAP 437 fifth edition was lowered to a threshold advisory limit of 1.75 m/s. This change was made to allow for flight in reduced cueing conditions, for the less able or experienced pilot, and to better align the associated measure of pilot workload with operational experience. However, it was known at the time that the lower criterion is close to onshore background turbulence levels, and that it would be unusual for a helideck not to exceed the lower threshold limit for at least some wind speeds and directions. In consideration of this the lower threshold limit of 1.75 m/s is intended to draw attention to conditions that might result in operating difficulties and to alert pilots to exercise caution, unless, or until, operating experience has confirmed the airflow characteristics to be acceptable. Therefore, the lower limit functions as the baseline which may be refined in light of in-service experience. Conversely if the airflow significantly exceeds the upper criterion of 2.4 m/s it may be advisable to consider modifications to the helideck to improve airflow (such as by increasing the air-gap), if operating restrictions are to be avoided. It is recommended that use is made of the helicopter operators' existing operations monitoring programmes to include the routine monitoring of pilot workload and that this be used to continuously inform and enhance the quality of the HLL entries for each platform (see CAA Paper 2008/02 – Validation of the Helicopter Turbulence Criterion for Operations to Offshore Platforms).

Note:
2.2 Following the establishment of the new turbulence criterion for helicopters operating to offshore installations, the need for retention of the long-standing CAP 437 criterion related to a vertical wind component of 0.9 m/s has been reviewed. As it has not been possible to link the criterion to any helicopter performance (i.e. torque related) or handling (pilot work related) hazard, it is considered that the vertical mean wind speed criterion can be removed from CAP 437. The basis for the removal from CAP 437 is described in detail in CAA Paper 2008/02 Study II – A Review of 0.9 m/s Vertical Wind Component Criterion for Helicopters Operating to Offshore Installations.
3. Unless there are no significant heat sources on the installation or vessel, offshore duty holders shall commission a survey of ambient temperature rise based on a Gaussian dispersion model and supported by wind tunnel tests or CFD studies for new-build helidecks, for significant modifications to existing topside arrangements, or for helidecks where operational experience has highlighted potential thermal problems. When the results of such modelling and/or testing indicate that there may be a rise of air temperature of more than 2°C (averaged over a three-second time interval), the helicopter operator shall be consulted at the earliest opportunity so that appropriate operational restrictions may be applied.

4. Previous editions of CAP 437 have suggested that ‘some form of exhaust plume indication shall be provided for use during helicopter operations, for example, by the production of coloured smoke’. Research has been conducted into the visualisation of gas turbine exhaust plumes and guidance on how this can be achieved in practice has been established. This work is now reported in CAA Paper 2007/02 which recommends that consideration shall be given to installing a gas turbine exhaust plume visualisation system on platforms having a significant gas turbine exhaust plume problem in order to highlight the hazards to pilots and thereby minimising its effects by making it easier to avoid encountering the plume. It is further recommended that use is made of the helicopter operators’ existing operations monitoring programmes to establish and continuously monitor the temperature environments around all offshore platforms. This action is aimed at identifying any ‘problem’ platforms, supporting and improving the contents of the HLL, identifying any new problems caused by changes to platform topsides or resulting from combined operations, and identifying any issues related to flight crew training or procedures.

5. The maximum permissible concentration of hydrocarbon gas within the helicopter operating area is 10% Lower Flammable Limit/ Lower Explosive Limit (LFL/LEL). Concentrations above 10% LFL/LEL have the potential to cause helicopter engines to surge and/or flame out with the consequent risk to the helicopter and its passengers. It shall also be appreciated that, in forming a potential source of ignition for flammable gas, the helicopter can pose a risk to the installation itself. It is considered unlikely that routine ‘cold flaring’ will present any significant risk, but the operation of emergency blow-down systems shall be assumed to result in excessive gas concentrations. Installation operators shall have in place a management system which ensures that all helicopters in the vicinity of any such releases are immediately advised to stay clear.
Note:
5.1 The installation of ‘Status Lights’ systems (see Chapter 4, paragraph 4.25) is not considered to be a solution to all potential flight safety issues arising from hydrocarbon gas emissions; these lights are only a visual warning that the helideck is in an unsafe condition for helicopter operations.

6. For ‘permanent’ multiple platform configurations, usually consisting of two or more bridge-linked fixed platforms in close proximity, where there is a physical separation of the helideck from the production and process operation, the environmental effects of hazards emanating from the ‘remote’ production platform 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 that carries any exhaust plumes from a neighbouring platform (bridge-linked module) in the direction of the helideck.

7. For ‘temporary’ combined operations, where one mobile installation or vessel (e.g. a flotel) is operated in close proximity to a fixed installation, the environmental effects of hazards emanating from one installation (or vessel) on the other installation (or vessel) shall be fully considered. This ‘assessment’ shall consider the effect of the turbulent wake from one platform impinging on the helideck of the other, and of any hot or cold gas exhausts from one installation or vessel influencing the approach to the other helideck. On occasions there may be more than two installations and/or vessels in a ‘temporary combined’ arrangement. Where this is the case, the effect of turbulent wake and hot gas exhausts from each installation or vessel on all helideck operations within the combined arrangement shall be considered.

Note:
7.1 Paragraphs 3.13 and 3.14 are primarily concerned with the issue of environmental effects on the helideck design. In respect of permanent multi-platform configurations and ‘temporary’ combined operations there are a number of other considerations that may need to be addressed. These include, but may not be limited to, the effect of temporary combined operations on helideck obstacle protection criteria. Additional considerations are described in more detail in Chapter 3 paragraphs 3.31 to 3.33 (Temporary Combined Operations) and in paragraphs 3.34 to 3.36 (Multiple Platform Configurations).
### HELIDECK LIMITATION LIST

1. Prohibited Landing Heading Segment was drawn for obstruction and single access.

2. Weight penalty of 5% from the calculated Take Off and Landing Weight for possible out of wind take off and landing due to PLHS

### SPECIAL PROCEDURES
## Appendix D  RESCUE EQUIPMENT

<table>
<thead>
<tr>
<th>Helicopter RFF Category</th>
<th>H1/H2</th>
<th>H3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable Wrench</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rescue axe, large (non-wedge or aircraft type)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cutter, bolt</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Crowbar, large</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hook, grab or salving</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hacksaw (heavy duty) and six spare blades</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Blanket, fire resistant</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ladder (two pieces)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Life line (5mm circumference x 15 m in length) plus rescue harness</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pliers, side cutting (tin snips)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Set of assorted screw drivers</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Harness knife and sheath or harness cutters (each helideck crew)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Man-made Mineral Fibre (MMMF) Filter Masks (each helideck crew)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gloves Fire resistant (each helideck crew)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Power cutting tool</td>
<td>-</td>
<td>1</td>
</tr>
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Appendix E  NDB FLIGHT INSPECTION REPORT

<table>
<thead>
<tr>
<th>Station</th>
<th>Serial No</th>
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</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Ident</td>
</tr>
<tr>
<td>Station Coordinates</td>
<td>Height</td>
</tr>
<tr>
<td>Owner</td>
<td>Type of Inspection</td>
</tr>
<tr>
<td>Inspection Date</td>
<td>Last Inspection Date</td>
</tr>
<tr>
<td>Pilot-in-Command</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Identification (Morse Code)</td>
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<tr>
<td>Interference</td>
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</tr>
<tr>
<td>I.A.P (+/- 10 degrees)</td>
<td>deg</td>
</tr>
<tr>
<td>Frequency (Nominal)</td>
<td>kHz</td>
</tr>
<tr>
<td>Frequency (Actual)</td>
<td>kHz</td>
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<tr>
<td>Coverage:</td>
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</tr>
<tr>
<td>Enroute</td>
<td>Nm</td>
</tr>
</tbody>
</table>

COMMENTS:

RECOMMENDED FACILITIES CLASSIFICATION: SATISFACTORY / UNSATISFACTORY

Facility Checked By:

........................................
Pilot in Command:
Aircraft registration: