Australian Government
Civil Aviation Safety Authority

ADVISORY CIRCULAR
AC 139.R-01 v3.1

Guidelines for heliports - design and operation

File ref: D24/504641

December 2024

Advisory circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

Advisory circulars should always be read in conjunction with the relevant regulations.

Audience

This advisory circular (AC) applies to:

- persons involved in the design, construction, and operation of heliports
- proponents of heliports
- helicopter owners/operators
- planning authorities
- aerodrome operators
- the Civil Aviation Safety Authority (CASA).

Purpose

The purpose of this AC is to provide guidance in the planning, design, and operation of heliports to support the safe and efficient operation of helicopters operating under both visual flight rules (VFR) and instrument flight rules (IFR).

This AC is not intended to restrict or limit a pilot from determining the most suitable landing area for the helicopter operation.

For further information

For further information or to provide feedback on this AC, visit CASA's contact us page.

Unless specified otherwise, all subregulations, regulations, Divisions, Subparts and Parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

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Status

This version of the AC is approved by the National Manager, Flight Standards Branch.

Note: Changes made in the current version are annotated with change bars.

Table 1: Status

Version	Date	Details
v3.1	December 2024	Inclusion of additional guidance for determining the design helicopter, and additional guidance on turbulence.
v3.0	August 2024	New information on aeronautical assessments in Section 4.2, Additional provisions for marking and lighting in section 5.2.1, and improved information about obstacle markings in section 5.2.18; rescue and firefighting provisions included in section 6.2, further detail of response times in section 6.5; additional guidance on the testing of the emergency plan in Section 6.10 and further information on radio licence requirements, and the addition of Appendix C rescue and firefighting equipment and services r assessment considerations. Additional notes have been added to address potential contradictions and gaps. Minor editorial changes including additional acronyms; additional references to international advisory material. Appendix D Airspace hazard safety assessment considerations has been added.
v2.1	February 2024	Single addition to the list of 'Advisory material' in the 'References' section.
v2.0	December 2023	Inclusion of detailed downwash and outwash information.
v1.1	November 2023	Minor amendments to address error in figures 3 & 4 as well as amendments to address apparent contradictions and gaps.
v1.0	June 2022	Initial issue. This concert with AC 91-29 this AC replaces CAAP 92-2(2) and CAAP 92-4(0).

Contents

Acknowledgement of Country

The Civil Aviation Safety Authority (CASA) respectfully acknowledges the Traditional Custodians of the lands on which our offices are located and their continuing connection to land, water and community, and pays respect to Elders past, present and emerging.

Artwork: James Baban.

1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Table 2: Acronyms

Acronym	Description
AC	advisory circular
ACMA	Australian Communications and Media Authority
AEO	all engines operating
AHJ	authority having jurisdiction
AIP	aeronautical information publication
AM(R)S	Aeronautical Mobile (Route) Service
ASPSL	arrays of segmented point source lighting
CASA	Civil Aviation Safety Authority
CASR	*Civil Aviation Safety Regulations 1998*
DIFFS	deck integrated firefighting system
FATO	final approach and take-off area
FAS	fixed application system
FFAS	fixed foam application system
FM	flight manual
FMS	fixed monitor system
FOD	foreign object debris
HIGE	hover in ground effect
HOGE	hover out of ground effect
HRP	heliport reference point
HV diagram	height-velocity diagram (as contained in the FM)
ICAO	International Civil Aviation Organization
IFR	instrument flight rules
LOS	limited obstacle sector/surface
LP	luminescent panels
MOS	Manual of Standards
MTOW	maximum take-off weight

Acronym	Description
NASF	national airports safeguarding framework
OEI	one engine inoperative
OLS	obstacle limitation surface
PC1	performance class 1
PC2	performance class 2
PC3	performance class 3
PIC	pilot in command
PinS	point-in-space
SA	safety area
RFM	rotorcraft flight manual
SARPS	standards and recommended practices
SHLS	strategically important helicopter landing site
TDPC	touchdown/positioning circle
TDPM	touchdown/positioning marking
TLOF	touchdown and lift off area
UCW	undercarriage width
VFR	visual flight rules
VMC	visual meteorological conditions

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below. Where definitions from the civil aviation legislation have been reproduced for ease of reference, these are identified by 'grey shading'. Should there be a discrepancy between a definition given in this AC and the civil aviation legislation, the definition in the legislation prevails.

Table 3: Definitions

Term	Definition
aerodrome	Repeated from the *Civil Aviation Act 1988*: An area on land or water (including any buildings, installations, and equipment), the use of which as an aerodrome is authorised under the regulations, being such an area intended to be used either wholly or in part for the arrival, departure, and movement of aircraft.
authority having jurisdiction	A government department, agency, authority, organisation, office or individual that has the authority and is responsible for enforcing the requirements of Legislation, an Order, Code or Standard, who may also be responsible for

Term	Definition
	enforcing an instruction or approving, an item of equipment, assembly, materials, installation, method or a procedure.
category A procedure	A procedure presented in the normal procedures, performance sections or performance supplement sections of the FM referenced as being mandatory requirements in the limitations section (unless a HV diagram valid for category A operations is presented), which assures adequate designated ground or water area and adequate performance capability for continued safe flight or safe rejected take-off in the event of engine failure
D	For rotorcraft, the maximum dimension of the rotorcraft. Typically, it is the largest overall dimension of the helicopter when rotor(s) are turning measured from the most forward position of the main rotor tip path plane to the most rearward position of the tail rotor tip path plane or helicopter structure.
design D	The D of the design helicopter.
D-value	A limiting dimension, in terms of "D", for a heliport, helideck or shipboard heliport, or for a defined area within.
declared distances - heliports	The following: a. take off distance available (TODAH): length of the FATO plus the length of helicopter clearway (if provided) declared available and suitable for helicopters to complete the take-off. b. rejected take-off distance available (RTODAH): length of the FATO declared available and suitable for helicopters operated in performance class 1 to complete a rejected take-off. c. landing distance available (LDAH): length of the FATO plus any additional area declared available and suitable for helicopters to complete the landing manoeuvre from a defined height.
downwash protection zone	The downwash protection zone is designed to protect the general public, other aircraft and those working in the immediate vicinity of an operating helicopter from the hazards of downwash and outwash.
dynamic load-bearing surface	A surface capable of supporting all types of loads generated by a helicopter in motion.
elevated heliport	A heliport located on a raised structure on land with a FATO or TLOF location that would introduce a risk of fall from height* or introduce a hazard to aircraft operations or to other people within or around the structure under the heliport. For information on managing the risk of falls at workplaces, refer to the relevant Safework Australia, State or Territory Safety Agency Code of Practice.
elevated helicopter clearway	A helicopter clearway that has been raised to a level that provides obstacle clearance
elongated*	When used with TLOF or FATO, elongated means an area which has a length more than twice its width.
final approach and take-off area (FATO)	For the operation of a rotorcraft at an aerodrome, means the area of the aerodrome: a. from which a take-off is commenced; or b. over which the final phase of approach to hover is completed.

Term	Definition
flight manual	for an aircraft: see clause 37 of Part 2 of the CASR Dictionary.
helicopter	means a heavier-than-air aircraft supported in flight by the reaction of the air on one or more normally power-driven rotors on substantially vertical axes.
helicopter clearway	A defined area on the ground or water, selected and/or prepared as a suitable area over which a helicopter operated in performance class 1 may accelerate and achieve a specific height.
helicopter landing site	An aerodrome, including a heliport, intended for use wholly or partly for the arrival, departure, or movement of helicopters and, when designed to and capable of accommodating, other rotorcraft or VTOL capable aircraft.
helicopter stand	A defined area intended to accommodate a helicopter for purposes of loading or unloading passengers, mail or cargo; fuelling, parking or maintenance; and, where air taxiing operations are contemplated, the TLOF.
helicopter taxiway	A defined path on a heliport intended for the ground movement of helicopters and that may be combined with an air taxi-route to permit both ground and air taxiing.
helicopter taxi-route	A defined path established for the movement of helicopters from one part of a heliport to another. a. Air taxi-route. A marked taxi-route intended for air taxiing. b. Ground taxi-route. A taxi-route centred on a taxiway.
helideck	Notwithstanding the definition of helideck contain in flight operations regulations, in relation to heliport design specifications, it is a heliport located on a fixed or floating offshore facility such as an exploration and/or production unit used for exploitation of oil or gas.
heliport	A helicopter landing site that meets or exceeds the specifications contained within this advisory circular.
heliport elevation	The elevation of the highest point of the FATO.
heliport reference point	The designated location of a heliport.
point-in-space (PinS) approach	The point-in-space approach is based on GNSS and is an approach procedure designed for helicopter only. It is aligned with a reference point located to permit subsequent flight manoeuvring or approach and landing using visual manoeuvring in adequate visual conditions to see and avoid obstacles.
point-in-space (PinS) visual segment	This is the segment of a helicopter PinS approach procedure from the MAPt to the landing location for a PinS “proceed visually” procedure. This visual segment connects the PinS to the landing location.
protection area	A defined area surrounding a stand intended to reduce the risk of damage from helicopters accidentally diverging from the stand.
obstacle	A fixed (whether temporarily or permanently) or mobile object, structure, or part of such objects and structures, that: a. is located on an area provided for the surface movement of aircraft; or b. extends above a defined surface designated to protect aircraft in flight; or c. stands outside the defined surfaces mentioned in paragraphs (a) and (b) and that have been assessed as being a hazard to air navigation.

Term	Definition
obstacle limitation surfaces	Means surfaces extending outwards and upwards from the FATO or safety area at angles compatible with the flight characteristics of the helicopter, used to evaluate approach and take-off climb surfaces for clearance of obstacles.
performance class	For a stage of flight of a rotorcraft, has the meaning given by the Part 133 Manual of Standards.
rejected take-off area	A defined area on a heliport suitable for helicopters operating in performance class 1 to complete a rejected take-off.
rotorcraft	means: (a) a helicopter; or (b) a gyroplane; or (c) a powered-lift aircraft.
runway-type FATO	A FATO having characteristics similar in shape to a runway
safety area	A defined area on a heliport surrounding the FATO which is free of obstacles, other than those required for air navigation purposes, and intended to reduce the risk of damage to helicopters accidentally diverging from the FATO.
shipboard heliport	Notwithstanding the definition of helideck contain in flight operations regulations, in relation to heliport design specifications, it is a heliport located on a ship that may be purpose or non-purpose built. A purpose-built shipboard heliport is one designed specifically for helicopter operations. A non-purpose-built shipboard heliport is one that utilises as area of the ship that is capable of supporting a helicopter but not specifically designed for that task.
static load bearing surface	A surface capable of supporting the mass of a helicopter situated on it.
Strategically important helicopter landing site	Means an HLS declared by a state or territory to be of critical need to the provision of identified services, including: a. an HLS associated with a hospital; or b. an HLS provided with point-in-space (PinS) approach instrument flight procedures; or c. any other facility identified as strategic by State/Territory or Commonwealth government/authorities.
touchdown and lift-off area (TLOF)	The surface over which the touchdown and lift-off is conducted. **Note:** A TLOF may be collocated with a FATO, or a stand.
touchdown positioning circle (TDPC)	A touchdown positioning marking in the form of a circle use for omnidirectional positioning in a TLOF.
touchdown/positioning marking (TDPM)	A marking or set of markings providing visual cues for the positioning of helicopters.
winching area	An area provided for the transfer by helicopter of personnel or stores to or from a ship.

1.3 References

Legislation

Legislation is available on the Federal Register of Legislation website https://www.legislation.gov.au/

Table 4: Legislation references

Document	Title
Part 139 MOS	Part 139 (Aerodromes) Manual of Standards 2019
Part 133	Civil Aviation Safety Amendment (Part 133) Regulations 1998
Part 133 MOS	Part 133 (Australian Air Transport Operations—Rotorcraft) Manual of Standards 2020
Part 91	Civil Aviation Safety Amendment (Part 91) Regulations 1998
Part 91 MOS	Part 91 (General Operating and Flight Rules) Manual of Standards 2020

International Civil Aviation Organization documents

International Civil Aviation Organization (ICAO) documents are available for purchase from http://store1.icao.int/

Many ICAO documents are also available for reading, but not purchase or downloading, from the ICAO eLibrary (https://elibrary.icao.int/home).

Table 5: ICAO references

Document	Title
ICAO SARPs	Annex 14 to the Convention on International Civil Aviation - Aerodromes - Volume II Heliports
ICAO Doc 9261	Heliport Manual
ICAO SARPs	Annex 6 Part III to the Convention on International Civil Aviation - Meteorological Services for International Air Navigation
ICAO SARPs	Annex 3 to the Convention on International Civil Aviation - Meteorological Services for International Air Navigation

Advisory material

CASA's advisory materials are available at https://www.casa.gov.au/publications-and-resources/guidance-materials

Table 6: Advisory material references

Document	Title
AC 1-01	Understanding the legislative framework
AC 91-29	Guidelines for helicopters - suitable places to take-off and land
AC 133-01	Performance class operations

Table 7: International advisory material

Document	Title
Helicopter Rotor Downwash Safety Guidebook	Preventing the Adverse Effects of Rotor Downwash. Director Générale de l'Aviation Civil (DGAC) France and French Aviation Safety Network (RSAF) (https://www.ecologie.gouv.fr/sites/default/files/guidance_material_helicopter_downwash.pdf)
NFPA 418	National Fire Protection Association - Standards for Heliports and Vertiports
UK CAP 437	Standards for offshore helicopter landing areas (CAA) (CAP 437: Standards for offshore helicopter landing areas | Civil Aviation Authority (caa.co.uk)) (CAP 437: Standards for offshore helicopter landing areas | Civil Aviation Authority (caa.co.uk)
UK CAP 1264	Standards for Helicopter Landing Areas at Hospitals (CAA) (https://www.caa.co.uk/publication/download/21880)
UK CAP 2576	Understanding the downwash/outwash characteristics of eVTOL aircraft. United Kingdom Civil Aviation Authority. (Hyperlink: https://publicapps.caa.co.uk/docs/33/CAP2576%20eVTOL%20aircraft%20downwash%20outwash.pdf)

National Airports Safeguarding Framework principles and guidelines

National Airports Safeguarding Framework principles and guidelines are available at https://www.infrastructure.gov.au/infrastructure-transport-vehicles/aviation/aviation-safety/aviation-environmental-issues/national-airports-safeguarding-framework/national-airports-safeguarding-framework-principles-and-guidelines

Table 8: National Airports Safeguarding Framework principles and guidelines

Document	Title
Guideline B	Managing the risk of building generated windshear and turbulence at airports
Guideline H	Protecting Strategically Important Helicopter Landing Sites

2 Introduction

2.1 Background

2.1.1 While regulation 91.410 of CASR places the onus on the helicopter operator and pilot in command (PIC) to consider all circumstances associated with safely taking off or landing at a place prior to doing so, it also ensures via subregulation 91.410(3) of CASR that any place that can be safely used for such operations is considered an aerodrome for the purposes of the legislation.

2.1.2 The generic term for an aerodrome used for the purposes of the taking-off or landing of rotorcraft, specifically helicopters, is helicopter landing site (HLS). Other forms of rotorcraft, such as gyroplanes and powered-lift aircraft may be able to use a HLS if not prevented from doing so by operational rules, requirements or other safety of flight considerations.

2.1.3 Where a standalone HLS is not itself a certified aerodrome or is an element of a larger certified aerodrome servicing other aircraft such as aeroplanes, a place may be authorised for use as an aerodrome by regulation 91.410 of CASR if the helicopter operator and PIC determines it is suitable for the landing and taking-off of aircraft. For further information, refer to Advisory Circular 91-29 Guidelines for helicopters - suitable places to take-off and land (AC 91.29).

2.1.4 Nothing in this AC precludes the use of information contained in the AC by the operators of HLS. HLS operators may choose to use this information in the context and scale of their operation, and the nature of aircraft operations they intend to support.

2.1.5 Hazards resulting from the operation of rotorcraft at heliports should be equally considered by the operators of HLS to ensure risks to people, animals, building and things not related to the operation of the helicopter or HLS are sufficiently considered, in the context of their intended operations

2.1.6 Variations of HLS types include heliports, basic HLS, secondary HLS, ground level HLS, elevated HLS, helidecks and strategically important HLS (SHLS). HLS may consist of one-off, short-term, temporary, or permanent facilities. Information about basic HLS and secondary HLS is included in AC 91-29 Guidelines for helicopters-suitable places to take off and land. SHLS are HLS declared by a state or territory to be of critical need to the provision of identified services. Refer to the National Airports Safeguarding Framework, Guideline H - Protecting strategically important helicopter landing sites for further information.

2.1.7 The use of the term HLS operator or helicopter operator refers to the person or organisation given authority to facilitate the use of the facility by the rotorcraft. The operator may be the facility owner, or a person or organisation authorised by the facility owner. As heliports are a subset of HLS, the focus of this AC is the use of heliports by rotorcraft, as shown in Figure 1 - Forms of uncertified aerodromes. However, the information contained in this AC may be of equal relevance to other forms of HLS.

2.1.8 The 'use of land' for the purpose of an HLS is a land use planning matter and thus certain types of aircraft operations should consider local planning regulations[1].

2.1.9 Further information on SHLS is included in National Airport Safeguarding Framework (NASF) Guideline H[2].

2.1.10 Variations of HLS types include heliports, basic HLS, secondary HLS, ground level HLS, elevated HLS, helidecks and strategically important HLS (SHLS). HLS may consist of one-off,

[1] Refer Victorian Civil and Administrative Tribunal matters cited in Planning requirements for heliports and helicopter landing sites- Planning Practice Note 75 (PPN75-Planning-requirements-for-heliports-and-helicopter-landing-sites.pdf)

[2] Refer National Airport Safeguarding Framework (NSAF) Guideline H at https://www.infrastructure.gov.au/sites/default/files/documents/8.1.1-Guideline-H-Helicopters.pdf

short-term, temporary, or permanent facilities. Information about basic HLS and secondary HLS is included in AC 91-29 Guidelines for helicopters-suitable places to take off and land. SHLS are HLS declared by a state or territory to be of critical need to the provision of identified services. Refer to the National Airports Safeguarding Framework, Guideline H - Protecting strategically important helicopter landing sites for further information.

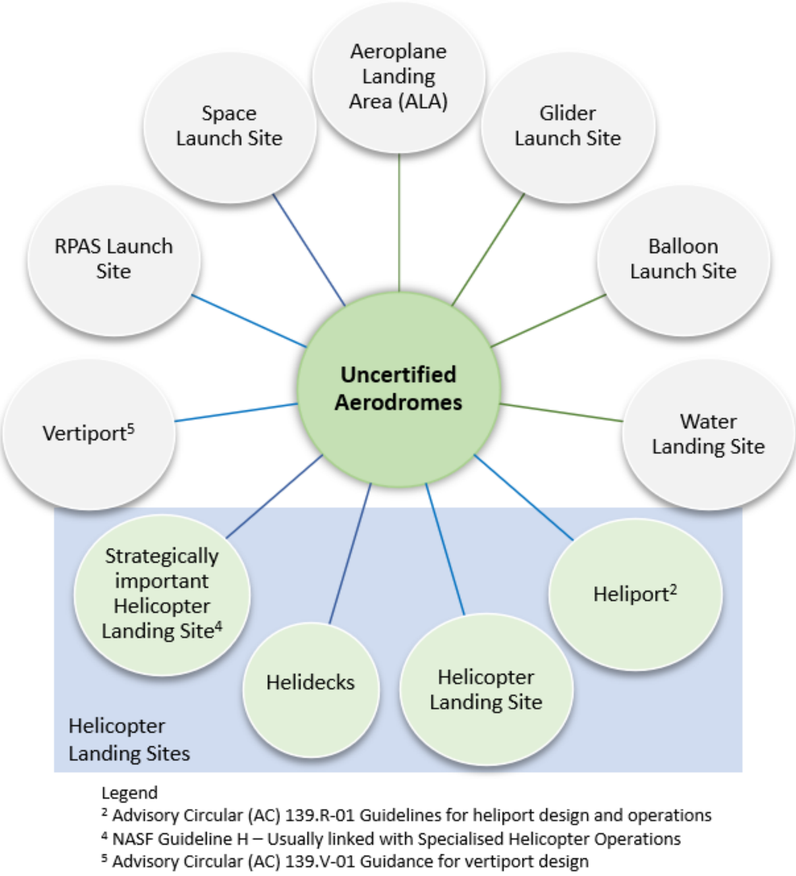


Figure 1: Forms of uncertified aerodromes in Australia

2.1.11 Heliports are a specific type of HLS which are designed and constructed in accordance with the guidance for design and construction outlined within this AC. A heliport may have one or more FATOs and TLOFs and associated stands, with additional facilities for passenger handling such as a terminal building. It may also include facilities such as a hangar, refuelling and lighting.

2.1.12 Owners and operators of HLS who wish to support operations in performance classes 1, 2 or 2 with exposure should do so by designing, operating and maintaining their facility to internationally recognised standards.

Note: This AC aligns with the International Civil Aviation Organization's (ICAO) Annex 14 Volume II, whose standards and recommended practices cover physical characteristics, visual aids, obstacle control and emergency response facilities.

2.1.13 Heliports are a form of HLS that are divided and sub-divided into separate categories depending on their location, as summarised in Figure 3. Guidance specifications in this advisory circular are assumed to apply to all categories and sub-categories of heliports unless specifically identified in the text of the specification or section title.

2.1.14 This AC uses the concept of 'the design helicopter' for heliport facilities. The design helicopter is a virtual helicopter composed of the most demanding characteristics of all the intended helicopters that the heliport intends to serve. These characteristics include, but are not limited to the:

- largest set of dimensions e.g. D (as per the definitions), rotor diameter or max width,
- greatest maximum take-off weight/mass (MTOW/MTOM),
- most critical flight path requirements i.e., approach/climb-out gradient and/or horizontal flight requirements following a critical failure.

As illustrated in Figure 2:

If the largest (in terms of D) helicopter a heliport operator intends to accommodate is a Bell 212, which has a D of 17.43 m, therefore the design helicopter would then have a (design) D of 17.43 m

If the heaviest helicopter being accommodated is a Leonardo AW139 at 7,000 kg (but which only has a D of 16.6 m) then the design helicopter retains the D from the Bell 212 but has the maximum take of weight of the AW139.

The AS 365, having a D, a width and a take-off weight less than the other three aircraft does not influence these any of these three aspects of the design helicopter specifications, however may, have the most critical flight path requirement.

If the operator plans for an interoperable heliport (a heliport designed to also accommodate advanced air mobility VTOL aircraft) then, for example, the addition of the CityAirbus NextGen (which reportedly will have a max width and D of about 16 m) would provide the design aircraft with a max width of 16 m, while the design D would still be 17.43 m.

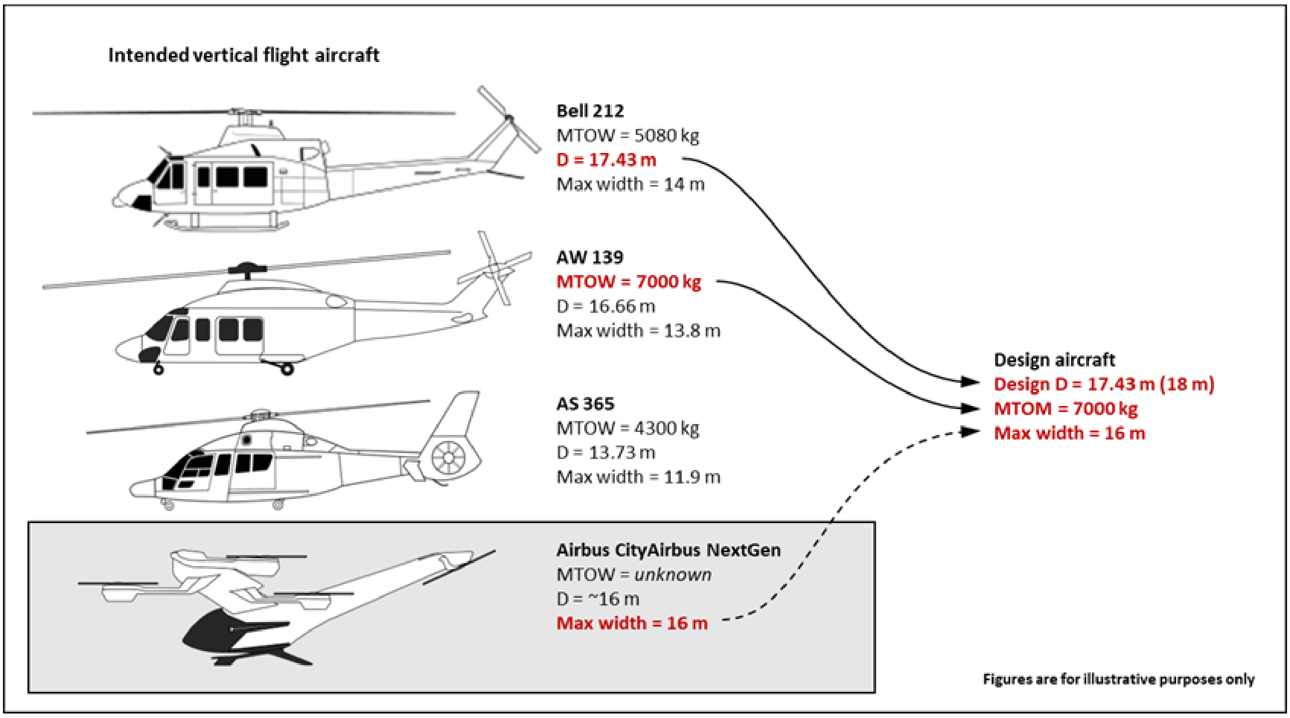


Figure 2: An example of some of the parameters that would be considered when compiling the design helicopter data

2.1.15 Further guidance on the determination of the design helicopters characteristics is contained in Appendix A to Chapter 3 of the ICAO Heliport Manual (Doc 9261).

2.1.16 The design helicopter may change over time as new helicopter types, variants and operating modes are introduced. The heliport operator should ensure the characteristics of defined areas are checked against the heliport's design helicopter.

2.1.17 Where existing heliports do not currently meet the guidance set out in this AC, heliport operator's do not need to upgrade their facility immediately. Where the specifications are not met, an assessment should be conducted to identify any alternate or additional mitigation measures to be put in place to achieve an acceptable level of safety of helicopter operations at the heliport.

2.1.18 An assessment mentioned in 2.1.10 may include a compatibility assessment, a fire safety assessment, an obstacle hazard safety assessment or risk assessment, or a combination of each.

2.1.19 Under regulation 91.410 of CASR, helicopter operators and PICs are required to ensure a place is suitable and safe for the operation of their aircraft, having regard to all of the circumstances of the proposed operation into the place. This will require them to undertake assessments of the heliport to ensure the facility meets their operational requirements.

2.1.20 Rotorcraft operators are required to take certain actions under regulation 133.170 of CASR. Heliport operators should assist operators of rotorcraft with the essential information required by the operator under regulation 133.170 of CASR.

2.1.21 Existing heliport operators and their designers should adopt the specifications in this circular when upgrading and replacing existing or building new heliport facilities.

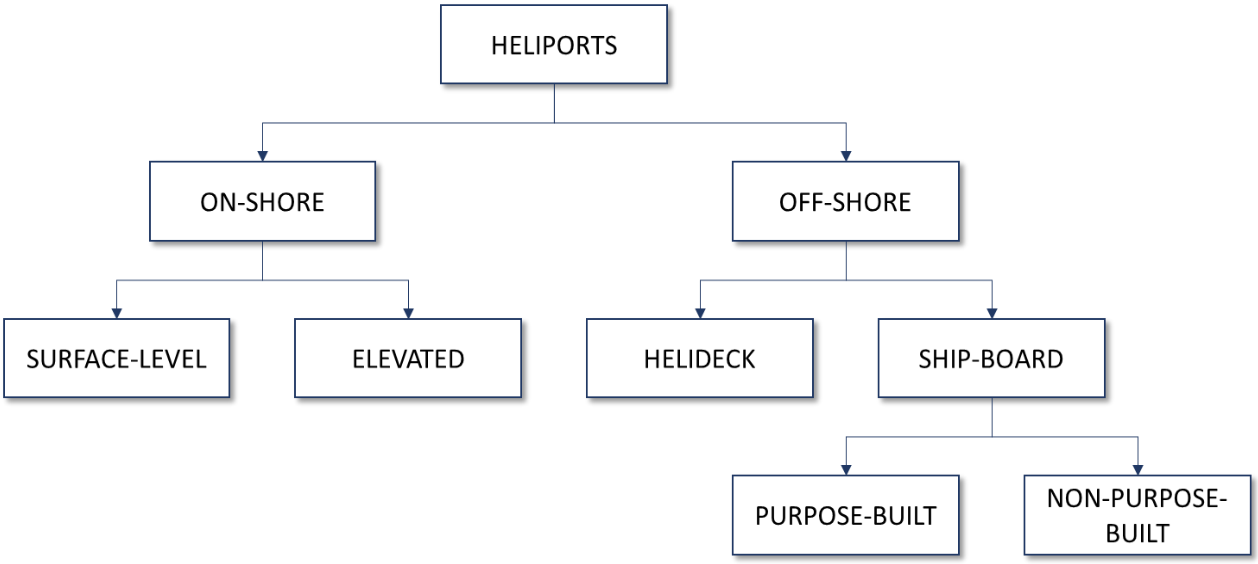


Figure 3: Heliport categories

2.2 Heliport site selection to minimise effects on third parties

2.2.1 Fundamental considerations

2.2.1.1 The selection of a heliport site involves the consideration of a range of variables including intended aircraft types, area available, landing site configuration and obstacle environment.

2.2.1.2 Limitations and restrictions to certain activities, such as aviation, may be imposed by State, Territory or Local Government on properties or locations through planning schemes or environmental planning instruments.

2.2.1.3 Site locations for proposed landing site locations should consider suitability from a land-use planning perspective including any limitations or restrictions that could apply to the site.

2.2.1.4 It is important to consider that information in this AC may be additional to any limitation or restriction to the use of a heliport site imposed by State, Territory or Local Government. Nothing in this AC limits the heliport operator accountability to other regulatory organisations.

2.2.1.5 Full consideration of some of these variables relies on effective engagement with a range of stakeholders. Heliport operators should establish open communication channels with aircraft operators, government stakeholders, nearby aerodrome operators (including certified aerodrome, non-certified aerodrome, helicopter landing site, heliport and vertiport) and, where appropriate, the local community.

2.2.1.6 The helicopter and other rotorcraft types that are expected to use the landing site form the basis for most design considerations when developing a heliport. Where the heliport operator intends to support a single helicopter type, that helicopter type will be the design helicopter. For heliports intended to service multiple helicopters, the design helicopter is a virtual aircraft composed of the most demanding characteristics of these helicopters include including the largest set of dimensions, the greatest maximum take-off weight (MTOW), and the most critical flight path requirements (i.e., approach/climb-out gradient and/or horizontal flight requirements following a critical failure).

2.2.1.7 Additional considerations of design helicopter may include considerations other than those mentioned in 2.2.1.3 of this AC. Other considerations may include undercarriage width, landing distance requirements, rejected take-off distance requirements and the impact of downwash and outwash when aircraft are landing, manoeuvring on the heliport or at take-off.

2.2.1.8 The area available at the heliport and the intended scope of aircraft operations may impact on the landing site configuration. The number of facilities, such as FATOs, taxi routes, stands and associated buildings, may be limited by the physical environment. This AC provides specifications for each heliport facility associated with the operation of helicopters without establishing a standard heliport layout.

2.2.1.9 The potential for heliports to be constructed in a complex wind (turbulent) environment means that specific considerations should be made when a heliport is to be established in the vicinity of buildings, and significant terrain.

2.2.1.10 Regarding complex wind turbulence, the standard deviation of the vertical airflow velocity of 1.75 m/s should not be exceeded. Where this is significantly exceeded (i.e. where the limit exceeds 2.4 m/s or more) there is the possibility that aircraft operators may need to implement operational restrictions which may impact the intended operation of the heliport. Where there is the potential for wind behaviour to increase in standard deviation of the vertical airflow velocity, the resulting hazard should be made known to the aircraft operator so that they can determine any increase or addition of risk to their intended operation.

2.2.1.11 Refer to NASF Guideline B Managing the risk of building generated windshear and turbulence at airports for matters relating to aerodromes that may be considered when establishing an HLS or heliport.

2.2.1.12 This AC does not cover all heliport development considerations. This AC does not cover all heliport development considerations. Heliport operators should consult with appropriate stakeholders (such as federal, state, and local government agencies) on topics that are outside CASA's remit including, but not limited to, noise, security, environmental concerns, weather reporting and privacy.

2.2.1.13 A gap analysis has identified that potential heliport locations may be subject to multiple federal, state, and local government regulatory requirements, as well as requirements from non-government sources. These requirements may vary between different a heliport locations and jurisdictions.

2.2.2 Impact on nearby certified aerodromes

2.2.2.1 Where heliports need to be located within the vicinity of a certified aerodrome, the siting and design of final approach and take-off (FATO) areas should be carefully considered to minimize the interactions between heliport traffic and pre-existing aerodrome traffic.

2.2.2.2 Where the heliport may be located within the vicinity of a controlled aerodrome, engagement with air traffic control to determine the impact to existing air traffic management, flight path trajectories, and radio frequency congesting should be considered. An operational study of helicopter flight-path trajectories should determine whether conflict detection by on board traffic advisory systems or ground surveillance radars is likely to occur.

2.2.2.3 Where interactions cannot be avoided, coordination between the heliport and helicopter operators, as well as the relevant air traffic services, should determine the appropriate operational measures to ensure there is no conflict (i.e., there is compatibility) between the heliport and aerodrome traffic.

2.2.3 Rotor downwash considerations

Background

2.2.3.1 Incidents associated with downwash and outwash involving the general public have been recorded in a number of Australian Transport Safety Bureau (ATSB) reports[3]. To avoid or reduce such incidents and accidents, downwash and outwash protection safe distances, known as downwash protection zones (DPZ) should be established around take-off and landing sites. The DPZ, delineated in the form of boundaries or areas of restriction or control of the movement of persons during aircraft operations, should be considered by the operator of heliports and helicopter landing sites in public and other locations.

2.2.3.2 In addition to the hover over the landing point, the DPZ parameters should recognize downwash and outwash will be prevalent during the final approach to the hover, the initial take-off, and whenever the helicopter is positioning to or away from the FATO.

2.2.3.3 When siting a heliport, the designer must consider the effect of downwash and outwash and include a protection zone that is appropriate to the design helicopter.

Downwash and outwash characteristics

2.2.3.4 Conducting aviation activities near the general public introduces inherent risk. The nature and level of the risk will vary depending on the site location and type and size of helicopters using the HLS The range of aircraft vary from light helicopters through to complex, medium to heavy multi-engine helicopters operating in differing performance classes.

2.2.3.5 Helicopters may generate significant downwash and outwash where a radial jet wall can extend out below the generating aircraft. The downwash and outwash produce effects comparable to high and gusty wind conditions that may be a hazard to the heliport operator, their surrounding environment and people, animals and things in proximity.

2.2.3.6 Specific data on outwash speed estimates when the helicopter is HIGE for common helicopter types is included in Appendix A.

[3] ATSB Transport Safety Report AD-2022-001 - Safety risks from rotor wash at hospital helicopter landing sites – 27 September 2023 (see https://www.atsb.gov.au/sites/default/files/2023-09/AD-2022-001-Final.pdf) and ATSB Safety Advisory Notice AD-2022-001-SAN-001 (see https://www.atsb.gov.au/sites/default/files/2023-09/AD-2022-001-SAN-001_0.pdfs

Note: In producing the lift forces required to fly, a powerful downdraft of air is generated below the helicopter which is known as 'downwash'. Downwash may be considered as the pressurised vertical movement of air.

2.2.3.7 The use of downwash and 'outwash' in this AC should be considered to encompass any potentially hazardous air movement effects that could be caused by aircraft, including vertical and horizontal airflow velocities, volumes of air movement, and turbulence effects during different flight profiles that may be flown by aircraft within the heliport and its vicinity.

2.2.3.8 The downwash airflow speed remains more or less constant up to 3-disc diameters below the rotor disc. Beyond this distance, turbulence will gradually dissipate the induced velocity such that it may be discounted beyond approximately 10 rotor diameters.

2.2.3.9 When downwash interacts with the surface under the flight path it changes direction to outwash, as shown in Figure 3 below. Dependant on the disc loading and rotor design of the helicopter this interaction can occur well above the surface. Further information can be found in Part 133 of CASR - Acceptable Means of Compliance and Guidance Materials (AMC-GM), Australian air transport – rotorcraft[4] .

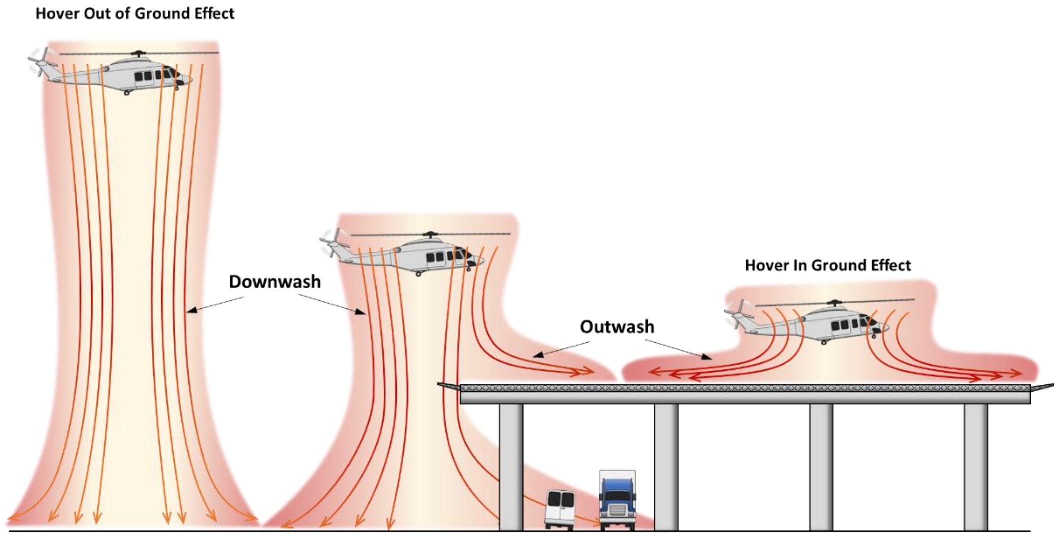


Figure 4: Generalised depiction of down wash and outwash

2.2.3.10 The localised downwash and outwash characteristics at any particular heliport will be determined by operational experience and based upon the type and intended manner in which a helicopter will use the heliport.

2.2.3.11 Downwash and outwash may also be impacted by variables such as wind speed and direction, ground surface levels, texture and slope, and aircraft landing and lift-off attitudes, as demonstrated in Figure 4 below. Accordingly, the heliport operator should consider climatic and seasonal weather patterns, the nature of heliport facility surface types and their ongoing maintenance, and the homogeneity of surface levels.

[4] Part 133 AMC-GM Australian air transport operations - rotorcraft https://www.casa.gov.au/node/54977

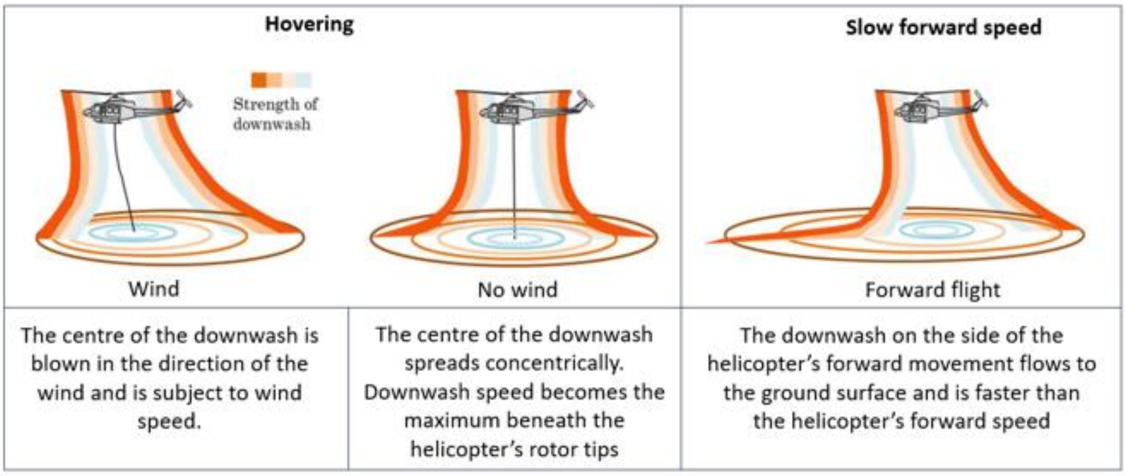


Figure 5: The impact of wind on helicopter downwash

2.2.3.12 The backwards or lateral (angled to the side of the heliport) initial climb phase of any intended Category A departure procedures and the lateral elements of any intended Category A approach procedures to be used at the heliport should also be considered when assessing areas sensitive to the potential exposure to helicopter rotor wash. Experience suggests, when adopting these procedures, the characteristics of the downwash may exhibit a hard jet on the surface, which though localized, can nevertheless be intense.

2.2.3.13 Where heliport facilities are elevated, the fluid dynamics of turbulent disturbed air generated by downwash and outwash, and the secondary effects of the disturbed air on people, animals, structures and things should be considered to minimise harm or damage during the movement of helicopters. Refer to Figure 6. In particular, this applies where a back-up manoeuvre is intended after lift-off, and where the back-up manoeuvre requires the helicopter to operate over an area not included in the heliport. Refer to Figure 7. The impact of downwash should be considered by the heliport operator, and those potentially impacted by the turbulent air.

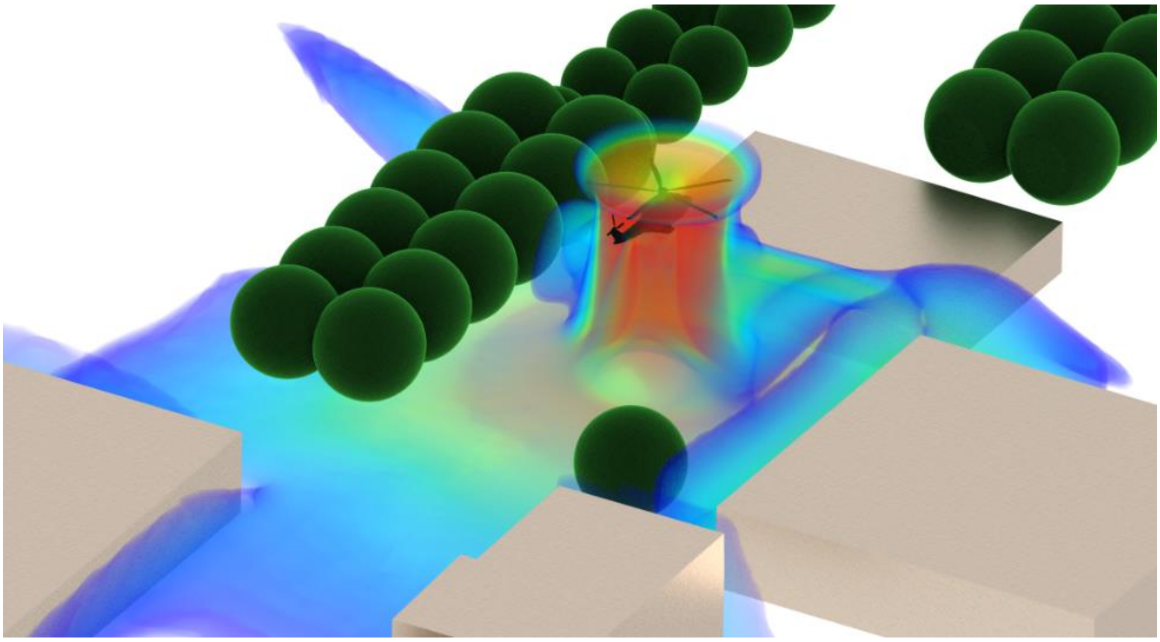
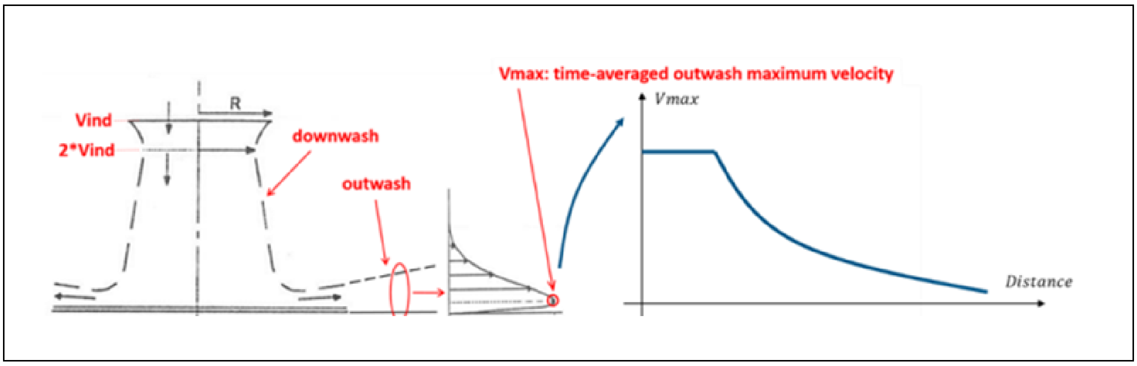


Figure 6: Computer generated fluid dynamics illustration of complex downwash and outwash interactions with structures. Image courtesy of Synergetics (2023)



Left: outwash variation as a function of the location compared to the ground.	Right: outwash maximum velocity as function of the distance to the rotor axis.

Figure 7: Demonstration of rotor downwash, outwash and maximum velocities

Downwash protection zone considerations

2.2.3.14 The design of a heliport facilities should minimize the exposure of persons, animals or loose objects to the downwash and outwash generated by helicopters. Within a distance of 3 rotor diameters from the FATO or Table 1 in Appendix A Type specific aircraft outwash data, whichever provides the most appropriate protection, no loose objects or light cladding should be allowed in areas which might be overflown by helicopters at low level, and no non-essential personnel should be present in these areas during helicopter operations.

2.2.3.15 Heliport operators should determine the level of downwash and outwash that staff, passengers and members of the public may be subject to when helicopters using their facilities are in the final approach to the hover and landing, the initial take-off, and whenever the helicopter is positioning to or away from the FATO or a stand. Once exposure limits are determined, the heliport facilities should be designed and maintained against determined exposure rates.

2.2.3.16 Where heliport facilities or conditions in the immediate vicinity of the heliport change, a review of exposure to staff, passengers, and member of the public may need to be reconsidered.

2.2.3.17 Heliport operators should engage with aircraft operators intending to use the heliport to determine the needs of the aircraft, and the manner in which the aircraft operator intends to operate the aircraft.

2.2.3.18 The range of aircraft, operating conditions and nature of aircraft operations to be supported should be considered by the heliport operator, and any ground-based risks resulting from those aircraft operations appropriately considered. The following link gives some guidance on downwash effects and although the offshore operating environment is different, there are general principles cited that are common also to other forms of heliports, https://www.youtube.com/watch?v=09bvuYRKwwc

Helicopter operators

2.2.3.19 The operators of helicopters and other aircraft using heliports are required to ensure the aircraft can land at, or take-off from, a place safely having regard to all the circumstances of the proposed landing or take-off (including the prevailing weather conditions) (refer regulation 91.410). Accordingly, the design, operation and any heliport change or upgrade should include stakeholder engagement between the heliport operator and aircraft operator(s). Accordingly, the design, operation and any heliport infrastructure or operational change or upgrade should include stakeholder engagement between the heliport operator and aircraft operator(s).

2.2.3.20 Aircraft operators should have procedures to consider the safety of persons, animals or things from the effects of rotor downwash and outwash. The heliport operator should consider the impact of, inter alia, downwash and outwash at any place where helicopters manoeuvre at the heliport, including in the immediate vicinity of the heliport where downwash may present a risk during take-off and landing manoeuvres.

3 Heliport physical characteristics

3.1 Onshore heliports

3.1.1 General

3.1.1.1 A heliport consists of set of essential components or defined areas as well as some optional components (refer Figure 8). These are the basic building blocks of a heliport and include:

a. one or more final approach and take-off (FATO) areas

b. one or more touchdown/lift-off (TLOF) areas

c. helicopter stands

d. helicopter taxiways and/or taxi-routes.

3.1.1.2 In addition to these defined areas, there are subsidiary areas that also impact directly on heliport design. They are:

a. safety areas

b. clearways

c. obstacle protection areas.

3.1.1.3 The following specifications are based on the design assumption that no more than one helicopter will be in the final approach and take-off (FATO) area at the same time.

3.1.1.4 Further, it is also assumed that operations to/from a FATO in proximity to another FATO will not be simultaneous. If simultaneous operations are planned, appropriate separation distances between FATOs should be determined with due regard to issues such as rotor downwash, flight paths and other airspace limitations.

3.1.1.5 Ground or elevated structure facility considerations are illustrated in Table 1 in Appendix B: Heliports. The ground/structure facilities consideration matrix provides guidance on when heliport facility considerations should associate individual characteristics of a proposed heliport, an expanding heliport, or heliport that is being reduced in its capability.

3.1.2 Final approach and take-off (FATO) area

3.1.2.1 A heliport should be provided with at least one FATO, which does not need to be solid.

3.1.2.2 A FATO should have the following features:

a. Free of obstacles, except for essential objects which because of their function are located on it, and of sufficient size and shape to ensure containment of every part of the design helicopter in the final phase of approach and commencement of take-off in accordance with the intended procedures. The shape of the FATO is optional (i.e., square, round, octagonal, rectangular etc.).

b. When solid, resistant to the effects of rotor downwash.

c. When collocated with a touchdown and lift-off (TLOF) area, contiguous and flush with the TLOF, and a bearing strength capable of withstanding the intended loads and effective drainage.

d. When non-collocated with a TLOF, free of hazards to a potential forced landing.

e. Associated with a safety area.

3.1.2.3 The dimensions of a FATO should be:

a. where intended to be used by helicopters operated in performance class 1:

i. the length of the rejected take-off distance (RTOD) for the most demanding required take-off procedure for the heliport prescribed in the flight manual (FM) of the helicopters for which the FATO is intended, or 1.5 Design D, whichever is greater

ii. the width for the required procedure prescribed in the FM of the helicopters for which the FATO is intended, or 1.5 Design D, whichever is greater

or

b. where intended to be used by helicopters operated in performance class 2 or 3, the lesser of:

i. an area within which can be drawn a circle of diameter of 1.5 Design D

or

ii. when there is a limitation on the direction of approach and touchdown, an area of sufficient width to meet the specification of 3.1.3.2 (a) but not less than 1.5 times the overall width of the design helicopter.

3.1.2.4 Essential objects (see 3.1.2.2 (a)) should not penetrate the horizontal plane at the FATO elevation by more than 50 mm.

3.1.2.5 When solid, the overall slope of a FATO should not exceed 2 per cent in any direction, except when the FATO is elongated and:

a. intended to be used by helicopters operated in performance class 1, it should not exceed 3 per cent overall, or have a local slope exceeding 5 per cent

or

b. intended to be used solely by helicopters operated in performance class 2 or 3, exceed 3 per cent overall, or have a local slope exceeding 7 per cent.

3.1.2.6 A FATO should be located so as to minimize the influence of the surrounding environment, including turbulence, which could have an adverse impact on helicopter operations.

3.1.3 Safety area

3.1.3.1 A FATO should be surrounded by a safety area (SA), which does not need to be solid.

3.1.3.2 A SA should have the following features:

a. Free of obstacles, except for essential objects which because of their function are located on it, to compensate for manoeuvring errors.

b. When solid, contiguous surface flush with the FATO, that is resistant to the effects of rotor downwash and ensures effective drainage.

3.1.3.3 For heliports with non-instrument approaches, the SA surrounding a FATO should extend outwards from the periphery of the FATO for a distance of at least 3 m or 0.25 Design D, whichever is greater.

3.1.3.4 For heliports with instrument approaches, the SA surrounding a FATO should extend:

a. laterally to a distance of at least 45 m on each side of the centre line

b. longitudinally to a distance of at least 60 m beyond the ends of the FATO.

3.1.3.5 No mobile object should be permitted in a SA during helicopter operations.

3.1.3.6 Essential objects located in the SA should not penetrate a surface originating at the edge of the FATO at a height of 250 mm above the plane of the FATO sloping upwards and outwards at a gradient of 5 per cent.

3.1.3.7 When solid, the slope of the SA should not exceed an upward slope of 4 per cent outwards from the edge of the FATO.

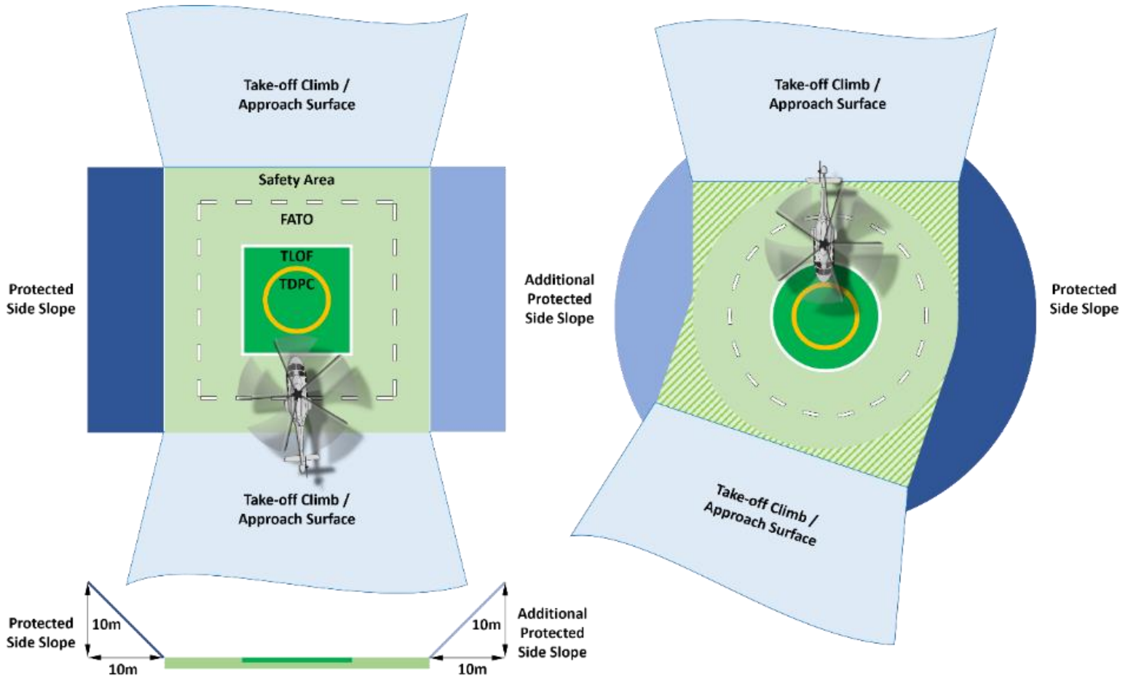


Figure 8: Basic features of onshore heliports

3.1.4 Protected side slope

3.1.4.1 See section 4.1.4.

3.1.5 Helicopter clearway

3.1.5.1 See section 4.1.6.

3.1.6 Touchdown and lift-off (TLOF) area

3.1.6.1 A heliport should be provided with at least one TLOF.

3.1.6.2 A TLOF should be provided whenever it is intended that the undercarriage of the helicopter will touch down or lift off. This may be within a FATO and/or within a stand. Therefore, more than one TLOF may be required. Touchdown to the TLOF could be from one of more of the following aircraft manoeuvres:

a. air taxi

b. PC1 rejected take-off or OEI approach – with or without forward speed

c. approach to the hover (the usual case)

d. PC2/3 approach.

The heliport operator should engage with their intended helicopter operators to determine the likely use of their TLOF, to ensure TLOF are appropriately located and marked.

3.1.6.3 The intended or actual direction of arrival at the TLOF or subsequent manoeuvring may be subject to limitations. This could affect the heliport design process with respect to containment of the TLOF within a collocated FATO.

3.1.6.4 A TLOF should have the following features:

a. Free of obstacles and sufficient size and shape to ensure containment of the undercarriage of the most demanding helicopter the TLOF is intended to serve in accordance with the intended orientation.

b. A surface which:

i. has sufficient bearing strength to accommodate the dynamic loads associated with the anticipated type of arrival of the helicopter at the designated TLOF

ii. is free of irregularities that would adversely affect the touchdown or lift-off of helicopters

iii. has sufficient friction to avoid skidding of helicopters or slipping of persons

iv. is resistant to the effects of rotor downwash

v. ensures effective drainage while having no adverse effect on the control or stability of a helicopter during touchdown and lift-off, or when stationary.

c. Associated with a FATO or a stand.

3.1.6.5 The dimensions of the TLOF should be:

a. when in a FATO intended to be used by helicopters operated in performance class 1, the dimensions for the required procedure prescribed in the FMs of the helicopters for which the TLOF is intended

b. when in a FATO intended to be used by helicopters operated in performance class 2 or 3, or in a stand:

i. when there is no limitation on the direction of touchdown, of sufficient size to contain a circle of diameter of at least 0.83 D or:

A in a FATO, the design helicopter

or

B in a stand, the largest helicopter the stand is intended to serve.

ii. when there is a limitation on the direction of touchdown, of sufficient width to meet the requirement of 3.1.6.4 (a) but not less than twice the undercarriage width (UCW) of:

A in a FATO, the design helicopter

or

B in a stand, the most demanding helicopter the stand is intended to serve.

3.1.6.6 For an elevated heliport, the minimum dimensions of a TLOF, when in a FATO, should be of sufficient size to contain a circle of diameter of at least 1 Design D.

3.1.6.7 The overall slope of a TLOF should not exceed 2 per cent in any direction, except when the TLOF is elongated and:

a. intended to be used by helicopters operated in performance class 1, it should not exceed 3 per cent overall, or have a local slope exceeding 5 per cent

or

b. intended to be used solely by helicopters operated in performance class 2 or 3, exceed 3 per cent overall, or have a local slope exceeding 7 per cent.

3.1.6.8 When a TLOF is within a FATO, it should be:

a. centred on the FATO

or

b. for an elongated FATO, centred on the longitudinal axis of the FATO.

3.1.6.9 When a TLOF is within a helicopter stand, it should be centred on the stand.

3.1.6.10 A TLOF should be provided with markings which clearly indicate the touchdown position and, by their form, any limitations on manoeuvring.

3.1.6.11 Where an elongated performance class 1 FATO/TLOF contains more than one touchdown position marking (TDPM), measures should be in place to ensure that only one can be used at a time.

3.1.6.12 Where alternative TDPMs are provided, they should be placed to ensure containment of the undercarriage within the TLOF and the helicopter within the FATO.

3.1.6.13 Safety devices such as safety nets or safety shelves should be located around the edge of an elevated heliport but should not exceed the height of the TLOF.

3.1.6.14 See ICAO Heliport Manual (Doc 9261) part II section 3.1.3.2.9 for more information on safety device specifications.

Note: Additional means of escape requirements for elevated heliports are contained in section 6.8.

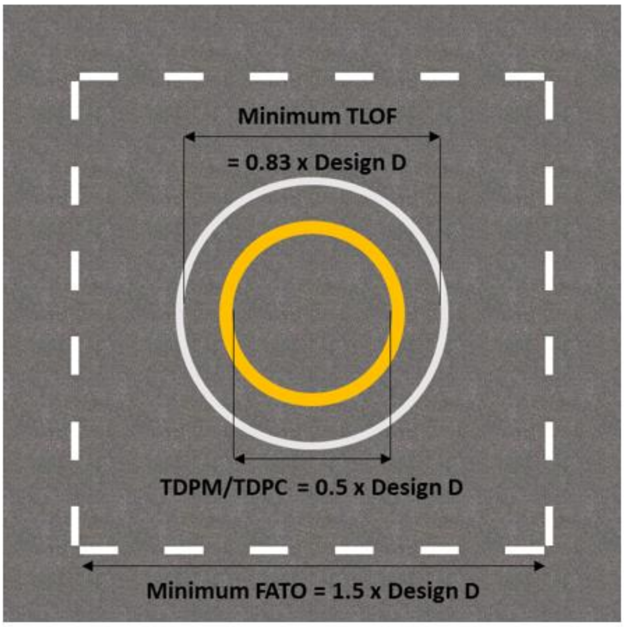


Figure 9: FATO and TLOF dimensions

3.1.7 Helicopter taxiways

3.1.7.1 A helicopter taxiway is a surface intended for the ground movement of a wheeled helicopter under its own power. This does not prevent a taxiway from being used for air taxi if it is associated with a helicopter taxi route.

3.1.7.2 A helicopter taxiway should have the following features:

a. Free of obstacles.

b. Surface which:

   i. has the bearing strength to accommodate the taxiing loads of the helicopters the taxiway is intended to serve

   ii. is free of irregularities that would adversely affect the ground taxiing of helicopters

   iii. is resistant to the effects of rotor downwash and outwash

iv. is located or protected such that the effects of rotor downwash and outwash do not create a hazard

v. ensures effective drainage while having no adverse effect on the control or stability of a wheeled helicopter when being manoeuvred under its own power, or when stationary.

c. Associated with a taxi-route.

3.1.7.3 The minimum width of a helicopter taxiway should be twice the UCW of the most demanding helicopter the taxiway is intended to serve.

3.1.7.4 The transverse slope of a taxiway should not exceed 2 per cent and the longitudinal slope should not exceed 3 per cent.

3.1.8 Helicopter taxi-routes

3.1.8.1 A helicopter taxi-route, examples shown in Figure 10, should have the following features:

a. Free of obstacles, except for essential objects which because of their function are located on it, established for the movement of helicopters.

b. When solid, surface which is resistant to the effects of rotor downwash and outwash; and

i. when collocated with a taxiway:

A is contiguous and flush with the taxiway

B the effects of rotor downwash and outwash do not create a hazard

C does no present a hazard to operations

D ensures effective drainage.

ii. when not collocated with a taxiway, is free of hazards should a forced landing be required.

3.1.8.2 No mobile object should be permitted on a taxi-route during helicopter operations.

3.1.8.3 When solid and collocated with a taxiway, the taxi-route should not exceed an upward transverse slope of 4 per cent outwards from the edge of the taxiway.

3.1.8.4 A helicopter ground taxi-route should have a minimum width of 1.5 times the overall width of the largest helicopter it is intended to serve be centred on a taxiway.

3.1.8.5 Essential objects located in a helicopter ground taxi-route should not:

a. be located at a distance of less than 500 mm outwards from the edge of the helicopter taxiway

b. penetrate a surface originating 500 mm outwards of the edge of the helicopter taxiway and a height of 250 mm above the surface of the taxiway and sloping upwards and outwards at a gradient of 5 per cent.

3.1.8.6 A helicopter air taxi-route should have a minimum width of twice the overall width of the largest helicopter it is intended to serve.

3.1.8.7 If collocated with a taxiway for the purpose of permitting both ground and air taxi operations:

a. the helicopter air taxi-route should be centre on the taxiway

b. essential objects located in the helicopter air taxi-route should not:

i. be located at a distance of less than 500 mm outwards from the edge of the helicopter taxiway

ii. penetrate a surface originating 500 mm outwards of the edge of the helicopter taxiway and a height of 250 mm above the surface of the taxiway and sloping upwards and outwards at a gradient of 5 per cent.

3.1.8.8 When not collocated with a taxiway, the slopes of the surface of an air taxi-route should not exceed the slope landing limitations of the helicopters the taxi-route is intended to serve. In any event, the transverse slope should not exceed 10 per cent and the longitudinal slope should not exceed 7 per cent.

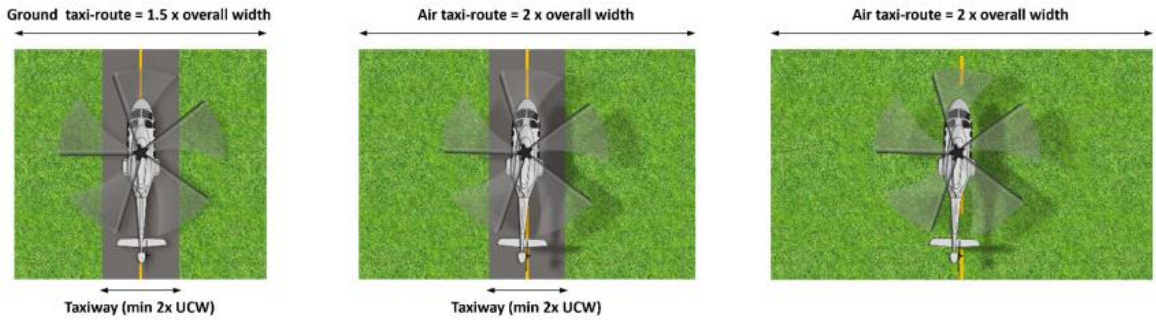


Figure 10: Taxi route examples

3.1.9 Helicopter stands

3.1.9.1 While this section does not specify the location for helicopters stands, they should not be located under a final approach or initial departure flight path.

3.1.9.2 A helicopter stand, examples shown in Figure 11and Figure 12, has the following features:

a. Free of obstacles and sufficient size and shape to ensure containment of every part of the largest helicopter the stand is intended to serve when it is being positioned within the stand.

b. Surface which:

   i. is resistant to the effects of rotor downwash

   ii. is free of irregularities that would adversely affect the manoeuvring of helicopters

   iii. has bearing strength capable of withstanding the intended loads

   iv. has sufficient friction to avoid skidding of helicopters or slipping of persons

   v. ensures effective drainage while having no adverse effect on the control or stability of a wheeled helicopter when being manoeuvred under its own power, or when stationary.

c. Associated with a protection area.

3.1.9.3 CASA does not recommend the operation of helicopters to mobile platforms (refer AC 91-29). Where helicopter operations use ground handling appliances, their use should be agreed by the heliport operator based on the aircraft operator's safety assessment of the use of the device.

3.1.9.4 The minimum dimensions of a helicopter stand should be:

a. a circle diameter of 1.2 D of the largest helicopter the stand is intended to serve

or

b. when there is a limitation on manoeuvring and positioning, of sufficient width to meet the requirement of 3.1.9.2 (a) but not less than 1.2 times the overall width of largest helicopter the stand is intended to serve.

3.1.9.5 The mean slope of a helicopter stand in any direction should not exceed 2 per cent.

3.1.9.6 Each helicopter stand should be provided with positioning markings to clearly indicate where the helicopter is to be positioning and, by their form, any limitation on manoeuvring.

3.1.9.7 A stand should be surrounded by a protection area when need not be solid.

3.1.10 Protection areas

3.1.10.1 Stand protection area should have the following features:

a. Free of obstacles, except for essential objects, which because of their function, are located on it.

b. When solid, contiguous surface flush with the stand, resistant to the effects of rotor downwash and outwash and ensures effective drainage.

3.1.10.2 When associated with a stand designed for turning, the protection area should extend outwards from the periphery of the stand for a distance of 0.4 D.

3.1.10.3 When associated with a stand designed for taxi-through, the minimum width of the stand and the protection area should not be less than the width of the associated taxi-route.

3.1.10.4 When associated with a stand designed for non-simultaneous use:

a. the protection area of adjacent stands may overlap but should not be less than the required protection area for the larger of the adjacent standards

b. the adjacent non-active stand may contain a static object, but it should be wholly with the boundary of the stand.

3.1.10.5 Essential objects located in the protection area should not:

a. If located at a distance of less than 0.75 D from the centre of the helicopter stand, penetrate a surface at a height of 50 mm above the surface of the central zone.

b. If located at a distance of 0.75 D or more from the centre of the helicopter stand, penetrate a surface at a height of 250 mm above the plane of the central zone and sloping upwards and outwards at a gradient of 5 per cent.

3.1.10.6 When solid, the slope of the protection area should not exceed an upward slope of 4 per cent outwards from the edge of the stand.

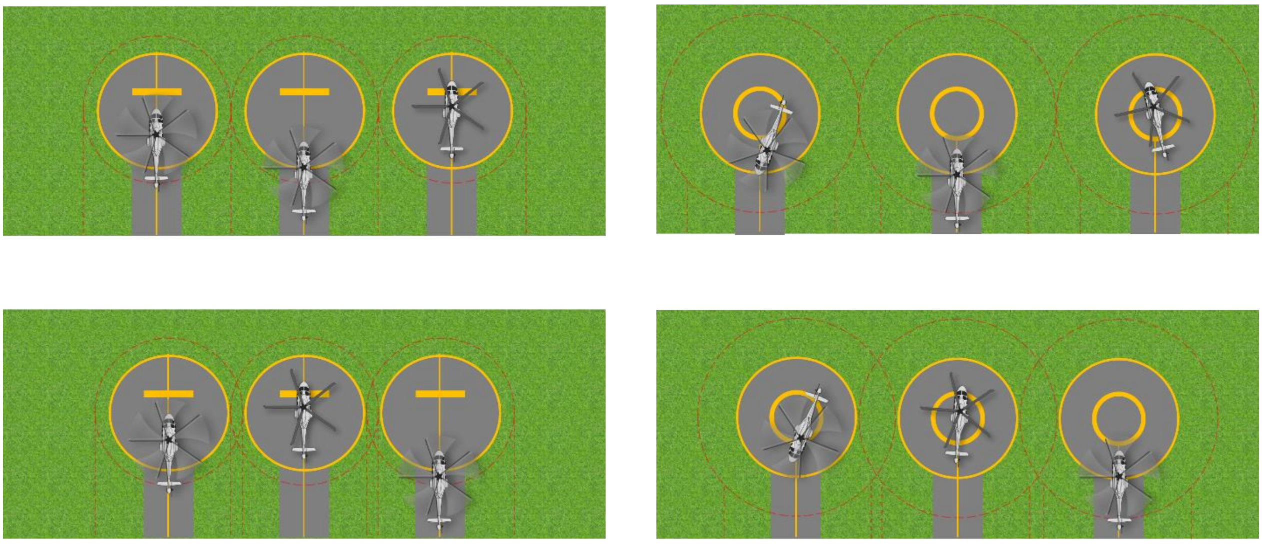


Figure 11: Ground taxi stand examples

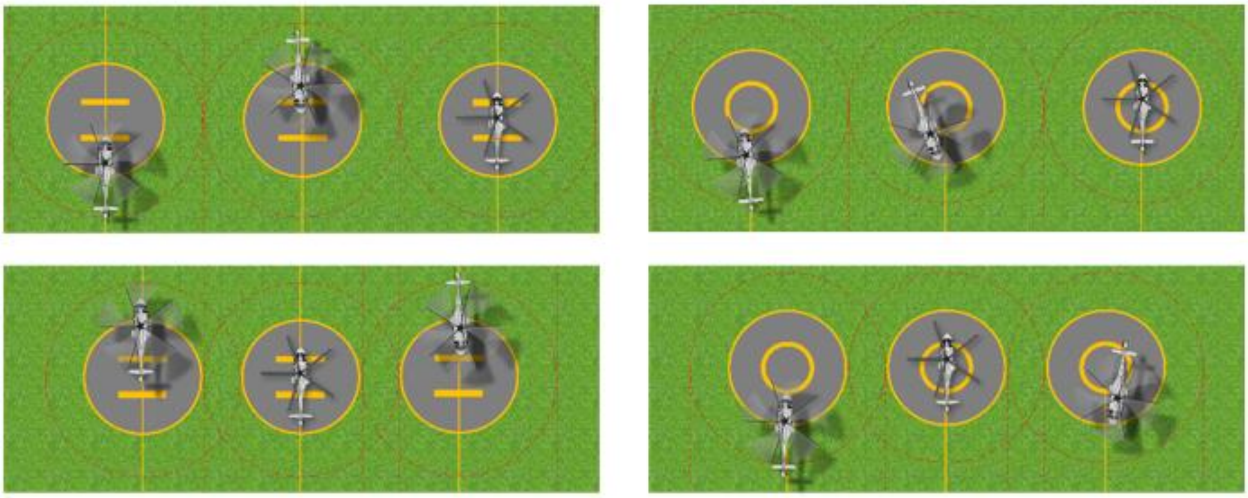


Figure 12: Air taxi stand examples

3.1.11 FATO separation distances

3.1.11.1 Where a FATO is located near a runway or taxiway, and where simultaneous operations are planned, the separation distance between the edge of a runway or taxiway and the edge of a FATO should not be less than the appropriate dimension in Table 9 below.

Table 9: FATO minimum separation distance for simultaneous operations

If aeroplane mass and/or helicopter mass are	Distance between FATO edge and runway or taxiway edge
Up to but not including 3,175 kg	60 m
3,175 kg up to but not including 5,760 kg	120 m
5,670 kg up to but not including 100,000 kg	180 m
100,000 kg and over	250 m

3.1.11.2 A FATO should not be located:

a. near taxiway intersections or holding points where jet engine efflux is likely to cause high turbulence

or

b. near areas where aeroplane vortex wake generation is likely to exist.

3.2 Offshore - Helidecks

3.2.1 Helidecks located on structures

3.2.1.1 The following specifications are for helidecks located on structures engaged in such activities as mineral exploitation and production, scientific research, construction and maintenance taskings (such as offshore windfarms).

3.2.2 FATOs and TLOFs

3.2.2.1 A helideck should be provided with one FATO and one coincident or collocated TLOF.

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

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

3.2.2.4 A helideck should be arranged to ensure that a sufficient and unobstructed air-gap is provided which encompasses the full dimensions of the FATO.

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

3.2.2.6 The TLOF should be dynamic load-bearing.

3.2.2.7 The TLOF should provide ground effect.

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

3.2.2.9 For any TLOF 1 D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle free sector whose function requires them to be located on the edge of the TLOF should be as low as possible and in any case, not exceed a height of 150 mm.

3.2.2.10 For any TLOF designed for use by helicopters having a D-value of 16.0 m or less, and any TLOF having dimensions of less than 1 D, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF, should not exceed a height of 50 mm.

3.2.2.11 Objects whose function requires them to be located within the TLOF (such as lighting or nets) should not exceed a height of 25 mm. Such objects should only be present if they do not represent a hazard to helicopters.

3.2.2.12 Safety devices such as safety nets or safety shelves should be located around the edge of a helideck but should not exceed the height of the TLOF.

3.2.2.13 See ICAO Heliport Manual (Doc 9261) part I section 3.5.7-9 for more information on safety device specifications.

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

> **Note:** Additional means of escape requirements for helidecks are contained in section 6.8.

3.3 Offshore - Shipboard heliports

3.3.1 Ship or purpose-built ship structures

3.3.1.1 When helicopter operating areas are provided in the bow or stern of a ship or are purpose-built above the ship’s structure, they should be regarded as purpose-built shipboard heliports.

3.3.2 FATOs and TLOFs

3.3.2.1 A shipboard heliport should be provided with one FATO and one coincidental or collocated TLOF.

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

3.3.2.3 The TLOF of a shipboard heliport should be dynamic load-bearing.

3.3.2.4 The TLOF of a shipboard heliport should provide ground effect.

3.3.2.5 For purpose-built shipboard heliports provided in a location other than the bow or stern, the TLOF should be of sufficient size to contain a circle with a diameter not less than 1 D of the largest helicopter the heliport is intended to serve.

3.3.2.6 For purpose-built shipboard heliports provided in the bow or stern of a ship, the TLOF should be of sufficient size to:

a. contain a circle with a diameter not less than 1 D of the largest helicopter the heliport is intended to serve

or

b. for operations with limited touchdown directions, contain an area within which can be accommodated two opposing arcs of a circle with a diameter of not less than 1 D in the helicopter’s longitudinal direction. The minimum width of the heliport should be not less than 0.83 D. (See Figure 13). The touchdown heading of the helicopter should be limited to the angular distance subtended by the 1 D arc headings, minus the angular distance which corresponds to 15 degrees at each end of the arc.

3.3.2.7 For non-purpose-built shipboard heliports, the TLOF should be of sufficient size to contain a circle with a diameter not less than 1 D of the largest helicopter the heliport is intended to serve.

3.3.2.8 A shipboard heliport should be arranged to ensure that a sufficient and unobstructed air-gap is provided which encompasses the full dimensions of the FATO.

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

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

3.3.2.11 For any TLOF 1 D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF should be as low as possible and in any case not exceed a height of 150 mm.

3.3.2.12 For any TLOF designed for use by helicopters having a D-value of 16.0 m or less, and any TLOF having dimensions of less than 1 D, objects in the obstacle-free sector, whose function requires them to be located on the edge of the TLOF, such as guttering, foam monitors or handrails, should not exceed a height of 50 mm.

Note: If, due to the design of the facility, the presence of guttering or handrails, etc. on or around the FATO or TLOF is unavoidable when not being used for the arrival or departure of helicopters, then a documented procedure should be implemented to ensure such gutters or handrails are removed/stowed prior to the arrival or and or departure of the helicopter.

3.3.2.13 Objects whose function requires them to be located within the TLOF (such as lighting or nets) should not exceed a height of 25 mm. Such objects should only be present if they do not represent a hazard to helicopters.

Note: If the unavoidable presence of lighting units or nets on the structure upon which the TLOF is located when being used for the arrival or departure of helicopters, a documented procedure should be implemented to ensure the PIC of the helicopter is made aware of the hazard.

3.3.2.14 If, due to the design of the facility, the presence of guttering or handrails, etc. on or around the FATO or TLOF is unavoidable when not being used for the arrival or departure of helicopters, a documented procedure should be implemented to ensure such gutters or handrails are removed/stowed prior to the arrival or and or departure of the helicopter.

3.3.2.15 Safety devices such as safety nets or safety shelves should be located around the edge of a shipboard heliport, except where structural protection exists, but should not exceed the height of the TLOF.

Note: See ICAO Heliport Manual (Doc 9261) part I section 3.6.7-9 for more information on safety.

3.3.2.16 The surface of the TLOF should be skid-resistant to both helicopters and persons.

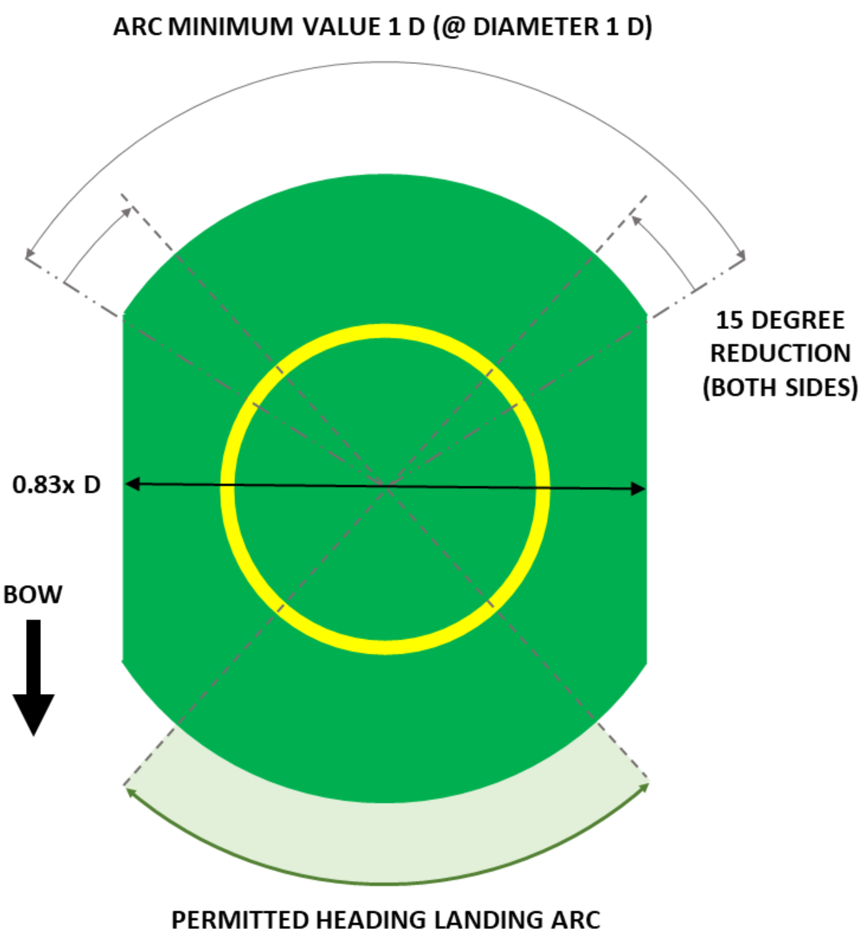


Figure 13: Shipboard permitted landing headings for limited heading operations

4 Obstacle control

4.1 Obstacle limitation surfaces and sectors

4.1.1 The following sections outline the characteristics of each obstacle limitation surface (OLS) and sector. The OLS are conceptual (imaginary) surfaces associated with a FATO, which identify the lower limits of the landing site and airspace above which objects become obstacles to helicopter operations.

4.1.2 The presence of existing obstacles, or introduction of new obstacles may result in restrictions to helicopter operations, including the potential inability to use the heliport. The heliport operator should ensure helicopter operators are made aware of the heliport’s obstacle environment. Where new obstacles are identified or proposed, heliport operators should engage with helicopter operators to identify any impact on helicopter operations.

4.2 Aeronautical Assessments

4.2.1 An assessment of intended activities at a heliport, the introduction of new aviation infrastructure in the vicinity of a heliport, or the introduction of more demanding aircraft may trigger the need for an aeronautical study to determine whether hazards and risks to the heliport, or those aircraft intending to use the heliport, remain acceptable to the heliport operator and those using the facility.

4.2.2 An aeronautical study is the process by which an appropriate authority determines whether an object, activity or thing will have a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft, operation of air navigation facilities, or existing or potential heliport capacity.

4.2.3 An aeronautical assessment may be required in any of the following circumstances:

a. prior to the development and introduction of a new heliport

b. aircraft using an existing heliport change and therefore the design values initially used to develop or last update the heliport facility have changed

c. a new aerodrome, heliport, vertiport or other form of aviation infrastructure or navigational aid is introduced within the vicinity of the heliport

d. new objects are proposed that could penetrate the heliports OLS or impact the safe movement of aircraft in the heliport’s navigable airspace, when new objects are identified.

e. when any object, or other hazard such as turbulence, plumes or hazardous sources of light emission that could negatively affect the safety of flight operations is identified.

f. where applicable, prior to the introduction of an instrument flight procedure or the amendment to any existing instrument flight procedure.

This list is not intended to be limited.

4.2.4 Any object, activity or thing that has the potential to negatively impact the safe movement of aircraft operating in navigable airspace at or in near proximity of the heliport may be subject to an aeronautical assessment.

4.2.5 CASA’s authority to promote the safe and efficient use of the navigable airspace, whether concerning existing or proposed structures, is predominantly derived from Section 139.E of CASR. However, it should be noted, Section 139.E of CASR does not provide specific authority for CASA to regulate or control how land (real property) may be used in regard to structures that may penetrate navigable airspace.

4.2.6 Section 139.E of CASR applies only to structures located within the obstacle limitation surfaces of a certified aerodromes, and 100 m above ground level of any state, territory, or possession of

Australian, within remote offshore territories or within territorial waters (12 NM) surrounding such states, territories, or possessions.

4.2.7 Where Section 139.E of CASR does not apply to the heliport, the heliport operator is to determine an appropriate authority. That determination authority should provide the heliport operator with all information used to conclude whether an object, activity or thing is a hazard to aircraft in navigational airspace or not, and whether any hazard mitigation has been recommended. The outcome of recommendation applications should be documented by the heliport operator.

Note:

1. This list is not intended to be limited. Any object, activity or thing that has the potential to negatively impact the safe movement of aircraft operating in navigable airspace at or in near proximity of the heliport may be subject to an aeronautical assessment.
2. CASA's authority to promote the safe and efficient use of the navigable airspace, whether concerning existing or proposed structures, is predominantly derived from Section 139.E of the CASR. It should be noted however, Section 139.E of the CASR does not provide specific authority for the CASA to regulate or control how land (real property) may be used in regard to structures that may penetrate navigable airspace.
2. Section 139.E of the CASR applies only to structures located within the obstacle limitation surfaces of a certified aerodromes, and 100 m above ground level of any state, territory, or possession of Australian, within remote offshore territories or within territorial waters (12 NM) surrounding such states, territories, or possessions.
4. Where Section 139.E of the CASR does not apply to the heliport, the heliport operator is to determine an appropriate authority. That determination authority should provide the heliport operator with all information used to conclude whether an object, activity or thing is a hazard to aircraft in navigational airspace or not, and whether any hazard mitigation has been recommended. The outcome of recommendation applications should be documented by the heliport operator.
5. Structures that may be subject to aeronautical study requirements associated with Section 139.E of the CASR may be human made (including mobile structures) or of natural growth and terrain whether existing, proposed, permanent, or temporary.

4.2.8 Outcomes of aeronautical assessment may result in the need for a hazard safety assessment. (refer Appendix D). Where a hazard safety assessment has determined objects, activities and things have the potential to be a hazard to air navigation, information should be provided to pilots and operators of helicopters using the heliport. The PICPIC of the aircraft is responsible for having regard to all the circumstances of the proposed landing or take-off (refer regulation 91.410 of CASR) when using an aerodrome, including heliport, and therefore needs to be aware of any hazard that may impact their aircraft when in flight,

4.2.9 Obstacle limitation surfaces and sectors are established by the heliport operator to provide a volume of airspace that is free of hazards. Where pilots and helicopter operators need to perform manoeuvres such as back up manoeuvres to achieve their intended flight objectives, the heliport operator should work with the helicopter operator to support intended operations.

4.2.10 Once airborne, the helicopter pilot or operator should have procedures that take into consideration of right-of-way rules for take-off and landing at controlled and non-controlled aerodromes, including heliports. Aeronautical assessments should take into consideration the right-of-way rules for take-off and landing when assessing objects, activities and things that may be a hazard to aircraft using navigable airspace at the heliport, and at any nearby aerodrome, heliport, vertiport or any other form of aviation infrastructure.

4.3 Surfaces

4.3.1 Approach surface

4.3.1.1 The approach surface consists of an inclined plane or a combination of planes or, when a turn is involved, a complex surface sloping upwards from the end of the SA and centred on a line passing through the centre of the FATO.

4.3.1.2 The limits of an approach surface comprise of:

a. an inner edge horizontal and equal in length to the minimum specified width/diameter of the FATO plus the SA, perpendicular to the centre line of the approach surface and located at the outer edge of the SA

b. two side edges originating at the ends of the inner edge:

   i. for heliports with non-instrument and non-precision approaches, diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO

   ii. for heliports with precision approaches, diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO, to a specified height above FATO, and then diverging uniformly at a specified rate to a specified final width and continuing thereafter at that width for the remaining length of the approach surface

c. an outer edge horizontal and perpendicular to the centre line of the approach surface and at a specified height above the elevation of the FATO.

4.3.1.3 The elevation of the inner edge is:

- where the FATO and associated SA are solid - the elevation of the SA at the point on the inner edge that is intersected by the centre line of the approach surface
- where the FATO and associated SA are not solid - the elevation of the FATO at the point on the inner edge that is intersected by the centre line of the approach surface
- when vertical procedures are being utilised; the level at which obstacle clearance is achieved.

4.3.1.4 For heliports intended to be used by helicopters operated in performance class 1 and when approved by an appropriate authority, the origin of the inclined plane may be raised directly above the FATO.

4.3.1.5 The slope(s) of the approach surface are measured in the vertical plane containing the centre line of the surface.

4.3.1.6 In the case of an approach surface involving a turn, the surface is a complex surface containing the horizontal normal to its centre line and the slope of the centre line should be the same as that for a straight approach surface as shown in Figure 15.

4.3.1.7 In the case of an approach surface involving a turn, the surface is limited to one curved portion.

4.3.1.8 Where a curved portion of an approach surface is provided, the sum of the radius of arc defining the centre line of the approach surface and the length of the straight portion originating at the inner edge is limited to a maximum length of 575 m.

4.3.1.9 For any variation in the direction of the centre line of an approach surface, the minimum turn radius is 270 m.

4.3.1.10 For heliports intended to be used by helicopters operated in performance class 2 or 3, it is good practice for the approach paths to be selected so as to permit safe forced landings or one-engine-inoperative landings such that, as a minimum requirement, injury to persons on the ground or water or damage to property are minimized. The most critical helicopter type for which the heliport is intended, and the ambient conditions may be factors in determining the suitability of such area.

4.3.2 Protected side slope

4.3.2.1 Where the heliport is not provided with PinS approach procedure where the pilot is required to proceed visually and an associated transitional surface is not otherwise provided, protected side slope should be provided.

4.3.2.2 The protected side slope should rise at 45 degrees from the edge of the SA and extending to a distance (height) of 10 m. A protected side slope is not provided along portions of the SA where an approach or take-off climb surface originates.

4.3.2.3 Where the FATO and associated SA is not square or rectangular in shape, small spaces can occur between the take-off climb surface or approach surface and the SA. These spaces should meet the criteria of the SA, not the protected side slope.

4.3.2.4 Where take-off climb and approach surfaces are not diametrically opposed, the protected side slope should cover the whole of the area between the obstacle limitation surfaces. This may sometimes extend beyond 180 degrees.

4.3.2.5 The surface of a protected side slope should not be penetrated by obstacles.

4.3.3 Transitional surface

4.3.3.1 The transitional surface is a surface along the side of the SA and part of the side of the approach/take-off climb surface, that slopes upwards and outwards to a predetermined height of 45 m above the FATO.

4.3.3.2 The limits of a single transitional surface comprise of:

a. a lower edge beginning at a point on the side of the approach or take-off climb surface at a specified height, extending down the side of the approach or take-off climb surface approach to the inner edge and from there along the length of the side of the helicopter clearway - when it is provided, and SA, parallel to the centre line of the FATO

b. an upper edge located at:

   i. 45 m above the FATO

   or

   ii. when vertical procedures are being utilised; 15 m above the elevation of the upper edge of the ascent/descent surface.

4.3.3.3 For heliports with opposing approach/take-off climb surfaces at angles less than 180 degrees (including heliports with more than two approach/take-off climb surfaces), adjacent transitional surfaces will be bound according to the limits specified in section 4.1.5.2 to the point of intersection of the two surfaces.

4.3.3.4 The elevation of a point on the lower edge is:

a. along the side of the approach/take-off climb surface — equal to the elevation of the approach/take-off climb surface at that point

b. if provided, along the helicopter clearway - equal to the elevation of the helicopter clearway

c. along the SA — equal to the elevation of the inner edge of the approach/take-off climb surface.

4.3.3.5 The slope of the transitional surface is measured in a vertical plane at right angles to the centre line of the approach/take-off climb surface.

4.3.4 Take-off climb surface

4.3.4.1 The take-off climb surface is an inclined plane, a combination of planes or, when a turn or turns are involved, a complex surface sloping upwards from the end of the SA, or the helicopter clearway, when it is provided, and centred on a line passing through the centre of the FATO.

4.3.4.2 The limits of a take-off climb surface comprise of:

a. an inner edge horizontal and perpendicular to the centre line of the take-off climb surface with a length equal to

   i. when located at the outer edge of the SA or helicopter clearway, width/diameter the FATO plus the SA

   or

   ii. when located at the outer edge of an elevated helicopter clearway, the width of the elevated helicopter clearway.

b. two side edges originating at the ends of the inner edge and diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO

c. an outer edge horizontal and perpendicular to the centre line of the take-off climb surface. and at a specified height of 152 m above the elevation of the FATO.

4.3.4.3 The elevation of the inner edge is the elevation of the FATO at the point on the inner edge that is intersected by the centre line of the take-off climb surface. For heliports intended to be used by helicopters operated in performance class 1 the origin of the inclined plane may be raised directly above the FATO.

4.3.4.4 Where a clearway is provided, the elevation of the inner edge of the take-off climb surface is located at the outer edge of the clearway at the highest point on the ground based on the centre line of the clearway or at the height of the clearway when elevated.

4.3.4.5 In the case of a straight take-off climb surface, the slope is measured in the vertical plane containing the centre line of the surface.

4.3.4.6 In the case of a take-off climb surface involving a turn, the surface is a complex surface containing the horizontal normal to its centre line and the slope of the centre line is the same as that for a straight take-off climb surface as shown in Figure 15.

4.3.4.7 In the case of a take-off climb surface involving a turn, the surface is limited to one curved portion.

4.3.4.8 Where a curved portion of a take-off climb surface, is provided, the sum of the radius of arc defining the centre line of the take-off climb surface and the length of the straight portion originating at the inner edge is limited to a maximum length of 575 m.

4.3.4.9 For any variation in the direction of the centre line of a take-off climb surface, the minimum turn radius is 270 m.

4.3.5 Helicopter clearway

4.3.5.1 When a helicopter clearway is provided, it should be located beyond the end of the FATO.

4.3.5.2 A helicopter clearway should have the following features:

a. free of obstacles, except for essential objects which because of their function are located on it, and of sufficient size and shape to ensure containment of the design helicopter when it is accelerating in level flight, and close to the surface, to achieve its safe climbing speed

b. when solid, contiguous surface flush with the FATO, is resistant to the effects of rotor downwash and is free of hazards should a forced landing be required.

4.3.5.3 The width of a helicopter clearway should not be less than that of the FATO and associated SA.

4.3.5.4 When solid, the ground in a helicopter clearway should not project above a plane having an overall upward slope of 3 per cent or having a local upward slope exceeding 5 per cent, the lower limit of this plane being a horizontal line which is located on the periphery of the FATO.

4.3.5.5 No object, which may endanger helicopters in the air, should be permitted in the helicopter clearway.

4.3.5.6 For heliports which are capable of supporting vertical PC1 category A procedures, clearways may be elevated to elevate the origin of the take-off climb or approach surfaces as necessary to minimise obstacle environment complexity. Refer Appendix A to chapter 4 of ICAO Heliport Manual Doc 9261 fifth edition for more information.

4.4 Obstacle limitation requirements

4.4.1 Introduction to obstacle limitation requirements

4.4.1.1 The requirements for obstacle limitation surfaces are specified on the basis of the intended use of a FATO, i.e., approach manoeuvre to hover or landing, or take-off manoeuvre and type of approach, and are intended to be applied when such use is made of the FATO.

4.4.1.2 Different OLS specifications may be established to support intended aircraft operations. For instances, the take-off climb surface may require a ground level or elevated clearway. The approach to a FATO may be ground level, and the take-off climb surfaces predicated on vertical departure procedures that include back-up manoeuvres,

4.4.1.3 In cases where operations are conducted to or from both directions of a FATO, then the function of some certain surfaces may be nullified because of more stringent requirements of another, lower surface.

4.4.2 Onshore heliports

4.4.2.1 The following obstacle limitation surfaces should be established for a FATO at heliports with a PinS approach procedure utilizing a visual segment surface:

a. take-off climb surface

b. approach surface

c. transitional surfaces.

4.4.2.2 The following obstacle limitation surfaces should be established for a FATO at heliports, with a PinS approach procedure, where a visual segment surface is not provided:

a. Take-off climb surface.

b. Approach surface.

4.4.2.3 For heliports with non-instrument approaches, the slopes of the obstacle limitation surfaces should not be greater than, and their other dimensions not less than, the one engine inoperative (OEI) category A performance capability of the design helicopter for this parameter. Table 9 outlines some slopes which can be related to PC1, PC2 and PC3 capability and indicative performance. Designers should ensure, if the heliport is to be used for PC1 operations, that a full review of the potential OEI performance of the most limiting helicopters intended to be operated is carried out. Further information is provided in Figure 16sub-figures A, B and C.

4.4.2.4 For heliports with instrument approaches, the slopes of the obstacle limitation surfaces should not be greater than, and their other dimensions not less than, those specified in Table 10, Table 11 and Table 13.

4.4.2.5 For heliports with non-instrument approaches that have an approach/take-off climb surface with a 4.5 per cent slope design, objects should be permitted to penetrate the obstacle limitation surface if the results of an airspace hazard safety assessment[5] have reviewed the associated risks and mitigation measures and found them to be satisfactory.

4.4.2.6 New objects or extensions of existing objects should not be permitted above any of the surfaces in 4.4.2.1 and 4.4.2.2 except when shielded by an existing immovable object or after an

[5] Further information on airspace hazard safety assessments see Appendix D

airspace hazard safety assessment that the object will not adversely affect the safety or significantly affect the regularity of operations of helicopters.

4.4.2.7 Existing objects above any of the surfaces in 4.4.2.1 and 4.4.2.2 should, as far as practicable, be removed except when the object is shielded by an existing immovable object or after an airspace hazard safety assessment determines that the object will not adversely affect the safety or significantly affect the regularity of operations of helicopters.

4.4.2.8 An onshore heliport should have at least two approach and take-off climb surfaces to avoid downwind conditions, minimize crosswind conditions and permit for a balked landing.

Table 10: Dimensions and slopes of obstacle limitation surfaces for all non-instrument FATOs

Surface and dimensions	Slope design categories		
	A	**B**	**C**
Approach and take-off climb surface:			
Length of inner edge	Width of safety area	Width of safety area	Width of safety area
Location of inner edge	Safety area boundary (Clearway boundary, if provided)	Safety area boundary	Safety area boundary
Divergence: (1st and 2nd section)			
Day use only	10%	10%	10%
Night use	15%	15%	15%
First section:			
Length	3386 m	245 m	1220 m
Slope	4.5% (1:22.2)	8% (1:12.5)	12.5% (1:8)
Outer width	(b)	N/A	(b)
Second section:			
Length	N/A	830 m	N/A
Slope	N/A	16% (1:6.25)	N/A
Outer width	N/A	(b)	N/A
Total length from inner edge (a)	3386 m	1075 m	1220 m
Transitional surface: (FATOs with a PinS approach procedure with a VSS)			
Slope	50% (1:2)	50% (1:2)	50% (1:2)
Height	45 m	45 m	45 m

(a) The approach and take-off climb surface lengths of 3,386 m, 1,075 m and 1,220 m associated with the respective slopes brings the helicopter to 152 m above FATO elevation.

(b) Seven rotor diameters overall width for day operations or 10 rotor diameters overall width for night operations.

Note: The slope design categories in Table 10 may not be restricted to a specific performance class of operation and may be applicable to more than one performance class of operation. The slope design categories depicted in Table 10 represent minimum design slope angles and not operational slopes. Slope category “A” generally corresponds with helicopters operated in performance class 1; slope category “B” generally corresponds with helicopters operated in performance class 3; and slope category “C” generally corresponds with helicopters operated in performance class 2. Consultation with helicopter operators will help to determine the appropriate slope category to apply according to the heliport environment and the most critical helicopter type for which the heliport is intended.

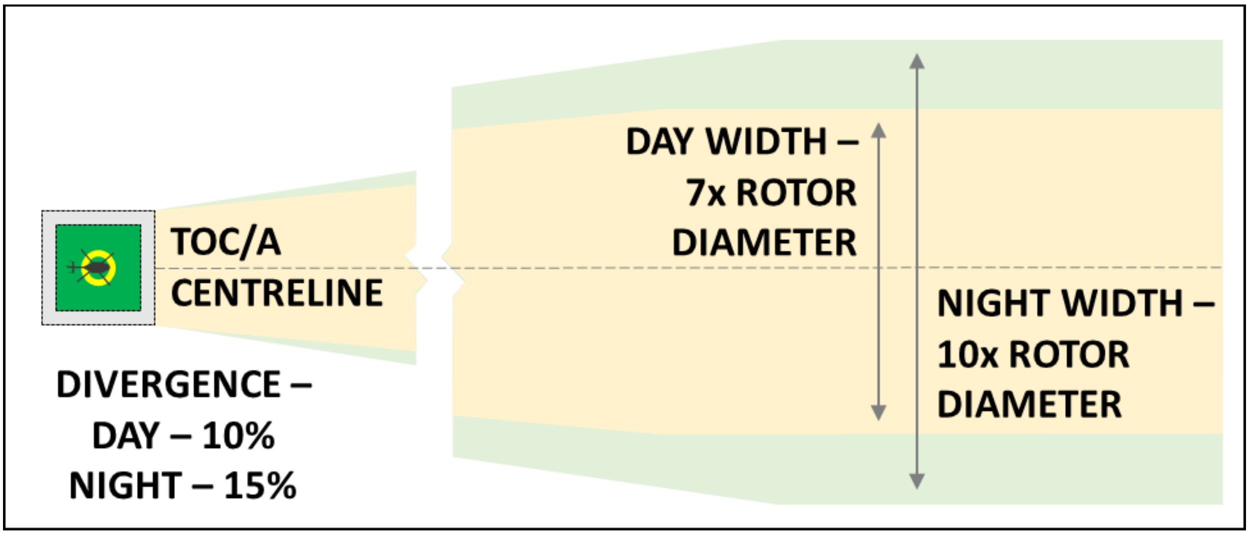
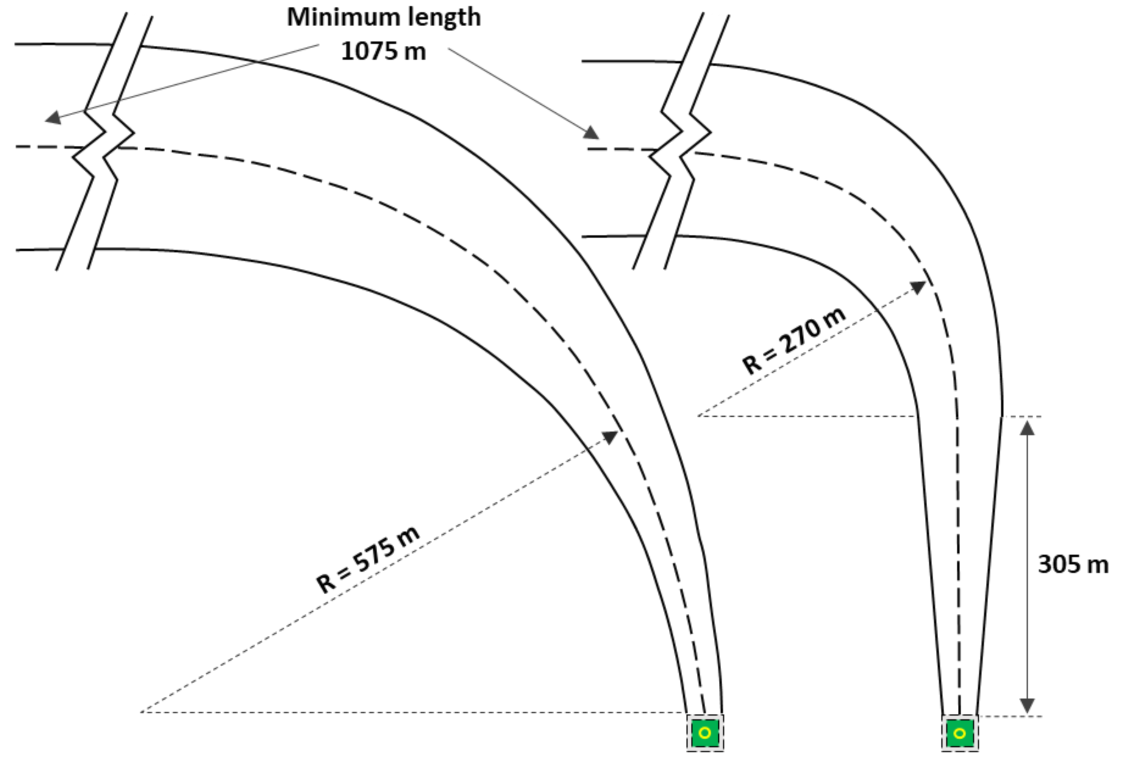


Figure 14: Overview of take-off climb/approach surface for non-instrument FATOs



NOTE 1 – Any combination of curve and straight portion may be established using the formula: S+R ≥ 575 m and R ≥ 270 m where S is the length of the straight portion and R is the radius of the turn. Note any combination ≥ 575 m will work.

NOTE 2 – The minimum length of the centreline of the curve and straight portion is 1075 m but may be longer depending on the slope used. See table 2 for longer lengths.

NOTE 3 – Helicopter take-off performance is reduced in a curve and as such a straight portion along the take-off climb surface prior to the start of the curve should be considered to allow for acceleration.

Figure 15: Curved approach & take-off climb surface for all FATOs

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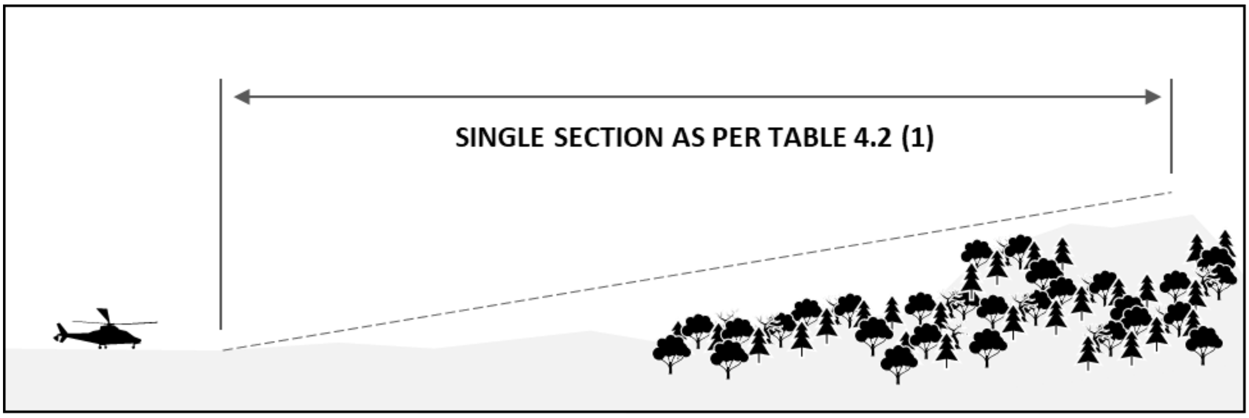
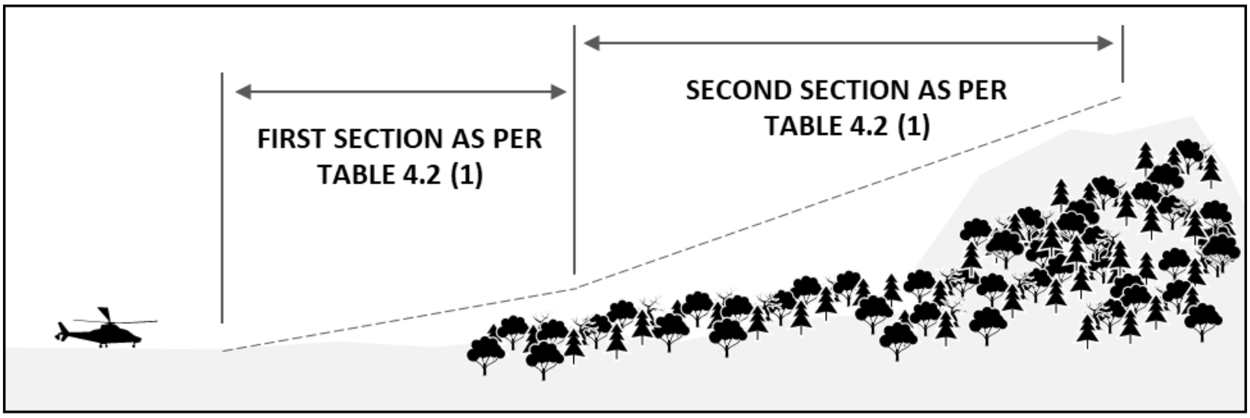
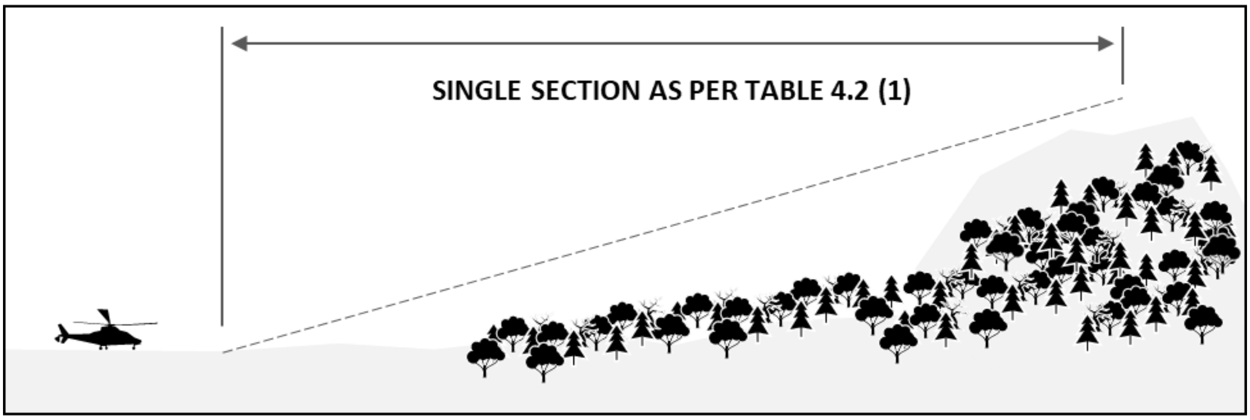


A) APPROACH AND TAKE-OFF CLIMB SURFACES – "A" SLOPE PROFILE – 4.5% DESIGN



B) APPROACH AND TAKE-OFF CLIMB SURFACES – "B" SLOPE PROFILE – 8% & 16% DESIGN



C) APPROACH AND TAKE-OFF CLIMB SURFACES – "C" SLOPE PROFILE – 12.5% DESIGN

Figure 16: Profile of take-off climb/approach surface slope design categories for

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Table 11: Dimensions and slopes of obstacle limitation surfaces for non-precision FATOs

Surface	Dimensions
Approach surface:	
Length of inner edge	90 m
Location of inner edge	Safety area boundary (Clearway boundary, if provided)
First section:	
Divergence	16%
Length	2500 m
Outer width	890 m
Slope (maximum)	3.33%
Second section:	
Divergence	-
Length	-
Outer width	-
Slope (maximum)	-
Third section:	
Divergence	-
Length	-
Outer width	-
Slope (maximum)	-
Transitional surface:	
Slope	20%
Height	45 m

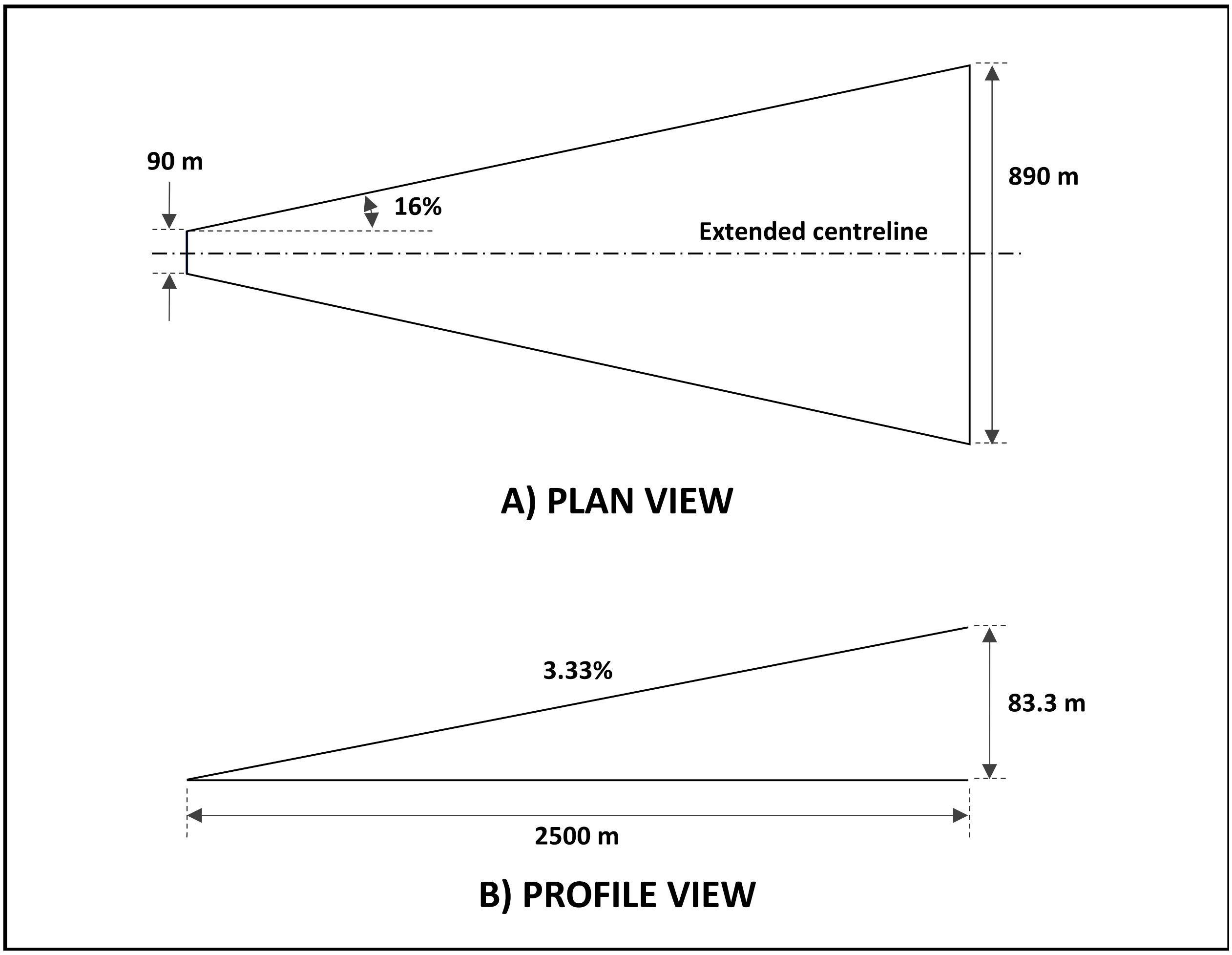

Figure 17: Approach surface for non-precision approach FATOs

Table 12: Dimensions and slopes of obstacle limitation surfaces for precision FATOs

Surface and dimensions	3-degree approach				6-degree approach			
	Height above FATO				Height above FATO			
	90 m	60 m	45 m	30 m	90 m	60 m	45 m	30 m
Approach surface:								
Length of inner edge	90 m	90 m	90 m	90 m	90 m	90 m	90 m	90 m
Distance from end of FATO	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m
Divergence each side to height above FATO	25%	25%	25%	25%	25%	25%	25%	25%
Distance to height above FATO	1745 m	1163 m	872 m	581 m	870 m	580 m	435 m	290 m

Surface and dimensions	3-degree approach				6-degree approach			
Width at height above FATO	962 m	671 m	526 m	380 m	521 m	380 m	307.5 m	235 m
Divergence to parallel section	15%	15%	15%	15%	15%	15%	15%	15%
Distance to parallel section	2793 m	3763 m	4246 m	4733 m	4250 m	4733 m	4975 m	5217 m
Width of parallel section	1800 m	1800 m	1800 m	1800 m	1800 m	1800 m	1800 m	1800 m
Distance to outer edge	5462 m	5074 m	4882 m	4686 m	3380 m	3187 m	3090 m	2993 m
Width at outer edge	1800 m	1800 m	1800 m	1800 m	1800 m	1800 m	1800 m	1800 m
Slope of first section	2.5%	2.5%	2.5%	2.5%	5.0%	5.0%	5.0%	5.0%
Length of first section	3000 m	3000 m	3000 m	3000 m	1500 m	1500 m	1500 m	1500 m
Slope of second section	3.0%	3.0%	3.0%	3.0%	6.0%	6.0%	6.0%	6.0%
Length of second section	2500 m	2500 m	2500 m	2500 m	1250 m	1250 m	1250 m	1250 m
Total length of surface	10000 m	10000 m	10000 m	10000 m	10000 m	10000 m	10000 m	10000 m
Transitional surface:								
Slope	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%
Height	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m

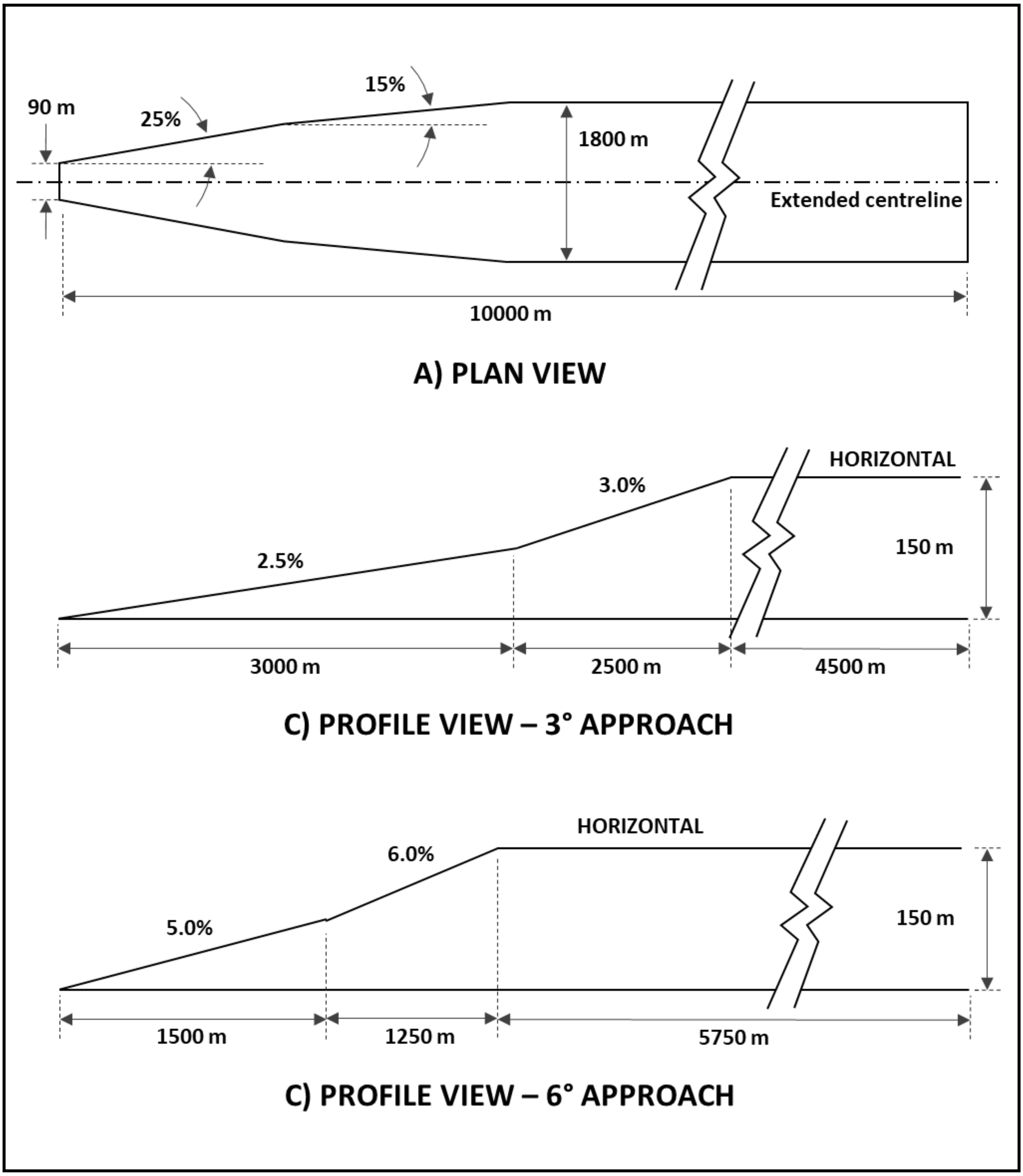

Figure 18: Approach surface for precision approach FATOs

Table 13: Dimensions and slopes of obstacle limitation surfaces for instrument FATOs with straight take-offs

Surface	Dimensions
Take-off climb surface	
Length of inner edge	90 m
Location of inner edge	Clearway boundary
First section	
Divergence:	30%
Length:	2850 m
Outer width:	1800 m
Slope (maximum)	3.5%
Second section	
Divergence:	Parallel
Length:	1510 m
Outer width:	1800 m
Slope (maximum)	3.5%*
Third section	
Divergence:	Parallel
Length:	7640 m
Outer width:	1800 m
Slope (maximum)	2%

* This slope exceeds the maximum mass one-engine-inoperative climb gradient of many helicopters which are currently operating.

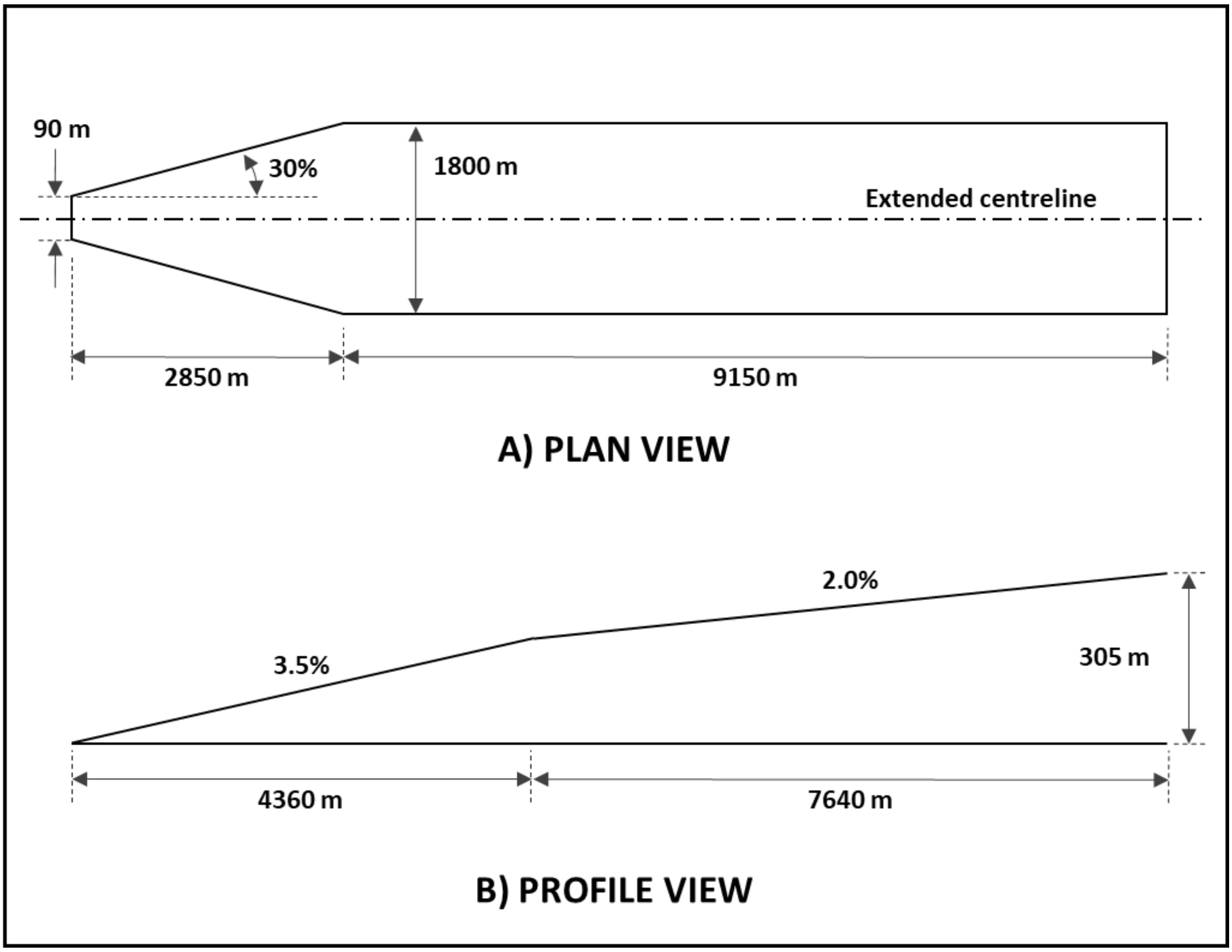

Figure 19: Take-off climb surface for instrument FATOs with straight take-offs

4.4.3 Helidecks

4.4.3.1 A helideck should have an obstacle-free sector.

4.4.3.2 There should be no fixed obstacles within the obstacle-free sector above the obstacle-free surface.

4.4.3.3 In the immediate vicinity of the helideck, obstacle protection for helicopters should be provided below the helideck level. This protection should extend over an arc of at least 180 degrees with the origin at the centre of the FATO, with a descending gradient having a ratio of one unit horizontally to five units vertically from the height of the FATO and the outer edges of either the FATO, safety netting, if provided, or any lower gangway that extends out beyond the FATO by no more than 2 metres and whose highest point lies below the surface of the FATO within the 180-degree sector. This descending gradient may be reduced to a ratio of one unit horizontally to three units vertically within the 180-degree sector for multi-engine helicopters operated in performance class 1 or 2. (See Figure 20).

4.4.3.4 For a TLOF of 1 D and larger, within the 150-degree limited obstacle surface/sector out to a distance of 0.12 D measured from the point of origin of the LOS, objects should not exceed a height of 250 mm above the TLOF. Beyond that arc, out to an overall distance of a further 0.21 D measured from the end of the first sector, the limited obstacle surface rises at a rate of one unit vertically for each two units horizontally originating at a height 0.05 D above the level of the TLOF. (See Figure 21).

4.4.3.5 For a TLOF less than 1 D within the 150-degree limited obstacle surface/sector out to a distance of 0.62 D and commencing from a distance 0.5 D, both measured from the centre of the TLOF, objects should not exceed a height of 50 mm above the TLOF. Beyond that arc, out to an overall distance of 0.83 D from the centre of the TLOF, the limited obstacle surface rises at a rate of one unit vertically for each two units horizontally originating at a height 0.05 D above the level of the TLOF. (See Figure 21).

4.4.3.6 Due to the complex nature and the limited space associated with the operational environment of an offshore facility, where obstacles are necessarily located on the structure near the helideck, the helideck may have a limited obstacle sector (LOS).

4.4.3.7 The limited obstacle sector/surface (LOS) is a complex surface originating at the reference point for the obstacle-free sector and extending over the arc not covered by the obstacle-free sector within which the height of obstacles above the level of the TLOF will be prescribed.

4.4.3.8 A limited obstacle sector is a subtended arc greater than 150 degrees originating at the edge of the FATO and extending from an edge 0.62 D to a maximum distance of 0.83 D from the centre of the FATO/TLOF.

4.4.3.9 The elevation of the lower limit of the limited obstacle sector/surface is 0.05 D above the TLOF surface.

4.4.3.10 The slope of the limited obstacle sector/surface extends upwards and outwards from the centre of the TLOF at a gradient of 1:2.

4.4.4 Shipboard heliports

4.4.4.1 When purposed-built helicopter operating areas are provided in the bow or stern of a ship they should apply the obstacle criteria for helidecks.

4.4.4.2 For shipboard heliports located amidships, forward and aft of a TLOF of 1 D and larger should be two symmetrically located sectors, each covering an arc of 150 degrees, with their apexes on the periphery of the TLOF. Within the area enclosed by these two sectors, there should be no objects rising above the level of the TLOF, except those aids essential for the safe operation of a helicopter and then only up to a maximum height of 250 mm.

4.4.4.3 For purpose-built and non-purpose-built shipboard heliports located amidships, objects whose function requires them to be located within the TLOF (such as lighting or nets) should not exceed a height of 25 mm. Such objects should only be present if they do not represent a hazard to helicopters.

4.4.4.4 For purpose-built and non-purpose-built shipboard heliports located amidships, to provide further protection from obstacles fore and aft of the TLOF, rising surfaces with gradients of one unit vertically to five units horizontally should extend from the entire length of the edges of the two 150-degree sectors. These surfaces should extend for a horizontal distance equal to at least 1 D of the largest helicopter the TLOF is intended to serve and should not be penetrated by any obstacle. (See Figure 22)

4.4.4.5 For non-purpose-built shipboard heliports located on the ship's side, no objects should be located within the TLOF except those aids essential for the safe operation of a helicopter (such as nets or lighting) and then only up to a maximum height of 25 mm. Such objects should only be present if they do not represent a hazard to helicopters.

4.4.4.6 For non-purpose-built shipboard heliports located on the ship's side, from the fore and aft mid-points of the D circle in two segments outside the circle, limited obstacle areas should extend to the ship’s rail to a fore and aft distance of 1.5 times the fore-to-aft-dimension of the TLOF, located symmetrically about the athwartships bisector of the D circle. Within these areas there should be no objects rising above a maximum height of 250 mm above the level of the TLOF. (See Figure 23) Such objects should only be present if they do not represent a hazard to helicopters.

4.4.4.7 For non-purpose-built shipboard heliports located on the ship's side, a LOS horizontal surface should be provided, at least 0.25 D beyond the diameter of the D circle, which should surround the inboard sides of the TLOF to the fore and aft mid-points of the D circle. The LOS should continue to the ship's rail to a fore and aft distance of 2.0 times the fore-to-aft dimension of the TLOF, located symmetrically about the athwartships bisector of the D circle. Within this sector there should be no objects rising above a maximum height of 250 mm above the level of the TLOF.

4.4.4.8 An area designated for winching on-board ships should be comprised of a circular clear zone of diameter 5 m and, extending from the perimeter of the clear zone, a concentric manoeuvring zone of diameter 2 D. (See Figure 24)

4.4.4.9 The manoeuvring zone should be comprised of two areas:

a. the inner manoeuvring zone extending from the perimeter of the clear zone and of a circle of diameter not less than 1.5 D

b. the outer manoeuvring zone extending from the perimeter of the inner manoeuvring zone and of a circle of diameter not less than 2 D.

4.4.4.10 Within the clear zone of a designated winching area, no objects should be located above the level of its surface.

4.4.4.11 Objects located within the inner manoeuvring zone of a designated winching area should not exceed a height of 3 m.

4.4.4.12 Objects located within the outer manoeuvring zone of a designated winching area should not exceed a height of 6 m.

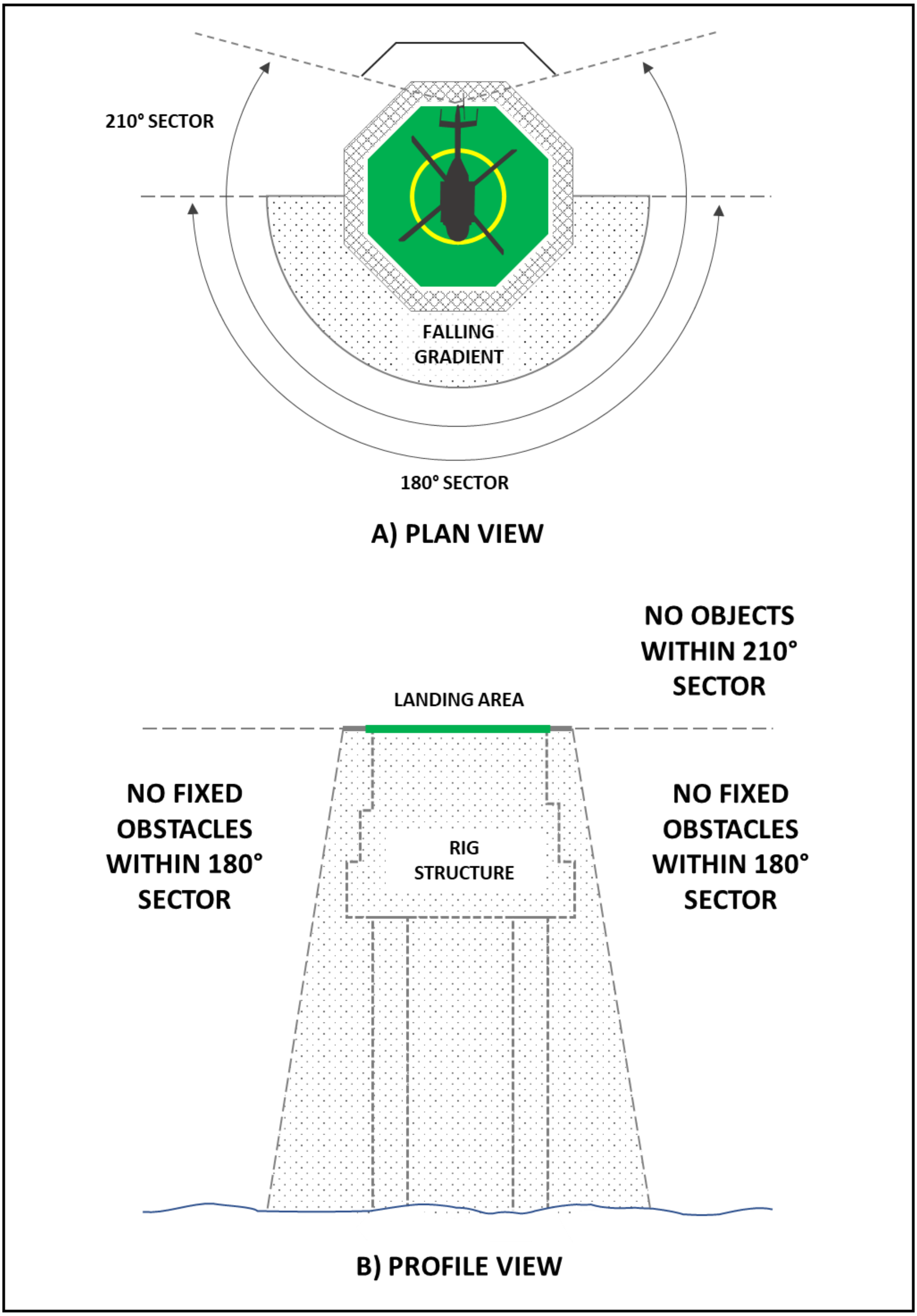

Figure 20: Helideck obstacle-free sector overview

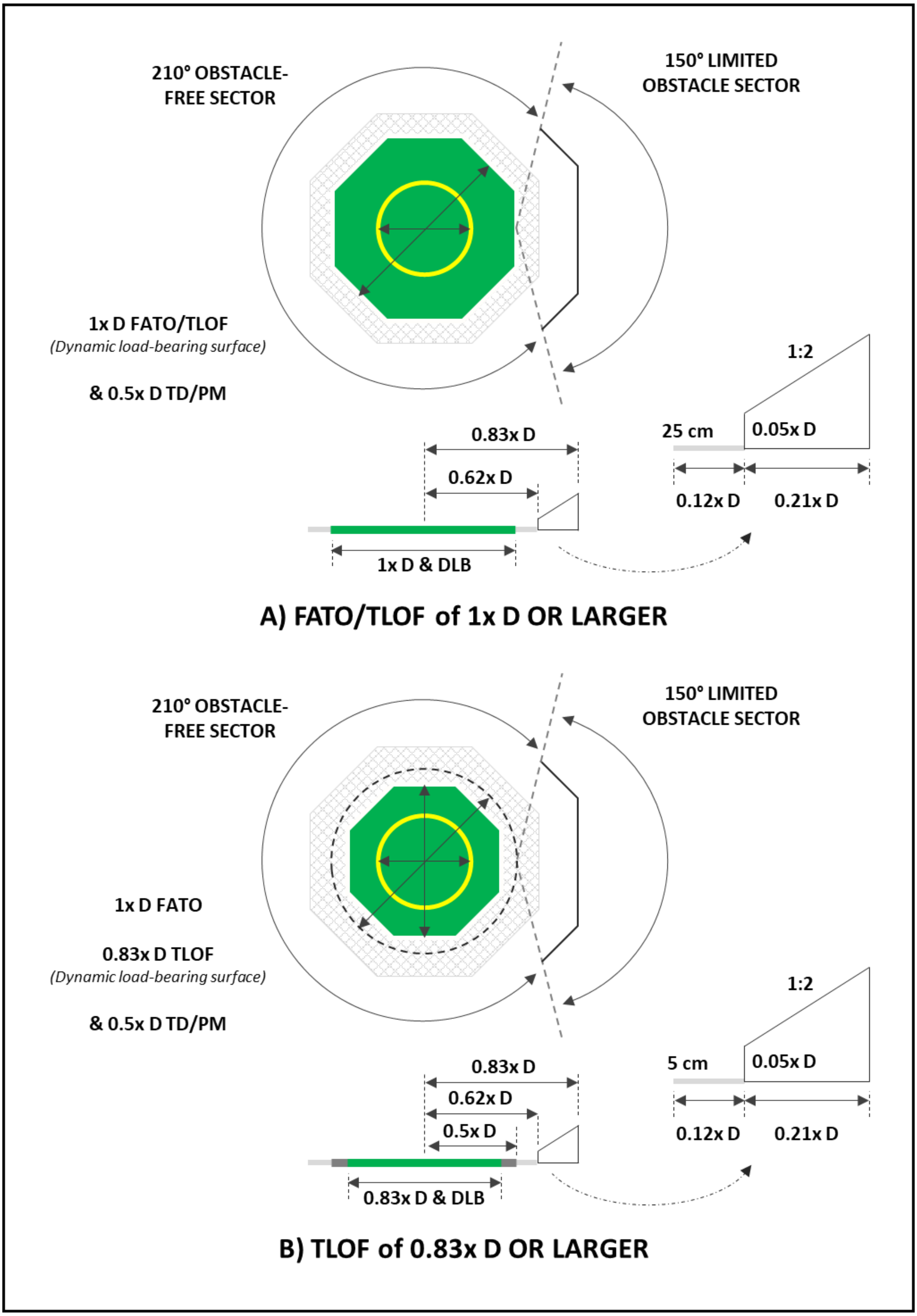

Figure 21: Helideck obstacle limitation surfaces and sectors

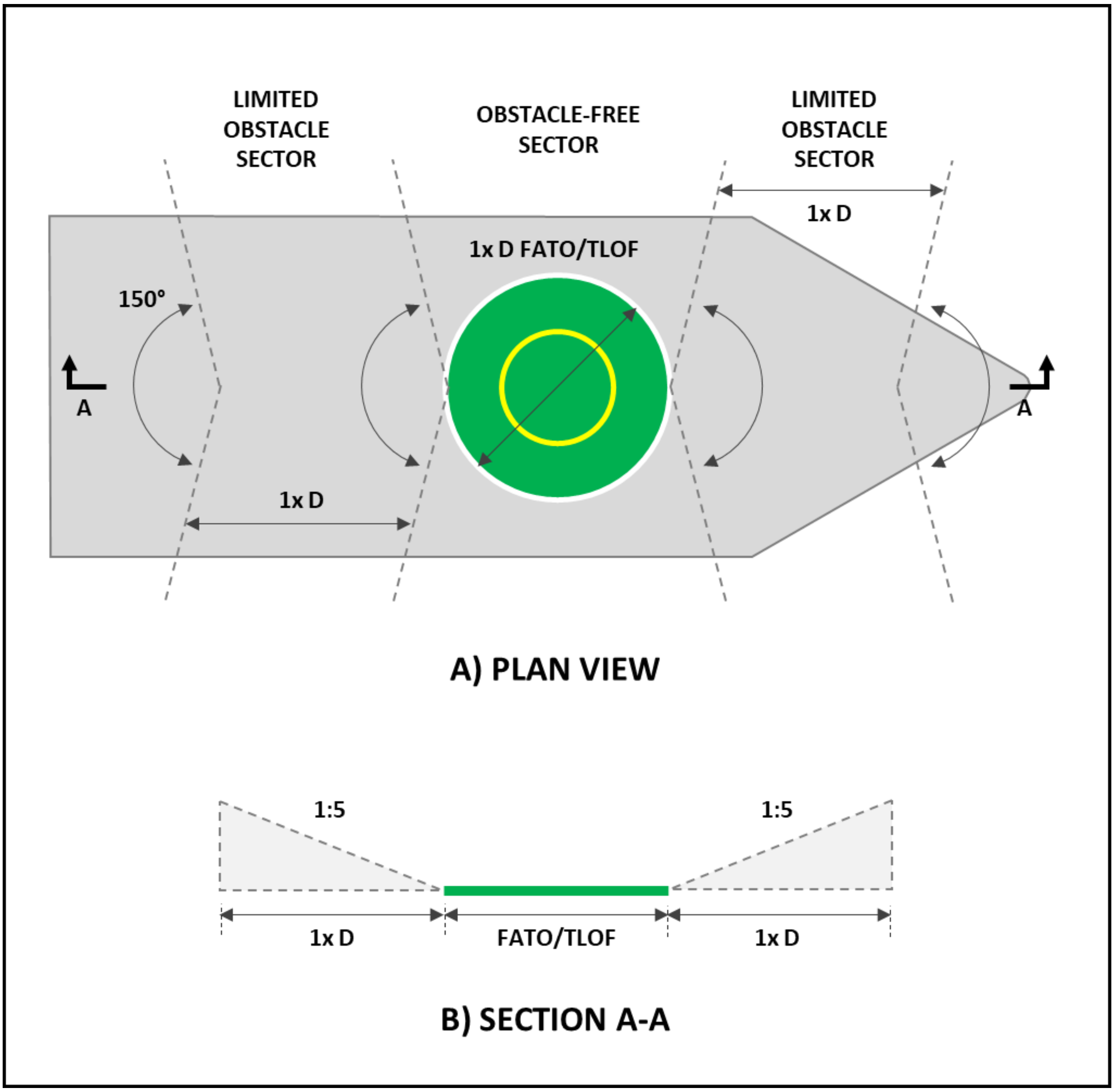

Figure 22: Amidships location – shipboard heliport obstacle limitation surfaces

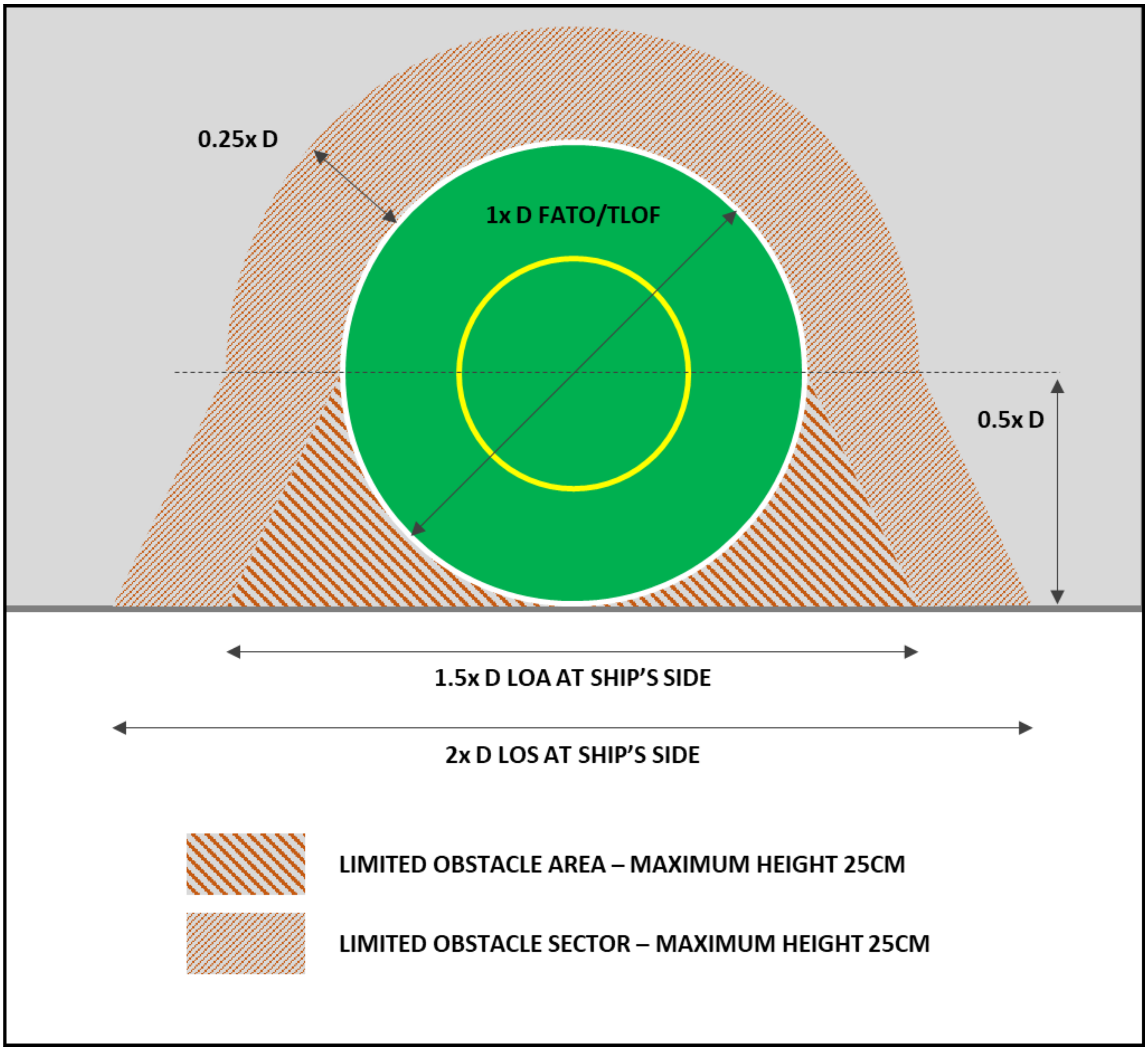

Figure 23: Ships-side non-purpose-built shipboard heliport obstacle limitation sectors and surfaces

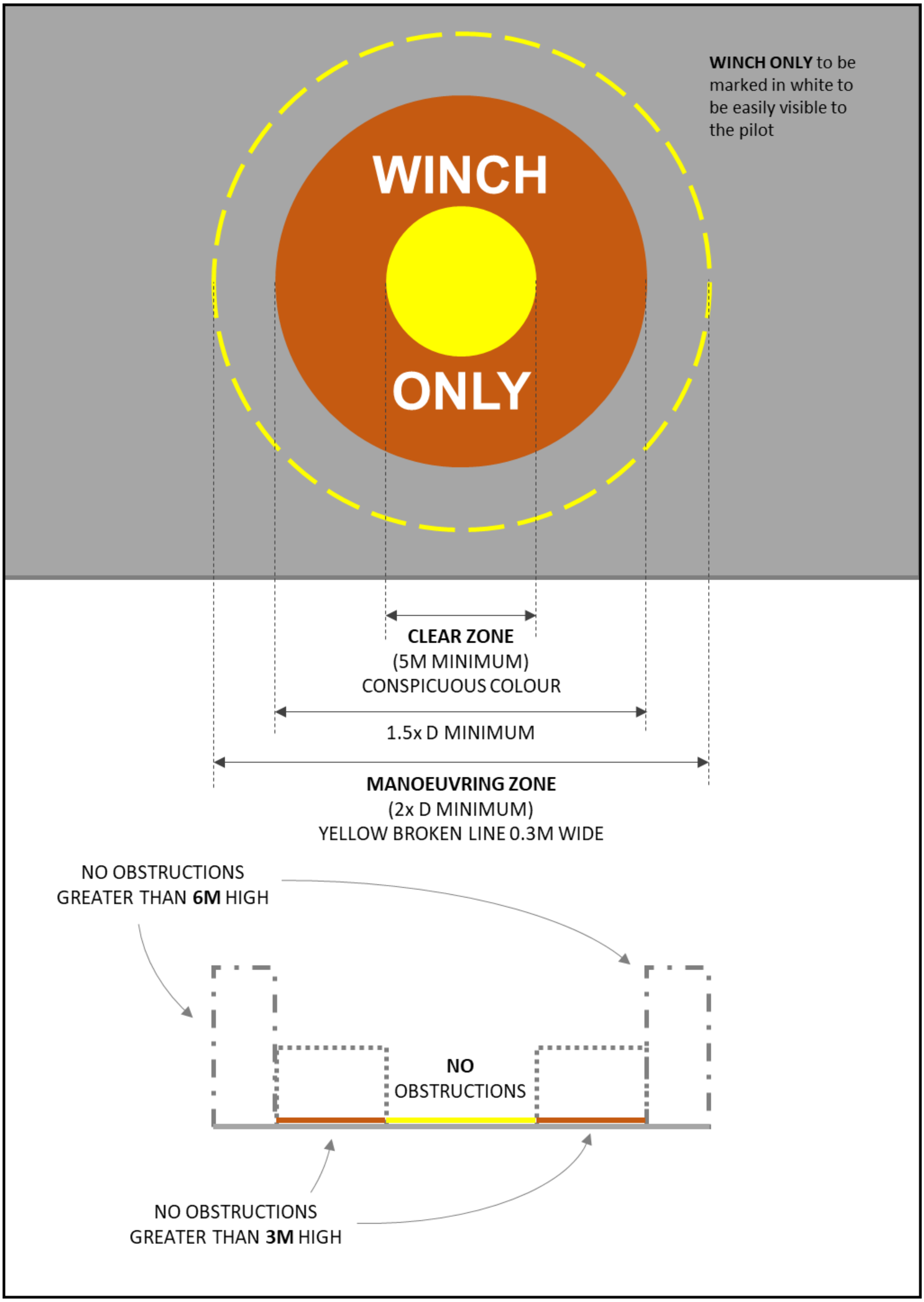

Figure 24: Shipboard winching area obstacle limitations and markings

5 Visual aids

5.1 Wind direction indicators

5.1.1 A heliport should be equipped with at least one wind direction indicator.

5.1.2 A wind direction indicator should be located to indicate the wind conditions over the FATO and TLOF and in such a way as to be free from the effects of airflow disturbances caused by nearby objects or rotor downwash. It should be visible from a helicopter in flight, in a hover or on the movement area.

5.1.3 Where a TLOF and/or FATO may be subject to a disturbed airflow, additional wind direction indicators located close to the area should be provided to indicate the surface wind on the area.

5.1.4 A wind direction indicator should be constructed so that it gives a clear indication of the direction of the wind and a general indication of the wind speed.

5.1.5 A wind direction indicator should be a truncated cone made of lightweight fabric and should have the dimensions described in Table 13 below.

Table 14: Wind direction indicator characteristics

Characteristics	Surface-level heliports	Elevated heliports and helidecks
Length	2.4 m	1.2 m
Diameter (larger end)	0.6 m	0.3 m
Diameter (smaller end)	0.3 m	0.15 m

5.1.6 The colour of the wind direction indicator should be so selected as to make it clearly visible and understandable from a height of at least 200 m above the heliport, having regard to background. 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.

5.1.7 A wind direction indicator at a heliport intended for use at night should be illuminated.

Note: See section 9.38, Part 139 for further information on illuminating wind direction indicators.

5.2 Markings and markers

5.2.1 Introduction

5.2.1.1 Markings and markers outlined in this section are not required in all circumstances. The heliport operator should provide markings and markers based on intended helicopter operations, or as required by helicopter pilots and aircraft operators.

5.2.1.2 Where the heliport operator has elected to install markings and markers, those items should be consistent with the information provided in this section.

5.2.2 General

5.2.2.1 In accordance with the following specifications, markers and markings should be installed at a heliport used or available for operations in daylight or at night.

5.2.2.2 Markers and markings should be clearly visible to the heliport user by way of:

a. provision of a contrasting background marking (a box or border)

b. where allowed for in the specifications below, the selection of an appropriate contrasting colour

c. any other method that would increase the conspicuity of the marking or marker in operational conditions.

5.2.2.3 Information about standard colours for aerodrome markings, markers, signals and signs can be found in Table 8.03 (1) of the Part 139 (Aerodromes) Manual of Standards 2019.

a. any other method that would increase the conspicuity of the marking or marker in operational conditions.

5.2.3 Winching area marking

5.2.3.1 The objective of winching area markings is to provide to the pilot visual cues to assist a helicopter to be positioned over, and retained within, an area from which a passenger or equipment can be lowered or raised.

5.2.3.2 Winching area markings should be provided at a designated winching area. (See Figure 24.)

5.2.3.3 Winching area markings should be located so that their centre(s) coincides with the centre of the clear zone of the winching area.

5.2.3.4 Winching area markings should comprise a winching area clear zone marking and a winching area manoeuvring zone marking.

5.2.3.5 A winching area clear zone marking should consist of a solid circle of diameter not less than 5 m and of a conspicuous colour.

5.2.3.6 A winching area manoeuvring zone marking should consist of a broken circle line of 300 mm in width and of a diameter not less than 2 D and be marked in a conspicuous colour. Within it “WINCH ONLY” should be marked to be easily visible to the pilot. (See Figure 24.)

5.2.4 Heliport identification marking

5.2.4.1 A heliport identification marking should be provided at a heliport.

5.2.4.2 For all FATOs except runway type FATOs, a heliport identification should be located at or near the centre of the FATO.

5.2.4.3 For all FATOs except runway-type FATOs which also contain a TLOF, heliport identification marking should be located in the FATO so the position of it coincides with the centre of the TLOF.

5.2.4.4 For runway-type FATOs, a heliport identification marking should be located in the FATO and when used in conjunction with FATO designation markings, should be displayed at each end of the FATO as shown in Figure 25 B.

5.2.4.5 A heliport identification marking, except for a heliport at a hospital, should consist of a letter H, in white. The dimensions of the H marking should be no less than those shown in Figure 24 A and where the marking is used for a runway-type FATO, its dimensions should be increased by a factor of 3 as shown in Figure 25 B and Figure 27.

5.2.4.6 A heliport identification marking for a heliport at a hospital should consist of a letter H, red in colour, on a white cross made of squares adjacent to each of the sides of a square containing the H as shown in Figure 25 C and Figure 26.

5.2.4.7 A heliport identification marking should be oriented with the cross arm of the H at right angles to the preferred final approach direction. For a helideck, the cross arm should be on or parallel to the bisector of the obstacle-free sector. For a non-purpose-built shipboard heliport located on a ship’s side, the cross arm should be parallel with the side of the ship.

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

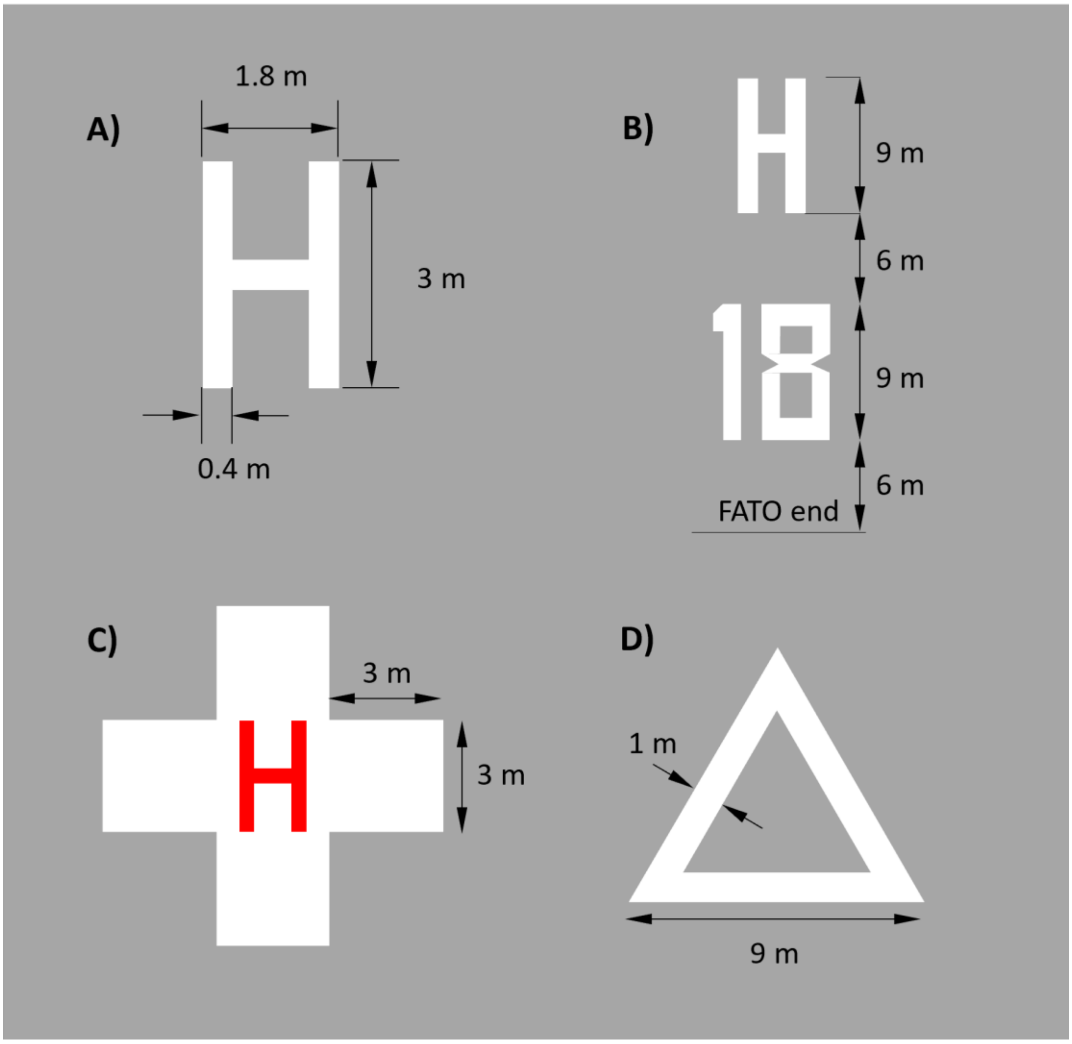

Figure 25: a) Heliport identification marking. b) Runway type FATO identification markings. c) Hospital heliport identification marking. d) Aiming point marking.

5.2.5 Maximum allowable mass marking

5.2.5.1 A maximum allowable mass marking should be displayed at a heliport.

5.2.5.2 A maximum allowable mass marking should be located within the TLOF or FATO and so arranged as to be readable from the preferred final approach direction as shown in Figure 25.

5.2.5.3 A maximum allowable mass marking should consist of a one-, two- or three-digit number.

5.2.5.4 The maximum allowable mass should be expressed in tonnes to the nearest 100 kg. The marking should be presented to one decimal place and rounded to the nearest 100 kg followed by the letter “t”.

5.2.5.5 When the maximum allowable mass is expressed to 100 kg, the decimal place should be preceded with a decimal point marked with a 300 mm square.

5.2.5.6 For all FATOs except runway-type FATOs, the numbers and the letter of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 28 for a D-value of more than 30 m. For a D-value between 15 m and 30 m, the height of the numbers and the letter of the marking should be a minimum of 900 mm, and for a D-value of less than 15 m, the height of the numbers and the letter of the marking should be a minimum of 600 mm, each with a proportional reduction in width and thickness.

5.2.5.7 For runway-type FATOs, the numbers and the letter of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 28.

5.2.6 D-value marking

5.2.6.1 For all FATOs except runway-type FATOs, a D-value marking should be displayed at a heliport.

5.2.6.2 A D-value marking should be located within the TLOF or FATO and so arranged as to be readable from the preferred final approach direction as shown in Figure 25.

5.2.6.3 Where there is more than one approach direction, additional D-value markings should be provided such that at least one D-value marking is readable from the final approach direction. For a non-purpose-built heliport located on a ship’s side, D-value markings should be provided on the perimeter of the D circle at the 2 o’clock, 10 o’clock and 12 o’clock positions when viewed from the side of the ship facing towards the centre line

5.2.6.4 The D-value marking should be rounded to the nearest whole metre with 0.5 rounded down.

5.2.6.5 The numbers of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 28 for a D-value of more than 30 m. For a D-value between 15 m and 30 m, the height of the numbers of the marking should be a minimum of 900 mm, and for a D-value of less than 15 m, the height of the numbers of the marking should be a minimum of 600 mm, each with a proportional reduction in width and thickness.

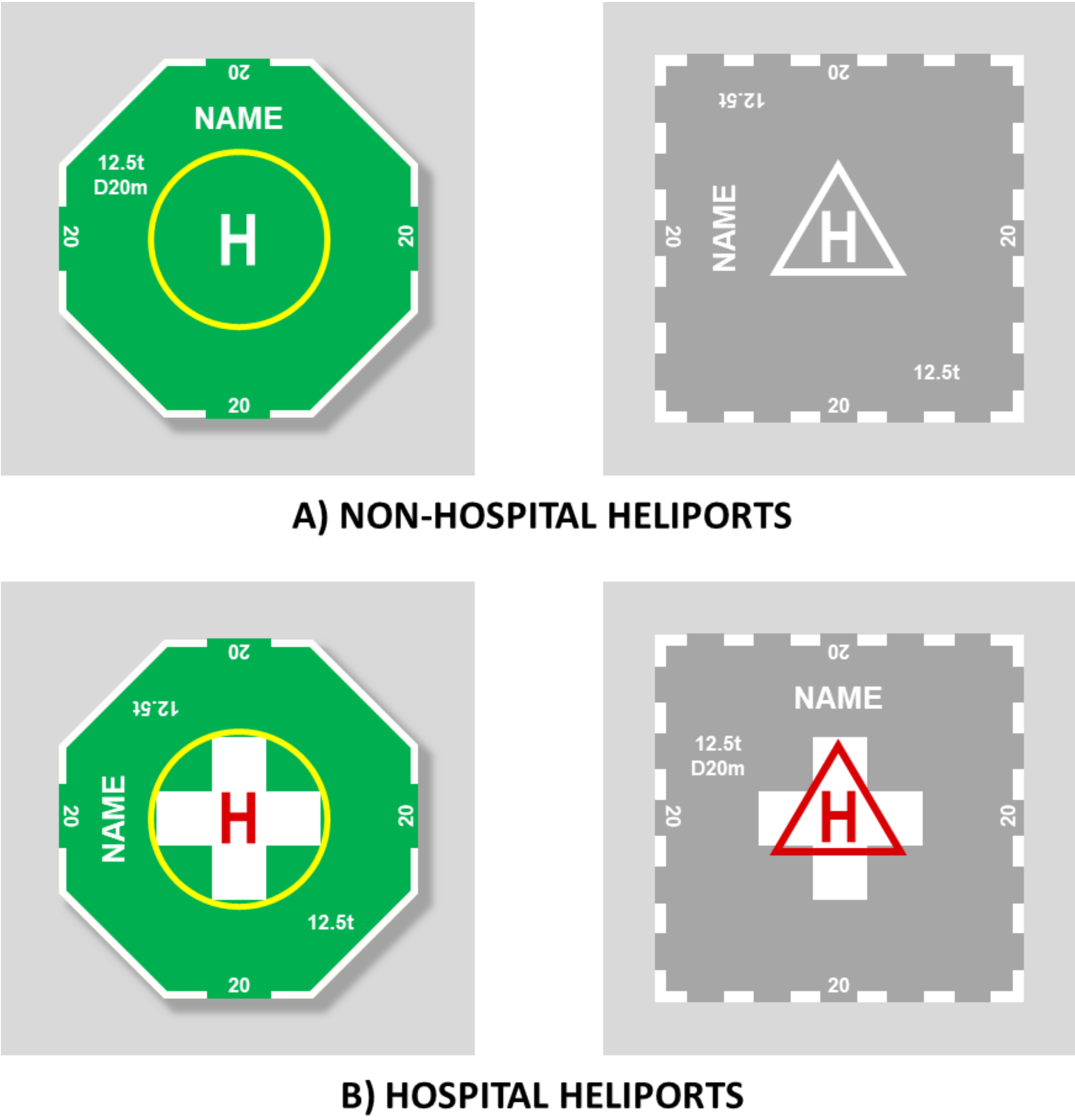

Figure 26: Examples of heliport identification markings with TLOF (left side) and aiming markings (right side) for heliports and hospital heliports

5.2.7 FATO perimeter marking or markers for surface-level heliports

5.2.7.1 FATO perimeter marking or markers should be provided at a surface-level heliport where the extent of a FATO with a solid surface is not self-evident.

5.2.7.2 The FATO perimeter marking or markers should be located on the edge of the FATO.

5.2.7.3 For runway-type FATOs, the perimeter of the FATO should be defined with markings or markers spaced at equal intervals of not more than 50 m with at least three markings or markers on each side including a marking or marker at each corner.

5.2.7.4 For runway-type FATOs, a FATO perimeter marking should be a rectangular stripe with a length of 9 m or one-fifth of the side of the FATO which it defines and a width of 1 m.

5.2.7.5 For runway-type FATOs, FATO perimeter markings should be white.

5.2.7.6 For runway-type FATOs, a FATO perimeter marker should be a gable marker shape, 1 m in width, 3 m in length, and 0.25 m high.

5.2.7.7 For runway-type FATOs, FATO perimeter markers should be a single colour, orange or red, or two contrasting colours, orange and white or, alternatively, red and white should be used except where such colours would merge with the background.

5.2.7.8 For all FATOs except runway-type FATOs, an unpaved FATO the perimeter should be defined with flush in-ground markers. The FATO perimeter markers should be 300 mm in width, 1.5 m in length, and with end-to-end spacing of not less than 1.5 m and not more than 2 m.

5.2.7.9 For all FATOs except runway-type FATOs, the corners of a square or rectangular FATO should be defined.

5.2.7.10 For all FATOs except runway-type FATOs, a paved FATO the perimeter should be defined with a dashed line. The FATO perimeter marking segments should be 300 mm in width, 1.5 m in length, and with end-to-end spacing of not less than 1.5 m and not more than 2 m. The corners of the square or rectangular FATO should be defined.

5.2.7.11 For all FATOs except runway-type FATOs, FATO perimeter markings and flush in-ground markers should be white.

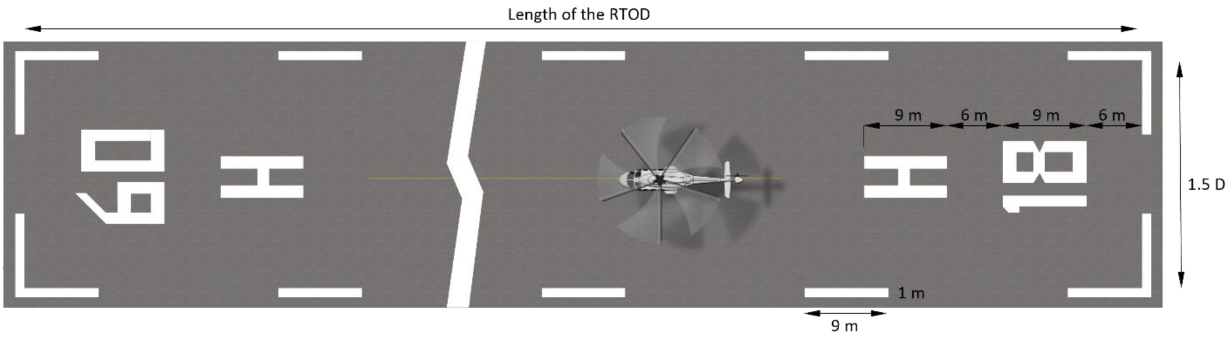

Figure 27: Runway type FATO marking example

5.2.8 FATO designation markings for runway-type FATO

5.2.8.1 A FATO designation marking should be provided at a heliport where it is necessary to designate the FATO to the pilot.

5.2.8.2 A FATO designation marking should be located at the beginning of the FATO as shown in Figure 27.

5.2.8.3 A FATO designation marking should consist of a two-digit number. The two-digit number should be the whole number nearest to one-tenth of the magnetic North when viewed from the direction of approach. When this rule would give a single digit number, it should be preceded by a zero. The marking, as shown in Figure 27, should be supplemented by the heliport identification marking.

5.2.9 Aiming point marking

5.2.9.1 An aiming point marking should be provided at a heliport where it is necessary for a pilot to make an approach to a particular point above a FATO before proceeding to a TLOF.

5.2.9.2 For runway-type FATOs, the aiming point marking should be located within the FATO.

5.2.9.3 All FATOs except runway-type FATOs, the aiming point marking should be located at the centre of the FATO as shown in Figure 26.

5.2.9.4 The aiming point marking should be an equilateral triangle with the bisector of one of the angles aligned with the preferred approach direction. The marking should consist of continuous lines providing a contrast with the background colour, and the dimensions of the marking should conform to those shown in Figure 25.

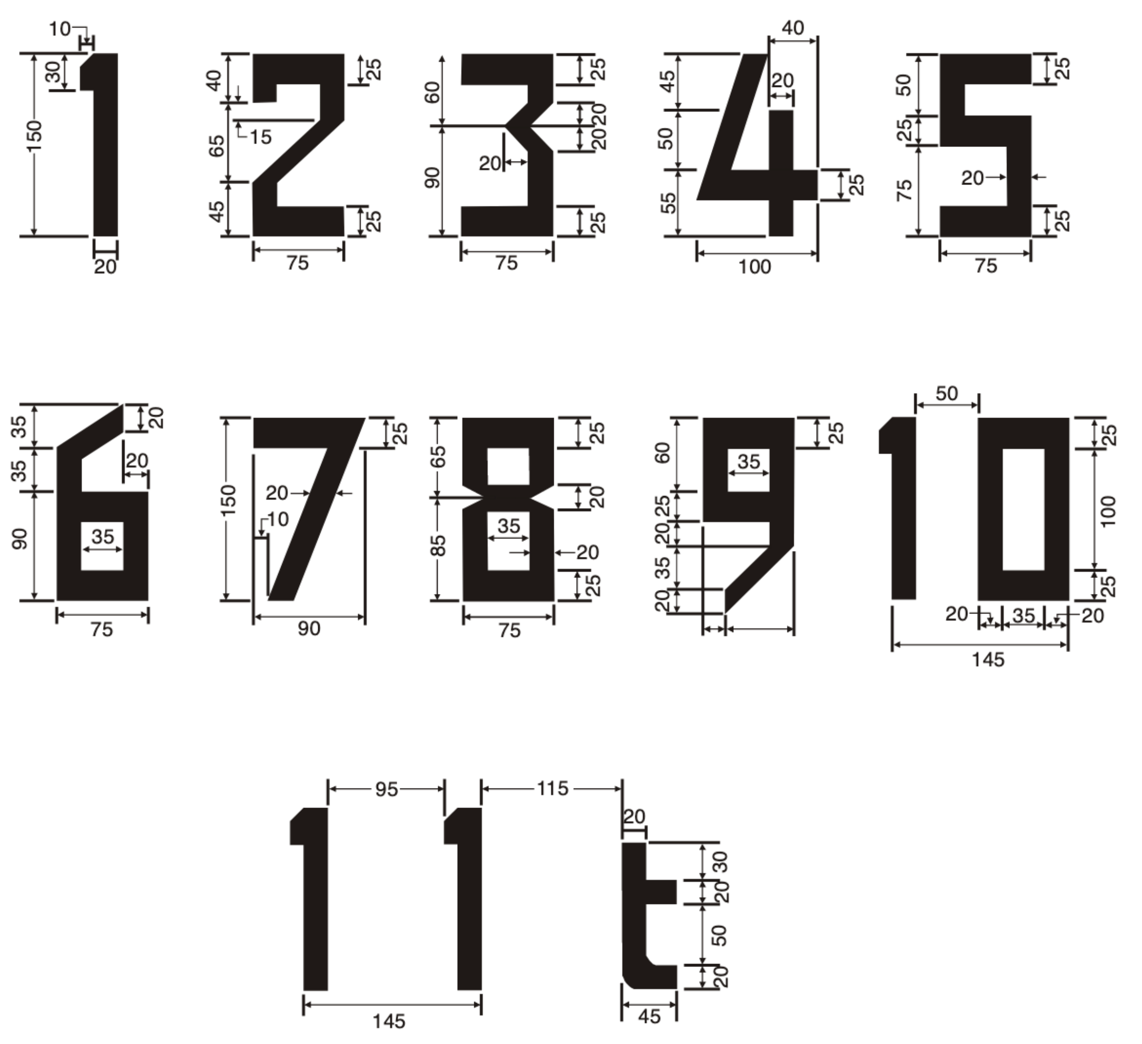

Figure 28: Form and proportion of numbers and letters

5.2.10 TLOF perimeter marking

5.2.10.1 A TLOF perimeter marking should:

a. be displayed on a TLOF located in a FATO at a surface-level heliport if the perimeter of the TLOF is not self-evident

b. be displayed on an elevated heliport, a helideck and a shipboard heliport

c. be located along the edge of the TLOF

d. consist of a continuous white line with a width of at least 300 mm.

5.2.11 Touchdown/positioning marking

5.2.11.1 The objective of touchdown/positioning marking (TDPM) is to provide visual cues which permit a helicopter to be placed in a specific position such that, when the pilot's seat is above the marking, the undercarriage is within the load bearing area and all parts of the helicopter will be clear of any obstacles by a safe margin.

5.2.11.2 A TDPM should be provided for a helicopter to touch down or be accurately placed in a specific position.

5.2.11.3 The TDPM should be:

a. when there is no limitation on the direction of touchdown/positioning, a touchdown/positioning circle (TDPC) marking

b. when there is a limitation on the direction of touchdown/positioning:

   i. for unidirectional applications, a shoulder line with an associated centreline

   or

   ii. for multidirectional applications, a TDPC marking with prohibited landing sector(s) marked.

5.2.11.4 The inner edge/inner circumference of the TDPM should be at a distance of 0.25 D from the centre of the area in which the helicopter is to be positioned.

5.2.11.5 On a helideck, the centre of the TDPC marking should be located at the centre of the FATO, except that the marking may be offset away from the origin of the obstacle-free sector by no more than 0.1 D where an aeronautical study indicates such offsetting is necessary and would not impair safety.

5.2.11.6 Prohibited landing sector markings, when provided, should be located on the TDPM, within the relevant headings, and extend to the inner edge of the TLOF perimeter marking.

5.2.11.7 The inner diameter of the TDPC should be 0.5 D of the largest helicopter the area is intended to serve.

5.2.11.8 A TDPM should have a line width of at least 0.5 m. For a helideck and a purpose-built shipboard heliport, the line width should be at least 1 m.

5.2.11.9 The length of a shoulder line should be 0.5 D of the largest helicopter the area is intended to serve.

5.2.11.10 The prohibited landing sector marking, when provided, should be indicated by white and red hatched markings as shown in Figure 29.

5.2.11.11 The TDPM should take precedence when used in conjunction with other markings on the TLOF except for the prohibited landing sector marking.

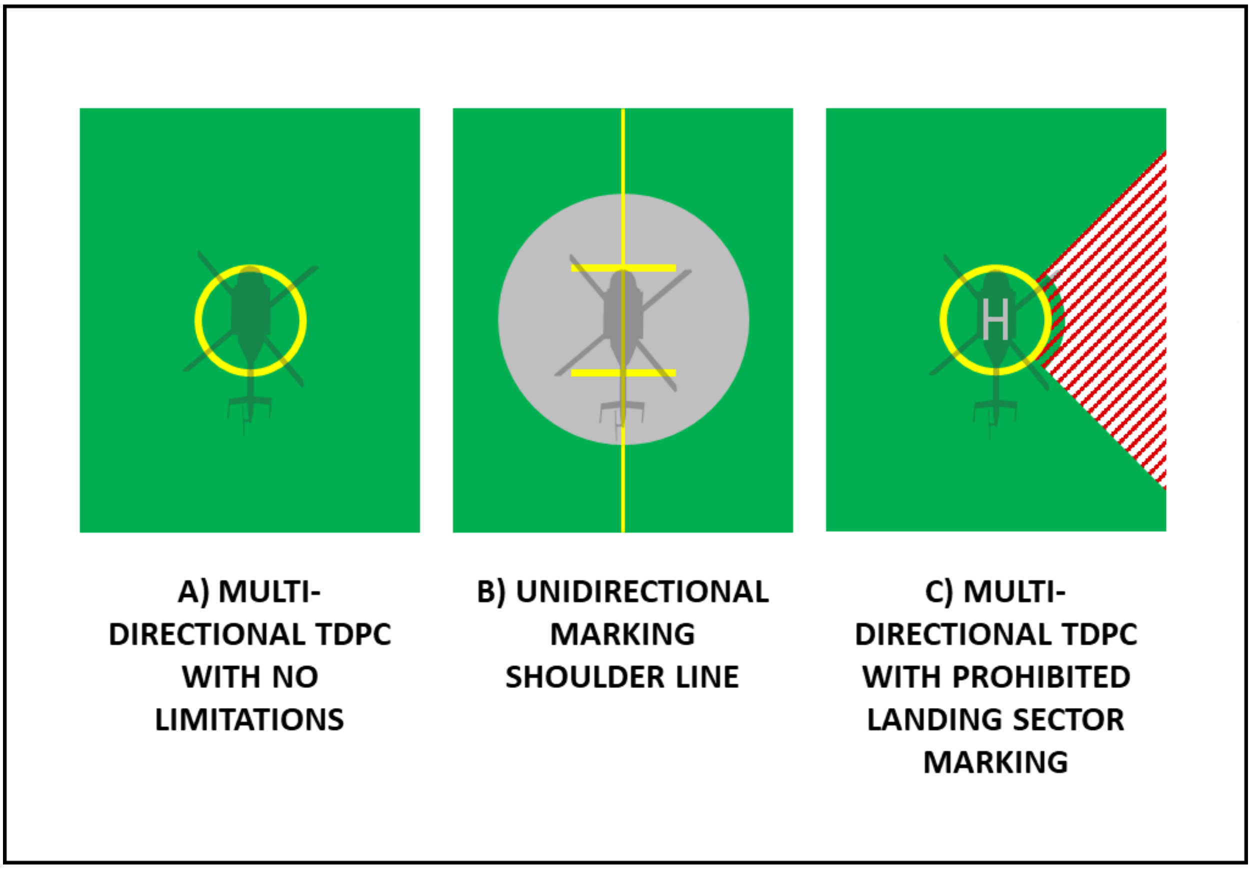

Figure 29: Examples of touchdown/positioning markings

5.2.12 Heliport name marking

5.2.12.1 A heliport name marking should be provided at a heliport and helideck where there is insufficient alternative means of visual identification.

5.2.12.2 Where a limited obstacle sector (LOS) exists on a helideck, the marking should be located on that side of the heliport identification marking. For a non-purpose-built heliport located on a ship's side, the marking should be located on the inboard side of the heliport identification marking in the area between the TLOF perimeter marking and the boundary of the LOS.

5.2.12.3 A heliport name marking should consist of the name, or the alphanumeric designator of the heliport as used in the radio (R/T) communications.

5.2.12.4 A heliport name marking intended for use at night or during conditions of poor visibility should be illuminated, either internally or externally.

5.2.12.5 For runway-type FATOs, the characters of the marking should be not less than 3 m in height.

5.2.12.6 For all FATOs except runway-type FATOs, the characters of the marking should be not less than 1.5 m in height at surface-level heliports and not less than 1.2 m on elevated heliports, helidecks and shipboard heliports. The colour of the marking should contrast with the background and preferably be white.

5.2.13 Helideck obstacle-free sector (chevron) marking

5.2.13.1 A helideck with adjacent obstacles that penetrate above the level of the helideck should have an obstacle-free sector marking.

5.2.13.2 A helideck obstacle-free sector marking should be located, where practicable, at a distance from the centre of the TLOF equal to the radius of the largest circle that can be drawn in the TLOF or 0.5 D, whichever is greater.

5.2.13.3 The helideck obstacle-free sector marking should indicate the location of the obstacle-free sector and the directions of the limits of the sector.

5.2.13.4 The height of the chevron should not be less than 300 mm.

5.2.13.5 The chevron should be marked in a conspicuous colour, preferably black.

5.2.14 Helideck and shipboard heliport surface marking

5.2.14.1 A surface marking should be provided to assist the pilot to identify the location of the helideck or shipboard heliport during an approach by day.

5.2.14.2 A surface marking should be applied to the dynamic load-bearing area bounded by the TLOF perimeter marking.

5.2.14.3 The helideck or shipboard heliport surface bounded by the TLOF perimeter marking should be of dark green using a high friction coating.

5.2.15 Helicopter taxiway markings and markers

5.2.15.1 The centre line of a helicopter taxiway should be identified with a marking along the taxiway centreline.

5.2.15.2 The edges of a helicopter taxiway, if not self-evident, should be identified with markings along or markers at a distance of 1 m to 3m beyond the edge of the helicopter taxiway.

5.2.15.3 Helicopter taxiway edge markers should be spaced at intervals of not more than 15 m on each side of straight sections and 7.5 m on each side of curved sections with a minimum of four equally spaced markers per section.

5.2.15.4 On a paved taxiway, a helicopter taxiway centre line marking should be a continuous yellow line 150 mm in width.

5.2.15.5 On an unpaved taxiway that will not accommodate painted markings, a helicopter taxiway centre line should be marked with flush in-ground 15-cm-wide and approximately 1.5 m in length yellow markers, spaced at intervals of not more than 30 m on straight sections and not more than 15 m on curves, with a minimum of four equally spaced markers per section.

5.2.15.6 Helicopter taxiway edge markings should be a continuous double yellow line, each 150 mm in width, and spaced 150 mm apart (nearest edge to nearest edge).

5.2.15.7 A helicopter taxiway edge marker should be blue and frangible to the wheeled undercarriage of a helicopter.

5.2.15.8 A helicopter taxiway edge marker should not exceed a plane originating at a height of 250 mm above the plane of the helicopter taxiway, at a distance of 0.5 m from the edge of the helicopter taxiway and sloping upwards and outwards at a gradient of 5 per cent to a distance of 3 m beyond the edge of the helicopter taxiway.

5.2.15.9 If the helicopter taxiway is to be used at night, the edge markers should be internally illuminated or retro-reflective.

5.2.16 Helicopter air taxi-route markings and markers

5.2.16.1 The centre line of a helicopter air taxi-route should be identified with markers or markings.

5.2.16.2 A helicopter air taxi-route centre line marking or flush in-ground centre line marker should be located along the centre line of the helicopter air taxi-route.

5.2.16.3 A helicopter air taxi-route centre line, when on a paved surface, should be marked with a continuous yellow line 150 mm in width.

5.2.16.4 A helicopter air taxi-route centre line, when on an unpaved surface that will not accommodate painted markings, should be marked with flush in-ground 15-cm-wide and approximately 1.5 m in length yellow markers, spaced at intervals of not more than 30 m on straight sections and not more than 15 m on curves, with a minimum of four equally spaced markers per section.

5.2.16.5 If the helicopter air taxi-route is to be used at night, markers should be either internally illuminated or retro-reflective.

5.2.17 Helicopter stand markings

5.2.17.1 A helicopter stand perimeter marking should be provided.

5.2.17.2 A helicopter stand should be provided with the appropriate TDPM. (See Figure 29.)

5.2.17.3 Alignment lines and lead-in/lead-out lines should be provided on a helicopter stand.

5.2.17.4 The TDPM, alignment lines and lead-in/lead-out lines should be located such that every part of the helicopter can be contained within the helicopter stand during positioning and permitted manoeuvring.

5.2.17.5 Alignment lines and lead-in/lead-out lines should be located as shown in Figure 29 below.

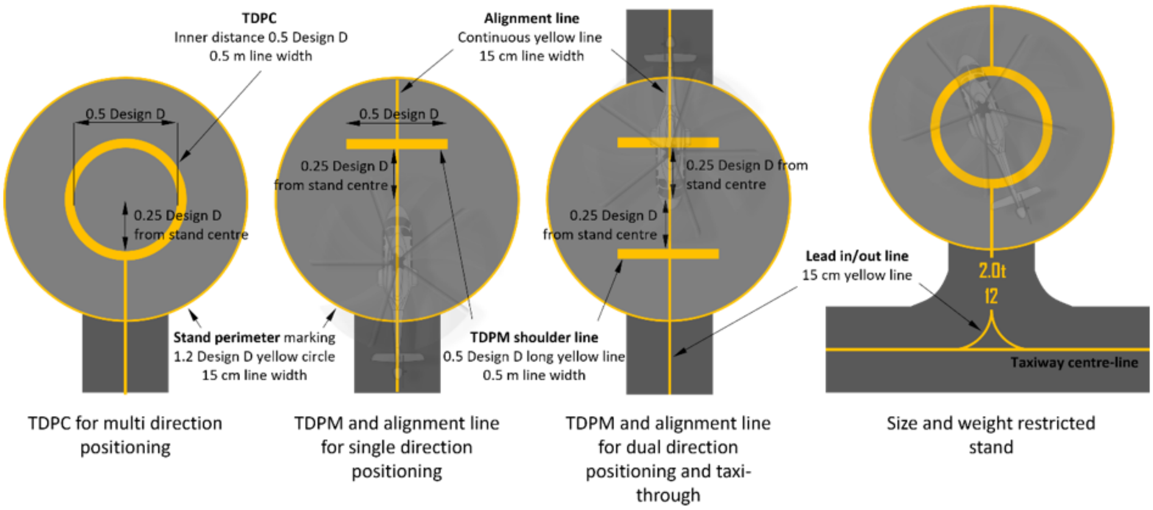

Figure 30: Helicopter stand markings

5.2.17.6 A helicopter stand perimeter marking should consist of a continuous yellow line and have a line width of 150 mm.

5.2.17.7 The TDPM should have the characteristics described in Section 5.2.11 above.

5.2.17.8 Alignment lines and lead-in/lead-out lines should be continuous yellow lines and have a width of 150 mm. Stand identification markings should be marked in a contrasting colour so as to be easily readable.

5.2.17.9 Curved portions of alignment lines and lead-in/lead-out lines should have radii appropriate to the most demanding helicopter type the helicopter stand is intended to serve.

5.2.17.10 Where the stand is designed to accommodate helicopters smaller than the design helicopter, the maximum allowable mass marking and the limiting D marking may be displayed on the lead-in line to the stand (see sections 5.2.5 and 5.2.6 of this AC).

5.2.18 Flight path alignment guidance marking

5.2.18.1 Flight path alignment guidance marking(s) should be provided at a heliport where it is desirable and practicable to indicate available approach and/or departure path direction(s).

5.2.18.2 The flight path alignment guidance marking should be located in a straight line along the direction of approach and/or departure path on one or more of the TLOF, FATO, SA or any suitable surface in the immediate vicinity of the FATO or SA.

5.2.18.3 Flight path alignment should be considered in context of airspace protection and obstacle limitation surfaces, including approach and departure splays, side protection or transitional surfaces (whichever apply). Flight path alignment markings demonstrate preferred FATO arrival or departure directions only.

5.2.18.4 A flight path alignment guidance marking should consist of one or more arrows marked on the TLOF, FATO and/or SA surface as shown in Figure 30 below. The stroke of the arrow(s) should be 500 mm in width and at least 3 m in length. When combined with a flight path alignment guidance lighting system it should take the form shown in Figure 30 B below which includes the scheme for marking “heads of the arrows” which are constant regardless of stroke length.

5.2.18.5 The markings should be in a colour which provides good contrast against the background colour of the surface on which they are marked, preferably white.

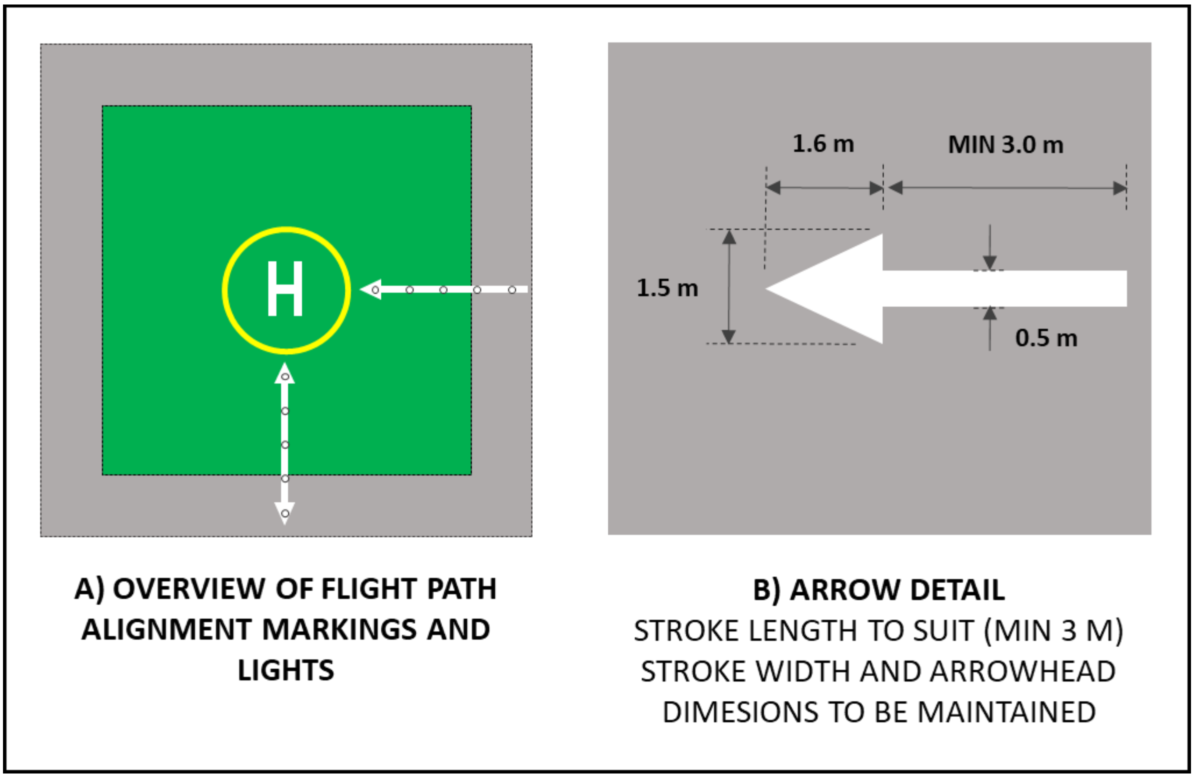

Figure 31: Flight path alignment guidance markings and lights

5.2.19 Obstacle markings

5.2.19.1 When a helicopter is on approach to, or departure from, the FATO, objects, things and activities should not infringe specific obstacle limitation surfaces. Object restrictions also apply to the FATO, TLOF, and the safety area. However, in certain circumstances such as a ship helideck, when a helicopter is not using the facility, it may be used for other purposes. Therefore, removable items may be present on or adjacent to the FATO which would otherwise pose a hazard to helicopter operations.

Heliports

5.2.19.2 Where the presence of existing obstacles, or introduction of new objects or things is unavoidable, if the object, thing or activity has been assessed as a hazard to air navigation, they may need to be marked or lit. Fixed obstacles which present a hazard to helicopters should be readily visible from the air.

5.2.19.3 The specifications for the marking of obstacles in the Part 139 MOS Chapter 8 Division 12 (as amended), should be applied equally to objects and things that penetrate obstacle limitation surfaces as if they have been determined to be obstacles, within the vicinity of a heliport.

5.2.19.4 Notwithstanding the specifications in the Part 139 MOS, any lattice tower structures or crane booms in near proximity to the heliport should be obstacle marked for the entirety of the structure, including any jack up units. Heliport operators should liaise with other helicopter operators to determine the boundary of such proximity based on intended operations to end from the heliport.

5.2.19.5 If the purpose of the obstacle or object requires the consideration of industrial safety matters, the colour of the obstacle marking may need to consider the visibility of the obstacle or the object by the pilot.

Offshore and shipboard Helidecks

5.2.19.6 Objects, whose function requires that they be located around an offshore or shipboard helideck, such as lighting, foam monitors or handrails and that would exceed the obstacle restriction heights whether or not being capable of being not stowed, folded, or otherwise removed during helicopter operations should marked. They should be marked to be readily visible from the air by a pilot.

5.2.19.7 If a paint scheme is necessary to enhance identification by day, alternate black and yellow, or red and white bands are recommended. They should be not less than 0.5 m and not more than 6 m wide. The use of' DayGlo orange may also be acceptable. The colour should be chosen to contrast with the background, viewed on approach by the pilot, to the maximum extent.

5.3 Lights

5.3.1 Introduction

5.3.1.1 Lights and lighting units outlined in this section are not required in all circumstances. The heliport operator should provide lights and lighting as outlined in this section based on intended helicopter operations, or as required by helicopter pilots and aircraft operators.

5.3.1.2 Where the heliport operator has elected to install lights and lighting, those items should be consistent with the information provided in this section.

5.3.1.3 In cases where operations into a heliport are to be conducted at night with night vision imaging systems (NVIS), it is important to ensure all heliport lighting are compatible with the NVIS through the addition of infrared emitters to the heliport lighting. Where the addition of infrared emitters is not practicable, helicopter operators using NVIS should be warned to use extra caution.

5.3.2 Heliport beacon

5.3.2.1 A heliport beacon should be provided at a heliport where:

a. long-range visual guidance is considered necessary and is not provided by other visual means

or

b. identification of the heliport is difficult due to surrounding lights.

5.3.2.2 The heliport beacon should be located on or adjacent to the heliport preferably at an elevated position and so that it does not dazzle a pilot at short range.

5.3.2.3 The heliport beacon should emit a morse code "H" as a repeated series of equi-spaced short duration white flashes in the format in four flashes of 0.5 to 2.0 milliseconds, over 0.8 s with a gap between series of 1.2 s.

5.3.2.4 The light from the beacon should show at all angles of azimuth.

5.3.2.5 The effective light intensity distribution of each flash should be as shown in Table 14, column (A).

5.3.3 Approach lighting system

5.3.3.1 An approach lighting system should be provided at a heliport where it is desirable and practicable to indicate a preferred approach direction.

5.3.3.2 The approach lighting system should be located in a straight line along the preferred direction of approach.

5.3.3.3 An approach lighting system should consist of a row of three lights spaced uniformly at 30 m intervals and of a crossbar 18 m in length at a distance of 90 m from the perimeter of the FATO as shown in Figure 32. The lights forming the crossbar should be as nearly as practicable in a horizontal straight line at right angles to, and bisected by, the line of the centre line lights and spaced at 4.5 m intervals. Where there is the need to make the final approach course more conspicuous, additional lights spaced uniformly at 30 m intervals should be added beyond the crossbar. The lights beyond the crossbar may be steady or sequenced flashing, depending upon the environment.

5.3.3.4 Where an approach lighting system is provided for a non-precision FATO, the system should not be less than 210 m in length.

5.3.3.5 The steady lights should be omnidirectional white lights.

5.3.3.6 Sequenced flashing lights should be omnidirectional white lights.

5.3.3.7 The light distribution of steady lights should be as indicated in Table 14, column (B) except that the intensity should be increased by a factor of three for a non-precision FATO.

5.3.3.8 The flashing lights should have a flash frequency of one per second and their light distribution should be as shown in Table 14, column (C). The flash sequence should commence from the outermost light and progress towards the crossbar.

5.3.3.9 A suitable brilliancy control should be incorporated to allow for adjustment of light intensity to meet the prevailing conditions.

a. steady lights — 100 per cent, 30 per cent and 10 per cent

b. flashing lights — 100 per cent, 10 per cent and 3 per cent.

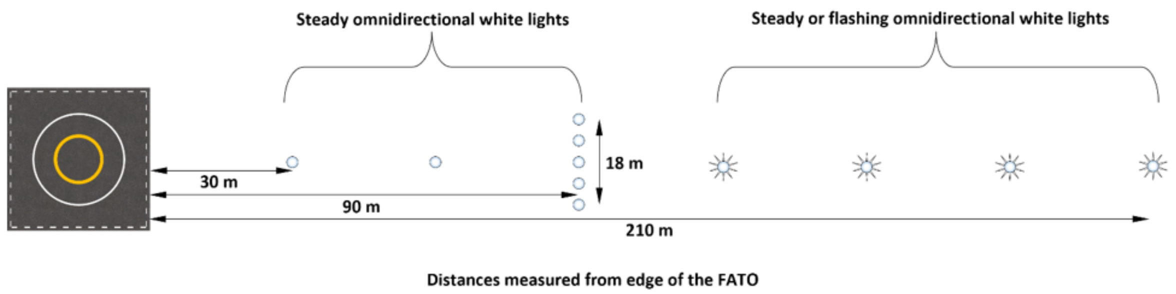

Figure 32: Approach lighting system

Table 15: Lighting system - isocandela (cd & cd/m2 for panels)

Elevation (degrees)	(A) Heliport beacon	(B) Steady approach	(C) Flashing approach	(D) FATO & aiming point	(E) TLOF perimeter & FPAGLS	(F) TLOF luminescent panels
90						55
60						55
40						50
30				10		45
25				50		
20				100	3	30
15		25	250			
13					8	
10	250				15	15
9		250	2500			
7	750					
6		350	3500			
5		350	3500		30	
4	1700					
3				100		
2.5	2500					
2		250	2500		15	
1.5	2500					
0	1700	25	250	10		5

5.3.4 Flight path alignment guidance lighting system

5.3.4.1 Flight path alignment guidance lighting system(s) (FPAG lights) should be provided at a heliport where it is desirable and practicable to indicate available approach and/or departure path direction(s).

5.3.4.2 The flight path alignment guidance lighting system should be in a straight line along the direction(s) of approach and/or departure path on one or more of the TLOF, FATO, SA or any suitable surface in the immediate vicinity of the FATO, TLOF or SA.

5.3.4.3 If combined with a flight path alignment guidance marking, as far as is practicable the lights should be located inside the “arrow” markings.

5.3.4.4 A flight path alignment guidance lighting system should consist of a row of three or more lights spaced uniformly with a total minimum distance of 6 m. Intervals between lights should not be less than 1.5 m and should not exceed 3 m. Where space permits, there should be 5 lights.

5.3.4.5 The lights should be steady omnidirectional inset lights of a contrasting colour, preferably white.

5.3.4.6 The distribution of the lights should be as indicated in Table 14, column (E).

5.3.4.7 A suitable control should be incorporated to allow for adjustment of light intensity to meet the prevailing conditions and to balance the flight path alignment guidance lighting system with other heliport lights and general lighting that may be present around the heliport.

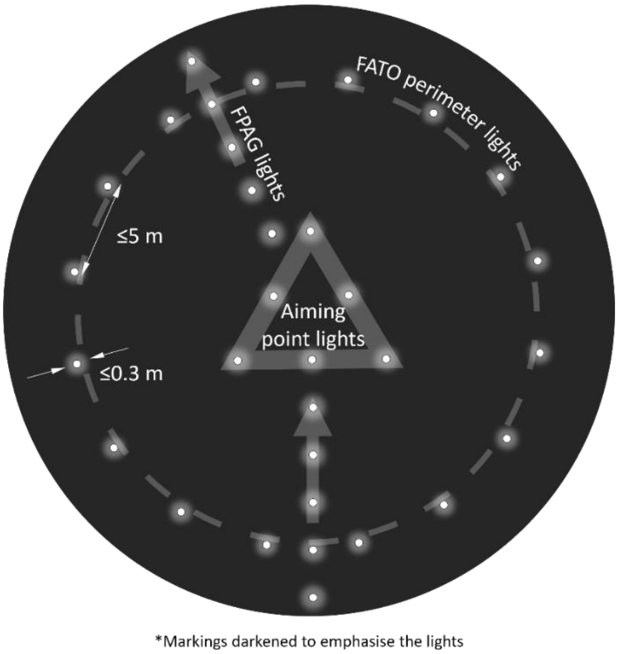

Figure 33: FPAG lights, FATO perimeter and aiming point lights

5.3.5 Visual alignment guidance system

5.3.5.1 A visual alignment guidance system should be provided to serve the approach to a heliport where one or more of the following conditions exist, especially at night:

a. obstacle clearance, noise abatement or traffic control procedures require a particular direction to be flown

b. the environment of the heliport provides few visual surface cues

c. it is physically impracticable to install an approach lighting system.

5.3.6 Visual approach slope indicator

5.3.6.1 A visual approach slope indicator should be provided to serve the approach to a heliport, whether or not the heliport is served by other visual approach aids or by non-visual aids, where one or more of the following conditions exist, especially at night:

a. obstacle clearance, noise abatement or traffic control procedures require a particular slope to be flown

b. the environment of the heliport provides few visual surface cues

c. the characteristics of the helicopter require a stabilized approach.

5.3.6.2 Where provided, a visual approach slope indicator system should be protected by an obstacle protection surface of the dimensions described in Table 15 below.

Table 16: Dimensions and slopes of the obstacle protection surface

Surface and dimensions	Non-precision FATO	
Length of inner edge	Width of safety area	
Distance from end of FATO	60 m	
Divergence	15%	
Total length	2500 m	
Slope	PAPI	0.57°
	HAPI	0.65°
	APAPI	0.90°

5.3.7 FATO lighting systems for onshore surface-level heliports

5.3.7.1 Where a FATO with a solid surface is established at a surface-level heliport intended for use at night, FATO lights should be provided except that they may be omitted where the FATO and the TLOF are nearly coincidental, or the extent of the FATO is self-evident.

5.3.7.2 FATO lights should be placed along the edges of the FATO. The lights should be uniformly spaced as follows:

a. for an area in the form of a square or rectangle, at intervals of not more than 5 m with a minimum of four lights on each side including a light at each corner

b. for any other shaped area, including a circular area, at intervals of not more than 5 m with a minimum of ten lights.

5.3.7.3 FATO lights should be fixed omnidirectional lights showing white or green. Where the intensity of the lights is to be varied, the lights should show variable white.

5.3.7.4 The light distribution of FATO lights should be as shown in Table 14, column (D).

5.3.7.5 The lights should not exceed a height of 250 mm and should be inset when a light extending above the surface would endanger helicopter operations. Where a FATO is not meant for lift-off or touchdown, the lights should not exceed a height of 250 mm above ground or snow level.

5.3.8 Aiming point lights

5.3.8.1 Where an aiming point marking is provided at a heliport intended for use at night, aiming point lights should be provided.

5.3.8.2 Aiming point lights should be collocated with the aiming point marking.

5.3.8.3 Aiming point lights should form a pattern of at least six omnidirectional white lights as shown in Figure 33. The lights should be inset when a light extending above the surface could endanger helicopter operations.

5.3.8.4 The light distribution of aiming point lights should be as shown in Table 14, column (D).

5.3.9 TLOF lighting system

5.3.9.1 A TLOF lighting system should be provided at a heliport intended for use at night.

5.3.9.2 For a surface-level heliport, lighting for the TLOF in a FATO should consist of one or more of the following:

a. perimeter lights
b. floodlighting
c. arrays of segmented point source lighting (ASPSL) or luminescent panel (LP) lighting to identify the TLOF when a) and b) are not practicable and FATO lights are available.

5.3.9.3 For an elevated heliport, shipboard heliport or helideck, lighting for the TLOF in a FATO should consist of:

a. perimeter lights
b. ASPSL and/or LPs to identify the TDPM and/or floodlighting to illuminate the TLOF.

5.3.9.4 TLOF ASPSL and/or LPs to identify the TDPM and/or floodlighting should be provided at a surface-level heliport intended for use at night when enhanced surface texture cues are required.

5.3.9.5 TLOF perimeter lights should be placed along the edge of the area designated for use as the TLOF or within a distance of 1.5 m from the edge. Where the TLOF is a circle, the lights should be:

a. located on straight lines in a pattern which will provide information to pilots on drift displacement
b. where a) is not practicable, evenly spaced around the perimeter of the TLOF at the appropriate interval, except that over a sector of 45 degrees the lights should be spaced at half spacing.

5.3.9.6 TLOF perimeter lights should be uniformly spaced at intervals of not more than 3 m for elevated heliports and helidecks and not more than 5 m for surface-level heliports. There should be a minimum number of four lights on each side including a light at each corner. For a circular TLOF where lights are installed in accordance with 5.3.9.5 b), there should be a minimum of fourteen lights.

5.3.9.7 The TLOF perimeter lights should be installed at an elevated heliport or fixed helideck such that the pattern cannot be seen by the pilot from below the elevation of the TLOF.

5.3.9.8 The TLOF perimeter lights should be installed on a moving helideck or shipboard heliport such that the pattern cannot be seen by the pilot from below the elevation of the TLOF when the helideck or shipboard heliport is level.

5.3.9.9 On surface-level heliports, ASPSL or LPs, if provided to identify the TLOF, should be placed along the marking designating the edge of the TLOF. Where the TLOF is a circle, they should be located on straight lines circumscribing the area.

5.3.9.10 On surface-level heliports, the minimum number of LPs on a TLOF should be nine. The total length of LPs in a pattern should not be less than 50 per cent of the length of the pattern. There should be an odd number with a minimum number of three panels on each side of the TLOF including a panel at each corner. LPs should be uniformly spaced with a distance between adjacent panel ends of not more than 5 m on each side of the TLOF.

5.3.9.11 When LPs are used on an elevated heliport or helideck to enhance surface texture cues, the panels should not be placed adjacent to the perimeter lights. They should be placed around a TDPM or coincident with heliport identification marking.

5.3.9.12 TLOF floodlights should be located so as to avoid glare to pilots in flight or to personnel working on the area. The arrangement and aiming of floodlights should be such that shadows are kept to a minimum.

5.3.9.13 The TLOF perimeter lights should be fixed omnidirectional lights showing green.

5.3.9.14 At a surface-level heliport, ASPSL or LPs should emit green light when used to define the perimeter of the TLOF.

5.3.9.15 The chromaticity and luminance of colours of LPs should conform to Annex 14, Volume I, Appendix 1, 3.4.

5.3.9.16 An LP should have a minimum width of 60 mm. The panel housing should be the same colour as the marking it defines.

5.3.9.17 For a surface-level or elevated heliport, the TLOF perimeter lights located in a FATO should not exceed a height of 50 mm and should be inset when a light extending above the surface could endanger helicopter operations.

5.3.9.18 For a helideck or shipboard heliport, the TLOF perimeter lights should not exceed a height of 50 mm, or for a FATO/TLOF, 150 mm.

5.3.9.19 When located within the SA of a surface-level or elevated heliport, the TLOF floodlights should not exceed a height of 250 mm.

5.3.9.20 For a helideck or shipboard heliport, the TLOF floodlights should not exceed a height of 50 mm, or for a FATO/TLOF, 150 mm.

5.3.9.21 The LPs should not extend above the surface by more than 25 mm.

5.3.9.22 The light distribution of the perimeter lights should be as shown in Table 14, column (E).

5.3.9.23 The light distribution of the LPs should be as shown in Table 14, column (F).

5.3.9.24 The spectral distribution of TLOF floodlights should be such that the surface and obstacle markings can be correctly identified.

5.3.9.25 The average horizontal illuminance of the floodlighting should be at least 10 lux, with a uniformity ratio (average to minimum) of not more than 8:1 measured on the surface of the TLOF.

5.3.9.26 Lighting used to identify the TDPC should comprise a segmented circle of omnidirectional ASPSL strips showing yellow. The segments should consist of ASPSL strips, and the total length of the ASPSL strips should not be less than 50 per cent of the circumference of the circle.

5.3.9.27 If utilized, the heliport identification marking lighting should be omnidirectional showing green.

5.3.10 Helicopter stand floodlighting

5.3.10.1 Helicopter stand floodlighting should be provided on a helicopter stand intended to be used at night.

5.3.10.2 Helicopter stand floodlights should be located so as to provide adequate illumination, with a minimum of glare to the pilot of a helicopter in flight and on the ground, and to personnel on the stand. The arrangement and aiming of floodlights should be such that a helicopter stand receives light from two or more directions to minimize shadows.

5.3.10.3 The spectral distribution of stand floodlights should be such that the colours used for surface and obstacle marking can be correctly identified.

5.3.10.4 Horizontal and vertical illuminance should be sufficient to ensure that visual cues are discernible for required manoeuvring and positioning, and essential operations around the helicopter can be performed expeditiously without endangering personnel or equipment.

5.3.10.5 Helicopter stand floodlighting may be extinguished when NVIS equipment is in use by operating aircraft. Arrangement should be made in writing with the aircraft operator as to when floodlighting may be relit if other non-NVIS intend to use the facility.

5.3.11 Winching area floodlighting

5.3.11.1 Winching area floodlighting should be provided at a winching area intended for use at night.

5.3.11.2 Winching area floodlights should be located so as to avoid glare to pilots in flight or to personnel working on the area. The arrangement and aiming of floodlights should be such that shadows are kept to a minimum.

5.3.11.3 The spectral distribution of winching area floodlights should be such that the surface and obstacle markings can be correctly identified.

5.3.11.4 The average horizontal illuminance should be at least 10 lux, measured on the surface of the winching area.

5.3.12 Taxiway lights

5.3.12.1 The specifications for taxiway centre line lights and taxiway edge lights in Part 139 MOS Chapter 9 (as amended), are equally applicable to taxiways intended for ground taxiing of helicopters.

5.3.13 Visual aids for denoting obstacles outside and below the obstacle limitation surface

5.3.13.1 Where an aeronautical study indicates that obstacles in areas outside and below the boundaries of the obstacle limitation surface established for a heliport constitute a hazard to helicopters, they should be marked and lit, except that the marking may be omitted when the obstacle is lighted with high-intensity obstacle lights by day.

5.3.13.2 Where an aeronautical study indicates that overhead wires or cables crossing a river, waterway, valley or highway constitute a hazard to helicopters, they should be marked, and their supporting towers marked and lit.

5.3.14 Floodlighting of obstacles

5.3.14.1 At a heliport intended for use at night, obstacles should be floodlighted if it is not possible to display obstacle lights on them.

5.3.14.2 Obstacle floodlights should be arranged so as to illuminate the entire obstacle and as far as practicable in a manner so as not to dazzle pilots.

5.3.14.3 Obstacle floodlighting should be such as to produce a luminance of at least 10 cd/m^2.

6 Heliport emergency response

6.1 Heliport emergency planning

6.1.1 A heliport emergency plan should be established commensurate with the helicopter operations and other activities conducted at the heliport.

6.1.2 The plan should identify agencies which could be of assistance in responding to an emergency at the heliport or in its vicinity.

6.1.3 The heliport emergency plan should provide for the coordination of the actions to be taken in the event of an emergency occurring at a heliport or in its vicinity.

6.1.4 Where an approach/departure path at a heliport is located over water, the plan should identify which agency is responsible for coordinating rescue in the event of a helicopter ditching and indicate how to contact that agency.

6.1.5 The plan should include, as a minimum, the following information:

a. the types of emergencies planned for

b. how to initiate the plan for each emergency specified

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

d. the role of each agency for each type of emergency

e. a list of pertinent on-heliport services available with telephone numbers or other contact information

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

g. a grid map of the heliport and its immediate vicinity.

6.1.6 All agencies identified in the plan should be consulted about their role in the plan.

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

6.2 Rescue and firefighting

6.2.1 The speed of initiating a response, and the effectiveness of that response, is the most important factors affecting the survivability of a helicopter accident including, inter alia, rejected take-off or forced landing. The principal objective of a rescue and firefighting response is to save lives.

6.2.2 A rejected take-off or forced landing, and or fuelling incident could result in a fuel spill with a resulting post-crash fire. An uncontrolled fuel fed fire could quickly cut off, or reduce preferred escape routes or other escape paths from the helicopter by the crew or helicopter occupants to a place of safety.

6.2.3 Rescue and firefighting (RFF) equipment and emergency response services should be provided at heliports located above occupied structures. The purpose for providing RFF equipment and services is to rapidly suppress any fire that occurs within the confines of the heliport response area. The primary objective of RFF equipment and services is to allow helicopter occupants to evacuate to safety and to protect persons in the building beneath the heliport from the effects of a fire situation.

6.2.4 A safety assessment should be performed firstly to determine whether any fire hazard[6] could harm all persons escaping a helicopter in the event of an accident or incident and secondly, to determine the level of survivability of helicopter occupants.

Note: National Fire Protection Association (NFPA) 418 - Standard for Heliports and vertiports provides comprehensive recommendations for fire risk assessment for both heliports and vertiports.

6.2.5 Prior to designing a heliport rescue and firefighting response, the following should be considered by the heliport proponent or operator and heliport planners or designers:

- The concept and definitions for the characteristics of intended helicopter operations.
- The types of heliport facilities helicopter operators may be expected to operate to.
- The effective distribution of primary extinguishing agent to address a worst-case crash and burn fire.

6.2.6 and their heliport planner A heliport operator and their heliport planner should also have a good understanding of technologies that demonstrate effective methods for delivering primary extinguishing agents.

6.2.7 Factors that need to be considered in any risk assessment to determine whether on-site rescue and firefighting equipment and services are required, or an off-site agency response can satisfactorily achieve the principal objective in the event of an emergency at the heliport, or in its vicinity, are included in Appendix C.

6.2.8 To provide an effective response, a heliport operator should be able to determine the practical critical area, the response area and response time objectives for their facility.

6.2.9 Local fire and rescue authorities also known as Authority Having Jurisdiction[7] or AHJ))—should be consulted at the earliest stages of the planning and provision of an elevated heliport to ensure that proper consideration is given to the effect that an accident could have on the structure below, above which the heliport is located[8].

6.2.10 The structure’s fire resistance may need to be considered by the heliport operator, the heliport operator and if the structure is not owned by the heliport operator, the owner of the structure. Structure fire resistance is outlined NFPA 418, and state and territory construction codes.

6.2.11 Where provided and when required, firefighting media should be activated in the quickest possible response time to the landing area. Response times should not exceed 2 minutes in optimum visibility and surface conditions. At elevated heliports and limited-sized surface-level heliports, the response time for the discharge of primary media at the required application rate should be 15 seconds measured from system activation.).

6.2.12 An FAS may include, but not necessarily be limited to; a fixed monitor system (FMS) or a deck integrated firefighting system (DIFFS) utilising a FFAS or a water only DIFFS associated with a passive fire retarding surface.

6.2.13 An FAS may be an automatic or semi-automatic method for the distribution of extinguishing agent. The purpose of the FAS is to knock down and bring a fire under control in the shortest possible time while protecting the means of escape for personnel to a place of safety.

6.2.14 The installation of an FAS should be considered within the context of the building or structure's fire solution, and any engineered fire response system within the structure or building. Fire response, monitoring and fire alarm systems should consider the risk of a helicopter crash or

[6] Fire hazard as defined in the National Construction Code.

[7] Refer AS1851-2012 Routine service of fire protection systems and equipment.

[8] Refer UKCAA CAP 1264 Standards for helicopter landing sites at hospitals (as amended).

fire where helicopters could use the building or structure as part of a rejected take-off or forced landing manoeuvre

6.3 Level of protection provided

6.3.1 For the application of primary media, the discharge rate (in litres/minute) applied over the assumed practical critical area (in m^2) should be predicated on a requirement to bring any fire which may occur on the heliport under control within one minute, measured from activation of the system at the appropriate discharge rate.

6.3.2 A fire is deemed to be under control at the point when the initial intensity of the fire is reduced by 90 per cent.

6.3.3 Practical critical area calculation where primary media is applied as a solid stream

6.3.3.1 The practical critical area should be calculated by multiplying the helicopter fuselage length (m) by the helicopter fuselage width (m) plus an additional width factor (W1) of 4 m. Categorization from H0 to H3 should be determined on the basis of the fuselage dimensions in Table 17 below.

Table 17: Heliport firefighting category

Category (1)	Maximum fuselage length (2)	Maximum fuselage width (3)
H0	up to but not including 8 m	1.5 m
H1	from 8 m up to but not including 12 m	2.0 m
H2	from 12 m up to but not including 16 m	2.5 m
H3	from 16 m up to 20 m	3.0 m

6.3.4 Practical critical area calculation where primary media is applied in a dispersed (spray) pattern

6.3.4.1 For heliports, except helidecks, the practical critical area should be based on an area contained within the heliport perimeter, which always includes the TLOF, and to the extent that it is load bearing, the FATO.

6.3.4.2 The practical critical area (helicopters) where primary extinguishing agent is applied in a dispersed (spray) pattern, is predicated on the dimensions of the operating area that needs to be protected.

6.3.4.3 For helidecks, the practical critical area should be based on the largest circle capable of being accommodated within the TLOF perimeter.

6.3.4.4 For an onshore purpose built or limited-sized heliport, such as, an elevated heliport at rooftop level, the practical critical area is assumed to accommodate the whole load-bearing area which always includes the TLOF, and to the extent that it is a load-bearing surface, also the FATO.

6.4 Extinguishing agents

Note: Throughout this section, the discharge rate of a performance level B foam is assumed to be based on an application rate of 5.5 L/min/m^2, and for a performance level C foam and for water, is assumed to be based on an application rate of 3.75 L/min/m^2. These rates may be reduced if, through practical testing, a safety case demonstrates that the objectives can be achieved for a specific foam use at a lower discharge rate (L/min).

Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level B or C rating is given in the Airport Services Manual (Doc 9137), Part 1.

6.4.1 Non-elevated (surface level) heliports with primary media applied as a solid stream using a portable foam application system (PFAS)

6.4.1.1 Where firefighting equipment or a rescue and firefighting service performed by an AHJ is provided at a surface-level heliport, the amounts of primary media and complementary agents should be in accordance with Table 18 below.

Table 18: Minimum usable amounts of extinguishing agents for non-elevated heliports

Category (1)	Foam meeting performance level B		Foam meeting performance level C		Complementary agentsComplimentary agents	
	Water (L) (2)	**Discharge rate foam solution/ minute (L) (3)**	**Water (L) (4)**	**Discharge rate foam solution/ minute (L) (5)**	**Dry chemical powder (kg) (6)**	**Gaseous media (kg) (7)**
H0	500	250	330	165	23	9
H1	800	400	540	270	23	9
H2	1200	600	800	400	45	18
H3	1600	800	1100	550	90	36

6.4.2 Elevated heliports with primary media applied as a solid stream using a fixed foam application system (FFAS)

6.4.2.1 Where firefighting equipment or a rescue and firefighting services performed by an AHJ is provided at an elevated heliport, the amount of foam media and complementary agents should be in accordance with Table 19 below. The minimum discharge duration in Table 19 below is assumed to be five minutes.

Note: Complementary agents are ideally dispensed from one or two extinguishers (although more extinguishers may be permitted where high volumes of an agent are specified, e.g. H3 operations). The discharge rate of complementary agents needs to be selected for optimum effectiveness of the agent used. When selecting dry chemical powders for use with foam, care needs to be exercised to ensure compatibility. Complementary agents need to comply with the appropriate specifications of the International Organization for Standardization (ISO).

Table 19: Minimum usable amounts of extinguishing agents for elevated heliports

Category (1)	Foam meeting performance level B		Foam meeting performance level C		Complementary agentsComplimentary agents	
	Water (L) (2)	Discharge rate foam solution/ minute (L) (3)	Water (L) (4)	Discharge rate foam solution/ minute (L) (5)	Dry chemical powder (kg) (6)	Gaseous media (kg) (7)
H0	1250	250	825	165	23	9
H1	2000	400	1350	270	45	18
H2	3000	600	2000	400	45	18
H3	4000	800	2750	550	90	36

6.4.3 Elevated heliports/limited-sized surface-level heliports with primary media applied in a dispersed pattern through an FFAS — a solid-plate heliport

6.4.3.1 The amount of water required for foam production should be predicated on the practical critical area (m^2) multiplied by the appropriate application rate ($L/min/m^2$), giving a discharge rate for foam solution (in L/min). The discharge rate should be multiplied by the discharge duration to calculate the amount of water needed for foam production.

6.4.3.2 The discharge duration should be at least three minutes.

6.4.3.3 Complementary media should be in accordance with Table 19, for H2 operations.

6.4.4 Purpose-built elevated heliports/limited-sized surface-level heliports with primary media applied in a dispersed pattern through a fixed application system (FAS) — a passive fire retarding surface with water-only deck integrated firefighting system (DIFFS)

6.4.4.1 The amount of water required should be predicated on the practical critical area (m^2) multiplied by the appropriate application rate (3.75 $L/min/m^2$) giving a discharge rate for water (in L/min). The discharge rate should be multiplied by the discharge duration to determine the total amount of water needed.

6.4.4.2 The discharge duration should be at least two minutes.

6.4.4.3 Complementary media (if used) should be in accordance with Table 19, for H2 operations.

Note: The recommendation for water-only is for a combination solution—a passive fire-retarding surface that also incorporates an active water-only DIFFS, delivering water at an application rate that is consistent with a Performance Level C foam.

6.4.5 Purpose-built helidecks with primary media applied in a solid stream or a dispersed pattern through a FFAS — a solid-plate heliport

6.4.5.1 The amount of water required for foam media production should be predicated on the practical critical area (m2) multiplied by the application rate (L/min/m2) giving a discharge rate for foam solution (in L/min). The discharge rate should be multiplied by the discharge duration to calculate the amount of water needed for foam production.

6.4.5.2 The discharge duration should be at least five minutes.

6.4.5.3 Complementary media should be in accordance with Table 19 to H0 levels for helidecks up to and including 16.0 m and to H1/H2 levels for helidecks greater than 16.0 m. Helidecks greater than 24 m should adopt H3 levels.

6.4.6 Purpose-built helidecks with primary media applied in a dispersed pattern through an FAS — a passive fire-retarding surface with water-only DIFFS

6.4.6.1 The amount of water required should be predicated on the practical critical area (m2) multiplied by the application rate (3.75 L/min/m2) giving a discharge rate for water (in L/min). The discharge rate should be multiplied by the discharge duration to calculate the amount of water needed.

6.4.6.2 The discharge duration should be at least three minutes.

6.4.6.3 Complementary media (when used) should be in accordance with Table 19 to H0 levels for helidecks up to and including 16.0 m and to H1/H2 levels for helidecks greater than 16.0 m. Helidecks greater than 24 m should adopt H3 levels.

6.5 Response time

6.5.1 Response time is defined as the time between the initial call to the rescue and firefighting service and the time when the first responder(s) is/are in position at the aircraft or site of the incident or accident.

Note: The most important factors bearing on effective escape in a survivable helicopter accident are the speed of initiating a response and the effectiveness of that response

6.5.2 Response arrangements to incidents and accidents at and in the near vicinity of heliports are the responsibility of the facility operator to determine.

6.5.3 Response times will vary based on the heliport operator's emergency response objectives.

6.5.4 If an objective is to ensure the effective escape of those involved in a survivable helicopter accident, rescue and firefighting response that is present at the heliport during the arrival or departure of helicopters is likely to be required.

6.5.5 At surface-level heliports, the operational objective of the onsite rescue and firefighting response should be to achieve response times not exceeding two minutes in optimum conditions of visibility and surface conditions.

Note: Optimum visibility and surface conditions are defined as: daytime, good visibility, no precipitation, or smoke with normal response route free of surface contamination (i.e., water, ice or snow).

6.5.6 At elevated heliports, limited-sized surface-level heliports and helidecks, the response time for the discharge of primary media at the required application rate should be 15 seconds measured from system activation.

6.5.7 If rescue and firefighting personnel are needed, they should be immediately available on or in the vicinity of the heliport while helicopter movements are taking place.

6.5.8 If the intended response objective is to reduce the consequence after a helicopter incident, or minimise damage to heliport facilities, or protect property, the response by offsite rescue and firefighting AHJ may suffice.

6.6 Rescue arrangements

6.6.1 Rescue arrangements commensurate with the overall risk of the helicopter operation should be provided at the heliport.

6.6.2 Heliport operators are encouraged to engage with local emergency management agencies when determining appropriate rescue arrangements.

6.6.3 Information about rescue arrangements at the heliport should be made available to pilots and aircraft operators using the heliport so that the pilot or helicopter operator can consider those arrangements when determining the place is suitable and safe for the operation of their aircraft.

6.7 Communication and alerting system

6.7.1 A suitable alerting and/or communication system should be provided in accordance with the emergency response plan.

6.7.2 The heliport operator may consider establishing a process to periodically test any alerting and/or communication system should be provided at the heliport.

6.8 Personnel

6.8.1 Where provided, the number of rescue and firefighting personnel should be sufficient for the required task.

6.8.2 Where onsite response personnel are provided, rescue and firefighting personnel should be trained to perform their duties and maintain their competence.

6.8.3 Where offsite personnel are likely to respond to an emergency at the heliport, the heliport operator may introduce an induction process to ensure potential response personnel are sufficiently familiar with the heliport facility.

6.8.4 Rescue and firefighting personnel should be provided with protective equipment.

6.9 Means of escape

6.9.1 Elevated heliports and helidecks should be provided with a main access and at least one additional means of escape.

6.9.2 The provision of an additional means of escape is necessary for evacuation of helicopter crew, passengers and heliport personnel, and for access by RFF personnel.

6.9.3 The size of an emergency access/egress route may require consideration of the number of passengers and of special operations such as helicopter emergency medical services that require passengers to be carried on stretchers or trolleys.

6.9.4 Access points should be located as far apart from each other as is practicable. Access points should be located as far apart from each other as is practicable[9].

Note: Refer to NFPA 418 for further information on means of escape (egress)**.**

6.10 Test of the emergency plan

6.10 1 A test of the emergency plan should be carried out at least once every 3 years, when the type or nature of aircraft using the facility change, or when changes to the plan have been made.

6.10.2 The testing of the plan should

- be commensurate to the nature of aircraft using the helicopters using the heliport,
- have the volume of movements of a period of time, and
- have the location in which the heliport is located.

6.10.3 A re-evaluation of the plan may be required where

- there is a significant change in the heliport infrastructure, where
- significant change in the heliport infrastructure is being considered
- the nature of aircraft change
- the manner aircraft using the heliport has or is intended to change (i.e., change from PC 2 to PC 1)
- where there is significant change in the emergency response capability by the needs in the local emergency response community,.

9 Refer to NFPA 418 for further information on means of escape (egress).

7 Heliport data

7.1 Aeronautical data

7.1.1 Whereas certified aerodromes are required to publish aeronautical information through an aeronautical information services provider, uncertified aerodromes, such as heliports, should provide accurate, valid and timely aeronautical information direct to their users. The following aeronautical data requirements should be considered in the collation and distribution of heliport data.

7.1.2 Determination and reporting of heliport-related aeronautical data should be in accordance with the accuracy and integrity classification required to meet the needs of the end-users of aeronautical data.

7.1.3 Digital data error detection techniques should be used during the transmission and/or storage of aeronautical data and digital data sets.

7.2 Heliport reference point

7.2.1 A heliport reference point should be established for a heliport not collocated with an aerodrome.

7.2.2 The heliport reference point should be located near the initial or planned geometric centre of the heliport and should normally remain where first established.

7.2.3 The position of the heliport reference point should be measured and reported in degrees, minutes and seconds.

7.3 Heliport elevations

7.3.1 The heliport elevation and geoid undulation at the heliport elevation position should be measured and reported to the accuracy of:

a. one-half metre for heliports with non-instrument and non-precision approaches

b. one-quarter metre for heliports with precision approaches.

7.3.2 The elevation of the TLOF and/or the elevation and geoid undulation of each threshold of the FATO (where appropriate) should be measured and reported to the accuracy of one -half metre.

7.4 Heliport dimensions and related information

7.4.1 The following data should be measured or described, as appropriate, for each facility provided on a heliport:

a. heliport type — surface-level, elevated, shipboard or helideck

b. TLOF — dimensions to the nearest metre, slope, surface type, bearing strength in tonnes (1 000 kg)

c. FATO — type of FATO, true bearing to one-hundredth of a degree, designation number (where appropriate), length and width to the nearest metre, slope, surface type

d. aircraft limitations - maximum allowable mass and D-value in accordance with markings on TLOF/FATO

e. SA — length, width and surface type

f. helicopter taxiway and helicopter taxi-route — designation, width, surface type

g. apron — surface type, helicopter stands

h. clearway — length, ground profile

i. visual aids for approach procedures, marking and lighting of FATO, TLOF, helicopter taxiways, helicopter taxi-routes and helicopter stands.

7.4.2 The geographical coordinates of the geometric centre of the TLOF and/or of each threshold of the FATO (where appropriate) should be measured and reported in degrees, minutes, seconds and hundredths of seconds.

7.4.3 The geographical coordinates of appropriate centre line points of helicopter taxiways and helicopter taxi-routes should be measured and reported in degrees, minutes, seconds and hundredths of seconds.

7.4.4 The geographical coordinates of each helicopter stand should be measured and reported in degrees, minutes, seconds and hundredths of seconds.

7.4.5 The geographical coordinates of obstacles in Area 2 (the part within the heliport boundary) and in Area 3 should be measured and reported in degrees, minutes, seconds and tenths of seconds. In addition, the top elevation, type, marking and lighting (if any) of obstacles should be reported.

7.4.6 In addition to the above, for heliports with precision approaches the distances to the nearest metre of localizer and glide path elements comprising an instrument landing system (ILS) or azimuth and elevation antenna of a microwave landing system (MLS) in relation to the associated TLOF or FATO extremities should be measured.

7.5 Declared distances

7.5.1 The following distances to the nearest metre should be declared, where relevant, for a heliport:

a. take-off distance available

b. rejected take-off distance available

c. landing distance available.

7.6 Coordination between heliport users and heliport authorities

7.6.1 To ensure that heliport users obtain up-to-date pre-flight information and to meet the need for in-flight information, arrangements should be made between heliport users and the heliport operator to report, with a minimum of delay:

a. information on heliport conditions

b. the operational status of associated facilities, services and navigation aids within their area of responsibility

c. the provision of weather information at the heliport as required by pilots and helicopter operators (refer to Section 8 of the AC)

d. any other information considered to be of operational significance.

7.7 Rescue and firefighting

7.7.1 The level of protection normally available at a heliport should be expressed in terms of the category of the rescue and firefighting service as described in 6.2 of this AC and in accordance with the types and amounts of extinguishing agents normally available at the heliport.

7.7.2 Changes in the level of protection normally available at a heliport for rescue and firefighting should be notified to heliport users. When such a change has been corrected, the heliport users should be advised accordingly.

7.7.3 A change should be expressed in terms of the new category of the rescue and firefighting service available at the heliport.

8 Weather reports

8.1 Authorised weather forecasts

8.1.1 As per section 7.02, Part 91 MOS, the PIC of an aircraft must study authorised weather forecasts and reports as well as any other reasonably available weather information prior to take-off.

8.1.2 An authorised weather forecast is a forecast made by the Bureau of Meteorology for aviation purposes.

8.1.3 An authorised weather report is a report made by any of the following:

a. the Bureau of Meteorology for aviation purposes

b. an individual who holds a certificate from the Bureau of Meteorology to give weather reports for aviation purposes

c. an automatic weather station at an aerodrome that is approved by the Bureau of Meteorology as an automatic weather station for the aerodrome

d. an automatic broadcast service published in the AIP

e. an individual who holds a pilot licence

f. a person included in a class of persons specified in the AIP for this subparagraph.

8.2 Automatic weather stations

8.2.1 The Bureau of Meteorology has established policies and procedures for the approval of automatic weather stations in support of compliance with Civil Aviation Safety Regulations 1998 and associated Manual of Standards.

8.2.2 Details on these policies as well as the approval process can be accessed via the Meteorological Authority Office's page of the Bureau's website.

9 Radio licence requirements

Radio transmitters may require an Apparatus Licence in accordance with procedures established by the Australian Communications and Media Authority.

A station that could require an aeronautical licence if it:

- is not fixed to an aircraft
- is operated on aeronautical frequencies
- is operated for purposes relating to the operation of an aircraft, or airport or aerodrome operation
- includes a mobile station operated on board the aircraft or on the ground in communication with aircraft.

For more information, see the Australian Communications and Media Authority's website.

Airservices Australia is responsible for the Aeronautical Mobile (Route) Service AM(R)S Spectrum within Australia and its Territories. Airservices is able to provide a frequency assignment service as a first step to obtaining an aeronautical apparatus licence to operate a radio transmitter within the AM(R)S bands.

The AM(R)S covers the following:

- Aeronautical HF communications;
- Aeronautical VHF communications (118-137 MHz);
- Precision and Non-Precision Navigational Aids
- Landing Systems.

Transmitting on an aviation safety radio frequency is limited to holders of flight crew licences or persons holding an approval under Part 64 of CASR.

> **Note:** A person is prohibited from transmitting on an aviation safety radio frequency unless the person is authorised or qualified to do so.

An Aeronautical Radio Operator Certificate (AROC) is required by anyone who needs to communicate on an aviation air-band radio frequency and is not already licensed or qualified pilot.

For more information, see the Civil Aviation Safety Authority’s website.

Appendix A
Type specific aircraft outwash data

The following tables provide data on the downwash and outwash when the aircraft is hovering in ground effect (HIGE) impact associated with certain helicopter types.

Appendix A, Table 1 contains as boundary limits the peak wind velocities of 15 m/s (54 km/h) and 20m/s (72 km/h), as concluded by Ferguson, ‘Rotorwash Operational Footprint Modelling ’ for several helicopter types in common use.

In recognition of the unique circumstances associated with existing hospital surface-level heliports, many of which are in the vicinity of car parks or access paths/roads for pedestrians (some of whom may be patients or elderly persons), a further boundary of 40 km/h has been introduced. This additional boundary may need to be considered in any airspace hazard safety assessment (refer appendix D) and review of locations where such persons may be impacted by downwash events.

These peak wind velocity distances can be used as reference distances by heliport operators for ensuring the safety of people, animals, building and things during helicopter operations through the establishment of downwash/outwash protection zone distances.

Table 20: Helicopter hovering in ground effect outwash estimates

Helicopter data				Peak wind velocity					
Type	**RD**	**Mass**	**D/L**	**Radius at 80 (km/h)**		**Radius at 60 (km/h)**		**Radius at 40 (km/h)**	
	(m)	**(kg)**	**(kg/m2)**	**R/r (radii)**	**(m)**	**R/r (radii)**	**(m)**	**R/r (radii)**	**(m)**
AW 101	18.6	15600	57.47	4.6	43	6.4	59	8.9	83
S92	17.2	12565	54.27	4.4	38	6.2	54	8.8	75
H225	16.2	11200	54.34	4.4	36	6.2	41	8.8	71
B525	16.6	9299	42.91	3.8	32	5.6	47	8.3	69
AW 189	14.6	8300	49.58	4.2	30	6.0	44	8.6	63
H175	14.8	7800	45.34	3.9	29	5.8	43	8.4	62
AW139	13.8	6800	45.46	3.9	27	5.8	40	8.4	58
H160	13.4	6050	42.90	3.8	25	5.6	38	8.3	55
Bell 412	14.0	5398	34.97	3.3	23	5.2	36	7.9	55
S76	13.4	5306	37.57	3.5	23	5.3	36	8.0	54
AW169	12.1	4800	41.61	3.7	23	5.6	34	8.2	50
H145	11.0	3800	39.99	3.6	20	5.5	30	8.1	45
Bell 429	11.0	3175	33.41	3.2	18	5.1	28	7.8	43

Helicopter data				Peak wind velocity					
AC135	10.4	2980	35.08	3.3	17	5.2	27	7.9	41

Appendix B Ground/structure facilities consideration matrix

Table 21: Heliports - Ground/structure facilities consideration matrix

Helicopter	Onshore heliports		Offshore heliports		
Facility	**Non-elevated**	**Elevated**	**Helideck**	**Shipboard**	
				Purpose	**Non-purpose**
FATO	Required	Required	Required	Required	Required
safety area	Required	Required	Optional	Optional (air gap)	Optional (air gap)
clearway	Optional	Optional	NA	NA	NA
TLOF (collocated with FATO or stand)	Required	Required	Required	Required	Required
Taxiways (Ground taxi)	Optional	Optional	NA	NA	NA
taxi-routes (hover taxi)	Optional	Optional	NA	NA	NA
stands	Optional	Optional	NA	NA	NA
stand protection area	Optional (where stand(s) provided)	Optional (where stand(s) provided)	NA	NA	NA
protected side slope	Required	Required	NA	NA	NA
transitional surface	Optional (necessary with PinS – proceed visually)	Optional (necessary with PinS – proceed visually)	NA	NA	NA
fall protection	NA	Required (where falls from height are a risk)	Required (where falls from height are a risk)	Required (where falls from height are a risk)	Required (where falls from height are a risk)

Appendix C
Rescue and firefighting equipment and services safety assessment considerations

A safety assessment should be performed to first determine whether there is a need for rescue and firefighting equipment and services at heliports.

The following factors (hazards) should be considered, in context, in any safety assessment:

a. Proximity of heliport to critical social public infrastructure, for example hospitals and schools and places of extensive public activity such as shopping centres or transport interchange hubs etc.
b. Number of movements planned/unplanned.
c. Frequency of movements.
d. Total number of helicopters in use at the site during peak periods.
e. Intended type of movements, i.e. whether conducting commercial air transport (CAT) and/or general aviation (GA).
f. Intended number of passengers.
g. Intended types of helicopters in use, their certification status with respect to crashworthiness and their performance characteristics.
h. Size and complexity of the response area, e.g. other helicopters are present in apron area.
i. Nature of the terrain, e.g. located near water or swampy areas.
j. Whether the heliport is elevated or at surface level.
k. Whether the heliport is in a congested or non-congested environment.
l. Availability of suitably trained and qualified onsite first responders.
m. Availability of local fire and rescue services (AHJ), i.e. how rapidly can services respond to an incident on the heliport.
n. Types of helicopters and specific hazards, e.g. construction materials are used in airframes such as composites, i.e. man-made mineral fibres.
o. Whether or not an emergency response plan has been established.
p. The type and quantity of fuel or energy stored in the aircraft.
q. The risk of flammable or combustible liquid spills and equipment or process for containment and control.
r. Life safety aspects of an emergency event at the heliport.
s. Fire threat to the heliport and exposed property or operations.
t. Fire threat from an incident at the heliport to the adjacent structures or properties.
u. Continuity of service, operation, and the effects of business interruption, including the business or operational impact of a loss of aircraft.
v. Economic loss from loss of function or business interruption.
w. Regulatory and reputation impact.

Appendix D Airspace hazard safety assessment considerations

An airspace hazard safety assessment may be carried out to identify hazards and propose mitigation actions for all changes that could impact on the heliport's operations.

An airspace hazard may:

a. pose a risk to the safe movement of helicopter:
   i. objects, activities or things that penetrate surfaces necessary for the intended type of helicopter operation to be performed need to be identified, removed or subject to mitigation. Hazards may represent a risk to certain helicopter operations, and for other helicopter operations the hazard may not represent a risk.
b. be caused by the movement of the helicopter:
   i. the movement of the helicopter on the heliport, on lift off and take-off, on landing and touch down may introduce hazardous effects caused by the helicopter. This may include the effect of downwash and outwash, disturbances to the surface of the heliport, and foreign object debris hazards.

Circumstances where an airspace hazard safety assessment may be required include:

a. The need to develop an airspace hazard safety assessment, and the depth of assessment analysis will be determined by the purpose of the assessment, and the level of potential impact to safety the circumstance may present. Circumstance may, amongst other things, include:
   i. Any proposed New objects, activities or things are proposed that will penetrate obstacle limitation surfaces or obstacle limitation sectorsectors
   ii. An unidentified object, activity or thing is identified above obstacle limitation surfaces or sectors
   iii. Changes to the local environment introduce hazards such as turbulent wind effects, glare, updrafts (plumes) or light sources that impact the PIC. Where night vision imaging system (NVIS) is intended to be used by the PIC, potential impact to the use of NVIS should be considered.
   iv. Adjacent properties are subject to the effects of downwash or outwash when the helicopter is arriving or departing the heliport.
   v. Reports from PIC that an object, activity or thing has the potential to be a risk to the safe operation of a helicopter
   vi. Reports that on arrival and departure, the helicopter is an actual or potential risk to those not part of the heliport or the helicopter’s operation.
b. Specific changes. Impact on the safety of heliport operations may result from changes:
   i. in the characteristics of infrastructures or the equipment at the heliport
   ii. in the characteristics of the facilities and systems located in the heliport’s movement area
   iii. in FATO or TLOF operations (e.g. type of approach); and
   iv. to the operating procedures of the heliport.

For any change in heliport operations as defined above, an airspace hazard safety assessment should be conducted.

Note: When the change involves a helicopter type/model new to the heliport, a compatibility study should also be conducted.

An airspace hazard safety assessment should be completed by suitably qualified persons.

Where a safety assessment identifies a hazardous condition may exist, the hazardous condition should be reported to each helicopter operator, or PIC, with details of all circumstances a hazardous condition may exist, including any mitigation the heliport operator has applied.

In all circumstances, the helicopter operator or PIC is responsible for the assessing and mitigating of any risk to the safe operation of the helicopter – the helicopter operator or PIC is the ultimate risk-based decision maker.