AC 139-4-6 (Rev 0)
23 October 2023

Civil Aviation Authority of Singapore

Advisory Circular

RECOMMENDED PRACTICES FOR HELIPORTS

GENERAL

Advisory Circulars (ACs) are issued by the Director-General of Civil Aviation (DGCA) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. ACs contain information about standards, practices and procedures acceptable to CAAS. An AC may be used, in accordance with section 11 of the Air Navigation Act 1966 (ANA), to demonstrate compliance with a statutory requirement. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

PURPOSE

This AC provides guidance and information on compliance to the requirements in Aviation Specification 6 – Heliports (AS-6) regarding the design, operations, maintenance of, and modifications to the heliport and recommended practices to which an operator of a heliport should endeavour to conform with.

APPLICABILITY

This AC is applicable to an operator who intends to or holds a heliport certificate (also known as the “heliport operator”).

RELATED REGULATIONS

This AC relates specifically to Regulation 19 of the ANR-139.

RELATED ADVISORY CIRCULAR

AC 139-2-1 Guidance on aerodrome manual or heliport manual
AC 139-4-2 Recommended Practices for aerodromes
AC 139-4-5 Guidance on development works and modification at the aerodrome
AC 139-5-4 Guidance on handling of obstructions

CANCELLATION
This is the first AC issued on the subject.

EFFECTIVE DATE
This AC is effective from 23 October 2023.

OTHER REFERENCES
- Aviation Specifications 5 - Aerodromes
- Aviation Specifications 6 - Heliports
- ICAO Annex 14 Vol. II Heliports
- ICAO Heliport Manual (Doc 9261)
- ICAO PANS Aerodromes (Doc 9981)
- ICAO PANS Aeronautical Information Management (Doc 10066)

1 RECOMMENDED PRACTICES FOR THE HELIPORT

1.1 Subparagraph (1)(a) of Regulation 19 in the ANR-139 requires that a heliport operator ensure that the design, operations and maintenance of, and any modifications to, the aerodrome comply with the design, operations and maintenance requirements specified in the relevant Aviation Specifications.

1.2 For a heliport, the heliport operator must comply with the requirements in the Aviation Specifications 6 – Heliports (AS-6) and should follow the related guidance provided in this AC, in the design, operations and maintenance of, and any modifications to the heliport. The heliport operator should endeavour to implement the recommended practices (RP) in this AC and inform CAAS on the status and assessment of their implementation.

1.3 This AC should be read in conjunction with AS-6.

1.4 Any term in this AC that is defined in AS-6 has the meaning given to that term to this AC.

2 GUIDANCE FOR CHAPTER 3 OF AS-6: COMMON REFERENCE SYSTEMS

2.1 Horizontal reference system

2.1.1 Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System – 1984 (WGS-84) Manual (Doc 9674).

2.2 Vertical reference system

2.2.1 The geoid globally most closely approximates mean sea level (MSL). It is defined as the equipotential surface in the gravity field of the Earth which coincides with the undisturbed MSL extended continuously through the continents.

2.2.2 Gravity-related heights (elevations) are also referred to as orthometric heights while distances of points above the ellipsoid are referred to as ellipsoidal heights.

3 GUIDANCE FOR CHAPTER 4 OF AS-6: HELIPORT DATA

3.1 Aeronautical data

3.1.1 Specifications concerning the accuracy and integrity classification of heliport-related aeronautical data are contained in the PANS-AIM (Doc 10066), Appendix 1.

3.2 Coordination between AIS provider and heliport operator

3.2.1 Detailed specifications concerning the aeronautical information regulation and control (AIRAC) system are contained in the PANS-AIM (Doc 10066), Chapter 6.

3.2.2 AIRAC information is distributed by the Aeronautical Information Services (AIS) at least 42 days in advance of the AIRAC effective dates with the objective of reaching recipients at least 28 days in advance of the effective date.

3.2.3 The schedule of the predetermined internationally agreed AIRAC common effective dates at intervals of 28 days and guidance for the AIRAC use are contained in the Aeronautical Information Services Manual (ICAO Doc 8126, Chapter 2).

3.3 Rescue and firefighting

3.3.1 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 AS-6 paragraph 8.1, and in accordance with the types and amounts of extinguishing agents normally available at the heliport.

3.3.2 Changes in the level of protection from that normally available at the heliport could result from, but may not be limited to, a change in the availability of extinguishing agent or equipment used to deliver agents, or of personnel used to operate the equipment.

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

4 GUIDANCE OF CHAPTER 5 OF AS-6: PHYSICAL CHARACTERISTICS

4.1 Onshore heliports

4.1.1 The provisions given in this section are common for surface-level heliports and elevated heliports unless otherwise specified, and based on the design assumption that no more than one helicopter will be in the final approach and take-off area (FATO) at the same time.

4.1.2 The design provisions given in AS-6 Chapter 5 assume when conducting operations to a FATO in proximity to another FATO, these operations will not be simultaneous. If simultaneous helicopter operations are required, appropriate separation distances between FATOs need to be determined, giving due regard to such issues as rotor downwash and airspace, and ensuring the flight paths for each FATO, defined in AS-6 Chapter 6, do not overlap. Guidance on this issue is given in the Heliport Manual (ICAO Doc 9261).

4.1.3 Guidance on the minimum size for elevated FATO/ touch-down and lift-off area (TLOF) in order to permit facilitation of essential operations around the helicopter is given in the Heliport Manual (ICAO Doc 9261).

4.1.4 Guidance on structural design to account for the presence on elevated heliports of personnel, freight, refuelling and firefighting equipment, etc. is given in the Heliport Manual (ICAO Doc 9261).

4.1.5 Guidance on siting of a heliport and the location of the various defined areas, with due consideration of the effects of rotor downwash and other aspects of helicopter operations on third parties, is given in the Heliport Manual (ICAO Doc 9261).

Final approach and take-off area (FATO)

4.1.6 Guidance on siting and orientation of the FATO at a heliport to minimise interference of arrival and departure tracks with areas approved for residential use and other noise-sensitive areas close to the heliport is given in the Heliport Manual (ICAO Doc 9261).

4.1.7 For essential objects located on the FATO, examples of these are visual aids (e.g. lighting) or others (e.g. firefighting systems) necessary for safety purposes. For further requirements regarding penetration of a FATO by essential objects, see AS-6 paragraph 5.1.4.

4.1.8 A resistant surface, in the case of a FATO surface, implies that effects from the rotor downwash neither cause a degradation of the surface nor result in flying debris.

4.1.9 A FATO may be located on or near a runway strip or taxiway strip.

4.1.10 The rejected take-off distance (RTOD) is intended to ensure containment of the helicopter during a rejected take-off. Although some helicopter flight manuals (HFM) provide the RTOD, in others the dimension provided is the “minimum demonstrated … size” (where “…” could be “heliport”, “runway”, “helideck”, etc.) and this may not include helicopter containment. When this is the case, it is necessary to consider sufficient safety area dimensions as well as the dimensions of 1.5 D for the FATO, should the HFM not deliver data. Guidance is given in the Heliport Manual (ICAO Doc 9261).

4.1.11 Local conditions, such as elevation, temperature, and permitted manoeuvring may need to be considered when determining the size of a FATO. Guidance is given in the Heliport Manual (ICAO Doc 9261).

4.1.12 When the FATO is solid the slope should not:

(a) except as provided in (b) or (c) below; exceed 2 per cent in any direction;

(b) when the FATO is elongated and intended to be used by helicopters operated in performance class 1, exceed 3 per cent overall, or have a local slope exceeding 5 per cent; and

(c) when the FATO is elongated and 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.

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

4.1.14 Guidance on determining the influence of turbulence is given in the Heliport Manual (ICAO Doc 9261). If turbulence mitigating design measures are warranted but not practical, operational limitations may need to be considered under certain wind conditions.

Safety areas

4.1.15 When solid, the slope of the safety area should not exceed an upward slope of 4 per cent outwards from the edge of the FATO.

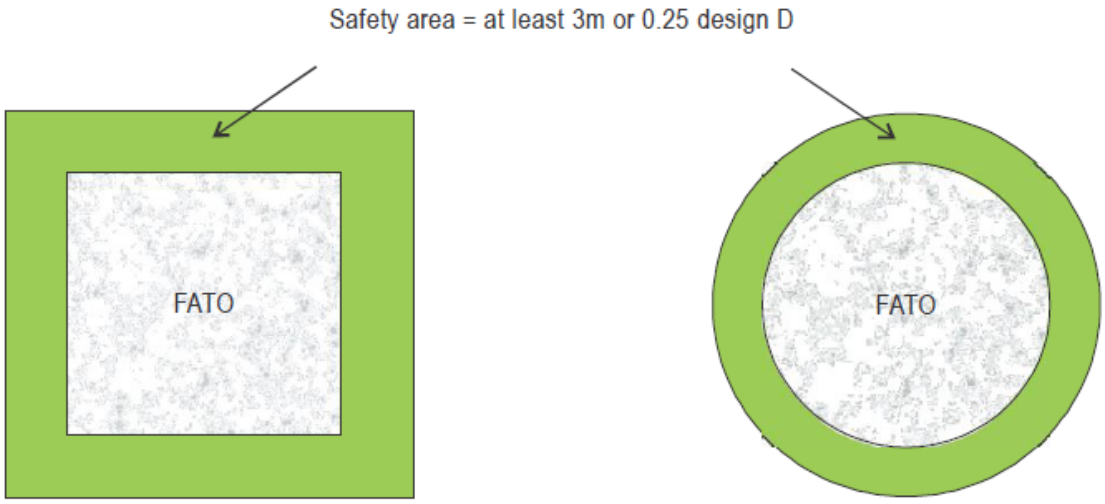


Figure 4-1. FATO and associated safety area

Protected side slope

4.1.16 A heliport should be provided with at least two protected side slopes, rising at 45 degrees outward from the edge of the safety area and extending to a distance of 10 m.

Helicopter clearways

4.1.17 The inclusion of detailed specifications for helicopter clearways in this section is not intended to imply that a clearway has to be provided.

4.1.18 The width of a helicopter clearway should not be less than that of the FATO and associated safety area. (See Figure 4-1)

4.1.19 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.

4.1.20 An object situated in a helicopter clearway, which may endanger helicopters in the air, should be regarded as an obstacle and should be removed.

Touchdown and lift-off area (TLOF)

4.1.21 The slope on a TLOF should not:

(a) except as provided in (b) or (c) below; exceed 2 per cent in any direction;

(b) when the TLOF is elongated and intended to be used by helicopters operated in performance class 1, exceed 3 per cent overall, or have a local slope exceeding 5 per cent; and

(c) when the TLOF is elongated and 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.

4.1.22 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.

4.1.23 When a TLOF in a FATO is larger than the minimum dimensions, the touchdown/positioning marking (TDPM) may be offset while ensuring containment of the undercarriage within the TLOF and the helicopter within the FATO.

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

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

4.1.26 The efficacy of the rejected take-off or landing distance will be dependent upon the helicopter being correctly positioned for take-off or landing.

Helicopter taxiways and taxi-routes

4.1.27 The specifications for ground taxi-routes and air taxi-routes are intended for the safety of simultaneous operations during the manoeuvring of helicopters. The effect of wind velocity/turbulence induced by the rotor downwash would need to be considered.

4.1.28 The defined areas addressed in this section are:

(a) taxiways associated with air taxi-routes which may be used by both wheeled and skidded helicopters for either ground or air taxiing;

(b) ground taxi-routes which are meant for use by wheeled helicopters for ground taxiing only; and

(c) air taxi-routes which are meant for use by air taxiing only.

Helicopter taxiways

4.1.29 A helicopter ground taxiway is intended to permit the surface movement of a wheeled helicopter under its own power.

4.1.30 A helicopter taxiway can be used by a wheeled helicopter for air taxi if associated with a helicopter air taxi-route.

4.1.31 When a taxiway is intended for use by aeroplanes and helicopters, the provisions for aeroplane taxiways, taxiway strips, helicopter taxiways and taxi-routes will be taken into consideration and the more stringent requirements will be applied.

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

Helicopter taxi-routes

4.1.33 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.

Helicopter air taxi-routes

4.1.34 A helicopter air taxi-route is intended to permit the movement of a helicopter above the surface at a height normally associated with ground effect and at ground speed less than 37km/h (20 kt).

4.1.35 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.

Helicopter stands

4.1.36 It is not considered good practice to locate helicopter stands under a flight path. Guidance is given in the Heliport Manual (ICAO Doc 9261).

4.1.37 For a helicopter stand intended to be used for taxi-through only, a width less than 1.2 D but which provides containment and still permits all required functions of a stand to be performed, might be used (in accordance with AS-6 paragraph 5.1.30 (a) (i)).

4.1.38 For a helicopter stand intended to be used for turning on the ground, the minimum dimensions may be influenced by the turning circle data provided by the manufacturer and are likely to exceed 1.2 D. Guidance is given in the Heliport Manual (ICAO Doc 9261).

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

Protection areas

4.1.40 When associated with a stand designed for non-simultaneous use, to ensure that only one of the adjacent stands is active at a time, instruction to pilots in the Aeronautical Information Publication (AIP) should make clear that a limitation on the use of the stands is in force.

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

Location of a FATO in relation to a runway or taxiway

4.1.42 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.

4.2 Helidecks

4.2.1 The following guidance are for helidecks located on structures engaged in such activities as mineral exploitation, research or construction.

FATOs and TLOFs

4.2.2 For helidecks that have a 1 D or larger FATO it is presumed that the FATO and the TLOF will always occupy the same space and have the same load bearing characteristics so as to be coincidental. For helidecks that are less than 1 D, the reduction in size is only applied to the TLOF which is a load bearing area. In this case, the FATO remains at 1 D but the portion extending beyond the TLOF perimeter need not be load bearing for helicopters. The TLOF and the FATO may be assumed to be collocated.

4.2.3 Guidance on the effects of airflow direction and turbulence, prevailing wind velocity and high temperatures from gas turbine exhausts or flare-radiated heat on the location of the FATO is given in the Heliport Manual (ICAO Doc 9261).

4.2.4 Guidance on the design and markings for helideck parking areas is given in the Heliport Manual (ICAO Doc 9261).

4.2.5 For helicopters with a maximum take-off mass (MTOM) of 3 175 kg or less, the TLOF 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.

4.2.6 Specific guidance on the characteristics of an air-gap is given in the Heliport Manual (ICAO Doc 9261). As a general rule, except for shallow superstructures of three stories or less, a sufficient air-gap for a helideck will be at least 3 m.

4.2.7 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.

4.2.8 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 15 cm.

4.2.9 Lighting, in the obstacle-free sector, that is mounted at a height of less than 25 cm is typically assessed for adequacy of visual cues before and after installation.

4.2.10 Examples of potential hazards posed by objects located within the TLOF include nets or raised fittings on the deck that might induce dynamic rollover for helicopters equipped with skids.

4.2.11 Guidance on rendering the surface of the TLOF skid-resistant is contained in the Heliport Manual (ICAO Doc 9261).

4.3 Shipboard heliports

FATOs and TLOFs

4.3.1 Except for the arrangement described in AS-6 paragraph 5.3.7 (b), for shipboard heliports it is presumed that the FATO and the TLOF will be coincidental. Guidance on the effects of airflow direction and turbulence, prevailing wind velocity and high temperature from gas turbine exhausts or flare-radiated heat on the location of the FATO is given in the Heliport Manual (ICAO Doc 9261).

4.3.2 A ship, which provides shipboard heliport(s), will need to be manoeuvred to ensure that the relative wind is appropriate to the direction of the helicopter touchdown heading.

4.3.3 The touchdown heading of the helicopter is 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.

4.3.4 Specific guidance on the characteristics of an air-gap is given in the Heliport Manual (ICAO Doc 9261). As a general rule, except for shallow superstructures of three stories or less, a sufficient air gap for a shipboard heliport will be at least 3m.

4.3.5 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.

4.3.6 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 15 cm.

4.3.7 Lighting, in the obstacle-free sector, that is mounted at a height of less than 25 cm is typically assessed for adequacy of visual cues before and after installation.

5 GUIDANCE FOR CHAPTER 6 OF AS-6: OBSTACLE ENVIRONMENT

5.1 General

5.1.1 This chapter describes obstacle limitation surfaces around a heliport that are to be maintained free from obstacles so as to permit intended helicopter operations to be conducted safely and to prevent heliports from becoming unusable by the growth of obstacles around them. This is achieved by establishing a series of obstacle limitation surfaces that define the limits to which objects may project into the airspace.

5.1.2 Guidance on handling of obstructions is contained in CAAS AC 139-5-4.

5.2 Obstacle limitation surfaces and sectors

Approach surface

5.2.1 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 minimised. The most critical helicopter type for which the heliport is intended and the ambient conditions may be factors in determining the suitability of such areas.

Take-off climb surface

5.2.2 Helicopter take-off performance is reduced in a turn and as such a straight portion along the take-off climb surface prior to the start of the curve allows for acceleration.

5.2.3 For heliports intended to be used by helicopters operated in performance class 2 or 3, it is good practice for the departure 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 minimised. The most critical helicopter type for which the heliport is intended and the ambient conditions may be factors in determining the suitability of such areas.

Obstacle-free sector/surface — helidecks

5.2.4 For both above helideck level and below helideck level obstacle-free sectors for helicopters operated in performance class 1 or 2, the horizontal extent of these distances from the helideck will be compatible with the one-engine-inoperative capability of the helicopter type to be used.

Limited obstacle sector/surface — helidecks

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

5.3 Obstacle limitation requirements

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

5.3.2 Guidance on obstacle protection surfaces, for when a visual approach slope indicator (VASI) is installed, is given in the onshore section of the Heliport Manual (ICAO Doc 9261).

Surface-level heliports

5.3.3 The Procedures for Air Navigation Services — Aircraft Operations, (PANS-OPS, ICAO Doc 8168), Volume II, Part IV — Helicopters, details procedure design criteria for a point-in-space (PinS) approach procedure at a heliport that utilises a visual segment surface.

5.3.4 Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual (ICAO Doc 9137), Part 6.

5.3.5 Existing objects above any of the surfaces in AS-6 paragraphs 6.2.1 and 6.2.2 should, as far as practicable, be removed except when the object is shielded by an existing immovable object or after an aeronautical study it is determined that the object will not adversely affect the safety or significantly affect the regularity of operations of helicopters.

5.3.6 The application of curved approach or take-off climb surfaces as specified in AS-6 paragraphs 6.1.4 or 6.1.15 may alleviate the problems created by objects infringing these surfaces.

5.3.7 A surface-level heliport should have at least two approach and take-off climb surfaces to avoid downwind conditions, minimise crosswind conditions and permit for a balked landing. Guidance is given in the Heliport Manual (ICAO Doc 9261).

Elevated heliports

5.3.8 An elevated heliport should have at least two approach and take-off climb approach surfaces to avoid downward conditions, minimise crosswind conditions and permit for a balked landing. Further guidance is given in the Heliport Manual (ICAO Doc 9261).

Helidecks

5.3.9 A helideck may have a LOS (see AS-6 paragraph 6.1.23).

5.3.10 Where there is a requirement to position, at sea surface level, one or more offshore support vessel(s) (e.g. a Standby Vessel) essential to the operation of a fixed or floating offshore facility, but located within the proximity of the fixed or floating offshore facility, any offshore support vessel(s) would need to be positioned so as not to compromise the safety of helicopter operations during take-off departure and/or approach to landing.

5.3.11 For a TLOF of 1 D and larger, where the area enclosed by the TLOF perimeter marking is a shape other than circular, the extent of the limited obstacle sector (LOS) segments are represented as lines parallel to the perimeter of the TLOF rather than arcs. Figure 5-1 has been constructed on the assumption that an octagonal helideck arrangement is provided. Guidance for square (quadrilateral) and circular FATO and TLOF arrangements is given in the Heliport Manual (ICAO Doc 9261).

5.3.12 For a TLOF less than 1 D, where the area enclosed by the TLOF perimeter marking is a shape other than circular, the extent of the LOS segments are represented as lines parallel to the perimeter of the TLOF rather than arcs. Figure 5-2 has been constructed on the assumption that an octagonal helideck arrangement is provided. Guidance for square (quadrilateral) and circular FATO and TLOF arrangements is given in the Heliport Manual (ICAO Doc 9261).

Shipboard heliports

Non-purpose-built heliports — Ship's side location

5.3.13 Any objects located within the areas described in AS-6 paragraphs 6.2.19 and 6.2.20 that exceed the height of the TLOF are notified to the helicopter operator using a

ship's helicopter landing area plan. For notification purposes, it may be necessary to consider immoveable objects beyond the limit of the surface prescribed in AS-6 paragraph 6.2.20, particularly if objects are significantly higher than 25 cm and in close proximity to the boundary of the LOS. See the Heliport Manual (ICAO Doc 9261) for guidance.

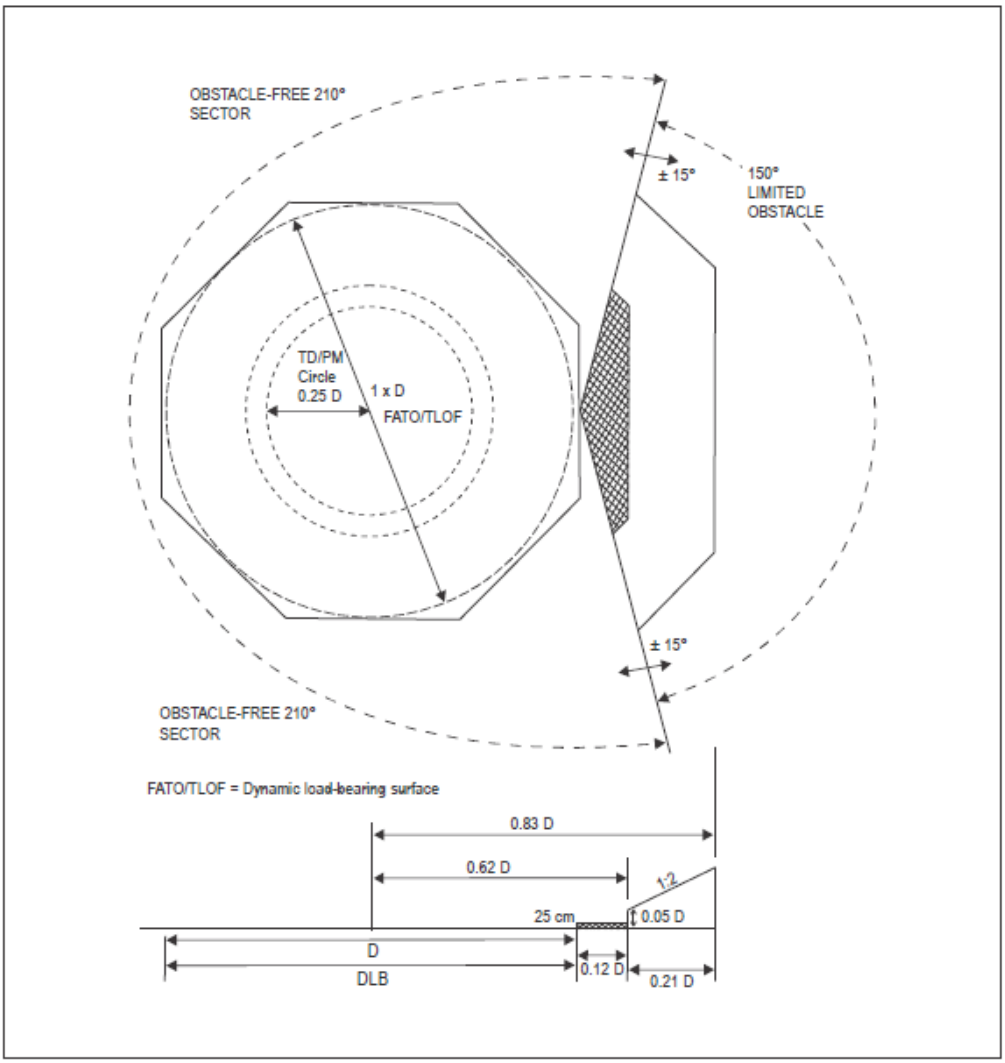


Figure 5-1. Helideck obstacle limitation sectors and surfaces
for a FATO and coincidental TLOF of 1 D and larger

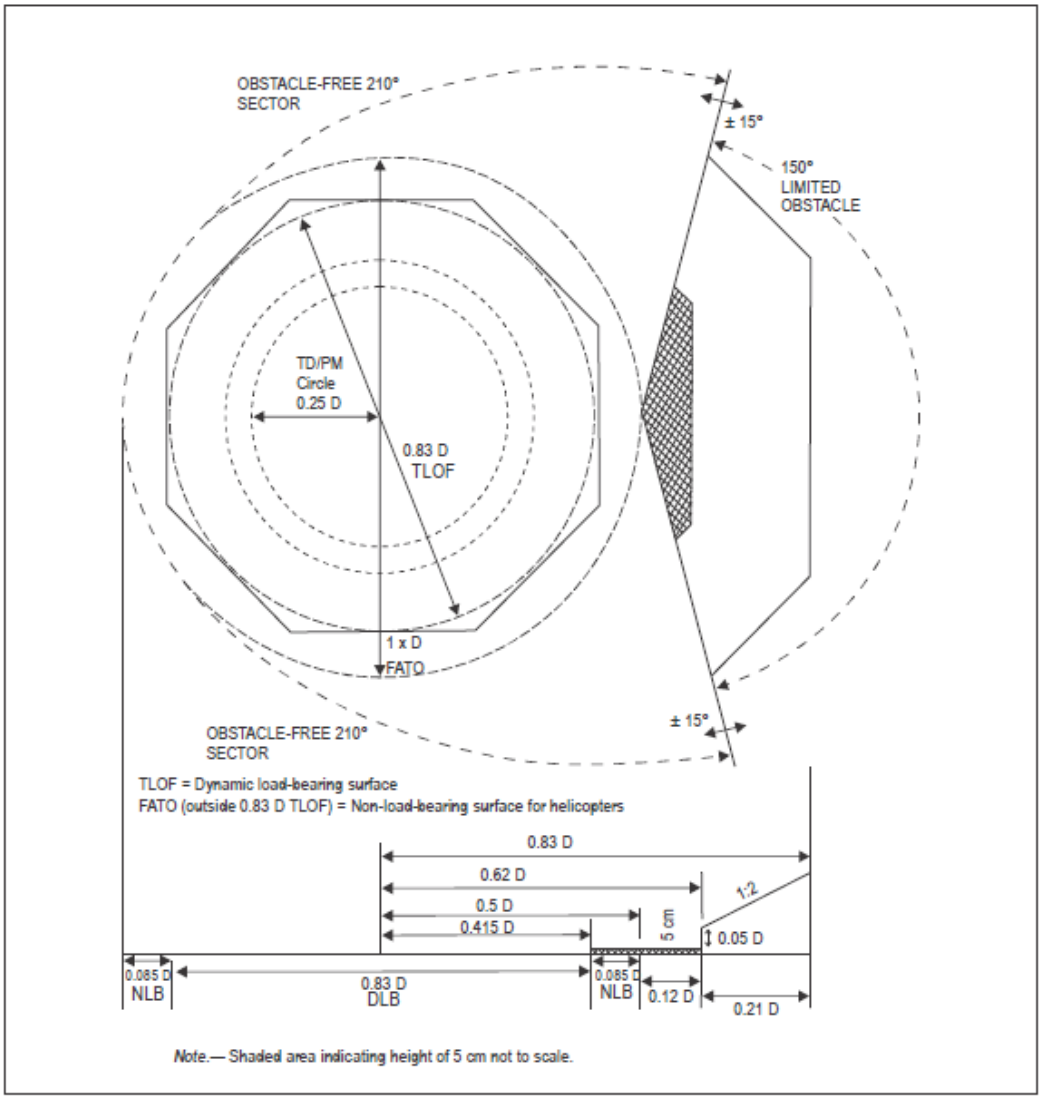


Figure 5-2. Helideck obstacle limitation sectors
and surfaces for a TLOF of 0.83 D and larger

6 GUIDANCE FOR CHAPTER 7 OF AS-6: VISUAL AIDS

6.1 General

6.1.1 The procedures used by some helicopters require that they utilise a FATO having characteristics similar in shape to a runway for fixed wing aircraft. For the purpose of this chapter, a FATO having characteristics similar in shape to a runway is considered as satisfying the concept for a “runway-type FATO”. For such arrangements it is sometimes necessary to provide specific markings to enable a pilot to distinguish a runway-type FATO during an approach. Appropriate markings are contained within sub-sections entitled “Runway-type FATOs”. The requirements applicable to all other types of FATOs are given within sub-sections entitled “All FATOs except runway-type FATOs”.

6.1.2 It has been found that, on surfaces of light colour, the conspicuity of white and yellow markings can be improved by outlining them in black.

6.1.3 Guidance is given in the Heliport Manual (ICAO Doc 9261) on marking the maximum allowable mass (AS-6 paragraph 7.2.2), and the D-value (AS-6 paragraph 7.2.3) on the heliport surface to avoid confusion between markings where metric units are used and markings where imperial units are used.

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

6.2 Indicators

6.2.1 Wind direction indicators

Location

6.2.1.1 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.

6.2.1.2 Guidance on the location of wind direction indicators is given in the Heliport Manual (ICAO Doc 9261).

Characteristics

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

	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	0.15m

6.2.1.4 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 (650 ft) 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.

6.3 Markings and markers

6.3.1 Heliport identification marking

Location – All FATOs except runway-type FATOs

6.3.1.1 The objective of a heliport identification marking is to provide to the pilot an indication of the presence of a heliport and, by its form, likely usage; the preferred direction(s) of approach; or the FATO orientation within the helideck obstacle environment. It has been found that, on runway surfaces of light colour, the conspicuity of white markings can be improved by outlining them in black.

6.3.1.2 For other than helidecks, the preferred direction(s) of approach corresponds to the median of the departure/arrival surface(s).

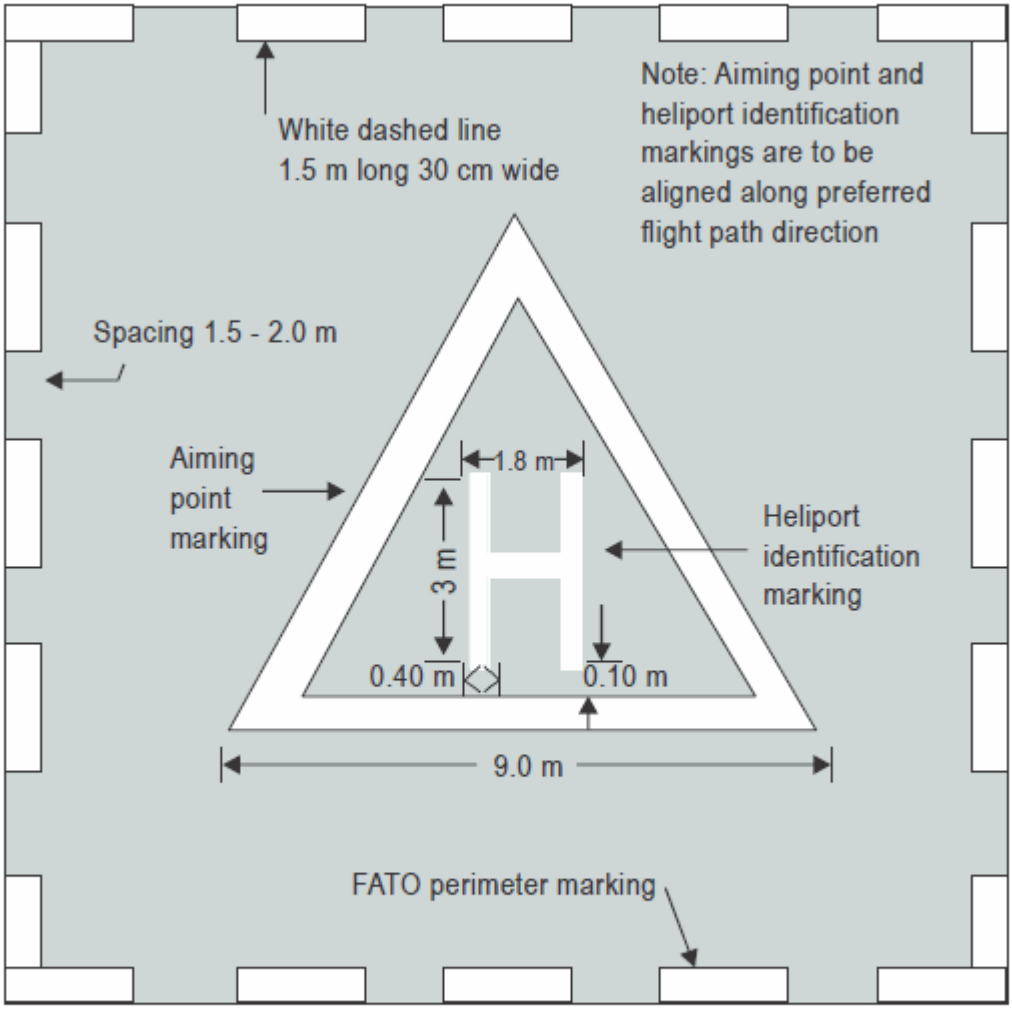
6.3.1.3 For helidecks, the bar of the “H” points to the centre of the limited obstacle sector (LOS).

6.3.1.4 If the touchdown/positioning marking (TDPM) is offset, the heliport identification marking is established in the centre of the TDPM.

6.3.1.5 On a FATO, which does not contain a TLOF and which is marked with an aiming point marking (see AS-6 paragraph 7.2.6), the heliport identification marking is established in the centre of the aiming point marking as shown in Figures 6-1 and 6-2.

Characteristics

6.3.1.6 On a helideck or a shipboard heliport where the D-value is 16.0 m or larger, 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 less than 16.0 m, 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.



Note.— The aiming point, heliport identification and FATO perimeter markings are white and may be edged with a 10 cm black border to improve contrast.

Figure 6-1 Combined heliport identification, aiming point and FATO perimeter marking

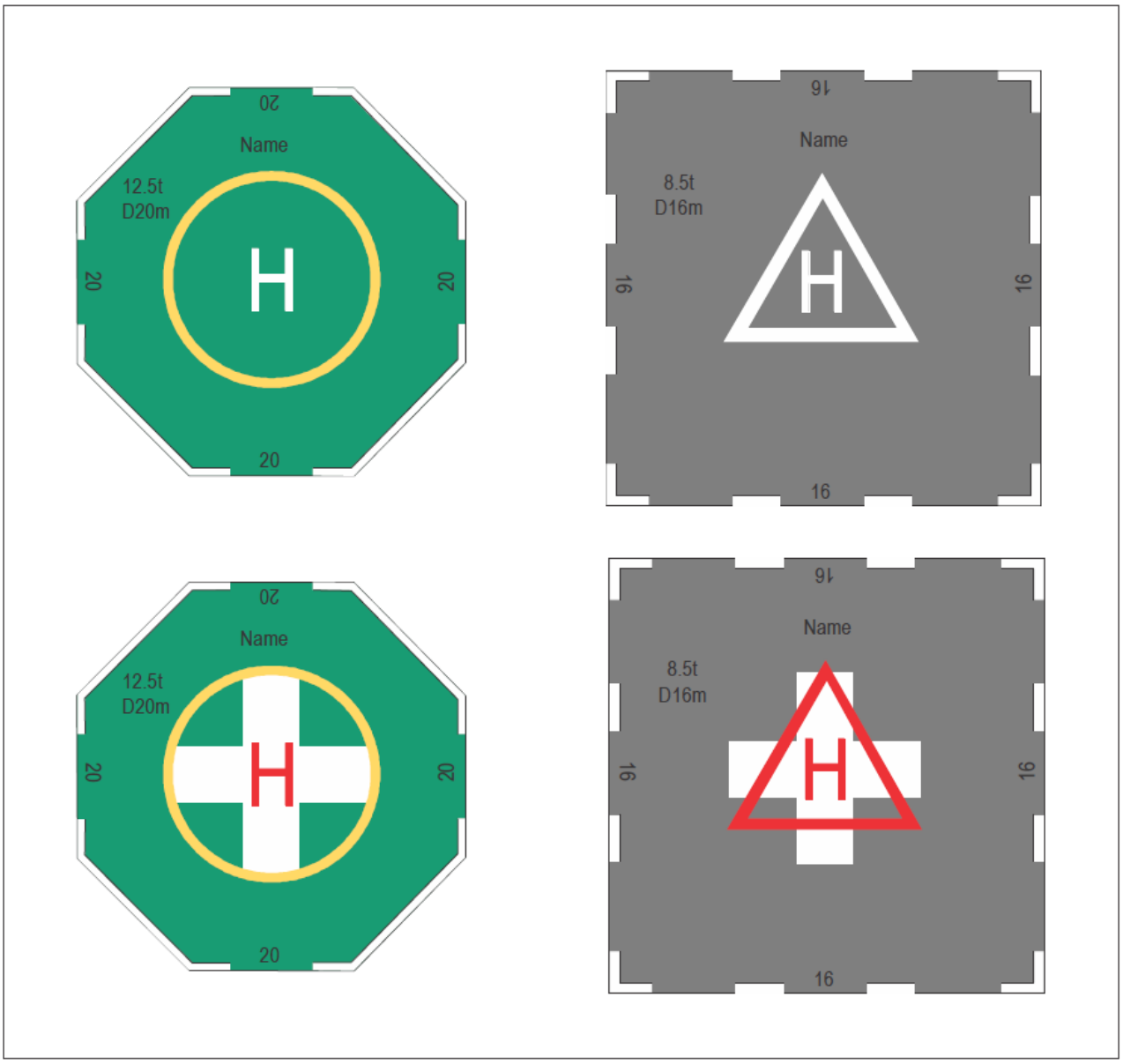


Figure 6-2 Heliport identification markings with TLOF and aiming markings for heliport and hospital heliport

6.3.2 Maximum allowable mass marking

6.3.2.1 The objective of the maximum allowable mass marking is to provide the mass limitation of the heliport such that it is visible to the pilot from the preferred final approach direction.

Application

6.3.2.2 A maximum allowable mass marking should be displayed at a surface-level heliport.

Location

6.3.2.3 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.

Characteristics

6.3.2.4 The allowable mass marking should be expressed 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”.

6.3.2.5 When the maximum allowable mass is expressed to 100 kg, the decimal place should be preceded with a decimal point marked with a 30 cm square.

All FATOs except runway-type FATOs

6.3.2.6 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 6-3 for D-value of more than 30 m. For a D-value of between 15 m to 30 m the height of the numbers and the letter of the marking should be a minimum of 90 cm, 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 60 cm, each with a proportional reduction in width and thickness.

Runway-type FATOs

6.3.2.7 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 6-3.

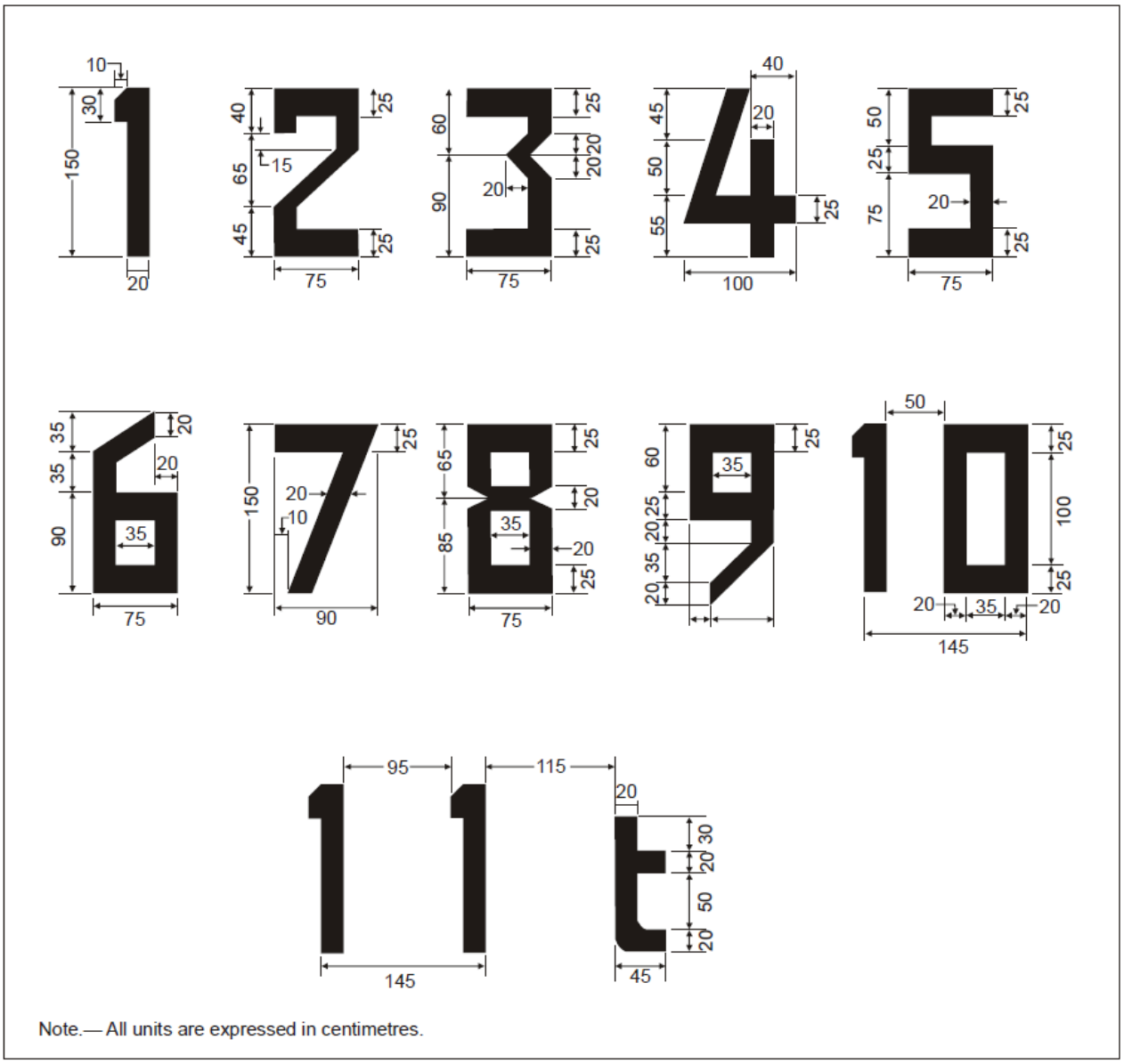


Figure 6-3 Form and proportions of numbers and letters

6.3.3 D-value marking

6.3.3.1 The objective of the D-value marking is to provide to the pilot the “D” of the largest helicopter that can be accommodated on the heliport. This value may differ in size from the FATO and the TLOF provided in compliance with AS-6 Chapter 5. The D-value is not required to be marked on a heliport with a runway-type FATO.

Location

6.3.3.2 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.

Characteristics

6.3.3.3 The numbers of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 6-3 for a D-value of more than 30 m. For a D-value with a dimension of between 15 m to 30 m, the height of the numbers of the marking should be a minimum of 90 cm, and for a dimension D-value of less than 15 m, the height of the numbers of the marking should be a minimum of 60 cm, each with a proportional reduction in width and thickness.

6.3.4 FATO perimeter marking or markers for surface-level heliports

6.3.4.1 The objective of FATO perimeter marking or markers is to provide to the pilot, where the perimeter of the FATO is not self-evident, an indication of the area that is free of obstacles and in which intended procedures or permitted manoeuvring may take place.

Characteristics – Runway-type FATOs

6.3.4.2 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.

6.3.5 FATO designation markings for runway-type FATOs

6.3.5.1 The objective of final FATO designation markings for runway-type FATOs is to provide to the pilot an indication of the magnetic heading of the runway.

Application

6.3.5.2 A FATO designation marking should be provided where it is necessary to designate the FATO to the pilot.

6.3.6 Aiming point marking

6.3.6.1 The objective of the aiming point marking is to provide to the pilot a visual cue indicating the preferred approach/departure direction, the point to which the helicopter approaches to the hover before positioning to a stand where a touchdown can be made, and that the surface of the FATO is not intended for touchdown.

Application

6.3.6.2 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.

6.3.7 TLOF perimeter marking

6.3.7.1 The objective of the TLOF perimeter marking is to provide to the pilot an indication of an area that free of obstacles; has dynamic load bearing; and in which, when positioned in accordance with the TDPM, undercarriage containment is assured.

6.3.8 Touchdown/ position marking

6.3.8.1 The objective of a 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.

Characteristics

6.3.8.2 The prohibited landing sector marking, when provided, is not intended to move the helicopter away from objects around the FATO, but to ensure that the tail is not placed in an orientation that might constitute a hazard. This is achieved by having the helicopter nose clear of the hatched markings during the touchdown.

6.3.9 Heliport name marking

6.3.9.1 The objective of a heliport name marking is to provide to the pilot a means of identifying a heliport which can be seen, and read, from all directions of approach.

Application

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

Location

6.3.9.3 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.

Characteristics

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

Runway-types FATOs

6.3.9.5 The characters of the marking should be not less than 3 m in height.

All FATOs except runway-type FATOs

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

6.3.10 Helideck obstacle-free sector (chevron) marking

6.3.10.1 The objective of the helideck obstacle-free sector (chevron) marking is to indicate the direction and limits of a sector that is free of obstacles above the level of the helideck for the preferred approach and departure directions.

Location

6.3.10.2 Where the point of origin of the helideck obstacle-free sector marking is outside the TLOF, and it is not practicable to physically paint the chevron, the chevron is relocated to the TLOF perimeter on the bisector of the obstacle-free sector. In this case, the distance and direction of displacement, along with the attention-getting "WARNING DISPLACED CHEVRON", is marked in a box beneath the chevron in black characters not less than 10 cm high. (An example figure is given in the Heliport Manual (ICAO Doc 9261).

Characteristics

6.3.10.3 Example figures of the helideck obstacle-free sector marking are given in the Heliport Manual (ICAO Doc 9261).

6.3.10.4 The colour of the chevron should be black.

6.3.11 Helideck and shipboard heliport surface marking

6.3.11.1 The objective of the helideck and shipboard heliport surface marking is to provide, by colour and conspicuity, the location of the TLOF on a helideck or shipboard heliport.

Application

6.3.11.2 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.

Location

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

Characteristics

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

6.3.11.5 Where the application of a surface coating may have a degrading effect on friction qualities, the surface might not be painted. In such cases, the best operating practice to enhance the conspicuity of markings is to outline deck markings with a contrasting colour.

6.3.12 Helicopter taxiway markings and markers

6.3.12.1 The objective of helicopter taxiway markings and markers is, without being a hazard to the helicopter, to provide to the pilot by day and, if necessary, by night, visual cues to guide movement along the taxiway.

6.3.12.2 The specifications for runway-holding position markings in AS-5 paragraph 8.2.10 are equally applicable to taxiways intended for ground taxiing of helicopters.

6.3.12.3 Ground taxi-routes and air taxi-routes over a taxiway are not required to be marked.

6.3.12.4 Unless otherwise indicated, it may be assumed that a helicopter taxiway is suitable for both ground taxiing and air taxiing of helicopters.

6.3.12.5 Signage may be required on an aerodrome where it is necessary to indicate that a helicopter taxiway is suitable only for the use of helicopters.

Application

6.3.12.6 The edges of a helicopter taxiway, if not self-evident, should be identified with markers or markings.

Characteristics

6.3.12.7 Guidance on suitable helicopter taxiway edge markers is given in the Heliport Manual (ICAO Doc 9261).

6.3.12.8 If blue markers are used on an aerodrome, signage may be required to indicate that the helicopter taxiway is suitable only for helicopters.

6.3.13 Helicopter air taxi-route markings and markers

6.3.13.1 The objective of helicopter air taxi-route markings and markers is to provide to the pilot by day and, if necessary, by night, visual cues to guide movement along the air taxi-route.

6.3.14 Helicopter stand markings

6.3.14.1 The objective of helicopter stand markings is to provide to the pilot a visual indication of: an area that is free of obstacles and in which permitted manoeuvring, and all necessary ground functions, may take place; identification, mass and D-value limitations, when required; and guidance for manoeuvring and positioning of the helicopter within the stand.

Application

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

6.3.14.3 See AS-6 Chapter 5, Figures 5-5 to 5-9.

6.3.14.4 Helicopter stand identification markings may be provided where there is a need to identify individual stands.

6.3.14.5 Additional markings relating to stand size may be provided. Guidance is given in the Heliport Manual (ICAO Doc 9261).

6.3.15 Flight path alignment guidance marking

6.3.15.1 The objective of flight path alignment guidance marking is to provide the pilot with a visual indication of the available approach and/or departure path direction(s).

Application

6.3.15.2 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).

6.3.15.3 The flight path alignment guidance marking can be combined with a flight path alignment guidance lighting system described in AS-6 paragraph 7.3.3.

Characteristics

6.3.15.4 In the case of a flight path limited to a single approach direction or single departure direction, the arrow marking may be unidirectional. In the case of a heliport with only a single approach/departure path available, one bidirectional arrow is marked.

6.3.15.5 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.

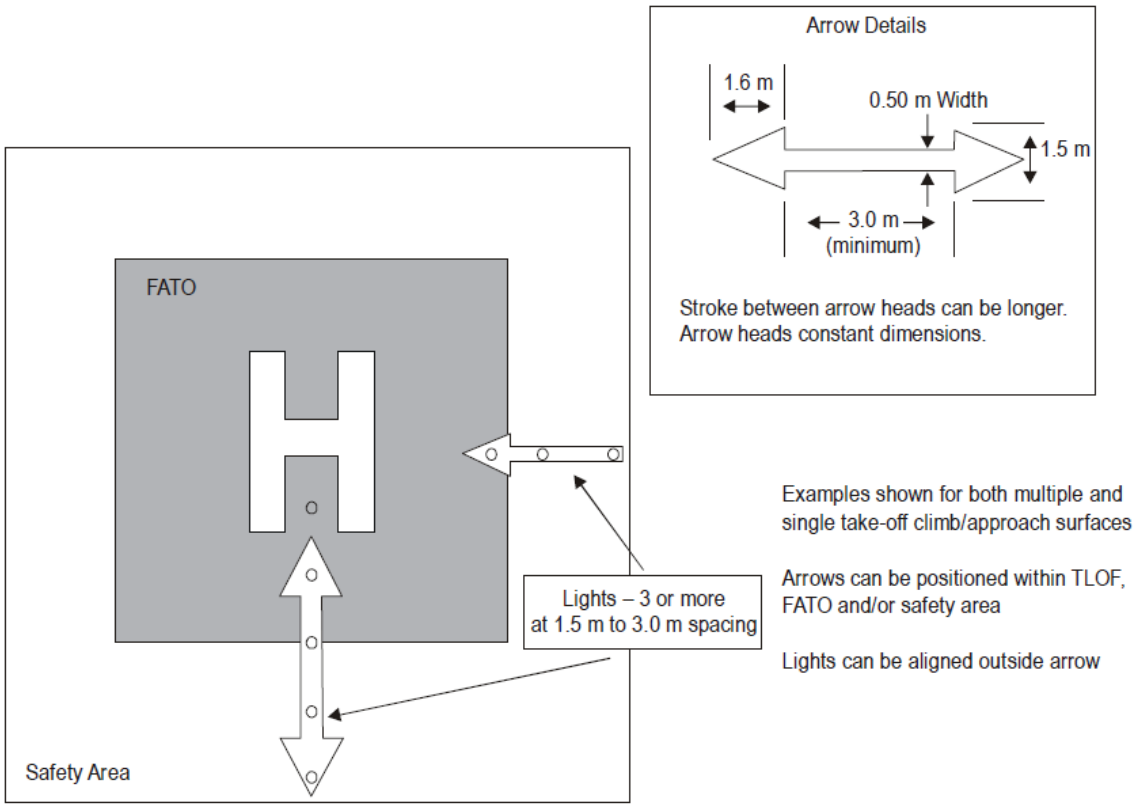


Figure 6-4 Flight path alignment guidance markings and lights

6.4 Lights

6.4.1 General

6.4.1.1 See AS-5 paragraph 8.3.1, concerning specifications on screening of non-aeronautical ground lights, and design of elevated and inset lights.

6.4.1.2 In the case of helidecks and heliports located near navigable waters, consideration needs to be given to ensuring that aeronautical ground lights do not cause confusion to mariners.

6.4.1.3 As helicopters will generally come very close to extraneous light sources, it is particularly important to ensure that, unless such lights are navigation lights exhibited in accordance with international regulations, they are screened or located so as to avoid direct and reflected glare.

6.4.1.4 Systems addressed in AS-6 paragraphs 7.3.3, 7.3.4 and 7.3.5 are designed to provide effective lighting cues based on night conditions. Where lights are to be used in conditions other than night (i.e. day or twilight), it may be necessary to increase the intensity of the lighting to maintain effective visual cues by use of a suitable brilliancy control. Guidance is provided in the Aerodrome Design Manual (ICAO Doc 9157), Part 4.

6.4.1.5 The specifications for marking and lighting of obstacles included in AS-5 Chapter 9 are equally applicable to heliports and winching areas.

6.4.1.6 In cases where operations into a heliport are to be conducted at night with Night Vision Imaging Systems (NVIS), it is important to establish the compatibility of the NVIS with all heliport lighting through an assessment by the helicopter operator prior to use.

6.4.2 Heliport beacon

Application

6.4.2.1 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.

Characteristics

6.4.2.2 The effective light intensity distribution of each flash should be as shown in Figure 6-5, Illustration 1.

6.4.2.3 Where brilliancy control is desired, settings of 10 per cent and 3 per cent have been found to be satisfactory. In addition, shielding may be necessary to ensure that pilots are not dazzled during the final stages of the approach and landing.

6.4.3 Approach lighting system

Application

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

Characteristics

6.4.3.2 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 6-6. 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.

6.4.3.3 Sequenced flashing lights may be useful where identification of the approach lighting system is difficult due to surrounding lights.

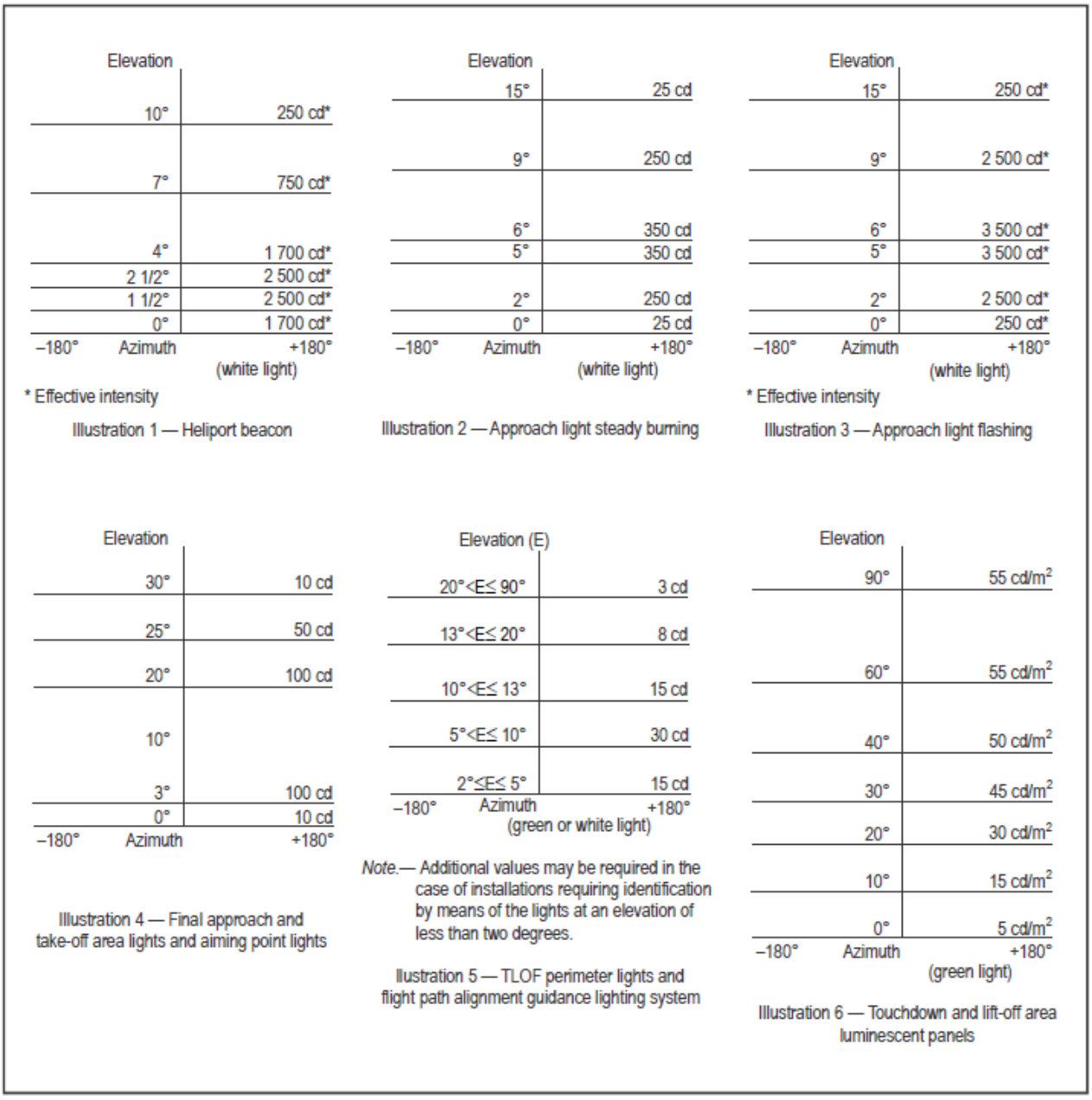


Figure 6-5. Isocandela diagrams

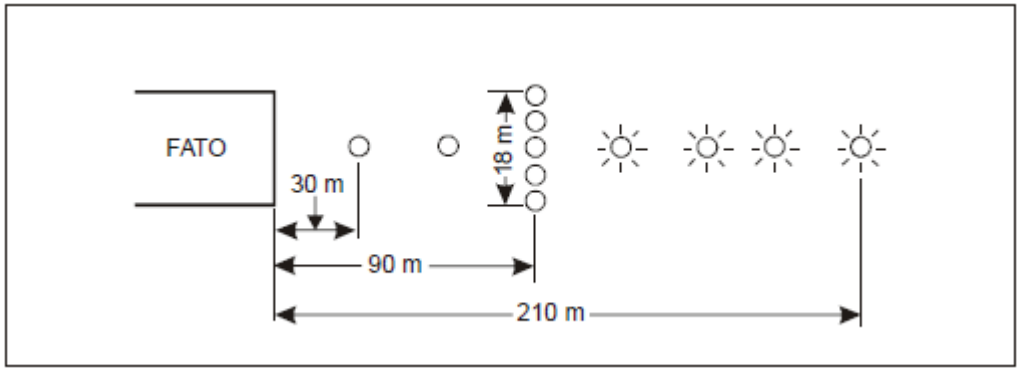


Figure 6-6. Approach lighting system

6.4.3.4 The flashing lights should have a flash frequency of one per second and their light distribution should be as shown in Figure 6-5, Illustration 3. The flash sequence should commence from the outermost light and progress towards the crossbar.

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

6.4.3.6 The following intensity settings have been found suitable:

(a) steady lights — 100 per cent, 30 per cent and 10 per cent; and

(b) flashing lights – 100 per cent, 10 per cent and 3 per cent.

6.4.4 Flight path alignment guidance lighting system

Application

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

6.4.4.2 The flight path alignment guidance lighting can be combined with the flight path alignment guidance marking described in AS-6 paragraph 7.2.14.

Location

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

Characteristics

6.4.4.4 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. (See Figure 6-4.)

6.4.4.5 The number of lights and spacing between these lights may be adjusted to reflect the space available. If more than one flight path alignment system is used to indicate available approach and/or departure path direction(s), the characteristics for each system are typically kept the same. (See Figure 6-4.)

6.4.4.6 The distribution of the lights should be as indicated in Figure 6-5, Illustration 5.

6.4.4.7 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.

6.4.5 Visual alignment guidance system

6.4.5.1 The objective of a visual alignment guidance system is to provide conspicuous and discrete cues to assist the pilot to attain, and maintain a specified approach track to a heliport. Guidance on suitable visual alignment guidance systems is given in the Heliport Manual (ICAO Doc 9261).

Application

6.4.5.2 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; and

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

6.4.6 Visual approach slope indicator

6.4.6.1 The objective of a visual approach slope indicator is to provide conspicuous and discrete colour cues, within a specified elevation and azimuth, to assist the pilot to attain and maintain the approach slope to a desired position within a FATO. Guidance on suitable visual approach slope indicators is given in the Heliport Manual (ICAO Doc 9261).

Application

6.4.6.2 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; and

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

6.4.7 FATO lighting systems for onshore surface-level heliports

6.4.7.1 The objective of a FATO lighting system for onshore surface-level heliports is to provide to the pilot operating at night an indication of the shape, location and extent of the FATO.

Characteristics

6.4.7.2 The light distribution of FATO lights should be as shown in Figure 6-5, Illustration 4.

6.4.7.3 The lights should not exceed a height of 25 cm 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 25 cm above ground or snow level.

6.4.8 Aiming point lights

6.4.8.1 The objective of aiming point lights is to provide a visual cue indicating to the pilot by night the preferred approach/departure direction; the point to which the helicopter approaches to a hover before positioning to a TLOF, where a touchdown can be made, and that the surface of the FATO is not intended for touchdown.

Application

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

Characteristics

6.4.8.3 The light distribution of aiming point lights should be as shown in Figure 6-5, Illustration 4.

6.4.9 TLOF lighting system

6.4.9.1 The objective of a TLOF lighting system is to provide illumination of the TLOF and required elements within. For a TLOF located in a FATO, the objective is to provide discernibility to the pilot, on a final approach, of the TLOF and required elements within; while for a TLOF located on an elevated heliport, shipboard heliport or helideck, the objective is visual acquisition from a defined range and to provide sufficient shape cues to permit an appropriate approach angle to be established.

Application

6.4.9.2 Where a TLOF is located in a stand, the objective of a TLOF lighting system may be met with the use of ambient lighting or stand floodlighting.

6.4.9.3 At elevated heliports, shipboard heliports and helidecks, surface texture cues within the TLOF are essential for helicopter positioning during the final approach and landing. Such cues can be provided using various forms of lighting (arrays of segmented point source lighting (ASPSL), luminescent panel (LP), floodlights or a combination of these lights, etc.) in addition to perimeter lights. Best results have been demonstrated by the combination of perimeter lights and ASPSL in the form of encapsulated strips of light emitting diodes (LEDs) and inset lights to identify the TDPM and heliport identification markings.

6.4.9.4 TLOF arrays of segmented point source lighting and/or luminescent panels (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.

Location

6.4.9.5 Guidance on TLOF perimeter lights is contained in the Heliport Manual (ICAO Doc 9261).

6.4.9.6 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.

6.4.9.7 ASPSL and LPs used to designate the TDPM and/or heliport identification marking have been shown to provide enhanced surface texture cues when compared to low-level floodlights. Due to the risk of misalignment, if floodlights are used, there will be a need for them to be checked periodically to ensure they remain within the specifications contained within AS-6 paragraph 7.3.6.

Characteristics

6.4.9.8 The chromaticity and luminance of colours of LPs should conform to AC 139-4-2 paragraph 12.2.4.

6.4.9.9 When located within the safety area of a surface-level or elevated heliport, the TLOF floodlights should not exceed a height of 25 cm.

6.4.9.10 The light distribution of the perimeter lights should be as shown in Figure 6-5, Illustration 5.

6.4.9.11 The light distribution of the LPs should be as shown in Figure 6-5, Illustration 6.

6.4.9.12 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.

6.4.9.13 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.

6.4.9.14 If utilised, the heliport identification marking lighting should be omnidirectional showing green.

6.4.10 Helicopter stand floodlighting

6.4.10.1 The objective of helicopter stand floodlighting is to provide illumination of the stand surface and associated markings to assist the manoeuvring and positioning of a helicopter and facilitation of essential operations around the helicopter.

Application

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

6.4.10.3 Guidance on stand floodlighting is given in the apron floodlighting section in the Aerodrome Design Manual (ICAO Doc 9157), Part 4.

Location

6.4.10.4 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 minimise shadows.

6.4.11 Taxiway lights

6.4.11.1 The specifications for taxiway centre line lights and taxiway edge lights in AS-5 paragraphs 8.3.14 and 8.3.15, are equally applicable to taxiways intended for ground taxiing of helicopters.

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

6.4.12.1 Arrangements for an aeronautical study of objects outside the obstacle limitation surface (OLS) and for other objects are addressed in AS-5 Chapter 7.

6.4.12.2 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.

6.4.12.3 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.

6.4.13 Floodlighting of obstacles

Characteristics

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

7 GUIDANCE FOR CHAPTER 8 OF AS-6: HELIPORT EMERGENCY RESPONSE

7.1 Rescue and firefighting

7.1.1 AS-6 section 8.1 should be read in conjunction with the appropriate detailed guidance on rescue and firefighting options given in the Heliport Manual (ICAO Doc 9261).

7.1.2 Provisions described in AS-6 section 8.1 are intended to address incidents or accidents within the heliport response area only. No dedicated firefighting provisions are included for helicopter accidents or incidents that may occur outside the response area, such as on an adjacent roof near an elevated heliport.

7.1.3 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).

7.1.4 Where a fixed monitor system (FMS) is installed, trained monitor operators, where provided, are positioned on at least the upwind location to ensure primary media is directed to the seat of the fire. For a ring-main system (RMS) practical testing has indicated that these solutions are only guaranteed to be fully effective for TLOFs up to 20 m diameter. If the TLOF is greater than 20 m, an RMS should not be considered

unless supplemented by other means to distribute primary media (e.g. additional pop-up nozzles installed in the centre of the TLOF).

7.1.5 The International Convention for the Safety of Life at Sea (SOLAS) sets forth provisions on rescue and firefighting (RFF) arrangements for purpose-built and non-purpose-built shipboard heliports in SOLAS regulations II 2/18, II-2-Helicopter Facilities, and the SOLAS Fire Safety Systems Code.

7.1.6 It may therefore be assumed that AS-6 section 8.1 does not include RFF arrangements for purpose built or non-purpose-built shipboard heliports or for winching areas.

7.1.7 Applicability

7.1.7.1 For areas for the exclusive use of helicopters at aerodromes primarily for the use of aeroplanes, distribution of extinguishing agents, response time, rescue equipment and personnel have not been considered in AS-6 section 8.1. See AS-5 Chapter 12.

7.1.7.2 A safety risk assessment should be performed to determine the need for RFF equipment and services at surface-level heliports and elevated heliports located above unoccupied structures.

7.1.7.3 Further guidance on factors to inform the safety risk assessment, including staffing models for heliports with only occasional movements and examples of unoccupied areas that may be located beneath elevated heliports, is given in the Heliport Manual (ICAO Doc 9261).

7.1.8 Level of protection provided

<u>Practical critical area calculation where primary media is applied as a solid stream</u>

7.1.8.1 This section is not applicable to helidecks regardless of how primary media is being delivered.

7.1.8.2 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. Categorisation from H0 to H3 should be determined on the basis of the fuselage dimensions in Table 7-1.

7.1.8.3 For helicopters which exceed one or both of the dimensions for a category H3 heliport, it will be necessary to recalculate the level of protection using practical critical area assumptions based on the actual fuselage length and the actual fuselage width of the helicopter plus an additional width factor (W1) of 6 m.

7.1.8.4 The practical critical area may be considered on a helicopter type-specific basis by using the formula in 7.1.8.2. Guidance on practical critical area in relation to the heliport firefighting category is given in the Heliport Manual (ICAO Doc 9261) where a discretionary 10 per cent tolerance on fuselage dimension “upper limits” is applied.

Table 7-1 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 m
H2	from 12 m up to but not including 16 m	2.5 m
H3	from 16 m up to 20 m	3 m

Practical critical area calculation where primary media is applied in a dispersed pattern

7.1.8.5 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.

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

7.1.8.7 Paragraph 7.1.8.6 is applied for the practical critical area calculation for helidecks regardless of how primary media is being delivered.

7.1.9 Extinguishing agents

7.1.9.1 Throughout paragraph 7.1.9, the discharge rate of a performance level B foam is assumed to be based on an application rate of 5.5 L/min/m², and for a performance level C foam and for water, is assumed to be based on an application rate of 3.75 L/min/m². These rates may be reduced if, through practical testing, a heliport operator demonstrates that the objectives of AS-6 paragraph 8.1.2 can be achieved for a specific foam use at a lower discharge rate (L/min).

7.1.9.2 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 (ICAO Doc 9137), Part 1.

Surface level heliports with primary media applied as a solid stream using a portable foam application system (PFAS)

7.1.9.3 Except for a limited-sized surface-level heliport, the assumption is made that foam dispensing equipment will be transported to the incident or accident location on an appropriate vehicle (a PFAS).

7.1.9.4 Where a rescue and firefighting service (RFFS) is provided at a surface-level heliport, the amount of primary media and complementary agents should be in accordance with Table 7-2.

7.1.9.5 The minimum discharge duration in Table 7-2 is assumed to be two minutes. However, if the availability of back-up specialist fire services is remote from the heliport, consideration may need to be given to increasing the discharge duration from two minutes to three minutes.

Table 7-2 Minimum usable amounts of extinguishing agents for surface-level heliports

	Foam meeting performance level B		*Foam meeting performance level C*		*Complementary agents*	
Category (1)	*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	45	18
H2	1 200	600	800	400	45	18
H3	1 600	800	1 100	550	90	36

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

7.1.9.6 The assumption is made that primary media (foam) will be delivered through a fixed foam application system such as an FMS.

7.1.9.7 Where an RFFS is provided at an elevated heliport, the amount of foam media and complementary agents should be in accordance with Table 7-3.

7.1.9.8 The minimum discharge duration in Table 7-3 is assumed to be five minutes.

7.1.9.9 For guidance on the provision of additional hand-controlled foam branches for application of aspirated foam, see the Heliport Manual (ICAO Doc 9261).

Table 7-3 Minimum usable amounts of extinguishing agents for elevated heliports

	Foam meeting performance level B		*Foam meeting performance level C*		*Complementary agents*	
Category (1)	*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	1 250	250	825	165	23	9
H1	2 000	400	1 350	270	23	9
H2	3 000	600	2 000	400	45	18
H3	4 000	800	2 750	550	90	36

Elevated heliports/limited-sized surface level heliports with primary media applied in a dispersed pattern through a fixed foam application system (FFAS) – a solid plate heliport

7.1.9.10 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.

7.1.9.11 The discharge duration should be at least three minutes.

7.1.9.12 Complementary media should be in accordance with Table 7-3, for H2 operations.

7.1.9.13 For helicopters with a fuselage length greater than 16 m and/or a fuselage width greater than 2.5 m, complementary media in Table 7-3 for H3 operations may be considered.

Purpose-built elevated heliports/limited-sized surface-level heliport 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)

7.1.9.14 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.

7.1.9.15 The discharge duration should be at least two minutes.

7.1.9.16 Complementary media should be in accordance with Table 7-3 for H2 operations.

7.1.9.17 For helicopters with a fuselage length greater than 16 m and/or a fuselage width greater than 2.5 m, complementary media for H3 operations may be considered.

Purpose-built helidecks with primary media applied in a solid stream or a dispersed pattern through a fixed foam application system (FFAS) – a solid-plate heliport

7.1.9.18 The amount of water required for foam media production should be predicated on the practical critical area (m^2) multiplied by the 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.

7.1.9.19 The discharge duration should be at least five minutes.

7.1.9.20 Complementary media should be in accordance with Table 7-3 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.

7.1.9.21 For guidance on the provision of additional hand-controlled foam branches for the application of aspirated foam, see the Heliport Manual (ICAO Doc 9261).

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

7.1.9.22 The amount of water required should be predicated on the practical critical area (m^2) multiplied by the 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 calculate the amount of water needed.

7.1.9.23 Sea-water may be used.

7.1.9.24 The discharge duration should be at least three minutes.

7.1.9.25 Complementary media should be in accordance with Table 7-3 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.

7.1.10 Response time

7.1.10.1 At surface level heliports, the operational objective of the RFF response should be to achieve response times not exceeding two minutes in optimum conditions of visibility and surface conditions.

7.1.10.2 Response time is considered to be the time between the initial call to the RFFS and the time when the first responding vehicle(s) (the service) is (are) in position to apply foam at a rate of at least 50 per cent of the discharge rate specified in Table 7-2.

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

7.1.11 Rescue arrangements

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

7.1.11.2 Guidance on the rescue arrangements, e.g. options for rescue and for personal protective equipment to be provided at a heliport, is given in the Heliport Manual (ICAO Doc 9261).

7.1.12 Communication and alerting system

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

7.1.13 Means of escape

7.1.13.1 Access points should be located as far apart from each other as is practicable.

7.1.13.2 The provision of an alternative means of escape is necessary for evacuation and for access by RFF personnel. The size of an emergency access/egress route may require consideration of the number of passengers and of special operations like helicopter emergency medical services that require passengers to be carried on stretchers or trolleys.

8 GUIDANCE ON CHAPTER 9 OF AS-6: INSTRUMENT HELIPORTS WITH NON-PRECISION AND/ OR PRECISION APPROACHES AND INSTRUMENT DEPARTURES

8.1 General

8.1.1 AS-6 contains standards (specifications) that prescribe the physical characteristics and obstacle limitation surfaces to be provided for at heliports, and certain facilities and technical services normally provided at a heliport. It is not intended that these specifications limit or regulate the operation of an aircraft.

8.1.2 The specifications in this chapter describe additional conditions beyond those found in AS-6, that apply to instrument heliports with non-precision and/or precision

approaches. All specifications contained within AS-6 are equally applicable to instrument heliports, but with reference to further provisions described in this chapter.

8.2 Visual Aids

8.2.1 Lights

Approach lighting systems

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

8.2.1.2 The light distribution of steady lights should be as indicated in Figure 6-5, Illustration 2 except that the intensity should be increased by a factor of three for a non-precision FATO.