Republic of the Philippines
CIVIL AVIATION AUTHORITY OF THE PHILIPPINES

MEMORANDUM CIRCULAR NO.: 001-2021

TO : ALL CONCERNED

FROM : DIRECTOR GENERAL

SUBJECT : AMENDMENT TO THE PHILIPPINE MANUAL OF STANDARDS FOR AERODROMES (MOS-AERODROMES) INCORPORATING AMENDMENT 9 TO ICAO ANNEX 14 VOL. II AND OTHER SUPPLEMENTARY AMENDMENTS

REFERENCE:

1. Philippine Manual of Standards for Aerodromes
2. ICAO Annex 14 Vol. II; Amendment 9
3. CAAP Regulations Amendment Procedures
4. Board Resolution No. 2012-054 dated 28 September 2012

Pursuant to the powers vested in me under the Republic Act 9497, otherwise known as the Civil Aviation Authority Act of 2008 and in accordance with the Board Resolution No.: 2012-054 dated 28 September 2012, I hereby approve the incorporation of ICAO Annex 14 Vol. II Amendment No. 9 to the Philippine Manual of Standards for Aerodromes.

ORIGINAL REGULATION SUBJECT FOR REVIEW AND REVISION:

MANUAL OF STANDARDS FOR AERODROMES, 2nd EDITION:

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CHAPTER 15. Heliport standards

Section 15.1 General

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15.1.6 Unless otherwise specified, the specification for a color referred to within this chapter shall be that contained in Chapter 9.

~~**Abbreviations and Symbols**~~

~~*Abbreviations*~~

~~APAPI~~	~~Abbreviated precision approach path indicator~~
~~ASPSL~~	~~Arrays of segmented point source lighting~~
~~cd~~	~~Candela~~
~~cm~~	~~Centimeter~~
~~DPWH~~	~~Department of Public Works and Highways~~
~~FATO~~	~~Final Approach and take-off area~~
~~ft~~	~~Foot~~

~~GNSS~~	~~Global navigation satellite system~~
~~HAPI~~	~~Helicopter approach path indicator~~
~~HFM~~	~~Helicopter flight manual~~
~~Hz~~	~~Hertz~~
~~kg~~	~~Kilogram~~
~~km/h~~	~~Kilometer per hour~~
~~kt~~	~~Knot~~
~~L~~	~~Liter~~
~~lb~~	~~Pounds~~
~~LDAH~~	~~Landing distance available~~
~~L/min~~	~~Liter per minute~~
~~LOA~~	~~Limited obstacle area~~
~~LOS~~	~~Limited obstacle sector~~
~~LP~~	~~Luminescent panel~~
~~M~~	~~Meter~~
~~MAPt~~	~~Missed approach point~~
~~MTOM~~	~~Maximum take-off mass~~
~~OFS~~	~~Obstacle free sector~~
~~PAPI~~	~~Precision approach path indicator~~
~~PinS~~	~~Point-in-space~~
~~R/T~~	~~Radio telephony or radio communications~~
~~RTODAH~~	~~Rejected take-off distance available~~
~~s~~	~~Second~~
~~t~~	~~Metric tonne (1000 kg)~~
~~TLOF~~	~~Touchdown and lift-off area~~
~~TODAH~~	~~Take-off distance available~~
~~UCW~~	~~Undercarriage width~~
~~VSS~~	~~Visual segment surface~~

~~*Symbols*~~

~~°~~	~~Degree~~
~~=~~	~~Equals~~
~~%~~	~~Percentage~~
~~±~~	~~Plus or minus~~

Section 15.2 Definitions

…

D. 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.

~~*Note: "D" is sometimes referred to in the text using the terminology "D-value"*~~

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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.

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Dynamic load bearing surface. A surface capable of supporting the loads generated by a helicopter ~~conducting an emergency touch-down on it~~ in motion.

…

Elongated. When used with TLOF or FATO, elongated means an area which has a length more than twice its width.

…

Helicopter stand. ~~An aircraft stand which provides for parking a helicopter and where ground taxi operations are completed, or where the helicopter touches down and lifts off for air taxi operations.~~ 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 air taxiway.** A defined path on the surface established for the air taxiing of helicopters.~~

Helicopter ~~ground~~ taxiway. A ~~taxiway~~ defined path on a heliport intended for the ~~surface~~ ground movement of ~~wheeled undercarriage~~ 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 taxi-route includes a helicopter air or ground taxiway which is centered on the taxi route.~~

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

b) *Ground taxi-route.* A taxi-route centered on a taxiway.

…

Heliport reference point (HRP). The designated location of a heliport ~~or a landing location~~.

~~**Landing location.** A marked or unmarked area that has the same physical characteristics as a visual heliport final approach and take-off area (FATO).~~

~~**Protection area.** An area within a taxi route and around a helicopter stand which provides separation from objects, the FATO, taxi routes and other helicopter stands for safe maneuvering of helicopters.~~

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

…

Touchdown/positioning circle (TDPC). A touchdown positioning marking (TDPM) in the form of a circle used for omnidirectional positioning in a TLOF.

Touchdown/positioning marking (TDPM). A marking or set of markings providing visual cues for the positioning of helicopters.

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Section 15.3 Aeronautical data for heliports

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15.3.2 Heliport reference point

15.3.2.1 ~~A geographical point shall be established for reference to a heliport which is not co-located with an aerodrome. The~~A heliport reference point shall be established ~~located at or near the initial or planned geometric center of the~~ for a heliport ~~and shall normally remain where first established~~ not collocated with an aerodrome.

Note: - When the heliport is collocated with an aerodrome, the established aerodrome reference point serves both aerodrome and heliport.

15.3.2.~~1~~2 ~~A geographical point shall be established for reference to a heliport which is not co-located with an aerodrome.~~ The heliport reference point shall be located ~~at or~~ near the initial or planned geometric center of the heliport and shall normally remain where first established.

15.3.2.~~2~~3 The position of the heliport reference point shall be measured and reported to CAAP AIS in degrees, minutes and seconds.

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15.3.4 Heliport dimensions and related information

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15.3.4.3 The following data elements shall be measured or described, as appropriate, for each facility provided on a heliport:

…

(e) Helicopter ~~ground~~ taxiway and helicopter ~~air taxiway~~ taxi route designation, width, surface type;

…

15.3.4.5 The geographical coordinates of appropriate centerline points of helicopter ~~ground~~ taxiways and helicopter ~~air taxiways~~ taxi-routes shall be measured and reported to the CAAP AIS in degrees, minutes, seconds and hundredths of seconds.

…

15.3.4.7 The geographical coordinates of obstacles in Area 2 (the part within the heliport boundary) and in Area 3 shall be measured and reported to CAAP AIS in degrees, minutes, seconds and tenths of a second. In addition, the top elevation, type, marking and lighting (if any) of obstacles shall be reported to the CAAP AIS.

~~*Note: - 1. See PANS-AIM (Doc 10066) Appendix 8 for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Areas 2 and 3.*~~

*Note: - ~~2.~~ ~~*PANS-AIM (Doc 10066)*~~ Manual of Standards for Aeronautical Information Services, Appendix 8, provides requirements for obstacle data determination in Areas 2 and 3.*

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15.3.7 Rescue and firefighting

Note: - See MOS 15.15 for information on rescue and firefighting services.

15.3.7.1 Information concerning the level of protection provided at a heliport for helicopter rescue and firefighting purposes shall be made available.

15.3.7.2 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 MOS 15.15 and in accordance with the types and amounts of extinguishing agents normally available at the heliport.

15.3.7.3 Changes in the level of protection normally available at a heliport for rescue and firefighting shall be notified to the appropriate aeronautical information services units and, where applicable, air traffic units to enable them to provide the necessary information to arriving and departing helicopters. When such a change has been corrected, the above units shall be advised accordingly.

Note: - 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.

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

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Section 15.5 ~~Surface level~~ Onshore heliports

Note: - 1. The provisions given in this section are based on the design assumption that no more than one helicopter will be in the FATO at the same time.

Note: - 2. The design provisions given in this section 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 MOS 15.10, do not overlap. Further guidance on this issue is given in the Heliport Manual *(Doc 9261).*

~~*Note: - 3. The specifications for ground taxi-routes and air taxi-routes are intended for the safety of simultaneous operations during the manoeuvring of helicopters. However, the wind velocity induced by the rotor downwash might have to be considered.*~~

Note: - 3. The provisions given in this section are common for surface-level heliports and elevated heliports unless otherwise specified.

Note: - 4. Guidance on the minimum size for elevated FATO/TLOFs in order to permit facilitation of essential operations around the helicopter is given in the Heliport Manual *(Doc 9261).*

Note: - 5. Guidance on structural design to account for the presence on elevated heliports of personnel, freight, refueling and firefighting equipment, etc. is given in the Heliport Manual *(Doc 9261).*

Note: - 6. 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 *(Doc 9261).*

15.5.1 Final approach and take-off area (FATO)

Note: - Guidance on siting and orientation of the FATO at a heliport to minimize 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 *(Doc 9261).*

…

~~15.5.1.1 A FATO shall be free of obstacles.~~

15.5.1.1 A FATO shall:

a) provide:

1) an area 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;

Note: - Essential objects 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 MOS Section 15.5.1.4.

2) when solid, a surface which is resistant to the effects of rotor downwash; and

i) when collocated with a TLOF, is contiguous and flush with the TLOF; has bearing strength capable of withstanding the intended loads; and ensures effective drainage; or

ii) when not collocated with a TLOF, is free of hazards should a forced landing be required; and

Note: - Resistant implies that effects from the rotor downwash neither cause a degradation of the surface nor result in flying debris.

and

b) be associated with a safety area.

~~15.5.1.2 The dimensions of a FATO shall be:~~

~~(a) as prescribed in the aircraft flight manual where the heliport is to be used by helicopters in performance class 1. Where a width is not prescribed in the flight manual, then the width shall be not less than the greatest overall dimension (D) of the largest helicopter the FATO is intended to serve;~~

~~(b) where the heliport is to be used by helicopters operated in performance category class 2 or 3 the FATO shall be of sufficient size and shape to contain an area within which a circle can be drawn that is:~~

~~(i) equal to D of the largest helicopter when the maximum take-off mass (MTOM) of helicopters intended to use the facility is more than 3175 kg; or~~

~~(ii) equal to 0.83D of the largest helicopter when the maximum takeoff mass (MTOM) of helicopters intended to use the facility is 3175 kg or less.~~

~~*Note: - The term FATO is not used in the HFM. The minimum landing/take-off area specified in the HFM for the appropriate performance class 1 flight profile is necessary to determine the size of the FATO. However, for vertical take-off procedures in performance class 1, the required rejected take-off area is not normally quoted in the HFM and it will be necessary to obtain information which includes complete containment – this figure will always be greater than 1D.*~~

~~(c) Where intended to be used by helicopters operated in performance class 2 or 3 with MTOM of 3 175 kg or less, the FATO shall be of sufficient size and shape to contain an area within which can be drawn a circle of diameter not less than 1 D.~~

~~*Note: - 1. The term FATO is not used in the HFM. The minimum landing/take-off area specified in the HFM for the appropriate performance class 1 flight profile is necessary to determine the size of the FATO. However, for vertical take-off procedures in performance class 1, the required rejected take-off area is not normally quoted in the HFM and it will be necessary to obtain information which includes complete containment – this figure will always be greater than 1D.*~~

~~*Note: - 2. Local conditions, such as elevation and temperature, may need to be considered when determining the size of a FATO. Guidance is given in the c replaced Heliport Manual (Doc 9261).*~~

15.5.1.8~~2~~ A ~~surface-level~~ heliport shall be provided with at least one final approach and take-off area (FATO), which need not be solid.

Note: - A FATO may be located on or near a runway strip or taxiway strip.

~~15.5.1.3 The FATO shall provide rapid drainage but the mean slope in any direction shall not exceed 3%. No portion of a FATO shall have a local slope exceeding:~~

~~(a) 5% where the heliport is intended to be used by helicopters operated in performance class 1; and~~

~~(b) 7% where the heliport is intended to be used by helicopters operated in performance class 2 or 3.~~

15.5.1.3 The minimum dimensions of a FATO shall 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 required Take-Off procedure prescribed in the helicopter flight manual (HFM) of the helicopters for which the FATO is intended, or 1.5 Design D, whichever is greater; and

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

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 requirement of MOS Section 15.5.1.1 a) 1) but not less than 1.5 times the overall width of the design helicopter.

Note: - 1. The RTOD is intended to ensure containment of the helicopter during a rejected take-off. Although some flight manuals 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. For further guidance see Heliport Manual *(Doc 9261).*

Note: - 2. 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 (Doc 9261).

~~15.5.1.4 The surface of the FATO shall:~~

~~(a) be resistant to the effects of rotor downwash;~~

~~(b) be free of irregularities that would adversely affect the take-off or landing of helicopters; and~~

~~(c) have bearing strength sufficient to accommodate a rejected take-off by helicopters operated in performance class 1.~~

15.5.1.4 Essential objects located in a FATO shall not penetrate a horizontal plane at the FATO elevation by more than 5 cm.

~~15.5.1.5 The surface of a FATO surrounding a touchdown and lift-off area (TLOF) intended for use by helicopters operated in performance class 2 or 3 shall be static load bearing.~~

15.5.1.5 When the FATO is solid the slope shall not:

a) except as provided in b) or c) below; exceed 2 percent in any direction;

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

c) when the FATO is elongated and intended to be used solely by helicopters operated in performance class 2 or 3, exceed 3 percent overall, or have a local slope exceeding 7 percent.

~~15.5.1.6 A FATO shall provide ground effect.~~

15.5.1.~~7~~6 The FATO shall be located so as to minimize the influence of the surrounding environment, including turbulence, which could have an adverse impact on helicopter operations.

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

15.5.1.7A FATO shall be surrounded by a safety area which need not be solid.

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15.5.2 Helicopter clearways

~~*Note: - A helicopter clearway would need to be considered when the heliport is intended to be used by helicopters operating in performance class 1. See Heliport Manual (Doc 9261).*~~

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

15.5.2.1 A helicopter clearway shall provide:

a) an area 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; and

b) when solid, a surface which: is contiguous and flush with the FATO; is resistant to the effects of rotor downwash; and is free of hazards if a forced landing is required.

15.5.2.~~1~~2 When a helicopter clearway is provided, it shall be located beyond the end of the FATO.

15.5.2.~~2~~3 The width of a helicopter clearway ~~shall~~ should not be ~~at least equal to that of the~~ *less than the width of the FATO and* associated safety area. (see MOS Figure 15-1A).

15.5.2.~~3~~4 *When solid, T*~~t~~*he* ground in a helicopter clearway ~~shall~~ should not project above a ~~plane~~ surface having an *overall* upward slope of 3% *or having a local upward slope exceeding 5 percent*, the lower limit of this surface ~~plane~~ being a horizontal line which is located on the periphery of the FATO. ~~An object on a clearway which will endanger helicopters shall be regarded as an obstacle and be Removed.~~

15.5.2.~~3~~5~~The ground in a helicopter clearway shall not project above a plane having an upward slope of 3%, the lower limit of this plane being a horizontal line which is located on the periphery of the FATO.~~ An object *situated in a helicopter* ~~on a~~ clearway which will endanger helicopters in the air shall be regarded as an obstacle and shall be removed.

15.5.3 Touchdown and lift-off areas (TLOF)

15.5.3.1 A TLOF shall:

a) provide:

(i) an area free of obstacles and of 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;

(ii) a surface which:

(1) has sufficient bearing strength to accommodate the dynamic loads associated with the anticipated type of arrival of the helicopter at the designated TLOF;

(2) is free of irregularities that would adversely affect the touchdown or lift-off of helicopters;

(3) has sufficient friction to avoid skidding of helicopters or slipping of persons;

(4) is resistant to the effects of rotor downwash; and

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

b) be associated with a FATO or a stand.

~~15.5.3.2 One TLOF shall be located within the FATO or one or more TLOFs shall be colocated with helicopter stands. For runway-type FATOs, additional TLOFs located in the FATO are acceptable.~~

~~*Note: - For further guidance see Heliport Manual (Doc 9261).*~~

15.5.3.~~1~~2~~At least~~A heliport~~one TLOF~~ shall be provided ~~at a heliport~~with at least one TLOF. ~~It shall be of sufficient size to contain a circle of diameter 0.83D of the largest helicopter the area is intended to serve.~~

~~*Note: - A TLOF may be any shape.*~~

~~15.5.3.3 Slopes on a TLOF shall be sufficient to prevent the accumulation of water on the surface, but shall not exceed 2% in any direction.~~

15.5.3.3 A TLOF shall be provided whenever it is intended that the undercarriage of the helicopter will touch down within a FATO or stand, or lift off from a FATO or stand.

~~15.5.3.4 Where the TLOF is located within a FATO which can contain a circle of diameter more than 1D, the TLOF shall be dynamic load bearing and the center of the TLOF shall be located not less than 0.5D from the edge of the FATO.~~

15.5.3.4 The minimum dimensions of a TLOF shall 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 helicopter flight manuals (HFMs) of the helicopters for which the TLOF is intended; and

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 of:

(1) in a FATO, the design helicopter; or

(2) 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 3.1.21 a) 1) above but not less than twice the undercarriage width (UCW) of:

(1) in a FATO, the design helicopter; or,

(2) in a stand, the most demanding helicopter the stand is intended to serve.

~~15.5.3.5 Where the TLOF is colocated with a helicopter stand, the TLOF shall be static load bearing and capable of withstanding the traffic of helicopters that the area is intended to serve.~~

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

15.5.3.6 Slopes on a TLOF should not:

a) except as provided in b) or c) below; exceed 2 percent in any direction;

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

c) when the TLOF is elongated and intended to be used solely by helicopters operated in performance class 2 or 3, exceed 3 percent overall, or have a local slope exceeding 7 percent.

15.5.3.7 When a TLOF is within a FATO it should be:

a) centered on the FATO; or

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

15.5.3.8 When a TLOF is within a helicopter stand, it shall be centered on the stand.

15.5.3.9 A TLOF shall be provided with markings which clearly indicate the touchdown position and, by their form, any limitations on maneuvering.

Note: - When a TLOF in a FATO is larger than the minimum dimensions, the TDPM may be offset while ensuring containment of the undercarriage within the TLOF and the helicopter within the FATO.

15.5.3.10 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.

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

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

Safety Devices

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

~~**15.6.9 Personnel Safety**~~

~~15.6.9.1 To mitigate the risk of damage to the properties and injuries to the helicopter passenger and helipad personnel dropping from the edges of elevated helipad, the safety devices such as safety nets or safety shelves shall be installed around the edge of the elevated helipad but shall not exceed the height of the TLOF.~~

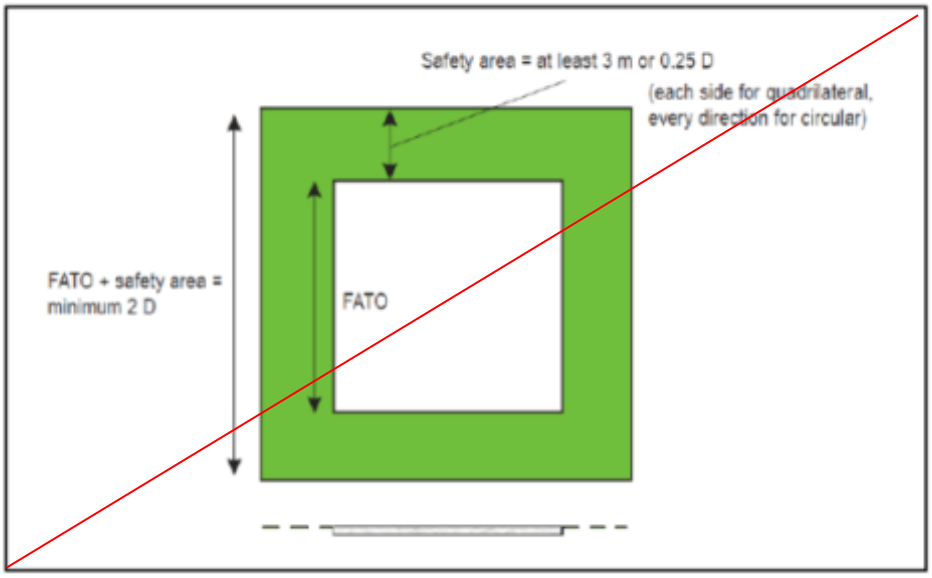
~~15.6.9.2~~ 15.5.3.13 The safety net shall extend at least 1.5 meters in the horizontal plane and be so arranged that the outboard edge is slightly above the level of the helipad edge, but by no more than 0.25 meters having an upward and outward slope of at least 10º. The net shall be strong enough to withstand, without a damage, a 75 kg mass being dropped from a height of 1.0 m.

Note: - See Heliport Manual (Doc 9621) for further guidance.

~~15.6.9.3~~ 15.5.3.14 There shall be a minimum of at least two access points to the helipad located equidistant around the perimeter. Such an arrangement will ensure that, in the event of an accident or incident on the helipad from which fire might ensue, personnel will be sure of at least one escape route upwind of the helipad.

~~15.6.9.4~~ 15.5.3.15 Where handrails associated with access points exceed the elevation of the FATO by 25 cm (10 in), they shall be made collapsible or removable. They shall be collapsed or removed whilst helicopter maneuvers are in progress.

Note: - See Heliport Manual (Doc 9621) for further guidance.



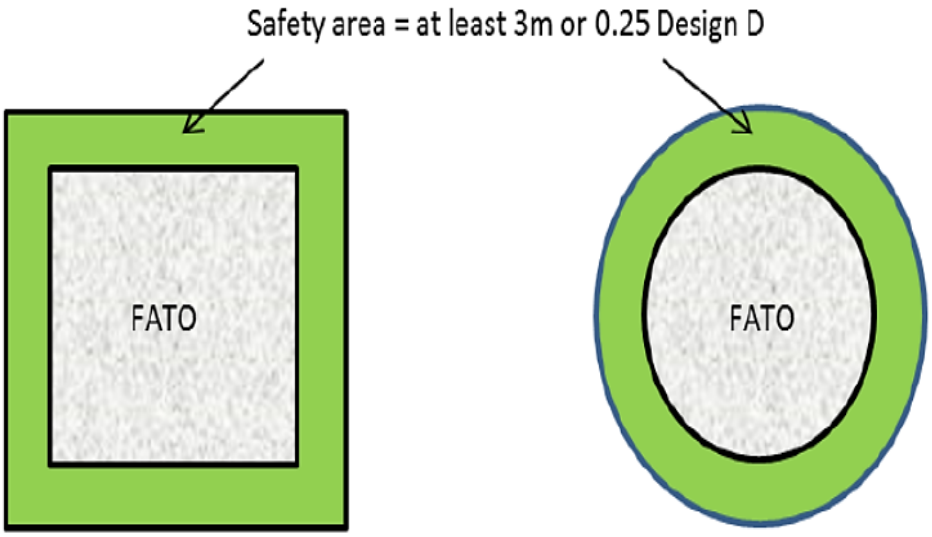


Figure 15-1A. FATO and associated safety area

15.5.4 Safety areas

~~15.5.4.1 A FATO shall be surrounded by a safety area which need not be solid.~~

15.5.4.1 A safety area shall provide:

a) an area free of obstacles, except for essential objects which because of their function are located on it, to compensate for manoeuvring errors; and

b) when solid, a surface which: is contiguous and flush with the FATO; is resistant to the effects of rotor downwash; and ensures effective drainage.

~~15.5.4.2 A safety area surrounding a FATO shall extend outwards from the periphery of the FATO for a distance of at least 3 metres, or 0.25D, whichever is greater, of the largest helicopter the FATO is intended to serve.~~

~~15.5.4.3 When a FATO is quadrilateral each external side of the safety area shall be at least 2D and where the FATO is circular the outer diameter of the safety area shall be at least 2D (See MOS Figure 15-1).~~

15.5.4.2 The safety area surrounding a FATO shall extend outwards from the periphery of the FATO for a distance of at least 3 m or 0.25 Design D, whichever is greater (see MOS Figure 15-1A).

15.5.4.~~7~~3~~No fixed object shall be permitted above the plane of the FATO on a safety area, except for frangible objects, which, because of their function must be located on the safety area.~~ No mobile object shall be permitted ~~on~~ in a safety area during helicopter operations.

15.5.4.4 Essential objects located in the safety area shall not penetrate a surface originating at the edge of the FATO at a height of 25 cm above the plane of the FATO sloping upwards and outwards at a gradient of 5 percent.

15.5.4.5 ~~The surface of a safety area, w~~When solid, ~~shall~~ should not exceed an upward slope of 4 percent outwards from the edge of the FATO.

Protected side slope

~~15.5.4.6 The surface of a safety area abutting a FATO shall be continuous with the FATO. The surface of a safety area shall be treated to prevent flying debris caused by rotor downwash.~~

15.5.4.4~~6There~~ A heliport shall be ~~a~~provided with at least one protected side slope, rising at 45 degrees outward from the edge of the safety area and extending to a distance of 10 meters (see MOS Figure 15-2).~~whose surface shall not be penetrated by obstacles, except that when obstacles are located to one side of the FATO only, they may be permitted to penetrate the side slope surface~~.

~~*Note: – When only a single approach and take-off climb surface is provided, the need for specific protected side slopes would be addressed in the aeronautical study required in MOS 15.12.1.7.*~~

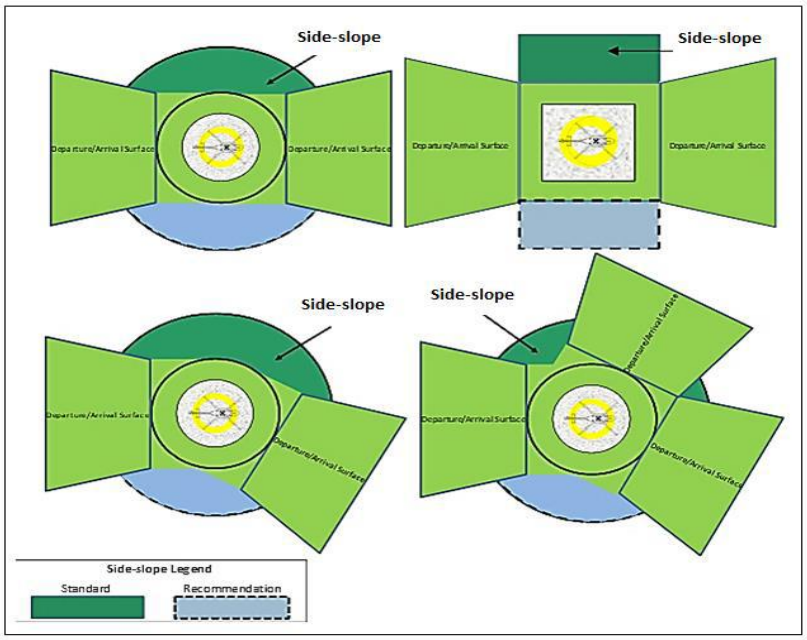
15.5.4.7 A heliport should be provided with at least two protected side slopes, rising at 45 degrees outward from the edge of the safety area and extending to a distance of 10 m.

~~15.5.4.8 Objects whose function requires them to be located on the safety area shall not:~~

~~(a) if located at a distance of less than 0.75 D from the center of the FATO, penetrate a plane at a height of 5 cm above the plane of the FATO; and~~

~~(b) if located at a distance of 0.75 D or more from the center of the FATO, penetrate a plane originating at a height of 25 cm above the plane of the FATO and sloping upwards and outwards at a gradient of 5%.~~

15.5.4.8 The surface of a protected side slope shall not be penetrated by obstacles.



Note: - These diagrams show a number of configurations of FATO/Safety Areas/Side slopes. For a more complex arrival/departure arrangement which consists of: two surfaces that are not diametrically opposed; more than two surfaces; or an extensive obstacle free sector (OFS) which abuts directly to the FATO, it can be seen that appropriate provisions are necessary to ensure that there are no obstacles between the FATO and/or safety area and the arrival/departure surfaces.

Figure 15-1B. FATO simple/complex safety area and side slope protection

15.5.5 Helicopter ~~ground~~ taxiways and ~~ground~~ taxi-routes.

Note: - 1. 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.

Note: - 2. The defined areas addressed in this section are taxiways and ground/air taxi-routes:

a) Taxiways associated with air taxi-routes may be used by both wheeled and skidded helicopters for either ground or air taxiing.

b) Ground taxi-routes are meant for use by wheeled helicopters, for ground taxiing only.

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

Helicopter taxiways

~~15.5.5.1~~ *Note: - 1. A helicopter ground taxiway is intended to permit the surface movement of a wheeled helicopter under its own power.*

Note: - 2. A helicopter taxiway can be used by a wheeled helicopter for air taxi if associated with a helicopter air taxi-route.

~~15.5.5.2~~ *Note: - 3. 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.*

15.5.5.1 A helicopter taxiway shall:

a) provide:

(i) an area free of obstacles and of sufficient width to ensure containment of the undercarriage of the most demanding wheeled helicopter the taxiway is intended to serve;

(ii) a surface which:

(1) has bearing strength to accommodate the taxiing loads of the helicopters the taxiway is intended to serve;

(2) is free of irregularities that would adversely affect the ground taxiing of helicopters;

(3) is resistant to the effects of rotor downwash; and

(4) 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; and

b) be associated with a taxi-route.

15.5.5.2 The minimum width of a helicopter taxiway shall be the lesser of:

a) two times the undercarriage width (UCW) of the most demanding helicopter the taxiway is intended to serve; or

b) a width meeting the requirements of 15.5.5.1 (a) (i).

~~15.5.5.3 The width of a helicopter ground taxiway shall be at least 1.5 times the largest width of the undercarriage (UCW) of helicopters the taxiway is intended to serve.~~

15.5.5.~~4~~3The transverse slope of a taxiway should not exceed 2 percent and ~~T~~the longitudinal slope ~~of a helicopter ground taxiway shall~~ should not exceed 3 percent.

~~15.5.5.5 A helicopter ground taxiway shall be static load bearing and be capable of withstanding the traffic of helicopters that it is intended to serve.~~

~~15.5.5.6 A helicopter ground taxiway shall be centered in a ground taxi-route.~~

~~15.5.5.7 A helicopter taxi-route shall extend symmetrically on each side of the centerline for at least 0.75 times the largest overall width of the helicopters it is intended to serve.~~

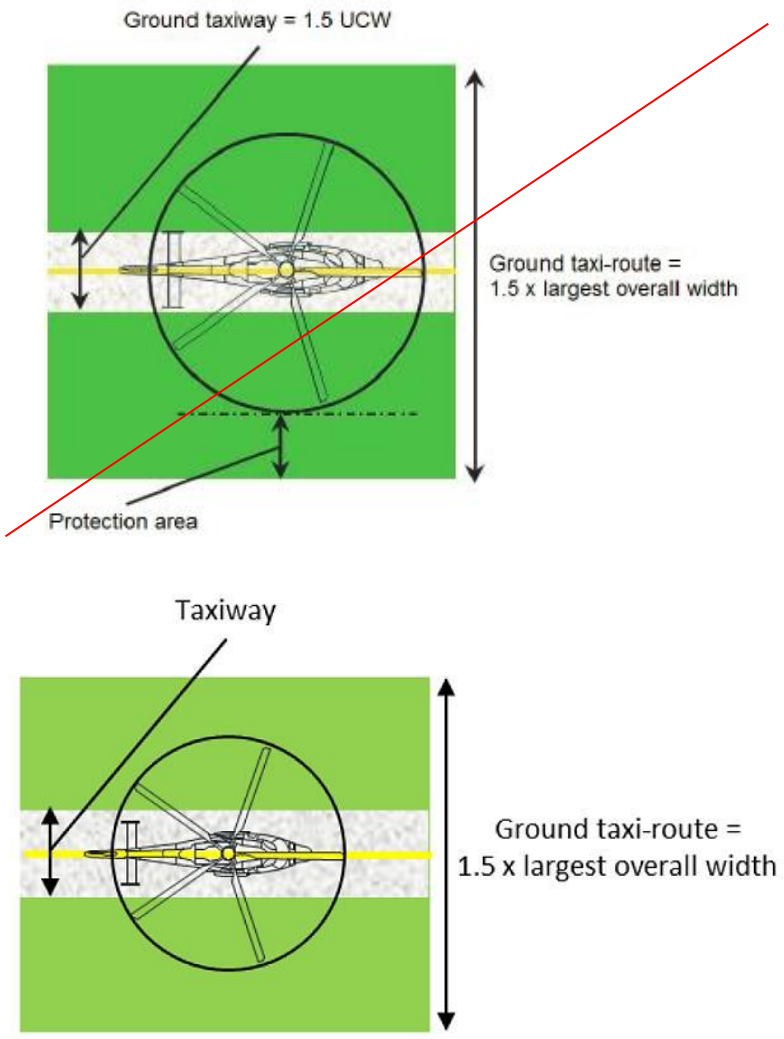


Figure 15-2. Helicopter ~~ground taxi-route~~/taxiway/ground taxi-route

Helicopter taxi-routes

~~15.5.5.8 The part of the helicopter ground taxi-route that extends symmetrically on each side of the centerline from 0.5 times the largest overall width of the helicopters it is intended to serve to the outermost limit of the helicopter ground taxi- route is its protection area.~~

15.5.5.4 A helicopter taxi-route shall provide:

a) an area free of obstacles, except for essential objects which because of their function are located on it, established for the movement of helicopters; with sufficient width to ensure containment of the largest helicopter the taxi-route is intended to serve;

b) when solid, a surface which is resistant to the effects of rotor downwash; and

(i) when collocated with a taxiway:

(1) is contiguous and flush with the taxiway;

(2) does not present a hazard to operations; and

(3) ensures effective drainage; and

(ii) when not collocated with a taxiway, is free of hazards if a forced landing is required.

15.5.5.~~95 No fixed objects shall be permitted above the surface of the ground on a helicopter ground taxi-route, except for frangible objects which must be located thereon because of their function~~ No mobile object shall be permitted on a ~~ground~~ taxi-route during helicopter movements operations. ~~Objects whose function requires them to be located on a helicopter ground taxi-route shall not:~~

~~(a) be located at a distance of less than 50 cm from the edge of the helicopter ground taxiway; and~~

~~(b) penetrate a plane originating at a height of 25 cm above the plane of the helicopter ground taxiway, at a distance of 50 cm from the edge of the helicopter ground taxiway and sloping upwards and outwards at a gradient of 5 per cent.~~

Note: - See the Heliport Manual *(Doc 9261) for further guidance.*

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

Helicopter ground taxi-routes

15.5.5.7 A helicopter ground taxi-route shall have a minimum width of 1.5 x the overall width of the largest helicopter it is intended to serve, and be centred on a taxiway (See MOS Figure 15-2).

15.5.5.8 Essential objects located in a helicopter ground taxi-route shall not:

(a) be located at a distance of less than 50 cm outwards from the edge of the helicopter ground taxiway; and

(b) penetrate a surface 50 cm outwards of the edge of the helicopter taxiway and a height of 25 cm above the surface of the taxiway and sloping upwards and outwards at a gradient of 5 percent.

~~15.5.5.10 The helicopter ground taxiway and the helicopter ground taxi-route shall provide rapid drainage but the helicopter ground taxiway transverse slope shall not exceed 2%.~~

~~15.5.11 The surface of a helicopter ground taxi-route shall be resistant to the effect of rotor downwash.~~

~~15.5.12 For simultaneous operations, the helicopter ground taxi-routes shall not overlap.~~

15.5.6 Helicopter ~~air taxiways and helicopter~~ air taxi-routes

~~15.5.6.1~~ *~~Note: -~~ A helicopter air ~~taxiway~~ taxi-route is intended to permit the movement of a helicopter above the surface at a height normally associated with ground effect and at a groundspeed less than 37 kph (20 kt).*

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

~~15.5.6.2 The width of a helicopter air taxiway shall be at least two times the largest width of the undercarriage (UCW) of the helicopters the air taxiway is intended to serve (see MOS Figure 15-3).~~

15.5.6.2 If collocated with a taxiway for the purpose of permitting both ground and air taxi operations (see MOS Figure-15-4 (b):

a) the helicopter air taxi-route shall be centered on the taxiway; and

b) essential objects located in the helicopter air taxi-route shall not:

(i) be located at a distance of less than 50 cm outwards from the edge of the helicopter taxiway; and

(ii) penetrate a surface originating 50 cm outwards of the edge of the helicopter taxiway and a height of 25 cm above the surface of the taxiway and sloping upwards and outwards at a gradient of 5 percent.

~~15.5.6.3 The surface of a helicopter air taxiway shall be static load bearing wherever possible.~~

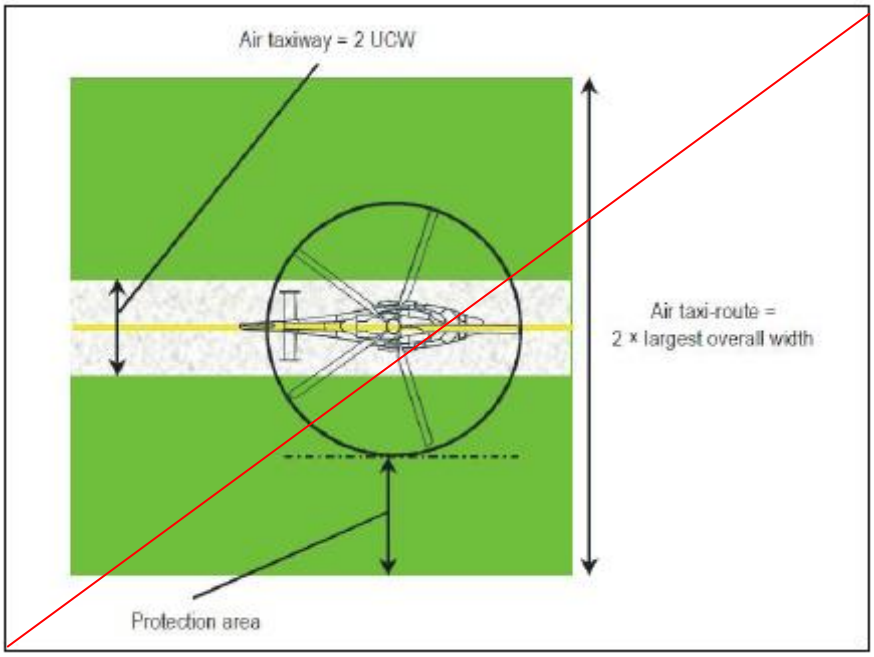
15.5.6~~.4~~.3 When not collocated with a taxiway, ~~T~~the slope of the surface of a ~~helicopter air taxiway~~ an air taxi route ~~shall~~ should not exceed the slope landing limitations of the helicopters ~~the helicopter air taxiway~~ the taxi-route is intended to serve. In any event the transverse slope should not exceed 10% and the longitudinal slope may not exceed 7%.

~~15.5.6.5 A helicopter air taxiway shall be centered on an air taxi-route.~~

~~15.5.6.6 A helicopter air taxi-route shall extend symmetrically on each side of the centerline for a distance at least equal to the largest overall width of the helicopters it is intended to serve.~~

~~*Note: - The part of the helicopter air taxi-route that extends symmetrically on each side of the centerline from 0.5 times the largest overall width of the helicopters it is intended to serve to the outermost limit of the helicopter air taxi-route is its protection area.*~~

~~15.5.6.7 No fixed objects shall be permitted above the surface of the ground on an air taxi-route, except for frangible objects, which must be located there because of their function. No mobile object shall be permitted on an air taxi-route during helicopter movements.~~



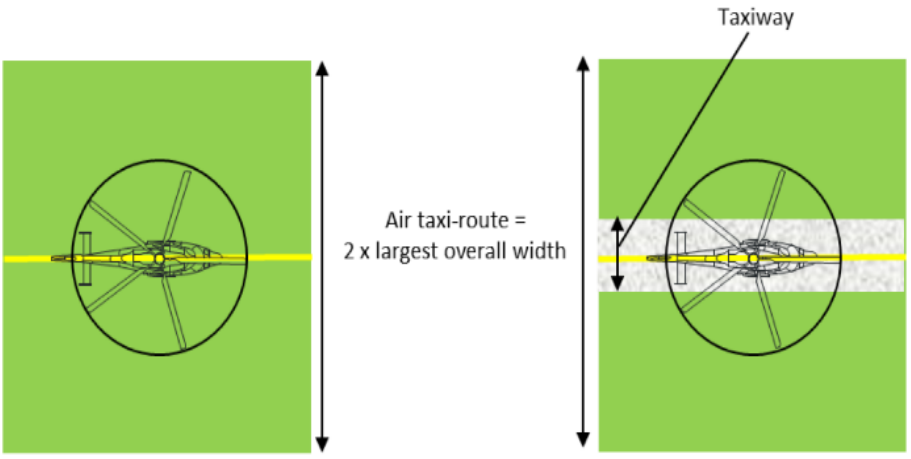


Figure 15 – 3 Helicopter air taxi-route and combined air taxi-route /taxiway

~~15.5.6.8 Objects above ground level whose function requires them to be located on a helicopter air taxi-route shall not:~~

~~(a) be located at a distance of less than 1 m from the edge of the helicopter air taxiway; and~~

~~(b) penetrate a plane originating at a height of 25 cm above the plane of the helicopter air taxiway, at a distance of 1 m from the edge of the helicopter air taxiway and sloping upwards and outwards at a 20 gradient of 5 per cent.~~

~~15.5.6.9 Objects above ground level whose function requires them to be located on a helicopter air taxi-route should not:~~

~~(a) be located at a distance of less than 0.5 times the largest overall width of the helicopter for which the helicopter air taxi-route is designed from the centerline of the helicopter air taxiway; and~~

~~(b) penetrate a plane originating at a height of 25 cm above the plane of the helicopter air taxiway, at a distance of 0.5 times the largest overall width of the helicopter for which the helicopter air taxi route is designed from the centerline of the helicopter air taxiway, and sloping upwards and outwards at a gradient of 5%.~~

~~15.5.6.10 The surface of a helicopter taxi-route shall be resistant to the effect of rotor downwash and shall provide ground effect.~~

~~15.5.6.11 For simultaneous operations, the helicopter air taxi-routes shall not overlap.~~

15.5.7 Helicopter stands

Note: - The provisions of this section do not specify the location for helicopter stands but allow a high degree of flexibility in the overall design of the heliport. However, it is not considered good practice to locate helicopter stands under a flight path. See Heliport Manual (Doc 9261) for further guidance.

~~15.5.7.1 When a TLOF is colocated with a helicopter stand, the protection area of the stand shall not overlap the protection area of any other helicopter stand or associated taxi route.~~

15.5.7.1 A helicopter stand shall:

a) provide:

(i) an area free of obstacles and of 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;

(ii) a surface which:

(1) is resistant to the effects of rotor downwash;

(2) is free of irregularities that would adversely affect the manoeuvring of helicopters;

(3) has bearing strength capable of withstanding the intended loads;

(4) has sufficient friction to avoid skidding of helicopters or slipping of persons; and

(5) 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; and

b) be associated with a protection area.

15.5.7.2 The minimum dimensions of a helicopter stand shall be:

a) a circle of 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 MOS Section 15.5.7.1 (a) (i) above but not less 1.2 times overall width of largest helicopter the stand is intended to serve.

Note: - 1. For a helicopter stand intended to be used for taxi-through only, a width less than 1.2D but which provides containment and still permits all required functions of a stand to be performed, might be used (in accordance with 15.5.7.1 (a)(i)).

Note: - 2. 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. See the Heliport Manual *(Doc 9261) for further guidance.*

15.5.7.~~2~~3 The ~~helicopter stand shall provide rapid drainage but the~~ mean slope *of a helicopter stand* in any direction ~~shall~~ should not exceed 2%.

~~*Note: - The requirements on the dimensions of helicopter stands assume the helicopter will turn in a hover when operating over a stand.*~~

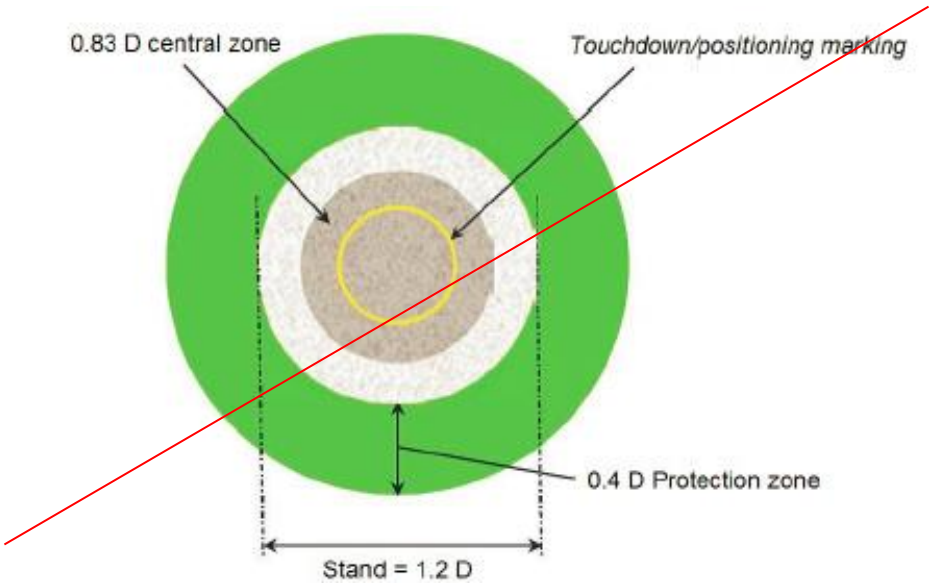
~~15.5.7.3 A helicopter stand intended to be used by helicopters turning in a hover shall be of sufficient size to contain a circle of diameter at least 1.2D of the largest helicopter the stand is intended to serve (See MOS Figure- 15-4a).~~

~~15.5.7.4 Where a helicopter stand is intended to be used for turning, it shall be surrounded by a protection area which extends for a distance of 0.4D from the edge of the helicopter stand. The minimum dimension of the stand and the protection area shall be not less than 2D (See MOS Figure- 15-4b).~~

15.5.7.4 Each helicopter stand shall be provided with positioning markings to clearly indicate where the helicopter is to be positioned and, by their form, any limitations on maneuvering.

~~15.5.7.5 Where a helicopter stand is intended to be used for taxi through and where the helicopter using the stand is not required to turn, the minimum width of the stand and associated protection area shall be that required for a taxi- route width.~~

15.5.7.5 A stand shall be surrounded by a protection area which need not be solid.



~~**Figure 15-4 (b) Helicopter stand and associated protection area**~~

Protection areas

~~15.5.7.6 When simultaneous operations on adjacent stands are conducted, the protection area of the helicopter stands and their associated taxi-routes shall not overlap (See MOS Figure 15-5).~~

~~*Note: - Where non-simultaneous operations are envisaged, the protection areas of helicopter stands and their associated taxi-routes may overlap (See MOS Figure 15-6).*~~

15.5.7.6 A protection area shall provide:

a) an area free of obstacles, except for essential objects which because of their function are located on it; and

b) when solid, a surface which is contiguous and flush with the stand; is resistant to the effects of rotor downwash; and ensures effective drainage.

~~15.5.7.7 A helicopter stand and associated protection area intended to be used for air taxiing shall provide ground effect.~~

15.5.7.7 When associated with a stand designed for turning, the protection area shall extend outwards from the periphery of the stand for a distance of 0.4D. (See MOS Figure 15-5).

~~15.5.7.8 No fixed objects shall be permitted above the surface of the ground on a helicopter stand.~~

15.5.7.8 When associated with a stand designed for taxi-through, the minimum width of the stand and protection area shall not be less than the width of the associated taxi-route (see MOS Figures 15-6 and 15-6A).

~~15.5.7.9 No fixed object shall be permitted above the surface of the ground in the protection area around a helicopter stand except for frangible objects, which because of their function, must be located there.~~

15.5.7.9 When associated with a stand designed for non-simultaneous use (see MOS Figures 15-6B and 15-6C):

a) the protection area of adjacent stands may overlap but shall not be less than the required protection area for the larger of the adjacent stands; and

b) the adjacent non-active stand may contain a static object but it shall be wholly within the boundary of the stand.

Note: - To ensure that only one of the adjacent stands is active at a time, instruction to pilots in the AIP make clear that a limitation on the use of the stands is in force.

~~15.5.7.10 No mobile object shall be permitted on a helicopter stand and the associated protection area during helicopter movements.~~

15.5.7.10 No mobile object shall be permitted in a protection area during helicopter operations.

15.5.7.11 Essential ~~O~~objects ~~whose function requires them to be~~ located in the protection area shall not:

(a) if located at a distance of less than 0.75D from the center of the helicopter stand, penetrate a plane at a height of 5 cm above the plane of the central zone; and

(b) if located at distance of 0.75D or more from the center of the helicopter stand, penetrate a plane at a height of 25 cm above the plane of the central zone and sloping upwards and outwards at a gradient of 5%.

~~15.5.7.12 The central zone of a helicopter stand shall be capable of withstanding the traffic of helicopters it is intended to serve and have a static load-bearing area:~~

~~(a) of diameter of 0.83D of the largest helicopter the stand is intended to serve; or~~

~~(b) for a helicopter stand intended to be used for taxi-through, and where the helicopter using the stand is not required to turn, the same width as the helicopter ground taxiway.~~

~~*Note: - For a helicopter stand intended to be used for turning on the ground by wheeled helicopters, the dimension of the helicopter stand, including the dimension of the central zone, would need to be significantly increased. See Heliport Manual (Doc 9261) for further guidance.*~~

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

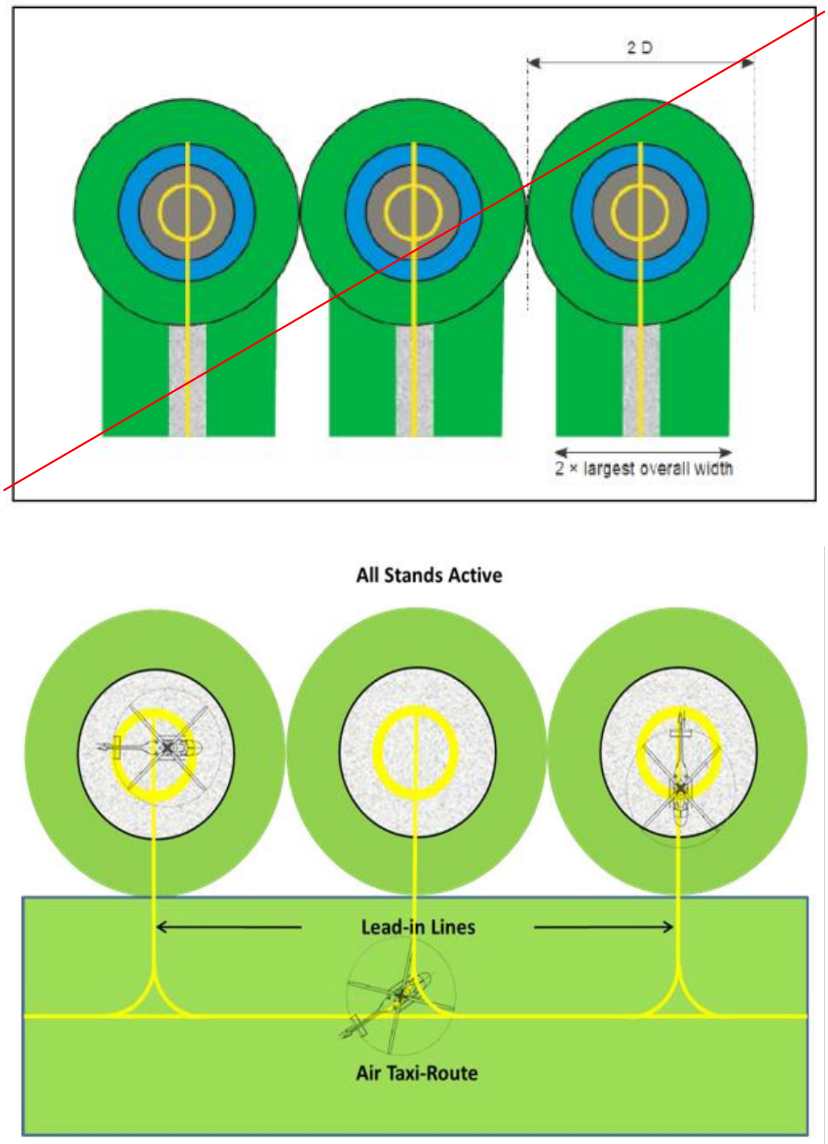


Figure 15-5. ~~Helicopter~~ Turning stands ~~designed for hover turns~~ (with air taxi-routes)~~/taxiways —~~ simultaneous use ~~operations~~

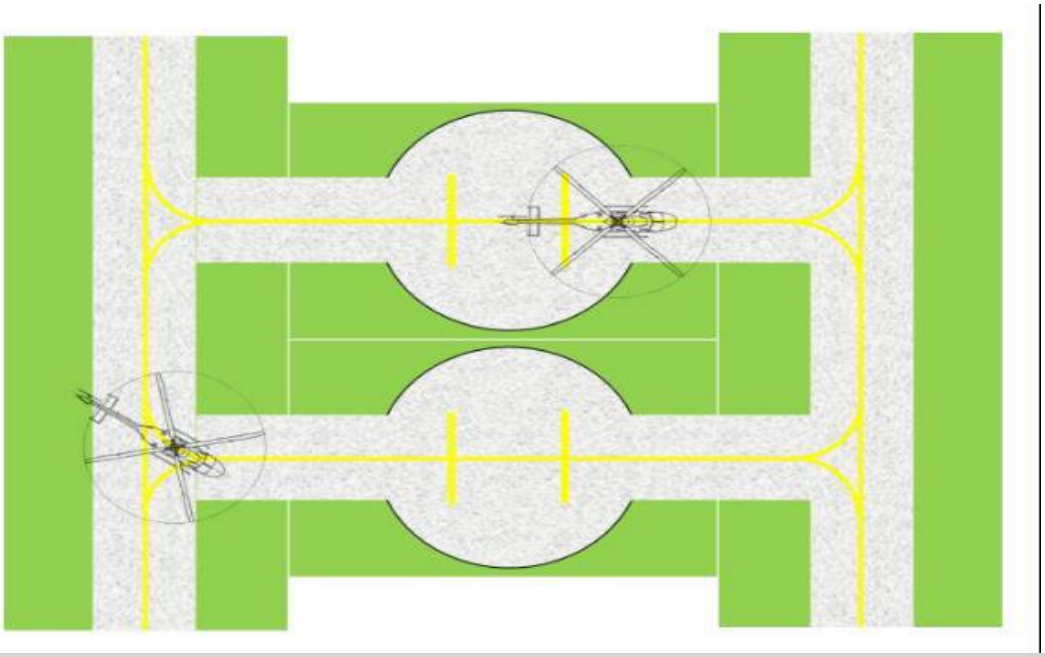


Figure 15-6 Ground taxi-through stands (with taxiway/ground taxi-route) simultaneous use

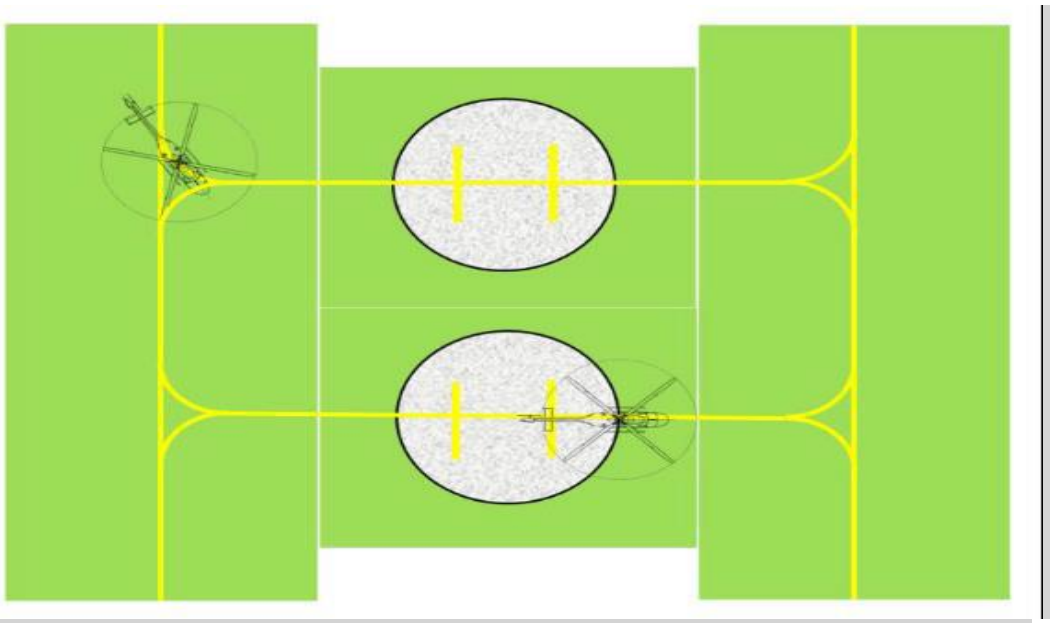
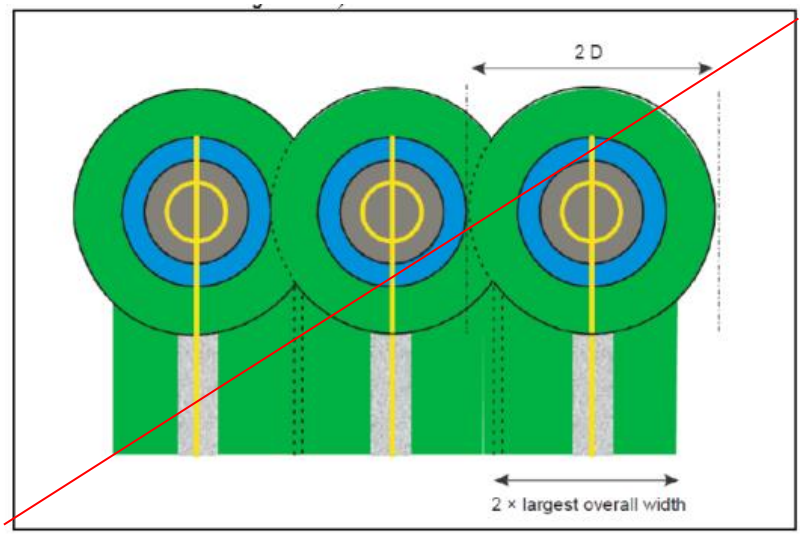


Figure 15-6A Air taxi-through stands (with air taxi-route) simultaneous use



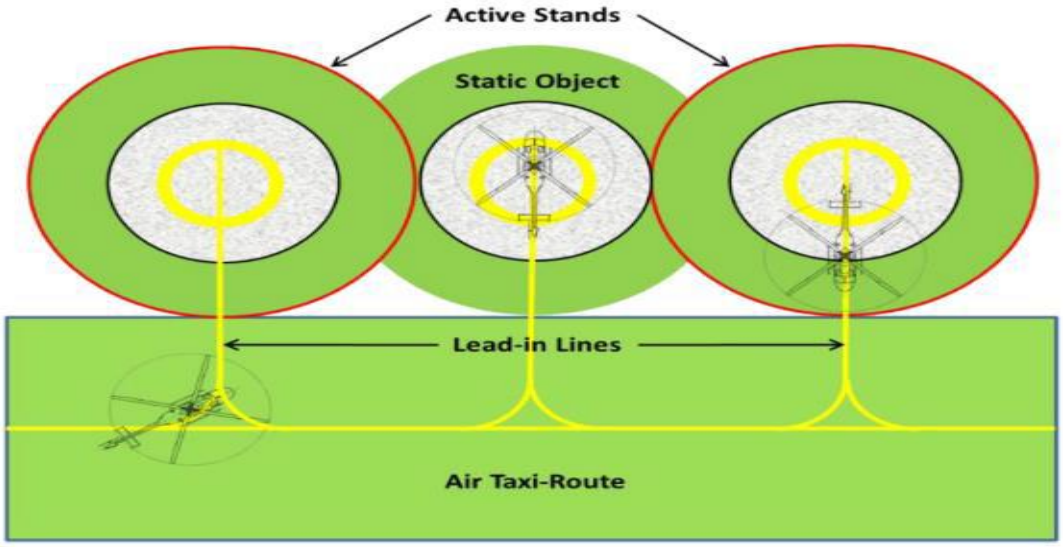


Figure 15-6B. ~~Helicopter~~ Turning stands ~~designed for hover turns~~ (with air taxi-routes)~~/taxiways~~ — non-simultaneous ~~operations~~use – outer stands active

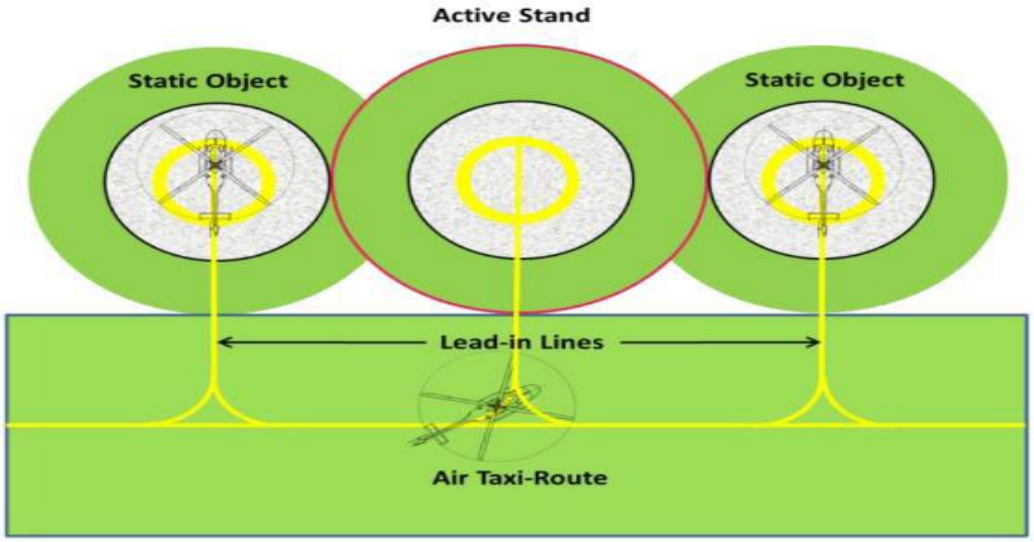


Figure 15-6C Turning stands (with air taxi-route) non-simultaneous use – inner stand active

15.5.8 Location of a final approach and take-off area in relation to a runway or taxiway

15.5.8.1 Where a FATO is located near a runway or taxiway and where simultaneous operations ~~in VMC~~ are planned, the separation distance between the edge of the runway or taxiway and the edge of the FATO shall be not less than the appropriate dimension in MOS Table ~~15-2~~. 15-1.

…

Aeroplane and or helicopter mass	Distance between edges of FATO and runway or taxiway
Up to but not including 3175 kg	60 m
3175kg up to but not including 5760 kg	120 m
5760 kg up to but not including 100,000 kg	180 m
100,000 kg and over	250 m

Table 15-1. FATO minimum separation distance for simultaneous operations

~~**Section 15.6 Elevated heliports**~~

~~**15.6.1 Introduction**~~

~~In the case of elevated heliports, the design considerations for different elements of the heliport shall take into account additional loading resulting from the presence of personnel, freight, refueling, safety and fire-fighting equipment and the like.~~

~~**15.6.2 Final approach and take-off area (FATO)**~~

~~15.6.2.1 An elevated heliport shall be provided with at least one FATO, and the FATO and the TLOF will be coincidental. A FATO shall be dynamic load bearing.~~

~~15.6.2.2 A FATO shall be free of obstacles.~~

~~15.6.2.3 The dimensions of a FATO shall be:~~

~~(a) as prescribed in the helicopter flight manual (HFM) where the heliport is intended to be used by helicopters in performance class 1. Where a width is not prescribed in the HFM, then the width shall be not less than the greatest overall dimension (D) of the largest helicopter the FATO is intended to serve; or~~

~~(b) where the heliport is intended to be used by helicopters operated in performance category class 2 or 3 the FATO shall be of sufficient size and shape to contain an area within which a circle can be drawn that is:~~

~~(i) equal to D of the largest helicopter when the maximum take-off mass (MTOM) of helicopters intended to use the facility is more than 3175kg; or~~

(ii) equal to 0.83D of the largest helicopter when the maximum takeoff mass (MTOM) of helicopters intended to use the facility is 3175 kg or less.

15.6.2.4 Slopes on the FATO at an elevated heliport shall be sufficient to prevent accumulation of water but shall not exceed 2% in any direction.

15.6.2.5 The surface of the FATO shall be:

(a) resistant to the effects of rotor downwash; and

(b) free of irregularities that would adversely affect the take-off or landing of helicopters.

15.6.2.6 A FATO shall provide ground effect.

15.6.3 Helicopter clearways

15.6.3.1 Where a helicopter clearway is provided, it shall be located beyond the end of the rejected take-off area provided.

15.6.3.2 The width of a helicopter clearway shall not be less than that of the associated safety.

15.6.3.3 When solid, the surface of the helicopter clearway shall not project above a plane having an upward slope of 3%, the lower limit of this plane being horizontal line which is located on the periphery of the FATO.

15.6.3.4 An object situated on a helicopter clearway which will endanger helicopters in the air shall be regarded as an obstacle and shall be removed.

15.6.4 Touchdown and lift-off area (TLOF)

15.6.4.1 One TLOF shall be coincidental with the FATO. It shall have the same dimensions and characteristics as the FATO.

Note: - Additional TLOF may be collocated with helicopter stands.

15.6.4.2 Where a TLOF is colocated with a helicopter stand, the TLOF shall be of sufficient size to contain a circle of diameter 0.83D of the largest helicopter the area is intended to serve.

15.6.4.3 Slopes on a TLOF colocated with a helicopter stand shall be sufficient to prevent the accumulation of water on the surface, but shall not exceed 2% in any direction.

15.6.4.4 Where the TLOF is colocated with a helicopter stand and is intended to be used for ground taxiing only, the TLOF shall be at least static load bearing and shall be capable of withstanding the traffic of helicopters that the area is intended to serve.

15.6.4.5 Where the TLOF is colocated with a helicopter stand and is intended to be used for air taxiing, the TLOF shall have a dynamic load-bearing area.

15.6.5 Safety area

~~15.6.5.1 The FATO shall be surrounded by a safety area which need not be solid.~~

~~15.6.5.2 The safety area surrounding a FATO intended to be used in visual meteorological conditions (VMC) by helicopters operated in performance class 1 shall extend outwards from the periphery of the FATO for a distance of the greater of at least 3 meters, or 0.25D of the largest helicopter the FATO is intended to serve.~~

~~(a) each external side of the safety area shall be at least 2 D where the FATO is quadrilateral; or~~

~~(b) the outer diameter of the safety area shall be at least 2 D where the FATO is circular.~~

~~15.6.5.3 The safety area surrounding a FATO intended to be used in visual meteorological conditions (VMC) by helicopters operated in performance class 2 or 3 shall extend outwards from the periphery of the FATO for a distance of the greater of at least 3 meters, or 0.5D of the largest helicopter the FATO is intended to serve.~~

~~(a) each external side of the safety area shall be at least 2 D where the FATO is quadrilateral; or~~

~~(b) the outer diameter of the safety area shall be at least 2 D where the FATO is circular.~~

~~15.6.5.4 There shall be a protected side slope rising at 45° from the edge of the safety area to a distance of 10 m, whose surface shall not be penetrated by obstacles. However, penetration may be permitted if obstacles are located to one side of the FATO only.~~

~~15.6.5.5 The surface of a safety area, when solid, shall not exceed an upward slope of 4% outwards from the edge of the FATO.~~

~~15.6.5.6 The surface of a safety area abutting a FATO shall be continuous with the FATO. The surface of a safety area shall be treated to prevent flying debris caused by rotor downwash.~~

~~15.6.5.7 No fixed object shall be permitted on a safety area, except for frangible objects, which, because of their function must be located on the safety area. No mobile object shall be permitted on a safety area during helicopter operations.~~

~~15.6.5.8 An object whose function requires it to be located on the safety area shall not exceed a height of 25 cm when located along the edge of a FATO, nor penetrate a plane originating at a height of 25 cm above the FATO and sloping upwards and outwards form the edge of the FATO at a gradient of 5%.~~

~~15.6.6 Helicopter ground taxiways and ground taxi-routes~~

~~15.6.6.1 The width of a helicopter ground taxiway shall be at least 2 times the largest width of the undercarriage (UCW) of helicopters the taxiway is intended to serve.~~

~~15.6.6.2 The longitudinal slope of a helicopter ground taxiway shall not exceed 3%.~~

~~15.6.6.3 A helicopter ground taxiway shall be static load bearing and be capable of withstanding the traffic of helicopters that it is intended to serve.~~

15.6.6.4 A helicopter ground taxiway shall be centered in a ground taxi-route.

15.6.6.5 A helicopter taxi-route shall extend symmetrically on each side of the centerline for a distance not less than the largest overall width of the helicopters it is intended to serve.

15.6.6.6 No objects shall be permitted on a helicopter taxi-route, except for frangible objects which must be located there because of their function.

15.6.6.7 A helicopter ground taxiway and a ground taxi-route shall provide rapid drainage but the helicopter ground taxiway transverse slope shall not exceed 2%.

15.6.6.8 The surface of a helicopter taxi-route shall be resistant to the effect of rotor downwash.

15.6.7 Helicopter air taxiways and air taxi-routes

Note: - A helicopter air taxiway is intended to permit the movement of a helicopter above the surface at a height normally associated with ground effect and at a groundspeed less than 37 km/h (20 kts).

15.6.7.1 The width of an air taxiway shall be at least three times the largest width of the undercarriage (UCW) of the helicopters the air taxiway is intended to serve.

15.6.7.2 The surface of an air taxiway shall be dynamic load bearing.

15.6.7.3 The transverse slope of the surface of a helicopter air taxiway shall not exceed 2% and the longitudinal slope may not exceed 7%. In any event the slopes may not exceed the slope landing limitations of the helicopters the air taxiway is intended to serve.

15.6.7.4 A helicopter air taxiway shall be centered in an air taxi-route.

15.6.7.5 A helicopter air taxi-route shall extend symmetrically on each side of the centerline for a distance at least equal to the largest overall width of the helicopters it is intended to serve.

15.6.7.6 No objects shall be permitted on a helicopter air taxi-route, except for frangible objects which must be located there because of their function.

15.6.7.7 The surface of a helicopter taxi-route shall be resistant to the effect of rotor downwash and shall provide ground effect.

15.6.8 Helicopter aprons

15.6.8.1 The slope in any direction on a helicopter apron stand shall not exceed 2%.

15.6.8.2 A helicopter stand shall be of sufficient size to contain a circle of diameter at least 1.2D of the largest helicopter the stand is intended to serve. (See MOS Figure- 15-4a).

15.6.8.3 When a helicopter stand is used for hover turns, it shall be surrounded by a protection area which extends for a distance of 0.4D from the edge of the helicopter stand. The minimum

~~dimension of the stand and the protection area shall be not less than 2D. (See MOS Figure- 15-4b).~~

~~15.6.8.4 When a helicopter stand is located within a taxi-route, the minimum width of the stand and its associated protection area shall be that of the taxi-route.~~

~~15.6.8.5 When simultaneous operations on adjacent stands are conducted, the protection area of the helicopter stands and their associated taxi-routes shall not overlap. (See MOS Figure-15-5).~~

~~*Note: - Where non-simultaneous operations are envisaged, the protection area of helicopter stands and their associated taxi-routes may overlap. (See MOS Figure 15-6).*~~

~~15.6.8.6 When ground taxi operations by wheeled helicopters are intended, the dimensions of a helicopter stand shall take into account the minimum turn radius of wheeled helicopters the stand is intended to serve.~~

~~15.6.8.7 A helicopter stand and associated protection area intended to be used for air taxiing shall provide ground effect.~~

~~15.6.8.8 No fixed objects shall be permitted on a helicopter stand and associated protection area.~~

~~15.6.8.9 The central zone of a stand shall be capable of withstanding the traffic of helicopters it is intended to serve and have a static load-bearing area with a diameter of 0.83D of the largest helicopter the stand is intended to serve. If the helicopter stand is intended to be used for air taxiing, the central zone shall be dynamic load bearing.~~

~~15.6.8.10 If a stand is located within a taxi-route, the minimum size of the central zone shall be not less than the width required for the ground taxiway.~~

…

Section 15.12 Obstacle limitation requirements

…

Note: - 2~~. - If a Visual approach slope indicator (VASI) is installed, there are additional obstacle protection surfaces, detailed in MOS 15.14, that need to be considered and may be more demanding than the obstacle limitation surfaces prescribed in MOS Table 15-3.~~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 *(Doc 9261).*

15.12.1 Surface level heliports

…

15.12.1.7 A surface level heliport shall have at least one take-off climb and approach surfaces. An aeronautical study shall be undertaken by an appropriate authority when only a single approach and take-off climb surface is provided considering as a minimum, the following factors:

…

(b) the obstacle environment surrounding the heliport and the availability of at least one protected side slope;

…

15.12.2 Elevated heliports

…

15.12.2.2 An elevated heliport shall have at least one approach and take-off climb surface. An aeronautical study shall be undertaken by an appropriate authority when only a single approach and take-off climb surface is provided considering as a minimum, the following factors:

…

(b) the obstacle environment surrounding the heliport and the availability of at least one protected side slope;

…

Section 15.13 Visual aids – ~~indicator and~~ markings and markers

…

Note: - 3. Guidance is given in the Heliport Manual (Doc.9261) on marking the maximum allowable mass (~~5.2.3~~MOS Section 15.13.4) ~~,~~and the D-value (~~5.2.4~~MOS Section 15.13.5) ~~and, if required, the actual FATO Dimension(s)~~ on the heliport surface to avoid confusion between markings where metric units are used and markings where imperial units are used.

…

Note: - 5. See MOS Section 8.3.1.1, Note 1, concerning improving conspicuity of markings.

…

15.13.2 Winching area marking

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

…

15.13.3 Heliport identification marking

15.13.3.1 ~~Location – All FATOs except runway-type FATOs 5.2.2.1~~ A heliport identification marking shall be provided at a heliport.

Location – All FATOs except runway-type FATOs

~~(i) provided at a heliport.~~

~~(ii)~~ 15.13.3.2 A heliport identification marking shall be located at or near the center of the FATO.

Note: - 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.

Note: - 2. For other than helidecks, the preferred direction(s) of approach corresponds to the median of the departure/arrival surface(s).

Note: - 3. For helidecks, the bar of the "H" points to the center of the Limited Obstacle Sector.

Note: - ~~1~~4. If the Touchdown/positioning marking is offset ~~on a helideck~~, the heliport identification marking is established in the center of the Touchdown/positioning marking.

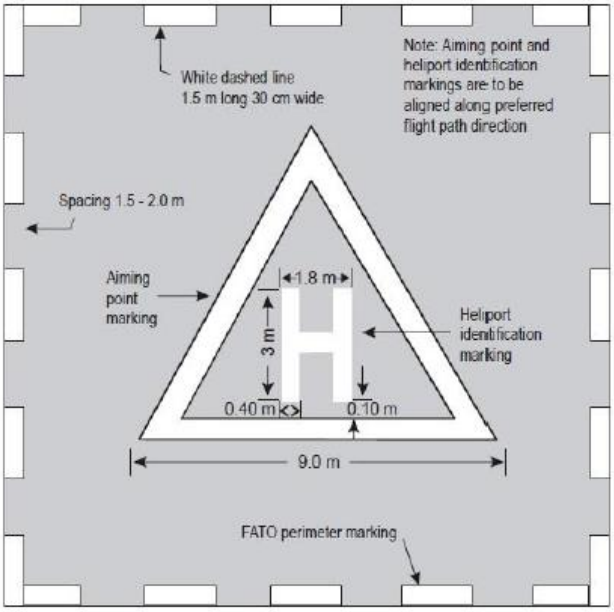
Note: - ~~2~~5. On a FATO, which does not contain a TLOF and which is marked with an aiming point marking (See MOS Section ~~8.4.2~~ -15.13.8 ~~Taxiway centerline marking~~), ~~except for a~~

~~heliport at a hospital~~, the heliport identification marking is established in the center of the aiming point marking as shown in MOS Figures 15-20 and 15- 20A.

~~(b)~~ 15.13.3.3 On a FATO which contains a TLOF, a heliport identification marking shall be located in the FATO so the position of it coincides with the center of the TLOF.

15.13.3.~~24~~ Location – Runway-type FATOs

…



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 15-20. Combined heliport identification, aiming point and FATO perimeter marking

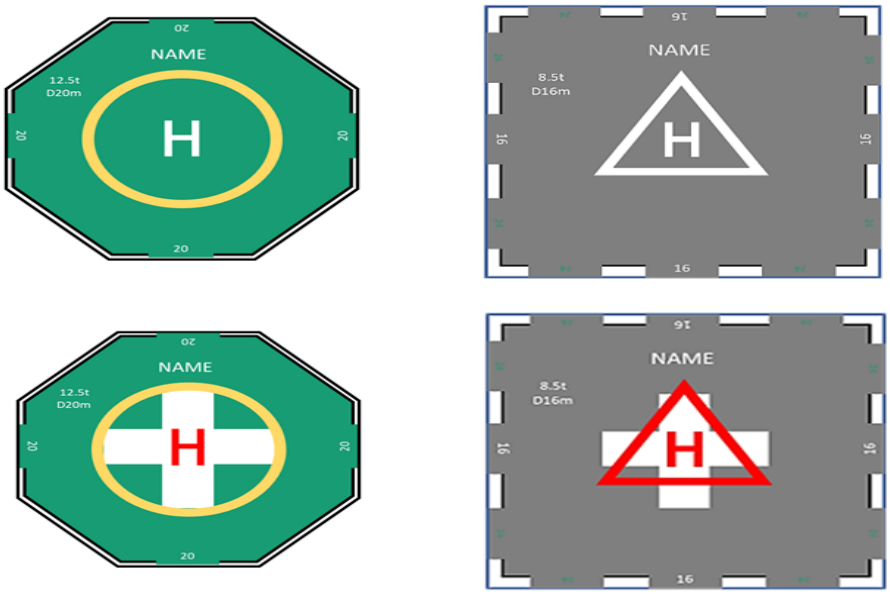


Figure 15–20A Heliport identification markings with TLOF and aiming markings for heliport and hospital heliport

…

15.13.4 Maximum allowable mass marking

Note: - 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.

…

15.13.4.2 All FATOs except runway-type FATOs

(a) The numbers and letter of the marking shall have a color contrasting with the background and be in the form and proportion shown in MOS Figure 15–23, for a ~~FATO with a dimension~~ *D-value* of more than 30 m. For a ~~FATO~~ *D-value* ~~*a dimension of*~~ between 15 m to 30 m the height of the numbers and the letter of the marking shall be a minimum of 90 cm, and for a ~~FATO with a dimension of~~ *D-value of* less than 15 m the height of the numbers and the letter of the marking shall be a minimum of 60 cm, each with a proportional reduction in width and thickness.

…

15.13.5 D-value marking

Note. - 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 MOS 15.5 - 15.8.

…

15.13.5.2 Runway-type FATOs

Note: - The D-value is not required to be marked on a heliport with a runway-type FATO.

(a) The D-value marking shall:

(i) be displayed at surface-level and elevated heliports ~~designed for helicopters operated in Performance Class 2 or 3~~.

(ii) be located within the TLOF or FATO and so arranged as to be readable from the preferred final approach direction.

(iii) be white in color and be rounded to the nearest whole meter or foot with 0.5 rounded down.

(b) Where there is more than one approach direction, additional D-value markings ~~shall~~ should be provided such that at least one D-value marking is readable from the final approach directions. For a non-purpose heliport located on a ship's side, D value markings ~~shall~~ 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 centerline.

(c) The numbers of the marking ~~shall~~ should have a color contrasting with the background and ~~shall~~ should be in the form and proportion shown in MOS Figure 15-23 ~~for a FATO with a dimension~~ D-Value of more than 30 m. For ~~a FATO~~ D-Value with a dimension of between 15 m to 30 m the height of the numbers of the marking ~~shall~~ should be a minimum of 90 cm, and for a ~~FATO with a dimension~~ D-Value of less than 15 m the height of the numbers of the marking ~~shall~~ should be a minimum of 60 cm, each with a proportional reduction in width and thickness.

…

~~**15.13.6 Final approach and take-off area dimension(s) marking**~~

~~15.13.6.1 The actual dimension(s) of the FATO intended to be used by helicopters operated in performance class 1 shall be marked on the FATO.~~

~~15.13.6.2 If the actual dimension(s) of the FATO to be used by helicopters operated in performance class 2 or 3 is less than 1D, the dimension(s) shall be marked on the FATO.~~

~~15.13.6.3 A FATO dimension marking shall be located within the FATO and so arranged as to be readable from the preferred final approach direction. The dimension(s) shall be rounded to the nearest meter or foot.~~

~~*Note: - If the FATO is rectangular both the length and width of the FATO relative to the preferred final approach direction is indicated.*~~

~~15.13.6.4 All FATOs except runway-type FATOs~~

~~(a) The numbers of the marking shall have a color contrasting with the background and shall be in the form and proportion shown in MOS Figure 15-23 for a FATO with a dimension of more than 30 m. For a FATO with a dimension between 15 m to 30 m the height of the numbers of the marking shall be a minimum of 90 cm, and for a FATO with a dimension of less than 15 m the height of the numbers of the marking shall be a minimum of 60 cm, each with a proportional reduction in width and thickness.~~

~~15.13.6.5 Runway-type FATOs~~

~~(a) The numbers of the marking shall have a color contrasting with the background and shall be in the form and proportion shown in MOS Figure 15-23.~~

15.13.~~7~~6 Final approach and take-off area perimeter marking or markers for surface level heliports

Note: - The objective of final approach and take-off area 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.

15.13.~~7~~6.1 FATO perimeter marking or markers shall:

(a) be provided at a surface level heliport on ground where the extent of ~~the~~ a final approach and take-off area with a solid surface is not self-evident.

…

15.13.~~7~~6.2 Runway-type FATOs

(a) The perimeter of the FATO shall:

…

(b) ~~A~~ FATO perimeter markers~~shall~~:

(i) shall have dimensional characteristics as shown in MOS Figure 15-24.

(ii) shall be of color(s) that contrast effectively against the operating background.

(iii) should be a single color, orange or red, or two contrasting colors, orange and white or alternatively red and white shall be used except where such colors would merge with the background.

15.13.~~7~~6.3 All FATOs except runway-type FATOs

(a) For an unpaved FATO the perimeter shall be defined with flush inground markers. The FATO perimeter markers shall be 30 cm 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 a square or rectangular FATO shall be defined.

…

15.13.~~8~~7 Final approach and take-off area designation markings for runway –type FATOs

Note: - The objective of final approach and take-off area designation markings for runway-type FATOs is to provide to the pilot an indication of the magnetic heading of the runway.

15.13.~~8~~7.1 A FATO designation marking shall be provided at a heliport where it is necessary to designate the ~~final approach and take-off area~~ FATO to the pilot.

15.13.~~8~~ 7.2 A FATO designation marking shall be located at the beginning of the FATO as shown in MOS Figure 15-21.

15.13.~~8~~7.3 A FATO designation marking shall consist of a two-digit number. The two-digit number shall be the whole number nearest the one-tenth of the magnetic North when viewed from the direction of approach. When the above rule would give a single digit number, it shall be a zero. The marking shown in MOS Figure 15-21 shall be supplemented by the heliport identification marking.

15.13.~~9~~8 Aiming point marking

Note: - The objective of the aiming point marking is to provide a visual cue indicating to the pilot 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.

15.13.~~9~~8.1 An aiming point marking ~~shall~~ 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 ~~touchdown and lift-off area~~ TLOF.

15.13.~~9~~82 Runway-type FATOs

(a) The aiming point marking shall be located within the final approach and take-off area.

15.13.~~9~~8.3 All FATOs except runway-type FATOs

(a) The aiming point marking shall be located at the center of the FATO as shown in MOS Figure 15-20.

(b) The aiming point marking shall he an equilateral triangle with the bisector of one of the angles aligned with the preferred approach direction. The marking shall consist of continuous ~~white~~ lines, providing a contrast with the background color, and the dimensions of the marking shall conform to those shown in Figure 15-25.

…

15.13.~~10~~9 Touchdown and lift-off area perimeter marking

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

15.13.~~10~~9.1 A TLOF perimeter marking shall:

(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 provided on each TLOF colocated with a helicopter stand at a surface level heliport.~~

~~(d)~~(c) be located along the perimeter edge of the TLOF.

~~(e)~~(d) consist of a continuous white line with a width of at least 30 cm.

15.13.1~~1~~0 Touchdown/positioning marking

~~15.13.11.1 A touchdown/positioning marking shall:~~

~~(a) be provided where it is necessary for a helicopter to touch down and/or be accurately positioned by the pilot. A touchdown/positioning marking shall be provided on a helicopter stand designed for turning.~~

~~(b) be located so that when the pilot's seat is over the marking, the whole or the undercarriage will be within the TLOF and all parts of the helicopter will be clear of any obstacle by a safe margin.~~

~~(c) A touchdown/positioning marking shall be a yellow circle and have a line width of at least 0.5 m. For a helideck or a purpose built shipboard heliport with a D value of 16.0 m or larger, the line width shall be at least 1m.~~

Note: - 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.

15.13.10.1 A touchdown/positioning marking shall be provided for a helicopter to touch down or be accurately placed in a specific position.

~~15.13.11.2 On a heliport, the center of the touchdown/positioning marking shall be located at the center of the TLOF, except the center of the touchdown/positioning marking must be offset away from the center of the TLOF where an aeronautical study indicates such offsetting to be necessary and providing that a marking so offset will not adversely affect safety. For a helicopter stand designed for hover turning, the touchdown/positioning marking shall be located in the center of the central zone (See MOS Figure 15-4).~~

15.13.10.2 The touchdown/positioning marking shall be:

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

(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.

~~15.13.11.3 On a helideck, the center of the touchdown marking shall be located at the center 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 to be necessary and that a marking so offset will not adversely affect safety.~~

~~*Note: - See Heliport Manual (Doc 9261) for guidance.*~~

15.13.10.3 The inner edge/inner circumference of the touchdown/positioning marking shall be at a distance of 0.25 D from the center of the area in which the helicopter is to be positioned.

~~15.13.11.4 The inner diameter of the touchdown/positioning marking shall be 0.5 D of the largest helicopter the TLOF and/or the helicopter stand is intended to serve.~~

15.13.10.4 On a helideck, the center of the TDPC marking shall be located at the center 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.

15.13.10.5 Prohibited landing sector markings, when provided, shall be located on the touchdown/positioning marking, within the relevant headings, and extend to the inner edge of the TLOF perimeter marking**.**

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

15.13.10.7 A touchdown/positioning marking shall have a line width of at least 0.5 m. For a helideck and a purpose-built shipboard heliport, the line width shall be at least 1 m.

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

15.13.10.9 The prohibited landing sector markings, when provided, shall be indicated by white and red hatched markings as shown in Figure 15-26.

15.13.10.10 The TDPM shall take precedent when used in conjunction with other markings on the TLOF except for the prohibited landing sector marking.

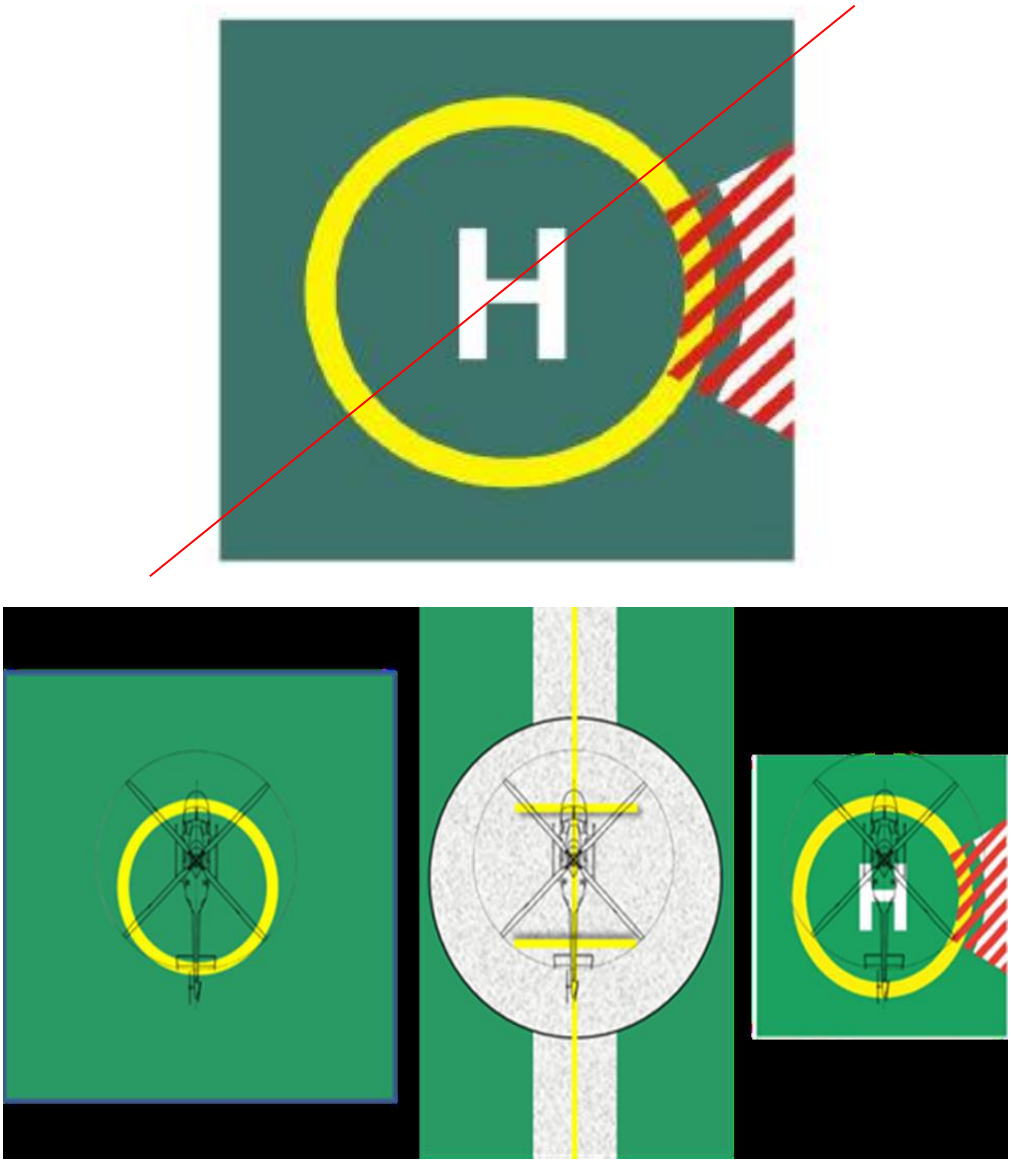


Figure 15-26 ~~Helideck prohibited landing sector marking~~(Left) multidirectional TDPC with no limitations. (Center) unidirectional marking shoulder line with associated centerline. (Right) multidirectional TDPC with prohibited landing sector marking

Note: - The prohibited landing sector (PLS) 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.

15.13.12~~1~~1 Heliport name marking

Note: - 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.

15.13.12~~1~~.1 A heliport name marking: ~~shall~~:

(a) shall be provided at a heliport and helideck where there is insufficient alternative means of visual identification.

(b) ~~be displayed on the heliport so as to be visible, as far as practicable, at all angles above the horizontal.~~ Where ~~an~~ *a limited* obstacle sector (LOS) exists on a helideck the marking ~~shall~~ should be located on the obstacle side of the "heliport identification marking". For a non-purpose built heliport located on a ship's side the marking shall 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.

(c) shall consist of the name or the alphanumeric designator of the heliport as used in the radio (R/T) communications.

d) should be illuminated, either internally or externally when intended for use at night or during conditions of poor visibility.

15.13.12~~1~~.2 Runway-type FATOs

(a) The characters of the marking shall be not less than 3 m in height.

15.13.12~~1~~.3 All FATOs except runway-type FATOs

(a) The characters of the marking shall 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 color of the marking s~~hall~~ should contrast with the background and preferably be white.

15.13.13~~2~~ Helideck obstacle-free sector (chevron) marking

Note: - 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.

15.13.13~~2~~.1 A helideck with adjacent obstacles that penetrate above the level of the helideck shall have an obstacle free sector marking.

15.13.13~~2~~.2 A helideck obstacle-free sector marking shall:

…

15.13.13~~2~~.3 The height of the chevron shall not be less than 30 cm.

15.13. 13~~2~~.4 The chevron shall be marked in a conspicuous color.

15.13.13~~2~~.5 The color of the chevron shall be black.

15.13.14~~3~~Helideck and shipboard heliport surface marking

Note: - 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.

15.13.~~14.~~13.1 A surface marking shall be provided to assist the pilot to identify the location of the helideck or shipboard heliport during an approach by day.

15.13.~~14.~~13.2 A surface marking shall be applied to the dynamic load bearing area bounded by the TLOF perimeter marking.

15.13.~~14.~~13.3 The helideck or shipboard heliport surface bounded by the TLOF perimeter marking shall be of dark green using a high friction coating.

~~**15.13.15 Helideck prohibited landing sector marking**~~

~~15.13.15.1 A helideck prohibited landing sector marking shall be provided where it is necessary to prevent the helicopter from landing within specified headings.~~

~~15.13.15.2 The prohibited landing sector marking shall be located on the touchdown/positioning marking to the edge of the TLOF within the relevant headings and shall be indicated by red and white hatched marking as shown in MOS Figure 15-26.~~

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

15.13.16~~4~~ Helicopter ground taxiway markings and markers

Note - 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.

Note: - ~~1~~2. The specifications for taxi-holding position markings in MOS Section 8.4.3, Runway Holding Position Marking are equally applicable to taxiways intended for ground taxiing of helicopters.

Note: - ~~2~~3. Ground taxi-routes are not required to be marked.

Note: - 4. Unless otherwise indicated it may be assumed that a helicopter taxiway is suitable for both ground taxiing and air taxiing of helicopters.

Note: - 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.

~~15.13.16.1 The centerline of a helicopter ground taxiway shall:~~

~~(a) be identified with a marking and the edges of a helicopter ground taxiway, if not self-evident, must be identified with markers or markings.~~

~~(b) be a continuous yellow line 15 cm in width.~~

15.13.14.1 The centerline of a helicopter taxiway shall be identified with a marking.

~~15.13.16.2 Helicopter ground taxiway markings shall:~~

~~(a) be along the centerline and, if required, along the edges of a helicopter ground taxiway.~~

~~(b) be a continuous double yellow line, each 15 cm in width, and spaced 15 cm apart (nearest edge to nearest edge).~~

~~*Note: - Signage may be required on an aerodrome where it is necessary to indicate that a helicopter ground taxiway is suitable only for the use of helicopters.*~~

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

~~15.13.16.3 Helicopter ground taxiway edge markers shall:~~

~~(a) be located at a distance of 0.5m to 3m beyond the edge of the helicopter ground taxiway.~~

~~(b) where provided, shall 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.~~

~~(c) be frangible.~~

~~(d) not exceed a plane originating at a height of 25 cm above the plane of the helicopter ground taxiway, at a distance of 0.5m from the edge of the helicopter ground taxiway and sloping upwards and outwards at a gradient of 5 per cent to a distance of 3m beyond the edge of the helicopter ground taxiway.~~

~~(e) be blue in color.~~

~~*Note: - 1. Guidance on suitable edge markers is given in the Heliport Manual (Doc 9261).*~~

~~*Note: - 2. If blue markers are used on an aerodrome, signage may be required to indicate that the helicopter ground taxiway is suitable only for helicopters.*~~

15.13.14.3 Helicopter taxiway markings shall be along the centerline and, if required, along the edges of a helicopter taxiway.

~~15.13.16.4 If the helicopter ground taxiway is to be used at night, the edge markers shall be internally illuminated or retroreflective.~~

15.13.14.4 Helicopter taxiway edge markers shall be located at a distance of 1 m to 3 m beyond the edge of the helicopter taxiway.

15.13.14.5 Helicopter taxiway edge markers, shall 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.

15.13.14.6 On a paved taxiway, a helicopter taxiway centerline marking shall be a continuous yellow line 15 cm in width.

15.13.14.7 On an unpaved taxiway that will not accommodate painted markings, a helicopter taxiway centerline shall 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.

15.13.14.8 Helicopter taxiway edge markings shall be a continuous double yellow line, each 15 cm in width, and spaced 15 cm apart (nearest edge to nearest edge).

15.13.14.9 A helicopter taxiway edge marker shall be frangible to the wheeled undercarriage of a helicopter.

15.13.14.10 A helicopter taxiway edge marker shall not exceed a plane originating at a height of 25 cm 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 percent to a distance of 3 m beyond the edge of the helicopter taxiway.

15.13.14.11 A helicopter taxiway edge marker shall be blue.

Note: - 1. Guidance on suitable edge markers is given in the Heliport Manual *(Doc 9261).*

Note: - 2. If blue markers are used on an aerodrome, signage may be required to indicate that the helicopter taxiway is suitable only for helicopters.

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

15.13.~~17~~15 Helicopter air ~~taxiway~~ taxi-route markings and markers

~~*Note: - Air taxi-routes are not required to be marked.*~~

Note: - 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.

~~15.13.17.1 The centerline of a helicopter air taxiway or, if not self-evident, the edges of a helicopter air taxiway shall be identified with markers or markings.~~

15.13.15.1 The centerline of a helicopter air taxi-route shall be identified with markers or markings.

~~15.13.17.2 A helicopter air taxiway centerline marking or flush in-ground centerline markers shall:~~

~~(a) be located along the centerline of the helicopter air taxiway.~~

~~(b) when on a paved surface, be marked with a continuous yellow line 15 cm in width.~~

~~(c) when on an unpaved surface that will not accommodate painted markings, 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.~~

15.13.15.2 A helicopter air taxi-route centerline marking or flush in-ground centerline marker shall be located along the centerline of the helicopter air taxiway.

~~15.13.17.3 Helicopter air taxiway edge markings shall:~~

~~(a) be located along the edges of a helicopter air taxiway.~~

~~(b) when on a paved surface, be marked with continuous double yellow lines each 15 cm in width, and spaced 15 cm apart (nearest edge to nearest edge).~~

~~*Note: - Where there is potential for a helicopter air taxiway to be confused with a helicopter ground taxiway, signage may be required to indicate the mode of taxi operations that are permitted.*~~

15.13.15.3 A helicopter air taxi-route centerline, when on a paved surface, shall be marked with a continuous yellow line 15 cm in width.

~~15.13.17.4 Helicopter air taxiway edge markers shall:~~

~~(a) be located at a distance of 1 m to 3 m beyond the edge of the helicopter air taxiway.~~

~~(b) not be located at a distance of less than 0.5 times the largest overall width of the helicopter for which designed from the centerline of the helicopter air taxiway.~~

~~(c) where provided, shall be spaced at intervals of not more than 30 m on each side of straight sections and not more than 15 m on each side of curves, with a minimum of four equally spaced markers per section.~~

~~(d) be frangible.~~

~~(e) not penetrate a plane originating at a height of 25 cm above the plane of the helicopter air taxiway, at a distance of 1 m from the edge of the helicopter air taxiway and sloping upwards and outwards at a gradient of 5% to a distance of 3m beyond the edge of the helicopter air taxiway.~~

~~(f) not penetrate a plane originating at a height of 25 cm above the plane of the helicopter air taxiway, at a distance of 0.5 times the largest overall width of the helicopter for which designed from the centerline of the helicopter air taxiway, and sloping upwards and outwards at a gradient of 5%.~~

~~(g) be of color(s) that contrast effectively against the operating background. The color red shall not be used for markers.~~

~~*Note: - Guidance for suitable edge markers is given in the Heliport Manual (Doc 9261).*~~

15.13.15.4 A helicopter air taxi-route centerline, when on an unpaved surface that will not accommodate painted markings, shall 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.

~~15.13.17.5 If the helicopter air taxiway is to be used at night, helicopter air taxiway edge markers shall be either internally illuminated or retroreflective.~~

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

15.13.~~18~~16 Helicopter stand markings

Note: - The objective of the 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.

~~15.13.18.1 A helicopter stand perimeter marking shall:~~

~~(a) be provided on a helicopter stand designed for turning. If a helicopter stand perimeter marking is not practicable, a central zone perimeter marking shall be provided instead if the perimeter of the central zone is not self-evident.~~

~~(b) be a yellow circle and have a line width of 15 cm.~~

15.13.16.1 A helicopter stand perimeter marking shall be provided.

~~15.13.18.2 A helicopter stand perimeter marking on a helicopter stand designed for turning or, a central zone perimeter marking, shall be concentric with the central zone of the stand.~~

15.13.16.2 A helicopter stand shall be provided with the appropriate TDPM. See Figure 15-26 in Section 15.13.10.

~~15.13.18.3 For a helicopter stand intended to be used for taxi-through and which does not allow the helicopter to turn:~~

~~(a) a stop line shall be provided;~~

~~(b) a stop line shall be located on the helicopter ground taxiway axis at right angles to the centerline; and~~

~~(c) a yellow stop line shall not be less than the width of the helicopter ground taxiway and have a line thickness of 50 cm.~~

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

Note: - 1. See Figures 15-5,15-6, 15-6A,15-6B, 15-6C, 15-6D of MOS 15.5 -15.8.

Note: - 2. Helicopter stand identification markings may be provided where there is a need to identify individual stands.

Note: - 3. Additional markings relating to stand size may be provided. See the Heliport Manual *(Doc 9261).*

~~15.13.18.4 Alignment lines and lead-in/lead-out lines shall be provided on a helicopter stand, wherever practicable.~~

~~*Note: - 1. See MOS Figure 15-27.*~~

~~*Note: - 2. Helicopter stand identification markings must be provided where there is a need to identify individual stands.*~~

~~*Note: - 3. Additional markings relating to stand size must be provided. See Heliport Manual (Doc 9261).*~~

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

~~15.13.18.5 A central zone perimeter marking shall be a yellow circle and have a line width of 15 cm, except when the TLOF is collocated with a helicopter stand, the characteristics of the TLOF perimeter markings shall apply.~~

15.13.16.5 Alignment lines and lead-in/lead-out lines shall be located as shown in Figures 15-27.

~~15.13.18.6 Alignment lines and lead-in/lead-out lines shall be continuous yellow lines and have a width of 15 cm.~~

~~(a) Curved portions of alignment lines and lead-in/lead-out lines shall have radii appropriate to the most demanding helicopter type the helicopter stand is intended to serve.~~

15.13.16.6 A helicopter stand perimeter marking shall consist of a continuous yellow line and have a line width of 15 cm.

~~15.13.18.7 Stand identification markings shall be marked in a contrasting color so as to be easily readable.~~

~~*Note: - 1. Where it is intended that helicopters proceed in one direction only, arrows indicating the direction to be followed must be added as part of the alignment lines.*~~

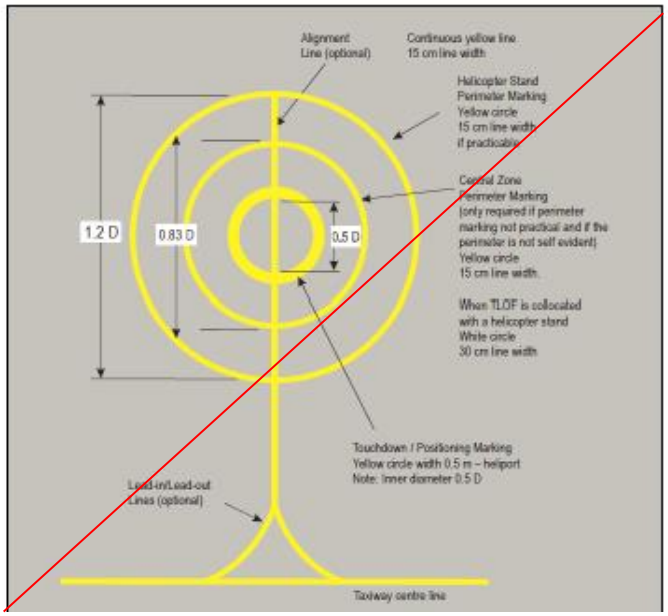
~~*Note: - 2. The characteristics of markings related to the stand size, and alignment and lead-in/lead-out lines are illustrated in MOS Figure 15-27.*~~

15.13.16.7 The TDPM shall have the characteristics described in MOS Section 15.13.10 above.

15.13.16.8 Alignment lines and lead-in/lead-out lines shall be continuous yellow lines and have a width of 15 cm.

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

15.13.16.10 Stand identification markings shall be marked in a contrasting colour so as to be easily readable.



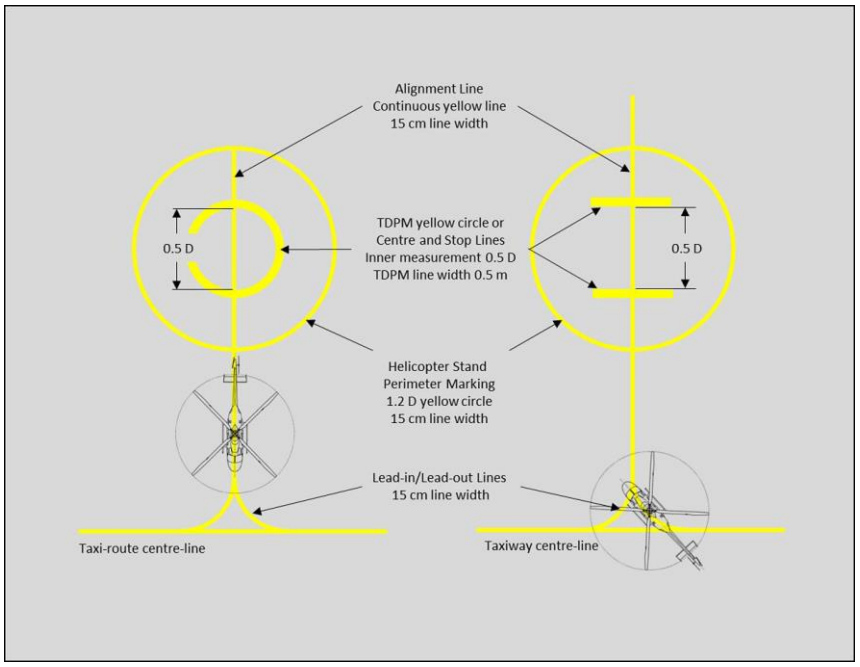


Figure 15-27 Helicopter stand markings

Note: - 1. Where it is intended that helicopters proceed in one direction only, arrows indicating the direction to be followed may be added as part of the alignment lines.

Note: - 2. The characteristics of markings related to the stand size and alignment and lead-in/lead-out lines are illustrated in Figure 15-27 – examples of stands and their markings can be seen in Figures-15-5, 15-6, 15-6A, 15-6B,15-6C of MOS 15.5 -15.8.

15.13.~~19~~17 Flight path alignment guidance marking

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

15.13.1~~9~~7.1 Flight path alignment guidance marking(s) ~~shall~~:

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

Note: - The flight path alignment guidance marking can be combined with a flight path alignment guidance lighting system described in MOS Section 15.14.~~4~~3.

(b) shall be located in a straight line along the direction of approach and/or departure path on one or more of the TLOF, FATO, safety area or any suitable surface in the immediate vicinity of the FATO or safety area.

(c) shall consist of one or more arrows marked on the TLOF, FATO and/or safety area surface as shown in MOS Figure 15-28. The stroke of the arrow(s) shall be 50 cm in width and at least 3 m in length. When combined with a flight path alignment guidance lighting system it shall take the form shown in MOS Figure 15-28 which includes scheme for marking 'heads of the arrows' which are constant regardless of stroke length.

Note: - 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.

15.13.1~~9~~7.2 The markings should be in a color which provides good contrast against the background color of the surface on which they are marked, preferably white.

…

Section 15.14 Visual aids – lights

Note: - 1. See MOS Section ~~9.1.3~~ 9.18.4.1 and MOS Section 9.1.12, concerning specifications on screening of non-aeronautical ground lights, and design of elevated and inset lights.

…

Note: - 4. ~~Specifications~~ Systems addressed in MOS Sections 15.14.3, 15.14.5, 15.14.6 and 15.14.7 are designed to provide effective lighting ~~systems~~ 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 (Doc 9157), Part 4 - Visual Aids.

Note: - 5. The specifications for marking and lighting of obstacles included in MOS 8.10 and 9.3, are equally applicable to heliports and winching areas.

Note: - 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 system with all heliport lighting through an assessment by the helicopter operator prior to use.

…

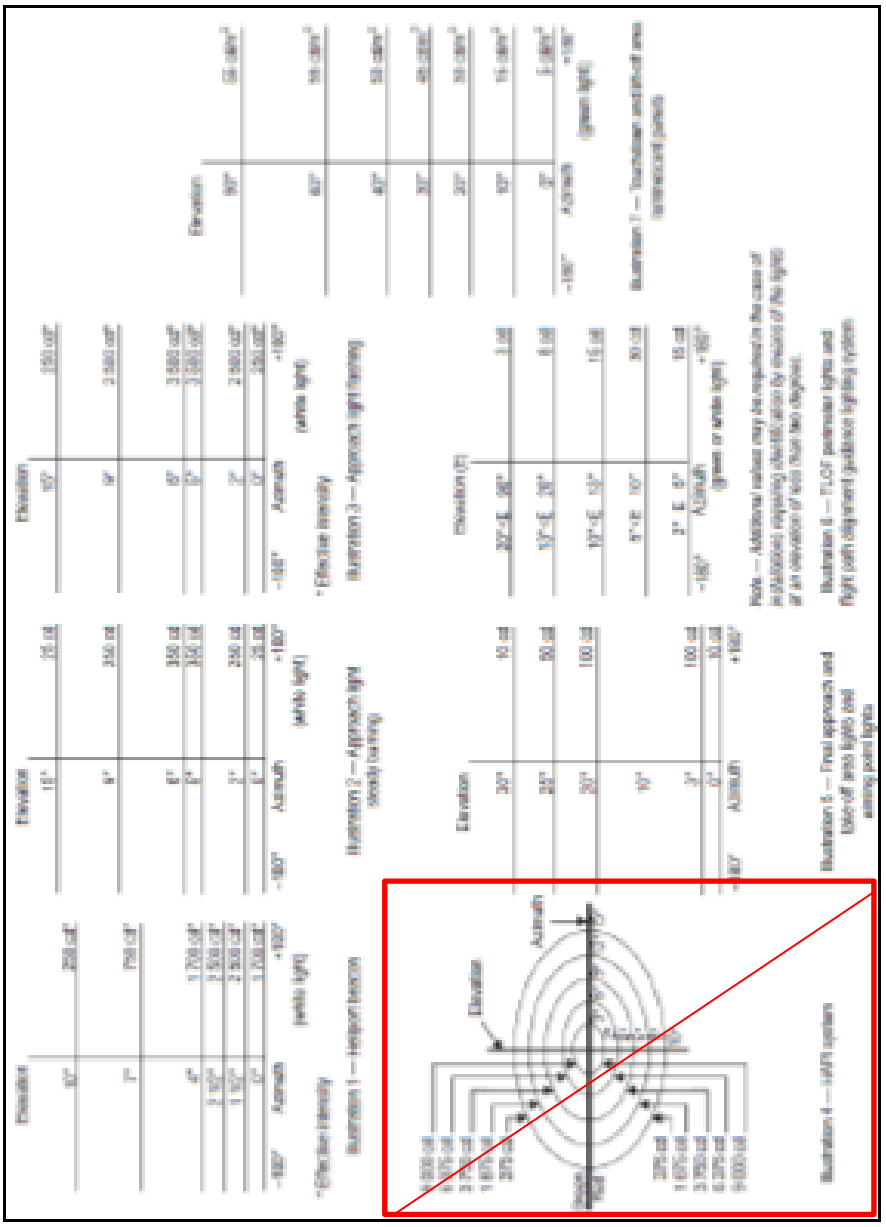


Figure 15-30 Isocandela Diagrams

~~15.14.1.1 A heliport beacon shall:~~

~~(a) be provided at a heliport, where it is has been determined that:~~

~~(i) long-range visual guidance is considered necessary and is not provided by other visual means; or~~

~~(ii) identification of the heliport is difficult due to surrounding lights.~~

~~(b) 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.~~

~~*Note: - Where a heliport beacon is likely to dazzle pilots at short range it may be switched off during the final stages of the approach and landing.*~~

~~(c) emit repeated series of equi-spaced short duration white flashes in the format in MOS Figure 15-26.~~

15.14.1.1 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.

~~15.14.1.2 The light from the beacon shall show at all angles of azimuth.~~

15.14.1.2 The heliport beacon shall 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.

Note: - Where a heliport beacon is likely to dazzle pilots at short range, it may be switched off during the final stages of the approach and landing.

~~15.14.1.3 The effective light intensity distribution of each flash shall be as shown in MOS Figure 15-27, Illustration 1 unless otherwise approved by CAAP.~~

~~*Note: - Where brilliancy control is desired, settings of 10% and 3% 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.*~~

15.14.1.3 The heliport beacon shall emit repeated series of equispaced short duration white flashes in the format in Figure 15-29.

15.14.1.4 The light from the beacon shall show at all angles of azimuth.

15.14.1.5 The effective light intensity distribution of each flash should be as shown in Figure 15-30, Illustration 1 unless otherwise approved by CAAP.

Note: - Where brilliancy control is desired, settings of 10 percent and 3 percent 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.

15.14.2 Approach lighting system

~~15.14.2.1 An approach lighting system shall:~~

~~(a) be provided where it has been determined necessary and practicable to indicate a preferred approach direction at a heliport.~~

~~(b) be located in a straight line along the preferred direction of approach.~~

~~(c) 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 final approach and take-off area as shown in MOS Figure 15-31. The lights forming the crossbar shall be as nearly as practicable~~

~~in a horizontal straight line at right angles to, and bisected by, the line of the centerline lights and spaced at 4.5 m intervals.~~

~~Where there is a need to make the final approach course more conspicuous additional lights spaced uniformly at 30 in intervals shall be added beyond the crossbar. The lights beyond the crossbar may be steady or sequenced flashing, depending upon the environment.~~

~~*Note: - Sequenced flashing lights may be useful where identification of the approach lighting system is difficult due to surrounding lights.*~~

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

~~15.14.2.2 The steady lights shall be omnidirectional white lights.~~

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

~~15.14.2.3 Sequenced flashing lights shall be omnidirectional white lights.~~

15.14.2.3 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 15-31. 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 center 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.

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

~~15.14.2.4 The flashing lights shall have a flash frequency of one per second and their light distribution shall be as shown in MOS Figure 15-30, Illustration 3. The flash sequence shall commence from the outermost light and progress towards the crossbar.~~

15.14.2.4 The steady lights shall be omnidirectional white lights.

~~15.14.2.5 A suitable brilliancy control shall be incorporated to allow for adjustment of light intensity to meet the prevailing conditions.~~

~~*Note: - The following intensity settings have been found suitable:*~~

~~*(a) steady lights - 100%, 30% and 10%; and*~~

~~*(b) flashing lights- 100%, 10% and 3%.*~~

15.14.2.5 Sequenced flashing lights shall be omnidirectional white lights.

15.14.2.6 The flashing lights should have a flash frequency of one per second and their light distribution should be as shown in Figure 15-30, Illustration 3. The flash sequence should commence from the outermost light and progress towards the crossbar.

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

Note: - The following intensity settings have been found suitable: a) steady lights — 100 percent, 30 percent and 10 percent; and b) flashing lights — 100 percent, 10 percent and 3 percent.

15.14.3 Flight path alignment guidance lighting system

~~15.14.3.1 Flight path alignment guidance lighting system(s) shall:~~

~~(a) be provided at a heliport where it is desirable and practicable to indicate available approach and/or departure path direction(s).~~

~~*Note: - The flight path alignment guidance lighting can be combined with a flight path alignment guidance marking(s) described in 15.14.3. sub-provision flight path alignment guidance marking(s)*~~

~~(b) be in a straight line along the direction(s) of approach and/or departure path on one or more of the TLOF, FATO, safety area or any suitable surface in the immediate vicinity of the FATO, TLOF or safety area.~~

~~(c) consist of a row of three or more lights spaced uniformly a total minimum distance of 6 m. Intervals between lights shall not be less than 1.5 m and shall not exceed 3 m. Where space permits there shall be 5 lights. (See MOS Figure 15-28).~~

15.14.3.1 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).

Note: - The flight path alignment guidance lighting can be combined with the flight path alignment guidance marking described in MOS Section 15.13.17.

~~15.14.3.2 If combined with a flight path alignment guidance marking, as far as is practicable, the lights shall be located inside the 'arrow' markings.~~

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

~~15.14.3.3 The lights shall be steady omnidirectional inset white lights.~~

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

~~15.14.3.4 The distribution of the lights shall be as indicated in Figure MOS 15-30. Illustration 6.~~

15.14.3.4 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 15-28.)

Note: - 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 15-28)

~~15.14.3.5 A suitable control shall 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.~~

15.14.3.5 The lights shall be steady omnidirectional inset white lights.

15.14.3.6 The distribution of the lights should be as indicated in Figure 15-30, Illustration 5.

15.14.3.7 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.

15.14.4 Visual alignment guidance system

Note: - 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 *(Doc 9261).*

15.14.4.1 A visual alignment guidance system ~~shall:~~ should (~~a~~) be provided~~,~~ to serve the approach to a heliport~~,~~ where ~~CAAP has determined that~~ one or more of the following conditions exist especially at night:

~~(i)~~(a) obstacle clearance, noise abatement or traffic control procedures require a particular direction to be flown;

~~(ii)~~ (b) the environment of the heliport provides few visual surface cues; and

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

~~(b) be located such that a helicopter is guided along the prescribed track towards the final approach and take-off area.~~

~~(c) be located at the downwind edge of the FATO and aligned along the preferred approach direction.~~

~~15.14.4.2 The light units shall be frangible and mounted as low as possible.~~

~~15.14.4.3 Where the lights of the system need to be seen as discrete sources, light units shall be located such that at the extremes of system coverage the angle subtended between units as seen by the pilot shall not be less than 3 minutes of arc.~~

~~15.14.4.4 The angles subtended between light units of the system and other units of comparable or greater intensities shall also be not less than 3 minutes of arc.~~

~~*Note: - Requirements of MOS 15.14.4.3 and 15.14.4.4 can be met for lights on a line normal to the line of sight if the light units are separated by 1 meter for every kilometer of viewing range.*~~

~~15.14.4.5 The signal format of the alignment guidance system shall:~~

~~(a) include a minimum of three discrete signal sectors providing "offset to the right", "on track" and "offset to the left" signals;~~

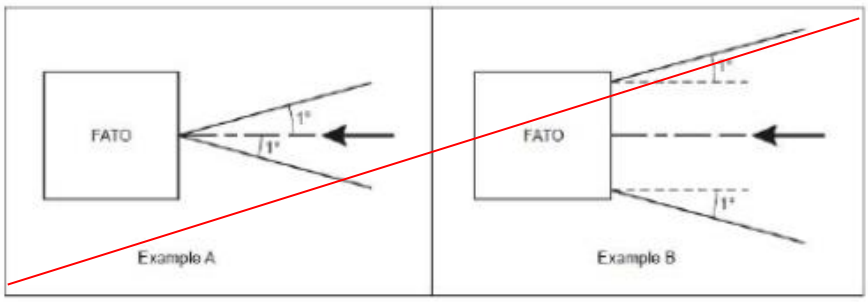
~~(b) be shown in MOS Figure 15-32; the divergence of the "on track" sector of the system;~~

~~(c) be such that there is no possibility of confusion between the system and any associated visual approach slope indicator or other visual aids;~~

~~(d) avoid the use of the same coding as any associated visual approach slope indicator;~~

~~(e) be such that the system is unique and conspicuous in all operational environments; and~~

~~(f) not significantly increase the pilot workload.~~



~~Figure 15-32 Divergence of the 'on-track' sector~~

~~15.14.4.6 In the event of the failure of any component affecting the signal format, the system shall be automatically switched off.~~

~~15.14.4.7 The light units shall be so designed that deposits of condensation, ice, dirt, etc. on optically transmitting or reflecting surfaces will interfere to the least possible extent with the light signal and will not cause spurious or false signals to be generated.~~

~~15.14.4.8 The useable coverage of the visual alignment guidance system shall be equal to or better than that of the visual approach slope indicator system, with which it is associated.~~

~~15.14.4.9 A suitable intensity control shall be provided so as to allow adjustment to meet the prevailing conditions and to avoid dazzling the pilot during approach and landing.~~

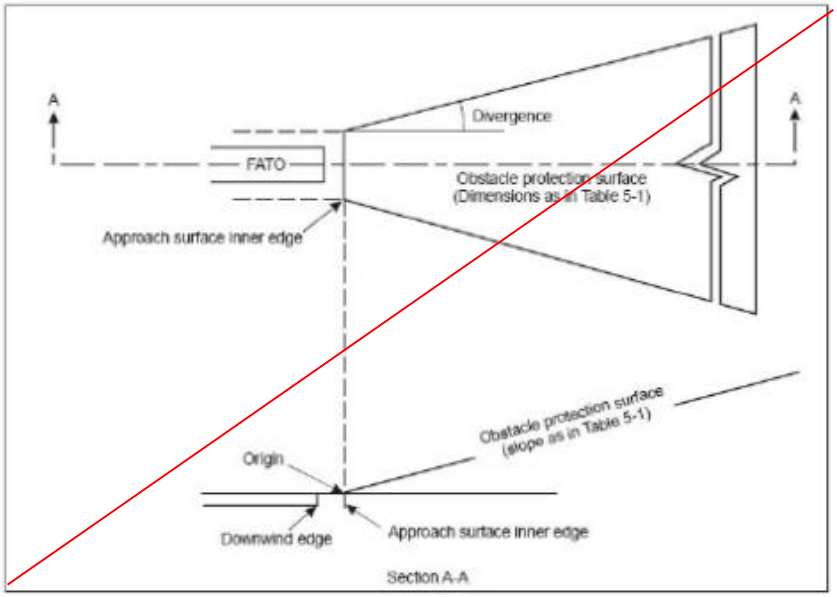
~~15.14.4.10 A visual alignment guidance system shall be capable of adjustment in azimuth to within ± 5 minutes of arc of the desired approach path.~~

~~15.14.4.11 The angle of azimuth guidance system shall be such that during an approach the pilot of a helicopter at the boundary of the "on track" signal will clear all objects in the approach area by a safe margin.~~

~~15.14.4.12 The characteristics of the obstacle protection surface specified in MOS Table 15-4 and in MOS Figure 15-33 shall equally apply to the system.~~

~~Table 15-4 Dimensions and slopes of the obstacle protection surface~~

SURFACE AND DIMENSIONS	FATO	
Length of inner edge	Width of safety area	
Distance from end of FATO	3 m minimum	
Divergence	10%	
Total length	2 500 m	
Slope	PAPI	A[a] – 0.57°
	HAPI	A[b] – 0.65°
	APAPI	A[a] – 0.9°
a. As indicated in MOS Figure 9.8-3. b. The angle of the upper boundary of the "below slope" signal.		



~~Figure 15-33 Obstacle protection surface for visual approach slope indicator systems~~

15.14.5 Visual approach slope indicator

Note: - 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 *(Doc 9261).*

15.14.5.1 A visual approach slope indicator ~~shall:~~ should ~~(a)~~ 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 ~~CAAP has determined~~ one or more of the following conditions exist especially at night:

(i) obstacle clearance, noise abatement or traffic control procedures require a particular slope to be flown;

(ii) the environment of the heliport provides few visual surface cues; and

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

~~(b) consists of the following:~~

~~(i) PAPI and APAPI systems conforming to the specifications contained in the CAAP Manual of Standards for Aerodromes Chapter 9 except that the angular size of the on-slope sector of the systems shall be increased to 45 minutes; or~~

~~(ii) helicopter approach path indicator (HAPI) system conforming to the specifications in MOS 15.14.6.~~

~~(c) be located such that a helicopter is guided to the desired position within the final approach and take-off area and so as to avoid dazzling the pilot during final approach and landing.~~

~~(d) be located adjacent to the nominal aiming point and aligned in azimuth with the preferred approach direction.~~

~~15.14.5.2 The light unit(s) shall be frangible and mounted as low as possible.~~

~~15.14.5.3 HAPI signal format~~

~~(a) The signal format of the HAPI shall include four discrete signal sectors, providing an "above slope", an "on slope", a "slightly below" and a "below slope" signal.~~

~~(b) The signal format of the HAPI shall be as shown in, MOS Figure 15- 34 Illustrations A and B.~~

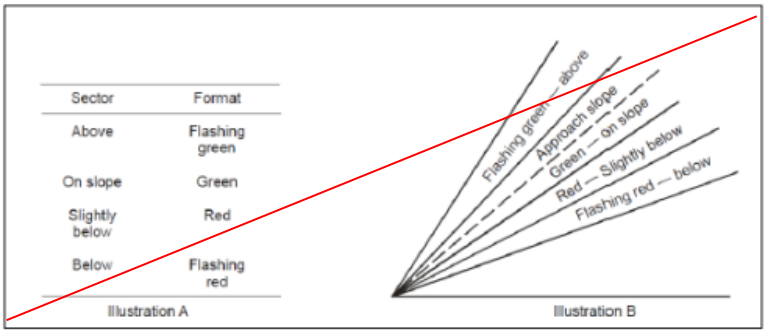
~~*Note: - Care is required in the design of the unit to minimize spurious signals between the signal sectors and at the azimuth coverage limits.*~~

~~(c) The signal repetition rate of the flashing sector of the HAPI shall be at least 2 Hz.~~

~~(d) The on-to-off ratio of pulsing signals of the HAPI shall be 1 to 1 and the modulation depth shall be at least 80%.~~

~~(e) The angular size of the "on-slope" sector of the HAPI shall be 45 minutes.~~

~~(f) The angular size of the "slightly below" sector of the HAPI shall be 15 minutes.~~



~~Figure 15-34 HAPI signal format~~

~~15.14.5.4 The light intensity distribution of the HAPI in red and green colors shall be as shown in MOS Figure 15-30, Illustration 4.~~

~~*Note: - A larger azimuth coverage can be obtained by installing the HAPI system on a turntable.*~~

~~15.14.5.5 Color transition of the HAPI in the vertical plane shall be such as to appear to an observer at a distance of not less than 300 m to occur within a vertical angle of not more than three minutes.~~

~~15.14.5.6 The transmission factor of a red or green filter shall be not less than 15% at the maximum intensity setting.~~

~~15.14.5.7 At full intensity the red light of the HAPI shall have a Y-coordinate not exceeding 0.320 and the green light shall be within the boundaries specified in MOS 9.2.2.3.~~

~~15.14.5.8 A suitable intensity control shall be provided so as to allow adjustment to meet the prevailing conditions and to avoid dazzling the pilot during approach and landing.~~

~~15.14.5.9 A HAPI system shall be capable of adjustment in elevation at any desired angle between 1 degree and 12 degrees above the horizontal with an accuracy of ±5 minutes of arc.~~

~~15.14.5.10 The angle of elevation setting of HAPI shall be such that during an approach, the pilot of a helicopter observing the upper boundary of the "below slope" signal will clear all objects in the approach area by a safe margin.~~

~~15.14.5.11 The system shall be so designed that:~~

~~(a) in the event the vertical misalignment of a unit exceeds ± 0.5' (± 30 minutes), the system will switch off automatically; and~~

~~(b) if the flashing mechanism fails, no light will be emitted in the failed flashing sector(s).~~

~~15.14.5.12 The light unit of the HAPI shall he so designed that deposits of condensation, dirt, etc., on optically transmitting or reflecting surfaces will interfere to the least possible extent with the light signal and will not cause spurious or false signals to be generated.~~

~~15.14.5.13 A HAPI system intended for installation on a floating helideck shall afford a stabilization of the beam to an accuracy of ±1/4 degree within ±3-degree pitch and roll movement of the heliport, whenever practicable.~~

~~15.14.5.14 Obstacle protection surface~~

~~*Note: - The following specifications apply to PAPI, APAPI and HAPI.*~~

~~(a) An obstacle protection surface shall be established when it is intended to provide a visual approach slope indicator system.~~

~~(b) The characteristics of the obstacle protection surface. i.e. origin, divergence, length anti slope shall correspond to those specified in the relevant column of MOS Table 15-4 and in MOS Figure 15-33.~~

~~(c) New objects or extensions of existing objects shall not be permitted above an obstacle protection surface except when. in the opinion of the appropriate authority, the new object or extension will be shielded by an existing immovable object.~~

~~*Note: - Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, Part 6, (Doc 9137).*~~

~~(d) Existing objects above an obstacle protection surface shall be removed except when in the opinion of the appropriate authority, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety of operations of helicopters.~~

~~(e) Where an aeronautical study indicates that an existing object extending above an obstacle protection surface can adversely affect the safety of operations of helicopters one or more of the following measures shall be taken to:~~

~~(i) suitably raise the approach slope of the system;~~

~~(ii) reduce the azimuth spread of the system so that the object is outside the confines of the beam;~~

~~(iii) displace the axis of the system and its associated obstacle protection surface by no more than 5°;~~

~~(iv) suitably displace the final approach and take-off area; and~~

~~(v) install a visual alignment guidance system specified in 15.14.4.~~

15.14.6 Final approach and take-off area lighting systems for onshore surface – level heliports

Note: - The objective of a final approach and take-off area 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.

15.14.6.1 Where a ~~final approach and take-off area~~ FATO with a solid surface is established at a surface level heliport ~~on ground~~ intended for use at night, ~~final approach and take-off area~~ FATO lights shall be provided except that they may be omitted where the ~~final approach and take-off area~~ FATO and the ~~touchdown and lift-off area~~ TLOF are nearly coincidental or the extent of the ~~final approach and take-off area~~ FATO is self-evident.

15.14.6.2 ~~Final approach and take-off area~~ FATO lights shall:

…

15.14.6.3 The light distribution of final approach and take-off area lights shall be as shown in MOS Figure 15-30, Illustration ~~5~~4.

15.14.6.4 The lights shall 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 level ~~without prior approval by CAAP of any alternative installation.~~

15.14.7 Aiming point lights

Note: - 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.

…

15.14.7.4 The light distribution of aiming point lights shall be as shown in MOS Figure 15-30, Illustration 4 ~~5~~.

15.14.8 Touchdown and lift-off area lighting system

Note: - The objective of a touchdown and lift-off area 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.

15.14.8.1 A ~~touchdown and lift-off area~~ TLOF lighting system shall be provided at a heliport intended for use at night.

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

15.14.8.2 ~~The touchdown and lift-off area lighting system f~~For a surface level heliport, lighting for the TLOF in a FATOshall consist of one or more of the following:

(a) perimeter lights.; ~~or~~

(b) floodlighting; ~~or~~

(c) arrays of segmented point source lighting (ASPSL) or luminescent panel (LP) lighting to identify the touchdown and lift-off area when (a) and (b) are not practicable and final approach and take-off area lights are available.

15.14.8.3 ~~The touchdown and lift-off area lighting system~~ For ~~all~~ an elevated heliport shipboard heliportor helideck, lighting of the TLOF in a FATO shall consist of:

(a) perimeter lights; and

(b) ASPSL, and/or LPs to identify the ~~touchdown marking~~ TDPM ~~where it is provided~~ and/or floodlighting to illuminate the ~~touchdown and lift-off area~~ TLOF.

Note: - At elevated heliports, shipboard heliports and helidecks, surface texture cues within the touchdown and lift-off (TLOF) area are essential for helicopter positioning during the final approach and landing. Such cues can be provided using various forms of lighting (ASPSL, 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 t~~~~ouchdown~~* TDPM *and heliport identification markings.*

15.14.8.4 ~~Touchdown and lift-off area~~ TLOF ASPSL and/or LPs to identify the ~~touchdown marking~~ TDPM and/or floodlighting shall be provided at a surface-level heliport intended for use at night when enhanced surface texture cues are required.

15.14.8.5 Touchdown and lift-off area perimeter lights shall:

(a) be placed along the edge of the area designated for use as the ~~touchdown and lift-off area~~ TLOF or within a distance of 1.5 m from the edge. Where the ~~touchdown and lift-off area~~ TLOF is a circle the lights shall be:

(i) located on straight lines in a pattern which will provide information to pilots on drift displacement; and

(ii) where (a)(i) is not practicable, evenly spaced around the perimeter of the ~~touchdown and lift-off area~~ TLOF at the appropriate interval except that over a sector of 45° the lights shall be spaced at half spacing.

…

(d) be installed ~~at~~ on a ~~floating~~ moving helideck or shipboard heliport, such that the pattern cannot be seen by the pilot from below the elevation of the ~~touchdown and lift-off area~~ TLOF when the helideck or shipboard heliport is level.

(e) be fixed omnidirectional lights showing ~~yellow~~ green.

…

15.14.8.7 When LPs are used on an elevated heliport or helideck to enhance surface texture cues, the panels shall not be placed adjacent to the perimeter lights. They shall be placed around a touchdown marking ~~where it is provided~~ or coincident with heliport identification marking.

15.14.8.8 ~~Touchdown and lift-off area~~ TLOF floodlights shall be located so as to avoid glare to pilots in flight or to personnel working on the area. The arrangement and aiming of floodlights shall be such that shadows are kept to a minimum.

Note: - ASPSL and LPs used to designate the ~~touchdown~~ TDPM and/or heliport identification marking have been shown to provide enhanced surface texture cues when compared to low-level floodlight. Due to the risk of misalignment, if floodlights are used, there is a need for them to be checked periodically to ensure they remain within the specifications contained within MOS 15.14.~~12~~.8.

…

15.14.8.12 For a surface level or elevated heliport, the TLOF ~~P~~perimeter lights located in a FATO shall not exceed a height of 25 cm and shall be inset when a light extending above the surface could endanger helicopter operations.

15.14.8.13 For a helideck or shipboard heliport, the TLOF perimeter lights shall not exceed a height of 5 cm, or for a FATO/TLOF, 15 cm.

15.14.8.1~~3~~4 When located within the safety area of a surface level or elevated heliport ~~or within the obstacle free sector of a helideck,~~ the ~~touchdown and lift-off area~~ TLOF floodlights shall not exceed a height of 25 cm.

15.14.8.15 For a helideck or shipboard heliport, the TLOF floodlights shall not exceed a height of 5 cm, or for a FATO/TLOF, 15 cm.

15.14.8.1~~4~~6 The LPs shall not extend above the surface by more than 2.5 cm.

15.14.8.1~~5~~7 The light distribution of the perimeter lights shall be as shown in MOS Figure 15-30, Illustration ~~6~~5.

15.14.8.1~~6~~8 The light distribution of the LPs shall be as shown in MOS Figure 15-30, Illustration ~~7~~6.

15.14.8.1~~7~~9 The spectral distribution of ~~touchdown and lift-off area~~ TLOF floodlights shall be such that the surface and obstacle marking can be correctly identified.

15.14.8.~~18~~20 The average horizontal illuminance of the floodlighting shall be at least 10 lux, with a uniformity ratio (average to minimum) of not more than 8:1 measured on the surface of the ~~touchdown and lift-off area~~ TLOF.

15.14.8.~~19~~21 Lighting used to identify the ~~touchdown marking~~ TDPC ~~shall~~ should comprise a segmented circle of omnidirectional ASPSL strips showing yellow. The segments shall consist of ASPSL strips, and the total length of the ASPSL strips being not less than 50% of the circumference of the circle.

15.14.8.2~~0~~2 If utilized, the heliport identification marking lighting shall be omnidirectional showing green.

15.14.9 Helicopter stand floodlighting

Note: - 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.

15.14.9.1 Floodlighting shall be provided on a helicopter stand intended to be used at night.

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

15.14.9.2 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.

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

15.14.9.4 Horizontal and vertical illuminance shall 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.

15.14.9~~10~~Winching area floodlighting

Note: - The objective of winching area floodlighting is to provide illumination of the surface, obstacles and 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.

15.14.9~~1~~0.1 Winching area floodlighting shall be provided at a winching area intended for use at night.

15.14.9~~1~~0.2 Winching area floodlights shall be located so as to avoid `glare to pilots in flight or to personnel working on the area. The arrangement and aiming of floodlights shall be such that shadows are kept to a minimum.

15.14.9~~1~~0.3 The spectral distribution of winching area floodlights shall be such that the surface and obstacle markings can be correctly identified.

15.14.9~~1~~0.4 The average horizontal illuminance ~~should~~ shall be at least 10 lux, measured on the surface of the winching area.

15.14.10~~1~~Taxiway lights

Note: - The specifications for taxiway centerline lights and taxiway edge lights in MOS Section 9.1.12.1 and MOS Section 9.1.12.~~2~~4 respectively, are equally applicable to taxiways intended for ground taxiing of helicopters.

15.14.11~~2~~ Visual aids for denoting obstacles outside and below the obstacle limitation surfaces

~~*Note: - The specifications for marking and lighting of obstacles included in MOS 8.10, are equally applicable to heliports and winching areas.*~~

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

15.14.12.1 Where an aeronautical study indicates that obstacles in areas outside and below the boundaries of the OLS, 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.

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

15.14.12~~2~~3 Floodlighting of obstacles

15.14.12~~2~~3.1 At a heliport intended for use at night obstacles shall be floodlighted if it is not possible to display obstacle lights on them.

15.14.1~~2~~3.2 Obstacle floodlights shall be arranged so as to illuminate the entire obstacle and as far as practicable in a manner so as not to dazzle the helicopter pilots.

15.14.12~~2~~3.3 Obstacle floodlighting shall be such as to produce a luminance of at least 10 cd/m2.

Section 15.15 Rescue and firefighting

~~*Note: - These specifications apply to surface-level heliports and elevated heliports only. The specifications complement those in MOS 14, concerning rescue and firefighting requirements at aerodromes.*~~

~~*The principal objective of a rescue and firefighting service is to save lives. For this reason, the provision of means of dealing with a helicopter accident or incident occurring at or in the immediate vicinity of a heliport assumes primary importance because it is within this area that there are the greatest opportunities for saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following a helicopter accident or incident or at any time during rescue operations.*~~

~~*The most important factors bearing on effective rescue in a survivable helicopter accident are the training received, the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and firefighting purposes can be put into use.*~~

~~*For an elevated heliport, requirements to protect any building or structure on which the heliport is located are not taken into account.*~~

~~*Rescue and firefighting requirements for helidecks may be found in the Heliport Manual (Doc 9261).*~~

~~15.15.1.1 The principal objective of a rescue and firefighting service is to save lives. For this reason, the provision of means of dealing with a helicopter accident or incident occurring at or~~

~~in the immediate vicinity of a heliport assumes primary importance because it is within this area that there are the greatest opportunities of saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following a helicopter accident or incident or at any time during rescue operations.~~

~~15.15.1.2 The most important factors bearing on effective rescue in a survivable helicopter accident are the training received, the of effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and firefighting purposes can be put into use.~~

~~15.15.1.3 For an elevated heliport, requirements to protect any building or structure on which the heliport is located are not taken into account.~~

~~15.15.1.4 The requirement for provision of a rescue and firefighting service t a heliport shall be as prescribed by CAAP after due consideration of all relevant safety considerations. When a rescue and firefighting service is required, it shall comply at least with the specifications of this section.~~

~~15.15.1.5 The level of protection to be provided for rescue and firefighting shall be based on the over-all length of the longest helicopter normally using the heliport and in accordance with the heliport firefighting category determined from Table 15-5 except at an unattended heliport with a low movement rate.~~

~~*Note: - Guidance to assist the appropriate authority in providing rescue and firefighting equipment and services at surface-level and elevated heliports is given in the Heliport Manual (Doc 9261).*~~

Category	Helicopter over-all length [a]
H1	up to but not including 15 m
H2	from 15 m up to but not including 24 m
H3	from 24 m up to but not including 35 m
[a] – Helicopter length including the tail boom and the rotors.	

~~Table 15-5 Heliport firefighting category~~

~~15.15.1.6 During anticipated periods of operations by smaller helicopters, the heliport firefighting category must be reduced to that of the highest category of helicopter planned to use the heliport during that time.~~

~~15.15.1.7 The principal extinguishing agent shall be performance level B.~~

~~*Note: - Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level B rating is given in the ICAO Document 9137, Airport Services Manual, Part 1.*~~

~~15.15.1.8 The amounts of water for foam production and the complementary agents to be provided shall be in accordance with the heliport firefighting category determined under 15.15.1.5 and Table 15-6 or Table 15-7 as appropriate.~~

~~*Note: - The amounts of water specified for elevated heliports do not have to be stored on or adjacent to the heliport if there is a suitable adjacent pressurized water main system capable of sustaining the required discharge rate.*~~

Category	Foam meeting performance level B		Complimentary agents		
	Water (L)	Discharge rate foam solution (L/min)	Dry chemical powders (kg) or	Halons (kg) or	CO_2 (kg)
(1)	(2)	(3)	(4)	(5)	(6)
H1	500	250	23	23	45
H2	1 000	500	45	45	45
H3	1 600	800	90	90	180

~~Table 15-6 Minimum usable amounts of extinguishing agents for surface level heliports~~

Category	Foam meeting performance level B		Complimentary agents		
	Water (L)	Discharge rate foam solution (L/min)	Dry chemical powders (kg) or	Halons (kg) or	CO_2 (kg)
(1)	(2)	(3)	(4)	(5)	(6)
H1	2 500	250	45	45	90
H2	5 000	500	45	45	90
H3	8 000	800	45	45	90

~~Table 15-7 Minimum usable amounts of extinguishing agents for elevated Heliports~~

~~15.15.1.9 At a surface level heliport it is permissible to replace all or part of the amount of water for foam production by complementary agents.~~

~~15.15.1.10 The discharge rate of the foam solution shall not be less than the rates shown in MOS Table 15-6 or Table 15-7 as appropriate. The discharge rate of complementary agents shall be selected for optimum effectiveness of the agent used.~~

~~15.15.1.11 At an elevated heliport, at least one hose spray line capable of delivering foam in a jet spray pattern at 250 L/min shall be provided. Additionally at elevated heliports in categories 2 and 3, at least two monitors shall be provided each having a capability of achieving the required discharge rate and positioned at different locations around the heliports so as to ensure the application of foam to any part of the heliport under any weather condition and to minimize the possibility of both monitors being impaired by a helicopter accident.~~

~~15.15.1.12 At an elevated heliport rescue equipment shall be stored adjacent to the heliport.~~

~~*Note: - Guidance on the rescue equipment to be provided at a heliport is given in the ICAO Heliport Manual.*~~

~~15.15.1.13 At a surface level heliport, the operational objective of the rescue and firefighting service shall be to achieve response times not exceeding two minutes in optimum conditions of visibility and surface conditions.~~

~~*Note: - Response time is considered to be the time between the initial call to the rescue and firefighting service 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% of the discharge rate specified in MOS Table 15-6.*~~

~~15.15.1.14 At an elevated heliport, the rescue and firefighting service shall be immediately available on or in the vicinity of the heliport while helicopter movements are taking place~~

General — Introductory Notes

The content of this section has been extensively revised and updated for Amendment 9. With new concepts and terms now to consider, it is important that MOS 15.15 be read in conjunction with the appropriate detailed guidance on rescue and firefighting options given in the Heliport Manual *(Doc 9261).*

Provisions described in this section 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.

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).

Where a fixed monitor system (FMS) is installed, trained monitor operators, where provided, be 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 are installed in the center of the TLOF).

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.

It may therefore be assumed that this chapter does not include RFF arrangements for purpose-built or non-purpose-built shipboard heliports or for winching areas.

15.15.1 Applicability

15.15.1.1 The following specifications shall apply to new builds or replacement of existing systems or part thereof from 1 January 2023:

MOS Section 15.15.2.1, MOS Section 15.15.3.3, MOS Section 15.15.3.4, MOS Section 15.15.3.6, MOS Section 15.15.3.7, MOS Section 15.15.3.9, MOS Section 15.15.3.10, MOS Section 15.15.3.12, MOS Section 15.15.3.13 and MOS Section 15.15.4.2

Note: - 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 this section; see MOS Chapter 14.

15.15.1.2 Rescue and firefighting equipment and services shall be provided at helidecks and at elevated heliports located above occupied structures.

15.15.1.3 Rescue and firefighting equipment and services shall be provided at surface level heliports and elevated heliports located above unoccupied structures.

15.15.2 Level of protection provided

15.15.2.1 For the application of primary media the discharge rate (in liters/minute) applied over the assumed practical critical area (in m^2) shall 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. (Applicable on 1 January 2023).

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

Note: - This section is not applicable to helidecks regardless of how primary media is being delivered.

15.15.2.2 The practical critical area shall 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 6-1 below.

Table 15-5 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

Note: - 1. 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 (W_1) of 6 m.

Note: - 2. The practical critical area may be considered on a helicopter type-specific basis by using the formula in MOS Section 15.15.2.2. Guidance on practical critical area in relation to the heliport firefighting category is given in the Heliport Manual *(Doc 9261) where a discretionary 10 percent tolerance on fuselage dimension "upper limits" is applied.*

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

15.15.2.3 For heliports, except helidecks, the practical critical area shall 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.

15.15.2.4 For helidecks the practical critical area shall be based on the largest circle capable of being accommodated within the TLOF perimeter.

Note: - MOS 15.15.2.4 is applied for the practical critical area calculation for helidecks regardless of how primary media is being delivered.

15.15.3 Extinguishing agents

Note: - 1. Throughout MOS Section 15.15.3 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, CAAP demonstrates that the objectives of MOS 15.15.2.1 can be achieved for a specific foam use at a lower discharge rate (l/min).

Note: - 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 *(Doc 9137), Part 1*.

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

Note: - 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).

15.15.3.1 Where an RFFS is provided at a surface level heliport, the amount of primary media and complementary agents shall be in accordance with Table 15-6.

Note: - The minimum discharge duration in Table 15-6 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 15-6 Minimum usable amounts of extinguishing agents for surface-level heliports

	Foam meeting performance level B		Foam meeting performance level C		Complementary agents	
Category	Water (L)	Discharge rate foam solution/minute (L)	Water (L)	Discharge rate foam solution/minute (L)	Dry chemical powder (kg)	and Gaseous media (kg)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
H 0	500	250	330	165	23	9
H 1	800	400	540	270	23	9
H 2	1 200	600	800	400	45	18
H 3	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)

Note: - The assumption is made that primary media (foam) will be delivered through a fixed foam application system such as a fixed monitor system (FMS).

15.15.3.2 Where an RFFS is provided at an elevated heliport, the amount of foam media and complementary agents shall be in accordance with Table 15-7.

Note: - The minimum discharge duration in Table 15-7 is assumed to be five minutes.

Table 15-7 Minimum usable amounts of extinguishing agents for elevated heliports

	Foam meeting performance level B		Foam meeting performance level C		Complementary agents	
Category	Water (L)	Discharge rate foam solution/minute (L)	Water (L)	Discharge rate foam solution/minute (L)	Dry chemical powder (kg)	Gaseous and media (kg)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
H 0	1 250	250	825	165	23	9
H 1	2 000	400	1 350	270	45	18
H 2	3 000	600	2 000	400	45	18
H 3	4 000	800	2 750	550	90	36

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

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

15.15.3.3 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. (Applicable on 1 January 2023)

15.15.3.4 The discharge duration should be at least three minutes. (Applicable on 1 January 2023)

15.15.3.5 Complementary media shall be in accordance with Table 15-7, for H2 operations.

Note: - For helicopters with a fuselage length greater than 16 m and/or a fuselage width greater than 2.5 m, complementary media in Table 15-7 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 DIFFS

15.15.3.6 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. (Applicable on 1 January 2023)

15.15.3.7 The discharge duration should be at least two minutes. (Applicable on 1 January 2023)

15.15.3.8 Complementary media shall be in accordance with Table 15-7, for H2 operations.

Note: - 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

15.15.3.9 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. (Applicable on 1 January 2023)

15.15.3.10 The discharge duration should be at least five minutes. (Applicable on 1 January 2023)

15.15.3.11 Complementary media shall be in accordance with Table 15-7, 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.

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

Purpose-built helidecks with primary media applied in a dispersed pattern through a fixed application system (FAS) – a passive fire-retarding surface with water-only DIFFS

15.15.3.12 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. (Applicable on 1 January 2023)

Note: - Sea-water may be used.

15.15.3.13 The discharge duration should be at least three minutes. (Applicable on 1 January 2023)

15.15.3.14 Complementary media shall be in accordance with Table 15-7, 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.

15.15.4 Response time

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

Note: - Response time is considered to be the time between the initial call to the rescue and firefighting service 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 percent of the discharge rate specified in Table 15-6.

15.15.4.2 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 personnel are needed, they should be immediately available on or in the vicinity of the heliport while helicopter movements are taking place. (Applicable on 1 January 2023)

15.15.5 Rescue arrangements

15.15.5.1 Rescue arrangements commensurate with the overall risk of the helicopter operation shall be provided at the heliport.

Note: - 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 *(Doc 9261)*.

15.15.6 Communication and alerting system

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

15.15.7 Personnel

Note: - The provision of rescue and firefighting personnel may be determined by use of a task/resource analysis. Guidance is given in the Heliport Manual *(Doc 9261)*.

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

15.15.7.2 Where provided, rescue and firefighting personnel shall be trained to perform their duties, and maintain their competence.

15.15.7.3 Rescue and firefighting personnel shall be provided with protective equipment.

15.15.8 Means of escape

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

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

Note: - The provision of an alternative means of escape is necessary for evacuation and for access by rescue and firefighting 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 (HEMS) that require passengers to be carried on stretchers or trolleys.

Section 15.16 Heliport Emergency Response

15.16.1 Heliport Emergency Planning

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

…

15.16.1.1 A heliport emergency plan ~~shall~~:

a) shall be established commensurate with the helicopter operations and other activities conducted at the heliport.

(b) shall identify agencies which could be of assistance in responding to an emergency at the heliport or in its vicinity; and

(c) 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.

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

15.16.1.3 ~~The plan shall should include, as a minimum, the following information:~~ The heliport emergency plan as a minimum shall include the 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; and~~

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

15.16.1.~~3~~4 ~~The plan should include, as a minimum, the following information:~~ Other information that should be included in the Heliport Emergency Plan are the following;

~~a) the types of emergencies planned for;~~

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

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

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

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

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

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

15.16.1.~~4~~5 All agencies identified in the plan ~~shall~~ should be consulted about their role in the plan.

15.16.1.~~5~~6 The plan ~~shall~~ 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.

15.16.1.~~6~~7 A test of the emergency plan ~~shall~~ should be carried out at least once every three years.

— END—

NEW/AMENDED REGULATION AFTER REVISION:

MANUAL OF STANDARDS FOR AERODROMES, 2nd EDITION:

…

CHAPTER 15. Heliport standards

…

Section 15.2 Definitions

…

D. 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.

…

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

…

Elongated. When used with TLOF or FATO, elongated means an area which has a length more than twice its width.

…

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 centered on a taxiway.

…

Heliport reference point (HRP). The designated location of a heliport.

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

…

Touchdown/positioning circle (TDPC). A touchdown positioning marking (TDPM) in the form of a circle used for omnidirectional positioning in a TLOF.

Touchdown/positioning marking (TDPM). A marking or set of markings providing visual cues for the positioning of helicopters.

…

Section 15.3 Aeronautical data for heliports

…

15.3.2 Heliport reference point

15.3.2.1 A heliport reference point shall be established for a heliport not collocated with an aerodrome.

Note: - When the heliport is collocated with an aerodrome, the established aerodrome reference point serves both aerodrome and heliport.

15.3.2.2 The heliport reference point shall be located near the initial or planned geometric center of the heliport and shall normally remain where first established.

15.3.2.3 The position of the heliport reference point shall be measured and reported to CAAP AIS in degrees, minutes and seconds.

…

15.3.4 Heliport dimensions and related information

…

15.3.4.3 The following data elements shall be measured or described, as appropriate, for each facility provided on a heliport:

…

(e) Helicopter taxiway and helicopter taxi route- designation, width, surface type;

…

15.3.4.5 The geographical coordinates of appropriate centerline points of helicopter taxiways and helicopter taxi-routes shall be measured and reported to the CAAP AIS in degrees, minutes, seconds and hundredths of seconds.

…

15.3.4.7 The geographical coordinates of obstacles in Area 2 (the part within the heliport boundary) and in Area 3 shall be measured and reported to CAAP AIS in degrees, minutes, seconds and tenths of a second. In addition, the top elevation, type, marking and lighting (if any) of obstacles shall be reported to the CAAP AIS.

Note: - Manual of Standards for Aeronautical Information Services, Appendix 8, provides requirements for obstacle data determination in Areas 2 and 3.

…

15.3.7 Rescue and firefighting

Note: - See MOS 15.15 for information on rescue and firefighting services.

15.3.7.1 Information concerning the level of protection provided at a heliport for helicopter rescue and firefighting purposes shall be made available.

15.3.7.2 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 MOS 15.15 and in accordance with the types and amounts of extinguishing agents normally available at the heliport.

15.3.7.3 Changes in the level of protection normally available at a heliport for rescue and firefighting shall be notified to the appropriate aeronautical information services units and, where applicable, air traffic units to enable them to provide the necessary information to arriving and departing helicopters. When such a change has been corrected, the above units shall be advised accordingly.

Note: - 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.

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

…

Section 15.5 Onshore heliports

Note: - 1. The provisions given in this section are based on the design assumption that no more than one helicopter will be in the FATO at the same time.

Note: - 2. The design provisions given in this section 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 MOS 15.10, do not overlap. Further guidance on this issue is given in the Heliport Manual *(Doc 9261).*

Note: - 3. The provisions given in this section are common for surface-level heliports and elevated heliports unless otherwise specified.

Note: - 4. Guidance on the minimum size for elevated FATO/TLOFs in order to permit facilitation of essential operations around the helicopter is given in the Heliport Manual *(Doc 9261).*

Note: - 5. 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 *(Doc 9261).*

Note: - 6. 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 *(Doc 9261).*

15.5.1 Final approach and take-off area (FATO)

Note: - Guidance on siting and orientation of the FATO at a heliport to minimize 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 *(Doc 9261).*

…

15.5.1.1 A FATO shall:

a) provide:

1) an area 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;

Note: - Essential objects 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 MOS Section 15.5.1.4.

2) when solid, a surface which is resistant to the effects of rotor downwash; and

i) when collocated with a TLOF, is contiguous and flush with the TLOF; has bearing strength capable of withstanding the intended loads; and ensures effective drainage; or

ii) when not collocated with a TLOF, is free of hazards should a forced landing be required; and

Note: - Resistant implies that effects from the rotor downwash neither cause a degradation of the surface nor result in flying debris.

and

b) be associated with a safety area.

15.5.1.2 A heliport shall be provided with at least one final approach and take-off area (FATO), which need not be solid.

Note: - A FATO may be located on or near a runway strip or taxiway strip.

15.5.1.3 The minimum dimensions of a FATO shall 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 required Take-Off procedure prescribed in the helicopter flight manual (HFM) of the helicopters for which the FATO is intended, or 1.5 Design D, whichever is greater; and

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

b) where intended to be used by helicopters operated in performance classes 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 requirement of MOS Section 15.5.1.1 a) 1) but not less than 1.5 times the overall width of the design helicopter.

Note: - 1. The RTOD is intended to ensure containment of the helicopter during a rejected take-off. Although some flight manuals 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. For further guidance see Heliport Manual *(Doc 9261).*

Note: - 2. 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 (Doc 9261).

15.5.1.4 Essential objects located in a FATO shall not penetrate a horizontal plane at the FATO elevation by more than 5 cm.

15.5.1.5 When the FATO is solid the slope shall not:

a) except as provided in b) or c) below; exceed 2 percent in any direction;

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

c) when the FATO is elongated and intended to be used solely by helicopters operated in performance class 2 or 3, exceed 3 percent overall, or have a local slope exceeding 7 percent.

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

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

15.5.1.7 A FATO shall be surrounded by a safety area which need not be solid.

…

15.5.2 Helicopter clearways

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

15.5.2.1 A helicopter clearway shall provide:

a) an area 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; and

b) when solid, a surface which: is contiguous and flush with the FATO; is resistant to the effects of rotor downwash; and is free of hazards if a forced landing is required.

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

15.5.2.3 The width of a helicopter clearway should not be less than the width of the FATO and associated safety area. (see MOS Figure 15-1A).

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

15.5.2.5 An object situated in a helicopter clearway which will endanger helicopters in the air shall be regarded as an obstacle and shall be removed.

15.5.3 Touchdown and lift-off areas (TLOF)

15.5.3.1 A TLOF shall:

a) provide:

(i) an area free of obstacles and of 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;

(ii) a surface which:

(1) has sufficient bearing strength to accommodate the dynamic loads associated with the anticipated type of arrival of the helicopter at the designated TLOF;

(2) is free of irregularities that would adversely affect the touchdown or lift-off of helicopters;

(3) has sufficient friction to avoid skidding of helicopters or slipping of persons;

(4) is resistant to the effects of rotor downwash; and

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

b) be associated with a FATO or a stand.

15.5.3.2 A heliport shall be provided with at least one TLOF.

15.5.3.3 A TLOF shall be provided whenever it is intended that the undercarriage of the helicopter will touch down within a FATO or stand, or lift off from a FATO or stand.

15.5.3.4 The minimum dimensions of a TLOF shall 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 helicopter flight manuals (HFMs) of the helicopters for which the TLOF is intended; and

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 of:

(1) in a FATO, the design helicopter; or

(2) 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 3.1.21 a) 1) above but not less than twice the undercarriage width (UCW) of:

(1) in a FATO, the design helicopter; or,

(2) in a stand, the most demanding helicopter the stand is intended to serve.

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

15.5.3.6 Slopes on a TLOF should not:

a) except as provided in b) or c) below; exceed 2 percent in any direction;

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

c) when the TLOF is elongated and intended to be used solely by helicopters operated in performance class 2 or 3, exceed 3 percent overall, or have a local slope exceeding 7 percent.

15.5.3.7 When a TLOF is within a FATO it should be:

a) centered on the FATO; or

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

15.5.3.8 When a TLOF is within a helicopter stand, it shall be centered on the stand.

15.5.3.9 A TLOF shall be provided with markings which clearly indicate the touchdown position and, by their form, any limitations on maneuvering.

Note: - When a TLOF in a FATO is larger than the minimum dimensions, the TDPM may be offset while ensuring containment of the undercarriage within the TLOF and the helicopter within the FATO.

15.5.3.10 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.

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

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

Safety Devices

15.5.3.13 The safety net shall extend at least 1.5 meters in the horizontal plane and be so arranged that the outboard edge is slightly above the level of the helipad edge, but by no more than 0.25 meters having an upward and outward slope of at least 10º. The net shall be strong enough to withstand, without a damage, a 75 kg mass being dropped from a height of 1.0 m.

Note: - See Heliport Manual (Doc 9621) for further guidance.

15.5.3.14 There shall be a minimum of at least two access points to the helipad located equidistant around the perimeter. Such an arrangement will ensure that, in the event of an accident or incident on the helipad from which fire might ensue, personnel will be sure of at least one escape route upwind of the helipad.

15.5.3.15 Where handrails associated with access points exceed the elevation of the FATO by 25 cm (10 in), they shall be made collapsible or removable. They shall be collapsed or removed whilst helicopter maneuvers are in progress.

Note: - See Heliport Manual (Doc 9621) for further guidance.

Figure 15-1A. FATO and associated safety area

15.5.4 Safety areas

15.5.4.1 A safety area shall provide:

a) an area free of obstacles, except for essential objects which because of their function are located on it, to compensate for manoeuvring errors; and

b) when solid, a surface which: is contiguous and flush with the FATO; is resistant to the effects of rotor downwash; and ensures effective drainage.

15.5.4.2 The safety area surrounding a FATO shall extend outwards from the periphery of the FATO for a distance of at least 3 m or 0.25 Design D, whichever is greater (see MOS Figure 15-1A).

15.5.4.3 No mobile object shall be permitted in a safety area during helicopter operations.

15.5.4.4 Essential objects located in the safety area shall not penetrate a surface originating at the edge of the FATO at a height of 25 cm above the plane of the FATO sloping upwards and outwards at a gradient of 5 percent.

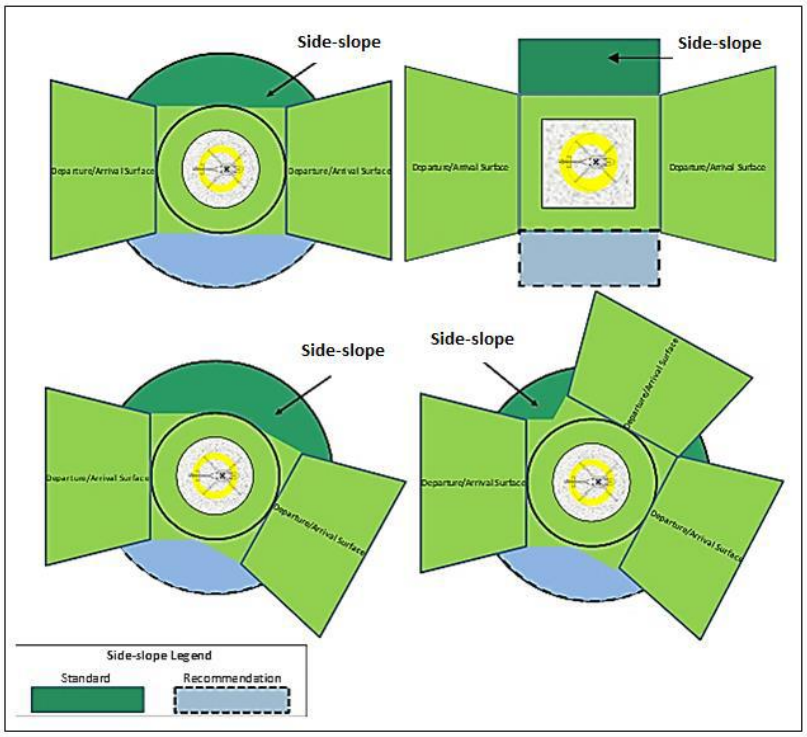
15.5.4.5 When solid, should not exceed an upward slope of 4 percent outwards from the edge of the FATO.

Protected side slope

15.5.4.6 A heliport shall be provided with at least one protected side slope, rising at 45 degrees outward from the edge of the safety area and extending to a distance of 10 meters (see MOS Figure 15-2).

15.5.4.7 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.

15.5.4.8 The surface of a protected side slope shall not be penetrated by obstacles.



Note: - These diagrams show a number of configurations of FATO/Safety Areas/Side slopes. For a more complex arrival/departure arrangement which consists of: two surfaces that are not diametrically opposed; more than two surfaces; or an extensive obstacle free sector (OFS) which abuts directly to the FATO, it can be seen that appropriate provisions are necessary to ensure that there are no obstacles between the FATO and/or safety area and the arrival/departure surfaces.

Figure 15-1B. FATO simple/complex safety area and side slope protection

15.5.5 Helicopter taxiways and taxi-routes.

Note: - 1. 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.

Note: - 2. The defined areas addressed in this section are taxiways and ground/air taxi-routes:

a) Taxiways associated with air taxi-routes may be used by both wheeled and skidded helicopters for either ground or air taxiing.

b) Ground taxi-routes are meant for use by wheeled helicopters, for ground taxiing only.

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

Helicopter taxiways

Note: - 1. A helicopter ground taxiway is intended to permit the surface movement of a wheeled helicopter under its own power.

Note: - 2. A helicopter taxiway can be used by a wheeled helicopter for air taxi if associated with a helicopter air taxi-route.

Note: - 3. 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.

15.5.5.1 A helicopter taxiway shall:

a) provide:

(i) an area free of obstacles and of sufficient width to ensure containment of the undercarriage of the most demanding wheeled helicopter the taxiway is intended to serve;

(ii) a surface which:

(1) has bearing strength to accommodate the taxiing loads of the helicopters the taxiway is intended to serve;

(2) is free of irregularities that would adversely affect the ground taxiing of helicopters;

(3) is resistant to the effects of rotor downwash; and

(4) 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; and

b) be associated with a taxi-route.

15.5.5.2 The minimum width of a helicopter taxiway shall be the lesser of:

a) two times the undercarriage width (UCW) of the most demanding helicopter the taxiway is intended to serve; or

b) a width meeting the requirements of MOS Section 15.5.5.1 (a) (i).

15.5.5.3The transverse slope of a taxiway should not exceed 2 percent and the longitudinal slope should not exceed 3 percent.

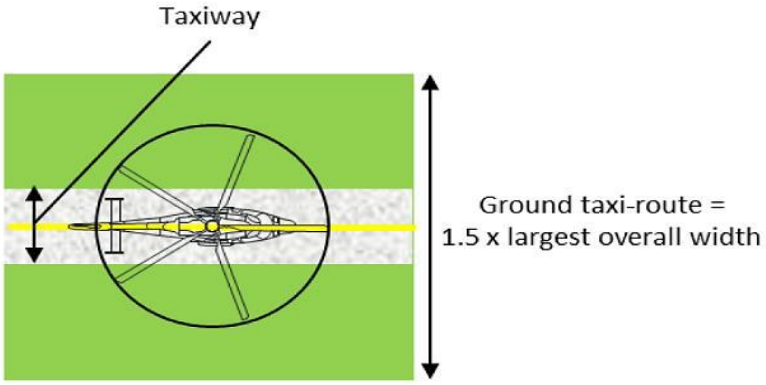


Figure 15-2. Helicopter ground taxi-route

Helicopter taxi-routes

15.5.5.4 A helicopter taxi-route shall provide:

a) an area free of obstacles, except for essential objects which because of their function are located on it, established for the movement of helicopters; with sufficient width to ensure containment of the largest helicopter the taxi-route is intended to serve;

b) when solid, a surface which is resistant to the effects of rotor downwash; and

(i) when collocated with a taxiway:

(1) is contiguous and flush with the taxiway;

(2) does not present a hazard to operations; and

(3) ensures effective drainage; and

(ii) when not collocated with a taxiway, is free of hazards if a forced landing is required.

15.5.5.5 No mobile object shall be permitted on a taxi-route during helicopter movements operations.

Note: - See the Heliport Manual *(Doc 9261) for further guidance.*

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

Helicopter ground taxi-routes

15.5.5.7 A helicopter ground taxi-route shall have a minimum width of 1.5 x the overall width of the largest helicopter it is intended to serve, and be centered on a taxiway (See MOS Figure 15-2).

15.5.5.8 Essential objects located in a helicopter ground taxi-route shall not:

(a) be located at a distance of less than 50 cm outwards from the edge of the helicopter ground taxiway; and

(b) penetrate a surface 50 cm outwards of the edge of the helicopter taxiway and a height of 25 cm above the surface of the taxiway and sloping upwards and outwards at a gradient of 5 percent.

15.5.6 Helicopter air taxi-routes

Note: - 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 a groundspeed less than 37 kph (20 kt).

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

15.5.6.2 If collocated with a taxiway for the purpose of permitting both ground and air taxi operations (see MOS Figure-15-4 (b):

a) the helicopter air taxi-route shall be centered on the taxiway; and

b) essential objects located in the helicopter air taxi-route shall not:

(i) be located at a distance of less than 50 cm outwards from the edge of the helicopter taxiway; and

(ii) penetrate a surface originating 50 cm outwards of the edge of the helicopter taxiway and a height of 25 cm above the surface of the taxiway and sloping upwards and outwards at a gradient of 5 percent.

15.5.6.3 When not collocated with a taxiway, the slope 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% and the longitudinal slope may not exceed 7%.

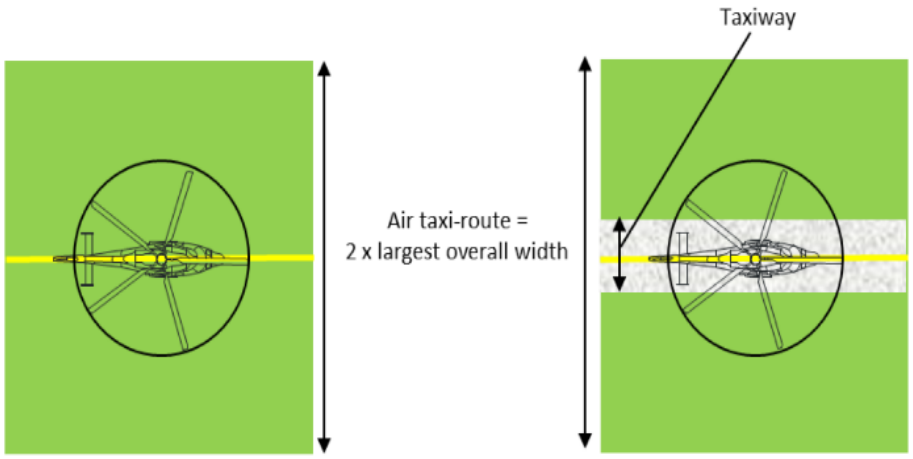


Figure 15 – 3 Helicopter air taxi-route and combined air taxi-route/taxiway

15.5.7 Helicopter stands

Note: - The provisions of this section do not specify the location for helicopter stands but allow a high degree of flexibility in the overall design of the heliport. However, it is not considered good practice to locate helicopter stands under a flight path. See Heliport Manual (Doc 9261) for further guidance.

15.5.7.1 A helicopter stand shall:

a) provide:

(i) an area free of obstacles and of 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;

(ii) a surface which:

(1) is resistant to the effects of rotor downwash;

(2) is free of irregularities that would adversely affect the manoeuvring of helicopters;

(3) has bearing strength capable of withstanding the intended loads;

(4) has sufficient friction to avoid skidding of helicopters or slipping of persons; and

(5) 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; and

b) be associated with a protection area.

15.5.7.2 The minimum dimensions of a helicopter stand shall be:

a) a circle of 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 MOS Section 15.5.7.1 (a) (i) above but not less 1.2 times overall width of largest helicopter the stand is intended to serve.

Note: - 1. For a helicopter stand intended to be used for taxi-through only, a width less than 1.2D but which provides containment and still permits all required functions of a stand to be performed, might be used (in accordance with 15.5.7.1 (a)(i)).

Note: - 2. 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. See the Heliport Manual *(Doc 9261) for further guidance.*

15.5.7.3 The mean slope *of a helicopter stand* in any direction should not exceed 2%.

15.5.7.4 Each helicopter stand shall be provided with positioning markings to clearly indicate where the helicopter is to be positioned and, by their form, any limitations on maneuvering.

15.5.7.5 A stand shall be surrounded by a protection area which need not be solid.

Protection areas

15.5.7.6 A protection area shall provide:

a) an area free of obstacles, except for essential objects which because of their function are located on it; and

b) when solid, a surface which is contiguous and flush with the stand; is resistant to the effects of rotor downwash; and ensures effective drainage.

15.5.7.7 When associated with a stand designed for turning, the protection area shall extend outwards from the periphery of the stand for a distance of 0.4D. (See MOS Figure 15-5).

15.5.7.8 When associated with a stand designed for taxi-through, the minimum width of the stand and protection area shall not be less than the width of the associated taxi-route (see MOS Figures 15-6 and 15-6A).

15.5.7.9 When associated with a stand designed for non-simultaneous use (see MOS Figures 15-6B and 15-6C):

a) the protection area of adjacent stands may overlap but shall not be less than the required protection area for the larger of the adjacent stands; and

b) the adjacent non-active stand may contain a static object but it shall be wholly within the boundary of the stand.

Note: - To ensure that only one of the adjacent stands is active at a time, instruction to pilots in the AIP make clear that a limitation on the use of the stands is in force.

15.5.7.10 No mobile object shall be permitted in a protection area during helicopter operations.

15.5.7.11 Essential objects located in the protection area shall not:

(a) if located at a distance of less than 0.75D from the center of the helicopter stand, penetrate a plane at a height of 5 cm above the plane of the central zone; and

(b) if located at distance of 0.75D or more from the center of the helicopter stand, penetrate a plane at a height of 25 cm above the plane of the central zone and sloping upwards and outwards at a gradient of 5%.

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

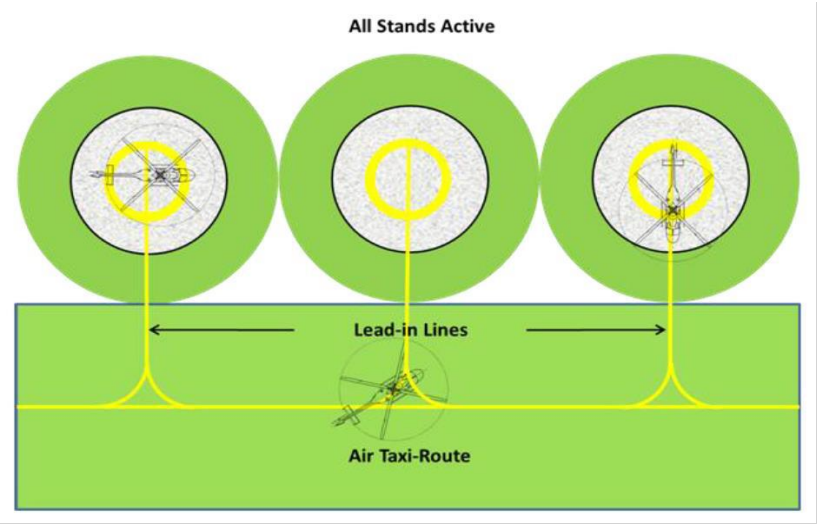


Figure 15-5. Turning stands (with air taxi-routes) simultaneous use

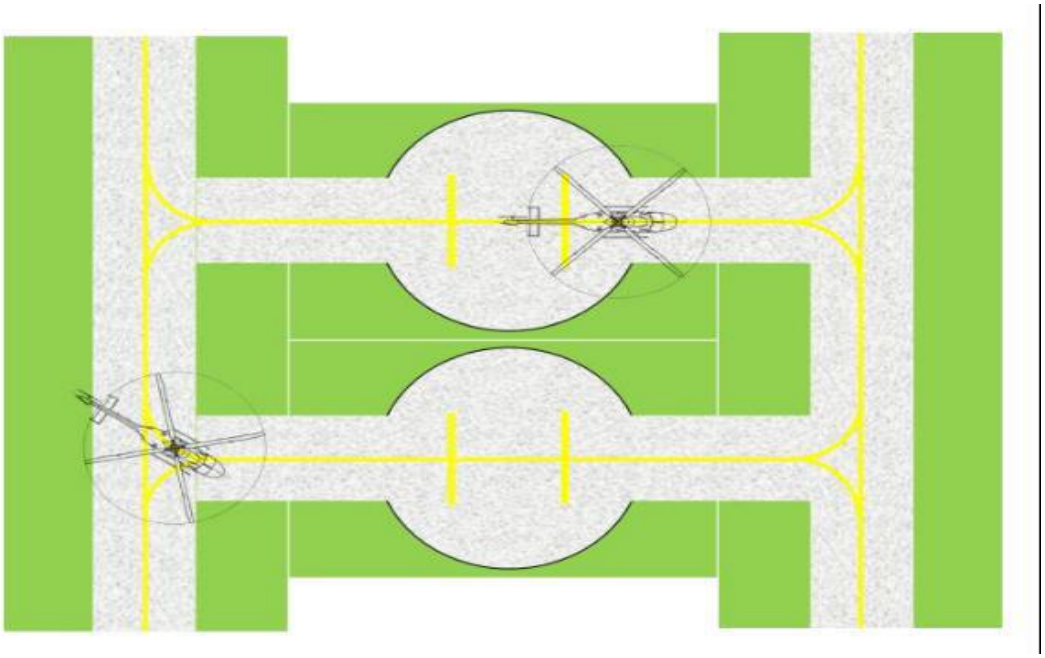


Figure 15-6 Ground taxi-through stands (with taxiway/ground taxi-route) simultaneous use

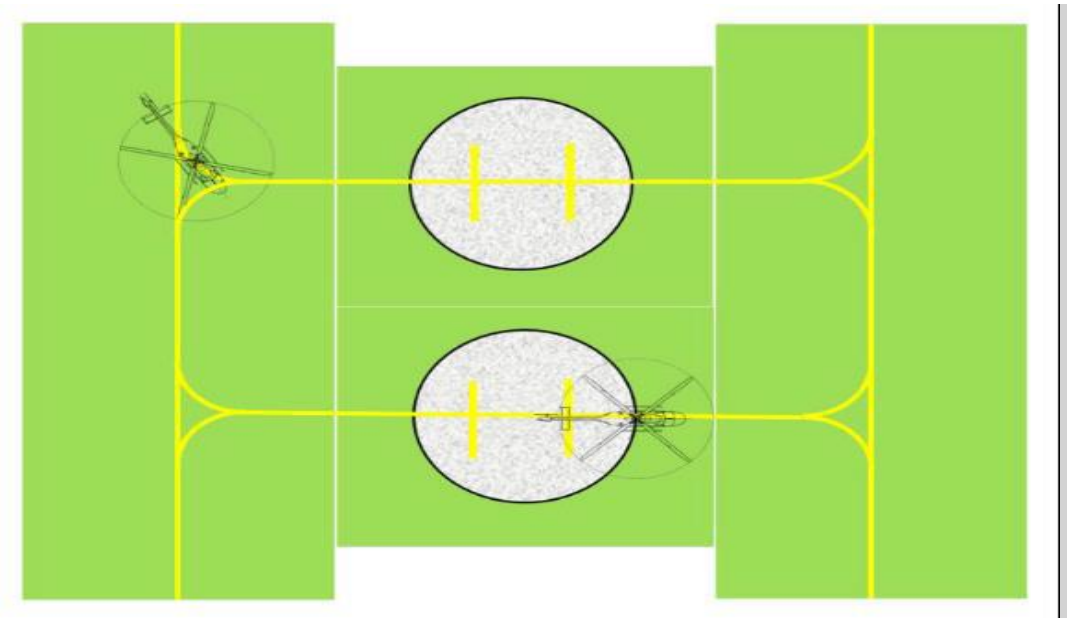


Figure 15-6A Air taxi-through stands (with air taxi-route) simultaneous use

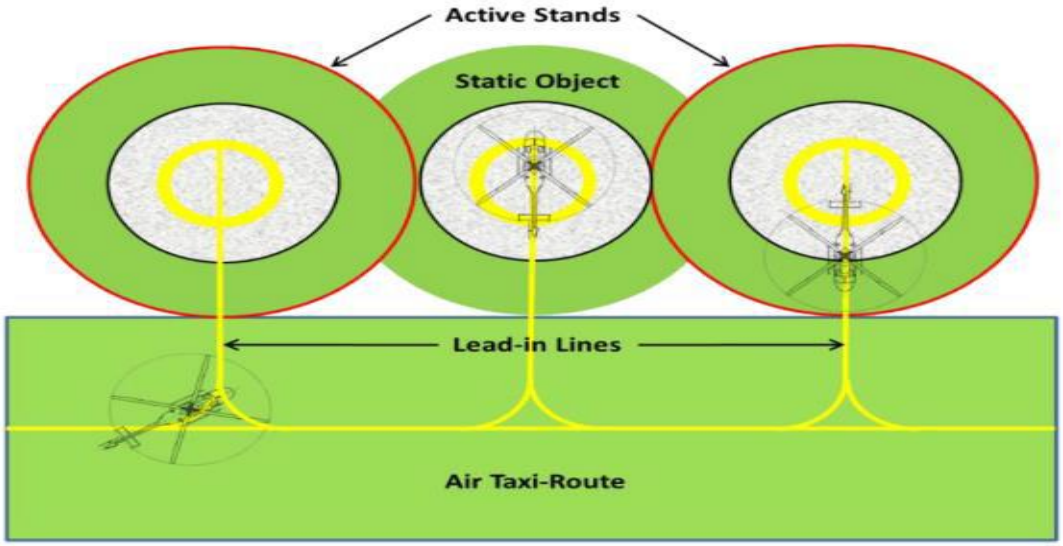


Figure 15-6B. (with air taxi-routes) use – outer stands active

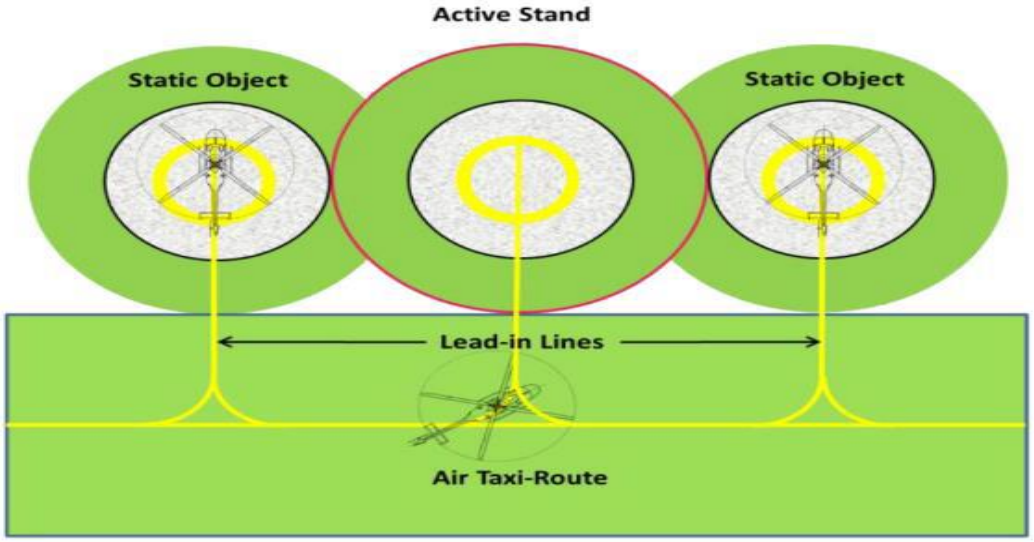


Figure 15-6C Turning stands (with air taxi-route) non-simultaneous use – inner stand active

15.5.8 Location of a final approach and take-off area in relation to a runway or taxiway

15.5.8.1 Where a FATO is located near a runway or taxiway and where simultaneous operations are planned, the separation distance between the edge of the runway or taxiway and the edge of the FATO shall be not less than the appropriate dimension in MOS Table 15-1.

…

Aeroplane and or helicopter mass	Distance between edges of FATO and runway or taxiway
Up to but not including 3175 kg	60 m
3175kg up to but not including 5760 kg	120 m
5760 kg up to but not including 100,000 kg	180 m
100,000 kg and over	250 m

Table 15-1. FATO minimum separation distance for simultaneous operations

…

Section 15.12 Obstacle limitation requirements

…

Note: - 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 *(Doc 9261).*

15.12.1 Surface level heliports

…

15.12.1.7 A surface level heliport shall have at least one take-off climb and approach surfaces. An aeronautical study shall be undertaken by an appropriate authority when only a single approach and take-off climb surface is provided considering as a minimum, the following factors:

…

(b) the obstacle environment surrounding the heliport and the availability of at least one protected side slope;

…

15.12.2 Elevated heliports

…

15.12.2.2 An elevated heliport shall have at least one approach and take-off climb surface. An aeronautical study shall be undertaken by an appropriate authority when only a single approach and take-off climb surface is provided considering as a minimum, the following factors:

…

(b) the obstacle environment surrounding the heliport and the availability of at least one protected side slope;

…

Section 15.13 Visual aids markings and markers

…

Note: - 3. Guidance is given in the Heliport Manual (Doc.9261) on marking the maximum allowable mass (MOS Section 15.13.4) and the D-value (MOS Section 15.13.5) on the heliport surface to avoid confusion between markings where metric units are used and markings where imperial units are used.

…

Note: - 5. See MOS Section 8.3.1.1, Note 1, concerning improving conspicuity of markings.

…

15.13.2 Winching area marking

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

…

15.13.3 Heliport identification marking

15.13.3.1 A heliport identification marking shall be provided at a heliport.

Location – All FATOs except runway-type FATOs

15.13.3.2 A heliport identification marking shall be located at or near the center of the FATO.

Note: - 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.

Note: - 2. For other than helidecks, the preferred direction(s) of approach corresponds to the median of the departure/arrival surface(s).

Note: - 3. For helidecks, the bar of the "H" points to the center of the Limited Obstacle Sector.

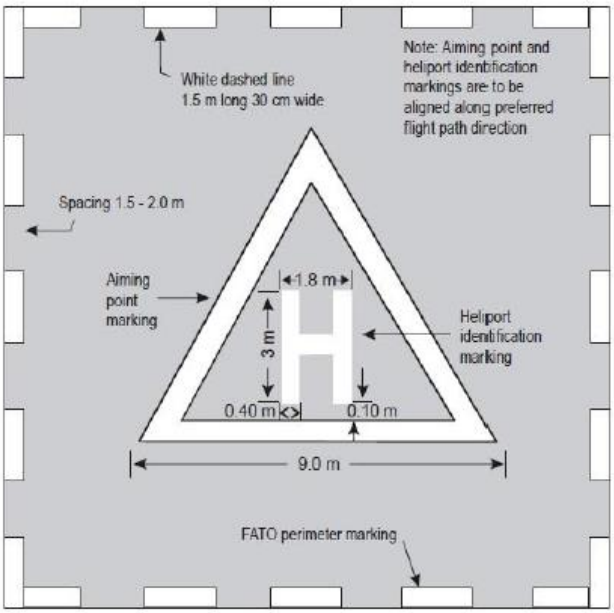
Note: - 4. If the Touchdown/positioning marking is offset, the heliport identification marking is established in the center of the Touchdown/positioning marking.

Note: - 5. On a FATO, which does not contain a TLOF and which is marked with an aiming point marking (See MOS -15.13.8), the heliport identification marking is established in the center of the aiming point marking as shown in MOS Figures 15-20 and 15- 20A.

15.13.3.3 On a FATO which contains a TLOF, a heliport identification marking shall be located in the FATO so the position of it coincides with the center of the TLOF.

15.13.3.4 Location – Runway-type FATOs

…



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 15-20. Combined heliport identification, aiming point and FATO perimeter marking

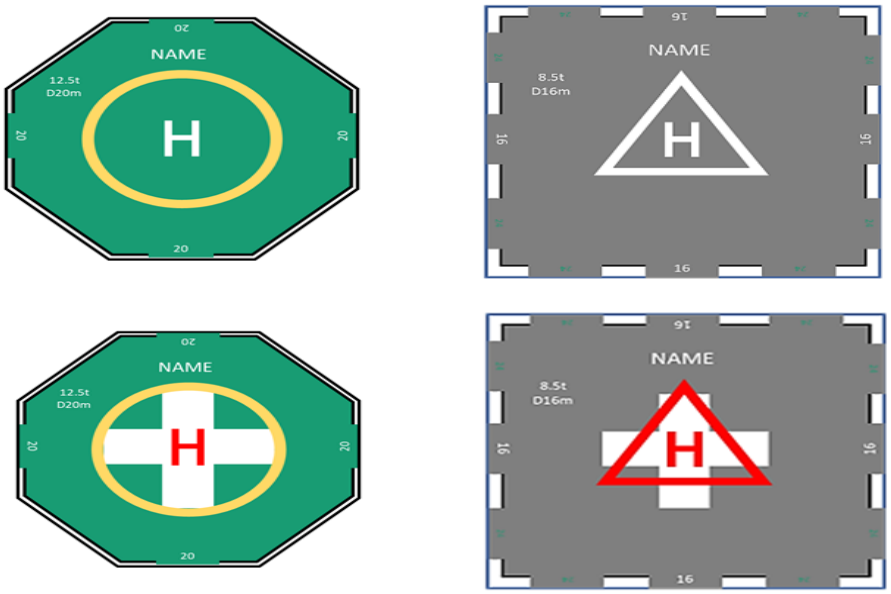


Figure 15–20A Heliport identification markings with TLOF and aiming markings for heliport and hospital heliport

…

15.13.4 Maximum allowable mass marking

Note: - 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.

…

15.13.4.2 All FATOs except runway-type FATOs

(a) The numbers and letter of the marking shall have a color contrasting with the background and be in the form and proportion shown in MOS Figure 15–23, for a *D-value* of more than 30 m. For a *D-value* between 15 m to 30 m the height of the numbers and the letter of the marking shall 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 shall be a minimum of 60 cm, each with a proportional reduction in width and thickness.

…

15.13.5 D-value marking

Note: - 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 MOS 15.5 - 15.8.

…

15.13.5.2 Runway-type FATOs

Note: - The D-value is not required to be marked on a heliport with a runway-type FATO.

(a) The D-value marking shall:

(i) be displayed at surface-level and elevated heliports.

(ii) be located within the TLOF or FATO and so arranged as to be readable from the preferred final approach direction.

(iii) be white in color and be rounded to the nearest whole meter or foot with 0.5 rounded down.

(b) 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 directions. For a non-purpose 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 centerline.

(c) The numbers of the marking should have a color contrasting with the background and should be in the form and proportion shown in MOS Figure 15-23 D-Value of more than 30 m. For 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 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.

…

15.13.6 Final approach and take-off area perimeter marking or markers for surface level heliports

Note: - The objective of final approach and take-off area 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.

15.13.6.1 FATO perimeter marking or markers shall:

(a) be provided at a surface level heliport on ground where the extent of a final approach and take-off area with a solid surface is not self-evident.

…

15.13.6.2 Runway-type FATOs

(a) The perimeter of the FATO shall:

…

(b) FATO perimeter markers:

(i) shall have dimensional characteristics as shown in MOS Figure 15-24.

(ii) shall be of color(s) that contrast effectively against the operating background.

(iii) should be a single color, orange or red, or two contrasting colors, orange and white or alternatively red and white shall be used except where such colors would merge with the background.

15.13.6.3 All FATOs except runway-type FATOs

(a) For an unpaved FATO the perimeter shall be defined with flush inground markers. The FATO perimeter markers shall be 30 cm 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 a square or rectangular FATO shall be defined.

…

15.13.7 Final approach and take-off area designation markings for runway –type FATOs

Note: - The objective of final approach and take-off area designation markings for runway-type FATOs is to provide to the pilot an indication of the magnetic heading of the runway.

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

15.13.7.2 A FATO designation marking shall be located at the beginning of the FATO as shown in MOS Figure 15-21.

15.13.7.3 A FATO designation marking shall consist of a two-digit number. The two-digit number shall be the whole number nearest the one-tenth of the magnetic North when viewed from the direction of approach. When the above rule would give a single digit number, it shall be a zero. The marking shown in MOS Figure 15-21 shall be supplemented by the heliport identification marking.

15.13.8 Aiming point marking

Note: - The objective of the aiming point marking is to provide a visual cue indicating to the pilot 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.

15.13.8.1 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.

15.13.8.2 Runway-type FATOs

(a) The aiming point marking shall be located within the final approach and take-off area.

15.13.8.3 All FATOs except runway-type FATOs

(a) The aiming point marking shall be located at the center of the FATO as shown in MOS Figure 15-20.

(b) The aiming point marking shall he an equilateral triangle with the bisector of one of the angles aligned with the preferred approach direction. The marking shall consist of continuous lines, providing a contrast with the background colour, and the dimensions of the marking shall conform to those shown in Figure 15-25.

15.13.9 Touchdown and lift-off area perimeter marking

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

15.13.9.1 A TLOF perimeter marking shall:

(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 perimeter edge of the TLOF.

(d) consist of a continuous white line with a width of at least 30 cm.

15.13.10 Touchdown/positioning marking

Note: - 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.

15.13.10.1 A touchdown/positioning marking shall be provided for a helicopter to touch down or be accurately placed in a specific position.

15.13.10.2 The touchdown/positioning marking shall be:

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

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

(i) for unidirectional applications, a shoulder line with an associated centerline; or

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

15.13.10.3 The inner edge/inner circumference of the touchdown/positioning marking shall be at a distance of 0.25 D from the center of the area in which the helicopter is to be positioned.

15.13.10.4 On a helideck, the center of the TDPC marking shall be located at the center 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.

15.13.10.5 Prohibited landing sector markings, when provided, shall be located on the touchdown/positioning marking, within the relevant headings, and extend to the inner edge of the TLOF perimeter marking**.**

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

15.13.10.7 A touchdown/positioning marking shall have a line width of at least 0.5 m. For a helideck and a purpose-built shipboard heliport, the line width shall be at least 1 m.

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

15.13.10.9 The prohibited landing sector markings, when provided, shall be indicated by white and red hatched markings as shown in Figure 15-26.

15.13.10.10 The TDPM shall take precedent when used in conjunction with other markings on the TLOF except for the prohibited landing sector marking.

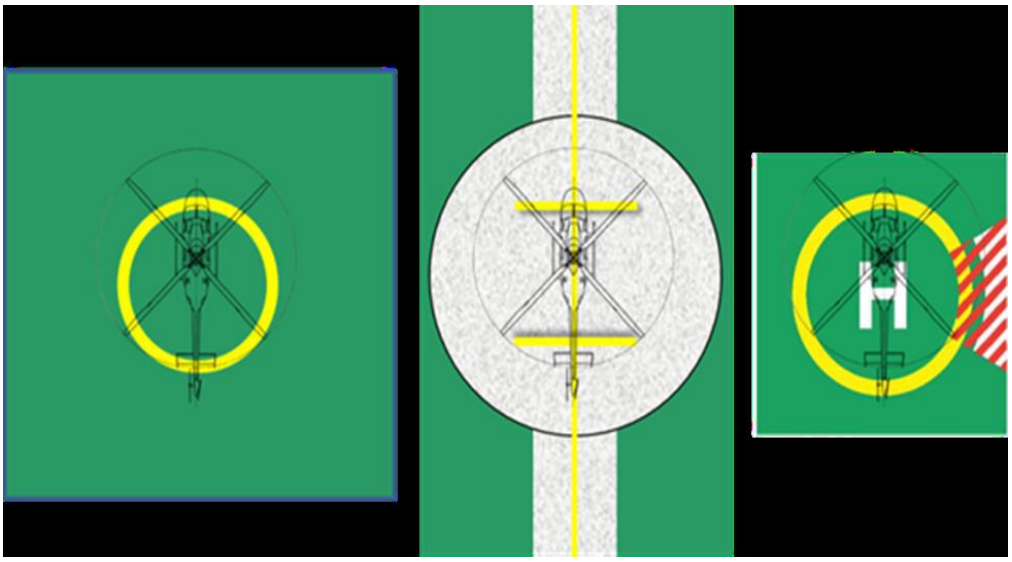


Figure 15-26 (Left) multidirectional TDPC with no limitations. (Center) unidirectional marking shoulder line with associated centerline. (Right) multidirectional TDPC with prohibited landing sector marking

Note: - The prohibited landing sector (PLS) 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.

15.13.11 Heliport name marking

Note: - 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.

15.13.11.1 A heliport name marking:

(a) shall be provided at a heliport and helideck where there is insufficient alternative means of visual identification.

(b) Where *a limited* obstacle sector (LOS) exists on a helideck the marking should be located on the obstacle side of the "heliport identification marking". For a non-purpose built heliport located on a ship's side the marking shall 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.

(c) shall consist of the name or the alphanumeric designator of the heliport as used in the radio (R/T) communications.

d) should be illuminated, either internally or externally when intended for use at night or during conditions of poor visibility.

15.13.11.2 Runway-type FATOs

(a) The characters of the marking shall be not less than 3 m in height.

15.13.11.3 All FATOs except runway-type FATOs

(a) The characters of the marking shall 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 color of the marking should contrast with the background and preferably be white.

15.13.12 Helideck obstacle-free sector (chevron) marking

Note: - 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.

15.13.12.1 A helideck with adjacent obstacles that penetrate above the level of the helideck shall have an obstacle free sector marking.

15.13.12.2 A helideck obstacle-free sector marking shall:
…
15.13.12.3 The height of the chevron shall not be less than 30 cm.

15.13. 12.4 The chevron shall be marked in a conspicuous color.

15.13.12.5 The color of the chevron shall be black.

15.13.13 Helideck and shipboard heliport surface marking

Note: - 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.

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

15.13.13.2 A surface marking shall be applied to the dynamic load bearing area bounded by the TLOF perimeter marking.

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

15.13.14 Helicopter ground taxiway markings and markers

Note - 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.

Note: - 2. The specifications for taxi-holding position markings in MOS Section 8.4.3, Runway Holding Position Marking are equally applicable to taxiways intended for ground taxiing of helicopters.

Note: - 3. Ground taxi-routes are not required to be marked.

Note - 4. Unless otherwise indicated it may be assumed that a helicopter taxiway is suitable for both ground taxiing and air taxiing of helicopters.

Note - 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.

15.13.14.1 The centerline of a helicopter taxiway shall be identified with a marking.

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

15.13.14.3 Helicopter taxiway markings shall be along the centerline and, if required, along the edges of a helicopter taxiway.

15.13.14.4 Helicopter taxiway edge markers shall be located at a distance of 1 m to 3 m beyond the edge of the helicopter taxiway.

15.13.14.5 Helicopter taxiway edge markers, shall 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.

15.13.14.6 On a paved taxiway, a helicopter taxiway center line marking shall be a continuous yellow line 15 cm in width.

15.13.14.7 On an unpaved taxiway that will not accommodate painted markings, a helicopter taxiway centerline shall 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.

15.13.14.8 Helicopter taxiway edge markings shall be a continuous double yellow line, each 15 cm in width, and spaced 15 cm apart (nearest edge to nearest edge).

15.13.14.9 A helicopter taxiway edge marker shall be frangible to the wheeled undercarriage of a helicopter.

15.13.14.10 A helicopter taxiway edge marker shall not exceed a plane originating at a height of 25 cm 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 percent to a distance of 3 m beyond the edge of the helicopter taxiway.

15.13.14.11 A helicopter taxiway edge marker shall be blue.

Note: - 1. Guidance on suitable edge markers is given in the Heliport Manual *(Doc 9261).*

Note: - 2. If blue markers are used on an aerodrome, signage may be required to indicate that the helicopter taxiway is suitable only for helicopters.

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

15.13.15 Helicopter air taxi-route markings and markers

Note: - 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.

15.13.15.1 The centerline of a helicopter air taxi-route shall be identified with markers or markings.

15.13.15.2 A helicopter air taxi-route centerline marking or flush in-ground centerline marker shall be located along the center line of the helicopter air taxiway.

15.13.15.3 A helicopter air taxi-route centerline, when on a paved surface, shall be marked with a continuous yellow line 15 cm in width.

15.13.15.4 A helicopter air taxi-route centerline, when on an unpaved surface that will not accommodate painted markings, shall 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.

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

15.13.16 Helicopter stand markings

Note: - The objective of the 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.

15.13.16.1 A helicopter stand perimeter marking shall be provided.

15.13.16.2 A helicopter stand shall be provided with the appropriate TDPM. See Figure 15-26 in Section 15.13.10.

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

Note: - 1. See Figures 15-5,15-6, 15-6A,15-6B, 15-6C, 15-6D of MOS 15.5 -15.8.

Note: - 2. Helicopter stand identification markings may be provided where there is a need to identify individual stands.

Note: - 3. Additional markings relating to stand size may be provided. See the Heliport Manual *(Doc 9261).*

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

15.13.16.5 Alignment lines and lead-in/lead-out lines shall be located as shown in Figures 15-27.

15.13.16.6 A helicopter stand perimeter marking shall consist of a continuous yellow line and have a line width of 15 cm.

15.13.16.7 The TDPM shall have the characteristics described in MOS Section 15.13.10 above.

15.13.16.8 Alignment lines and lead-in/lead-out lines shall be continuous yellow lines and have a width of 15 cm.

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

15.13.16.10 Stand identification markings shall be marked in a contrasting colour so as to be easily readable.

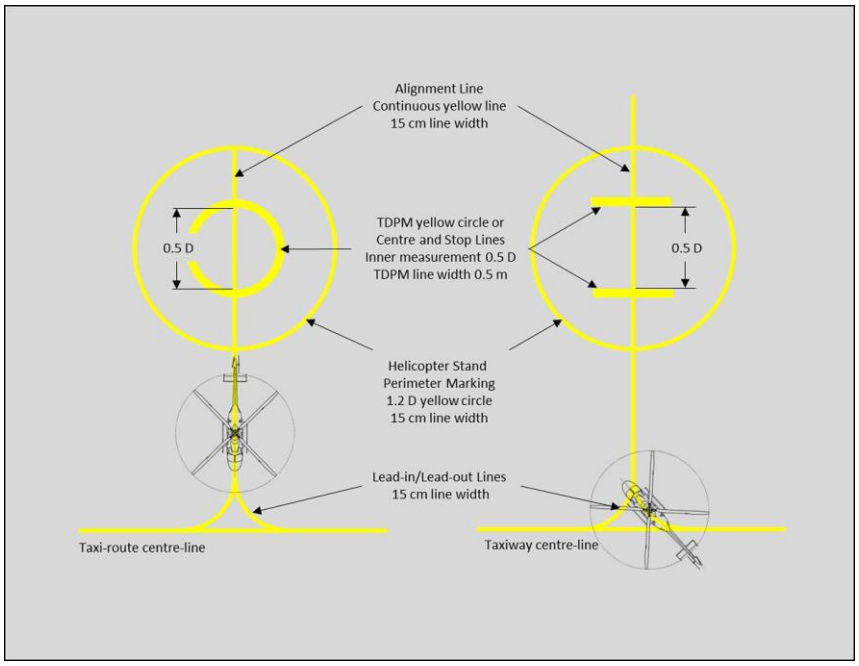


Figure 15-27 Helicopter stand markings

Note: - 1. Where it is intended that helicopters proceed in one direction only, arrows indicating the direction to be followed may be added as part of the alignment lines.

Note: - 2. The characteristics of markings related to the stand size and alignment and lead-in/lead-out lines are illustrated in Figure 15-27 – examples of stands and their markings can be seen in Figures-15-5, 15-6, 15-6A, 15-6B,15-6C of MOS 15.5 -15.8.

15.13.17 Flight path alignment guidance marking

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

15.13.17.1 Flight path alignment guidance marking(s):

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

Note: - The flight path alignment guidance marking can be combined with a flight path alignment guidance lighting system described in MOS Section 15.14.3.

(b) shall be located in a straight line along the direction of approach and/or departure path on one or more of the TLOF, FATO, safety area or any suitable surface in the immediate vicinity of the FATO or safety area.

(c) shall consist of one or more arrows marked on the TLOF, FATO and/or safety area surface as shown in MOS Figure 15-28. The stroke of the arrow(s) shall be 50 cm in width and at least 3 m in length. When combined with a flight path alignment guidance lighting system it shall take the form shown in MOS Figure 15-28 which includes scheme for marking 'heads of the arrows' which are constant regardless of stroke length.

Note: - 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.

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

…

Section 15.14 Visual aids – lights

Note: - 1. See MOS Section 9.18.4.1 and MOS Section 9.1.12, concerning specifications on screening of non-aeronautical ground lights, and design of elevated and inset lights.

…

Note: - 4. Systems addressed in MOS Sections 15.14.3, 15.14.5, 15.14.6 and 15.14.7 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 (Doc 9157), Part4 - Visual Aids.

Note: - 5. The specifications for marking and lighting of obstacles included in MOS 8.10 and 9.3, are equally applicable to heliports and winching areas.

Note: - 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 system with all heliport lighting through an assessment by the helicopter operator prior to use.

15.14.1.1 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.

15.14.1.2 The heliport beacon shall 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.

Note: - Where a heliport beacon is likely to dazzle pilots at short range, it may be switched off during the final stages of the approach and landing.

15.14.1.3 The heliport beacon shall emit repeated series of equispaced short duration white flashes in the format in Figure 15-29.

15.14.1.4 The light from the beacon shall show at all angles of azimuth.

15.14.1.5 The effective light intensity distribution of each flash should be as shown in Figure 15-30, Illustration 1 unless otherwise approved by CAAP.

Note: - Where brilliancy control is desired, settings of 10 percent and 3 percent 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.

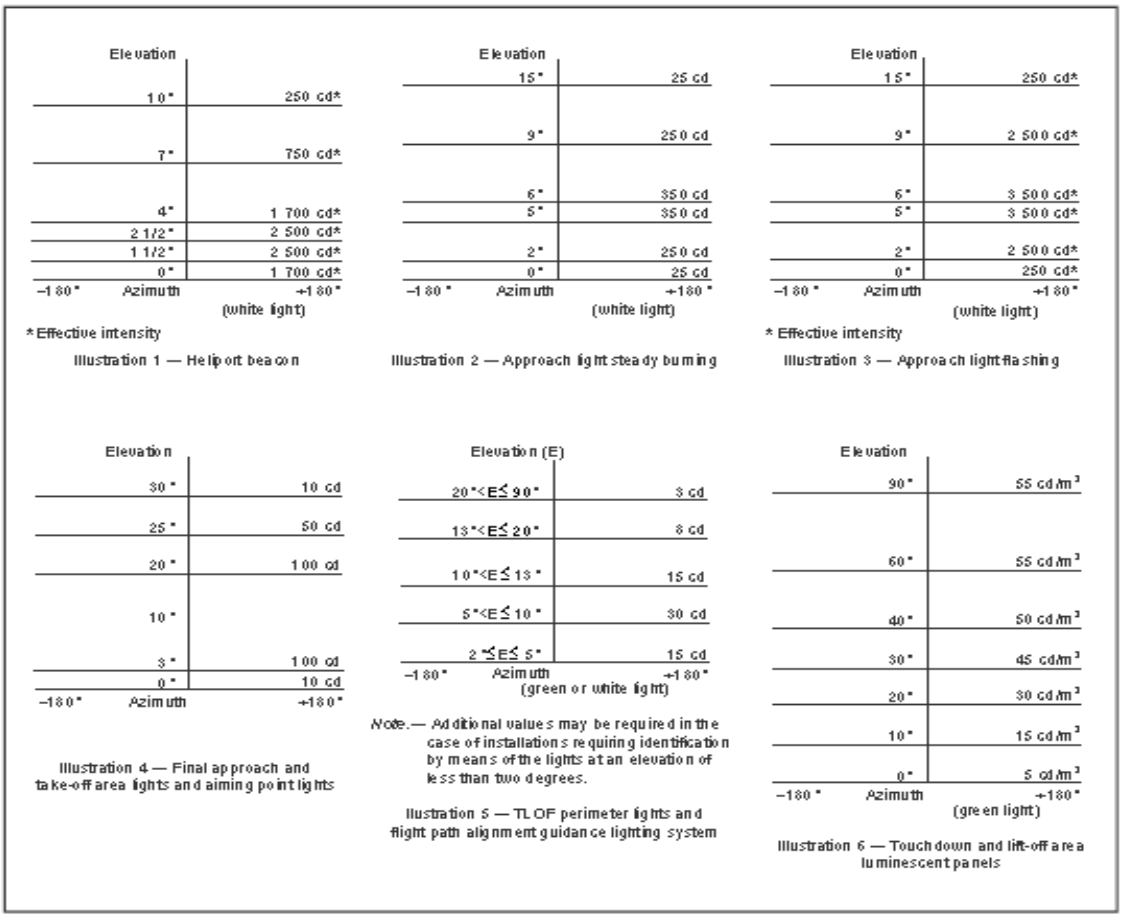


Figure 15-30 Isocandela Diagrams

15.14.2 Approach lighting system

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

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

15.14.2.3 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 15-31. 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 center 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.

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

15.14.2.4 The steady lights shall be omnidirectional white lights.

15.14.2.5 Sequenced flashing lights shall be omnidirectional white lights.

15.14.2.6 The flashing lights should have a flash frequency of one per second and their light distribution should be as shown in Figure 15-30, Illustration 3. The flash sequence should commence from the outermost light and progress towards the crossbar.

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

Note: - The following intensity settings have been found suitable: a) steady lights — 100 percent, 30 percent and 10 percent; and b) flashing lights — 100 percent, 10 percent and 3 percent.

15.14.3 Flight path alignment guidance lighting system

15.14.3.1 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).

Note: - The flight path alignment guidance lighting can be combined with the flight path alignment guidance marking described in MOS Section 15.13.17.

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

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

15.14.3.4 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 15-28.)

Note: - 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 15-28).

15.14.3.5 The lights shall be steady omnidirectional inset white lights.

15.14.3.6 The distribution of the lights should be as indicated in Figure 15-30, Illustration 5.

15.14.3.7 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.

15.14.4 Visual alignment guidance system

Note: - 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 *(Doc 9261).*

15.14.4.1 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; and

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

15.14.5 Visual approach slope indicator

Note: - 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 *(Doc 9261).*

15.14.5.1 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:

(i) obstacle clearance, noise abatement or traffic control procedures require a particular slope to be flown;

(ii) the environment of the heliport provides few visual surface cues; and

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

15.14.6 Final approach and take-off area lighting systems for onshore surface – level heliports

Note: - The objective of a final approach and take-off area 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.

15.14.6.1 Where a FATO with a solid surface is established at a surface level heliport intended for use at night, FATO lights shall 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.

15.14.6.2 FATO lights shall:

…

15.14.6.3 The light distribution of final approach and take-off area lights shall be as shown in MOS Figure 15-30, Illustration 4.

15.14.6.4 The lights shall 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 level.

15.14.7 Aiming point lights

Note: - 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.

…

15.14.7.4 The light distribution of aiming point lights shall be as shown in MOS Figure 15-30, Illustration 4.

15.14.8 Touchdown and lift-off area lighting system

Note: - The objective of a touchdown and lift-off area 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.

15.14.8.1 A TLOF lighting system shall be provided at a heliport intended for use at night.

Note: - Where a TLOF is located in a stand, the `objective may be met with the use of ambient lighting or stand floodlighting.

15.14.8.2 For a surface level heliport, lighting for the TLOF in a FATOshall 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 touchdown and lift-off area when (a) and (b) are not practicable and final approach and take-off area lights are available.

15.14.8.3 For an elevated heliport shipboard heliportor helideck, lighting of the TLOF in a FATO shall consist of:

(a) perimeter lights; and

(b) ASPSL, and/or LPs to identify the TDPM and/or floodlighting to illuminate the TLOF.

Note: - At elevated heliports, shipboard heliports and helidecks, surface texture cues within the touchdown and lift-off (TLOF) area are essential for helicopter positioning during the final approach and landing. Such cues can be provided using various forms of lighting (ASPSL, 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.*

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

15.14.8.5 Touchdown and lift-off area perimeter lights shall:

(a) 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 shall be:

(i) located on straight lines in a pattern which will provide information to pilots on drift displacement; and

(ii) where (a)(i) is not practicable, evenly spaced around the perimeter of the TLOF at the appropriate interval except that over a sector of 45° the lights shall be spaced at half spacing.

…

(d) 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.

(e) be fixed omnidirectional lights showing green.

…

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

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

Note: - 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 floodlight. Due to the risk of misalignment, if floodlights are used, there is a need for them to be checked periodically to ensure they remain within the specifications contained within MOS 15.14.8.

…

15.14.8.12 For a surface level or elevated heliport, the TLOF perimeter lights located in a FATO shall not exceed a height of 25 cm and shall be inset when a light extending above the surface could endanger helicopter operations.

15.14.8.13 For a helideck or shipboard heliport, the TLOF perimeter lights shall not exceed a height of 5 cm, or for a FATO/TLOF, 15 cm.

15.14.8.14 When located within the safety area of a surface level or elevated heliport the TLOF floodlights shall not exceed a height of 25 cm.

15.14.8.15 For a helideck or shipboard heliport, the TLOF floodlights shall not exceed a height of 5 cm, or for a FATO/TLOF, 15 cm.

15.14.8.16 The LPs shall not extend above the surface by more than 2.5 cm.

15.14.8.17 The light distribution of the perimeter lights shall be as shown in MOS Figure 15-30, Illustration 5.

15.14.8.18 The light distribution of the LPs shall be as shown in MOS Figure 15-30, Illustration 6.

15.14.8.19 The spectral distribution of TLOF floodlights shall be such that the surface and obstacle marking can be correctly identified.

15.14.8.20 The average horizontal illuminance of the floodlighting shall 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.

15.14.8.21 Lighting used to identify the TDPC should comprise a segmented circle of omnidirectional ASPSL strips showing yellow. The segments shall consist of ASPSL strips, and the total length of the ASPSL strips being not less than 50% of the circumference of the circle.

15.14.8.22 If utilized, the heliport identification marking lighting shall be omnidirectional showing green.

15.14.9 Helicopter stand floodlighting

Note: - 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.

15.14.9.1 Floodlighting shall be provided on a helicopter stand intended to be used at night.

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

15.14.9.2 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.

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

15.14.9.4 Horizontal and vertical illuminance shall 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.

15.14.10 Winching area floodlighting

Note: - The objective of winching area floodlighting is to provide illumination of the surface, obstacles and 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.

15.14.10.1 Winching area floodlighting shall be provided at a winching area intended for use at night.

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

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

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

15.14.11 Taxiway lights

Note: - The specifications for taxiway centerline lights and taxiway edge lights in MOS Section 9.1.12.1 and MOS Section 9.1.12.4 respectively are equally applicable to taxiways intended for ground taxiing of helicopters.

15.14.12 Visual aids for denoting obstacles outside and below the obstacle limitation surfaces

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

15.14.12.1 Where an aeronautical study indicates that obstacles in areas outside and below the boundaries of the OLS, 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.

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

15.14.13 Floodlighting of obstacles

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

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

15.14.13.3 Obstacle floodlighting shall be such as to produce a luminance of at least 10 cd/m2.

Section 15.15 Rescue and firefighting

General — Introductory Notes

The content of this section has been extensively revised and updated for Amendment 9. With new concepts and terms now to consider, it is important that MOS 15.15 be read in conjunction with the appropriate detailed guidance on rescue and firefighting options given in the Heliport Manual *(Doc 9261).*

Provisions described in this section 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.

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).

Where a fixed monitor system (FMS) is installed, trained monitor operators, where provided, be 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 are installed in the center of the TLOF).

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.

It may therefore be assumed that this chapter does not include RFF arrangements for purpose-built or non-purpose-built shipboard heliports or for winching areas.

15.15.1 Applicability

15.15.1.1 The following specifications shall apply to new builds or replacement of existing systems or part thereof from 1 January 2023:

MOS Section 15.15.2.1, MOS Section 15.15.3.3, MOS Section 15.15.3.4, MOS Section 15.15.3.6, MOS Section 15.15.3.7, MOS Section 15.15.3.9, MOS Section 15.15.3.10, MOS Section 15.15.3.12, MOS Section 15.15.3.13 and MOS Section 15.15.4.2

Note: - 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 this section; see MOS Chapter 14.

15.15.1.2 Rescue and firefighting equipment and services shall be provided at helidecks and at elevated heliports located above occupied structures.

15.15.1.3 Rescue and firefighting equipment and services shall be provided at surface level heliports and elevated heliports located above unoccupied structures.

15.15.2 Level of protection provided

15.15.2.1 For the application of primary media the discharge rate (in liters/minute) applied over the assumed practical critical area (in m^2) shall 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. (Applicable on 1 January 2023).

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

Note: - This section is not applicable to helidecks regardless of how primary media is being delivered.

15.15.2.2 The practical critical area shall 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 6-1 below.

Table 15-5 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

Note: - 1. 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 (W_1) of 6 m.

Note: - 2. The practical critical area may be considered on a helicopter type-specific basis by using the formula in MOS 15.15.2.2. Guidance on practical critical area in relation to the heliport firefighting category is given in the Heliport Manual *(Doc 9261) where a discretionary 10 percent tolerance on fuselage dimension "upper limits" is applied.*

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

15.15.2.3 For heliports, except helidecks, the practical critical area shall 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.

15.15.2.4 For helidecks the practical critical area shall be based on the largest circle capable of being accommodated within the TLOF perimeter.

Note: - MOS Section 15.15.2.4 is applied for the practical critical area calculation for helidecks regardless of how primary media is being delivered.

15.15.3 Extinguishing agents

Note: - 1. Throughout MOS Section 15.15.3 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, CAAP demonstrates that the objectives of MOS Section 15.15.2.1 can be achieved for a specific foam use at a lower discharge rate (l/min).

Note: - 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 *(Doc 9137), Part 1.*

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

Note: - 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).

15.15.3.1 Where an RFFS is provided at a surface level heliport, the amount of primary media and complementary agents shall be in accordance with Table 15-6.

Note: - The minimum discharge duration in Table 15-6 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 15-6 Minimum usable amounts of extinguishing agents for surface-level heliports

	Foam meeting performance level B		Foam meeting performance level C		Complementary agents	
Category	Water (L)	Discharge rate foam solution/minute (L)	Water (L)	Discharge rate foam solution/minute (L)	Dry chemical powder (kg)	and Gaseous media (kg)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
H 0	500	250	330	165	23	9
H 1	800	400	540	270	23	9
H 2	1 200	600	800	400	45	18
H 3	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)

Note: - The assumption is made that primary media (foam) will be delivered through a fixed foam application system such as a fixed monitor system (FMS).

15.15.3.2 Where an RFFS is provided at an elevated heliport, the amount of foam media and complementary agents shall be in accordance with Table 15-7.

Note: - The minimum discharge duration in Table 15-7 is assumed to be five minutes.

Table 15-7 Minimum usable amounts of extinguishing agents for elevated heliports

	Foam meeting performance level B		Foam meeting performance level C		Complementary agents	
Category	Water (L)	Discharge rate foam solution/minute (L)	Water (L)	Discharge rate foam solution/minute (L)	Dry chemical powder (kg)	Gaseous and media (kg)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
H 0	1 250	250	825	165	23	9
H 1	2 000	400	1 350	270	45	18
H 2	3 000	600	2 000	400	45	18
H 3	4 000	800	2 750	550	90	36

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

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

15.15.3.3 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. (Applicable on 1 January 2023)

15.15.3.4 The discharge duration should be at least three minutes. (Applicable on 1 January 2023)

15.15.3.5 Complementary media shall be in accordance with Table 15-7, for H2 operations.

Note: - For helicopters with a fuselage length greater than 16 m and/or a fuselage width greater than 2.5 m, complementary media in Table 15-7 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 DIFFS

15.15.3.6 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. (Applicable on 1 January 2023)

15.15.3.7 The discharge duration should be at least two minutes. (Applicable on 1 January 2023)

15.15.3.8 Complementary media shall be in accordance with Table 15-7, for H2 operations.

Note: - 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

15.15.3.9 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. (Applicable on 1 January 2023)

15.15.3.10 The discharge duration should be at least five minutes. (Applicable on 1 January 2023)

15.15.3.11 Complementary media shall be in accordance with Table 15-7, 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.

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

Purpose-built helidecks with primary media applied in a dispersed pattern through a fixed application system (FAS) – a passive fire-retarding surface with water-only DIFFS

15.15.3.12 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. (Applicable on 1 January 2023)

Note. - Sea-water may be used.

15.15.3.13 The discharge duration should be at least three minutes. (Applicable on 1 January 2023)

15.15.3.14 Complementary media shall be in accordance with Table 15-7, 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.

15.15.4 Response time

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

Note: - Response time is considered to be the time between the initial call to the rescue and firefighting service 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 percent of the discharge rate specified in Table 15-6.

15.15.4.2 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 personnel are needed, they should be immediately available on or in the vicinity of the heliport while helicopter movements are taking place. (Applicable on 1 January 2023)

15.15.5 Rescue arrangements

15.15.5.1 Rescue arrangements commensurate with the overall risk of the helicopter operation shall be provided at the heliport.

Note: - 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 *(Doc 9261)*.

15.15.6 Communication and alerting system

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

15.15.7 Personnel

Note: - The provision of rescue and firefighting personnel may be determined by use of a task/resource analysis. Guidance is given in the Heliport Manual *(Doc 9261)*.

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

15.15.7.2 Where provided, rescue and firefighting personnel shall be trained to perform their duties, and maintain their competence.

15.15.7.3 Rescue and firefighting personnel shall be provided with protective equipment.

15.15.8 Means of escape

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

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

Note: - The provision of an alternative means of escape is necessary for evacuation and for access by rescue and firefighting 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 (HEMS) that require passengers to be carried on stretchers or trolleys.

Section 15.16 Heliport Emergency Response

15.16.1 Heliport Emergency Planning

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

…

15.16.1.1 A heliport emergency plan:

a) shall be established commensurate with the helicopter operations and other activities conducted at the heliport.

(b) shall identify agencies which could be of assistance in responding to an emergency at the heliport or in its vicinity; and

(c) 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.

15.16.1.2 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.

15.16.1.3 The heliport emergency plan as a minimum shall include the information;

a) the types of emergencies planned for;

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

c) a grid map of the heliport and its immediate vicinity.

15.16.1.4 Other information that should be included in the Heliport Emergency Plan are the following;

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

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

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

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

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

15.16.1.6 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.

15.16.1.7 A test of the emergency plan should be carried out at least once every three years

xxx

"End of Amendment"

i. ***Separability Clause.*** **-** If, for any reason, any provision of this Memorandum Circular is declared invalid or unconstitutional, the other part or parts thereof which are not affected thereby shall continue to be in full force and effect.

ii. ***Repealing Clause.*** **-** All orders, rules, regulations and issuances, or parts thereof which are inconsistent with this Memorandum Circular are hereby repealed, superseded or modified accordingly.

iii. ***Determination of changes.*** **–** To highlight the amendments and/or revisions in the Memorandum Circular, the deleted text shall be shown with strikethrough and the new inserted text shall be highlighted with grey shading, as illustrated below:

1. Text deleted: ~~Text to be deleted is shown with a line through it.~~
2. New text inserted: New text is highlighted with grey shading.
3. New text replacing existing text: ~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.

iv. ***Effectivity Clause.*** **-** This Memorandum Circular shall take effect fifteen (15) days following completion of its publication in a newspaper of general circulation or the Official Gazette and a copy filed with the U.P. Law Center - Office of the National Administrative Register. The amendment shall be incorporated to Philippine CAR-ANS in the next regular Amendment Cycle.

So Ordered. Signed this 05 day of JANUARY 2021, at the Civil Aviation Authority of the Philippines, MIA Road, Pasay City, Metro Manila, 1301.

CAPTAIN JIM C. SYDIONGCO
Director General