



## Chapter 4 – Obstacle Environment

- Approach surface – description, dimensions
- Take-off climb surface – description, dimensions
- Curved approach & take-off surfaces – description & dimensions
- Transitional surface – description, dimensions
- One approach / take-off climb surface, versus more than one, – Standard / Recommendation
- How slopes relate to performance class operations (Annex 6, Part 3 – Helicopter operations)



## General Notes and Comments

*Note.— The objectives of the specifications in this chapter are to describe the airspace around heliports so as to permit intended helicopter operations to be conducted safely and to prevent, where appropriate State controls exist, heliports from becoming unusable by the growth of obstacles around them.*

*This is achieved by establishing a series of obstacle limitation surfaces that define the limits to which objects may project into the airspace.*

It should be noted that identifying obstacle limitation surfaces, in its self does not protect the surfaces; in most cases a state would need to enact some form of regulation restricting the limits of heights of objects, whether it be natural growth or buildings and/or structures.

*Description.* An inclined plane or a combination of planes or, when a turn is involved, a complex surface sloping upwards from the end of the safety area and centred on a line passing through the centre of the FATO.

*This chapter relies on figures and table to provide the specifications required.*

*See Figures 4-1, 4-2, 4-3 and 4-4 for depiction of surfaces. See Table 4-1 for dimensions and slopes of surfaces.*



## Further Notes and Comments

- *All heliports (surface level & elevated) require to have at least one take-off climb surface and one approach surface.*
- *It is recommended that heliports; both surface level & elevated, have at least two 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:*
  - the area/terrain over which the flight is being conducted;
  - the obstacle environment surrounding the heliport;
  - the performance and operating limitations of helicopters intending to use the heliport; and
  - the local meteorological conditions including the prevailing winds.
- *A heliport may have only one take-off climb and approach surface that depart and arrive to/from the same direction.*
- *A heliport may have only one direction available for take-offs and one direction for approaches (usually) opposing.*
- *A heliport may have multiple take-off and approach surfaces.*
- *Multiple take-off climb and approach surfaces are the most desirable to provide the most options for crews*

## Approach Surface – Inner/Outer Limits

Approach surface shall comprise:

- Inner edge horizontal and equal in length to the minimum specified width/diameter of the FATO plus the safety area, perpendicular to the centre line of the approach surface and located at the outer edge of the safety area;
- Two side edges originating at the ends of the inner edge diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO; and:
- An outer edge horizontal and perpendicular to the centre line of the approach surface and at a specified height of 152 m (500 ft) above the elevation of the FATO.

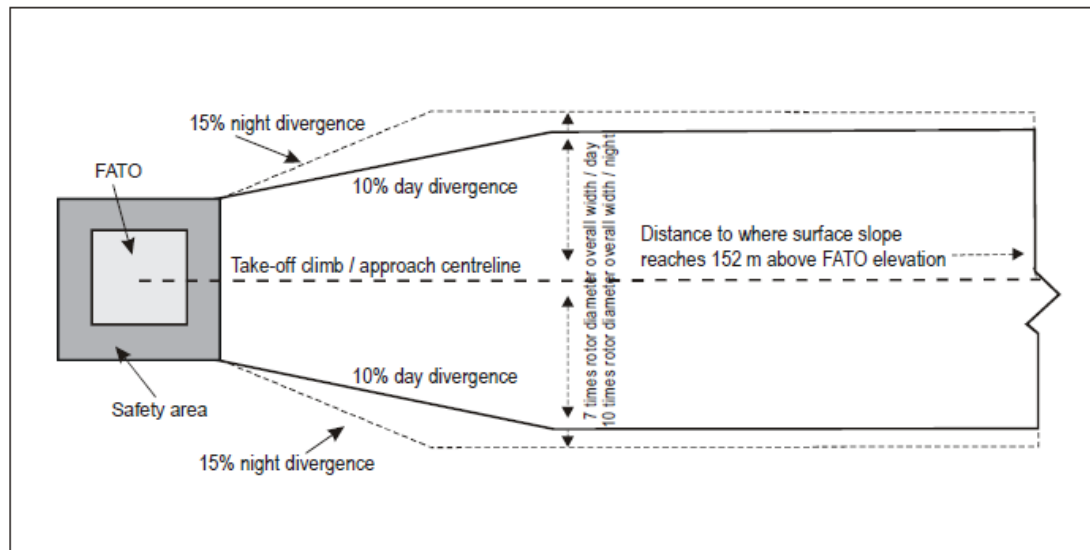


Figure 4-2. Take-off climb/Approach surface width

## Approach Surface – Slope Description

- The elevation of the inner edge shall be the elevation of the FATO at the point on the inner edge that is intersected by the centre line of the approach surface.
- The slope(s) of the approach surface shall be measured in the vertical plane containing the centre line of the surface.
- *The slope of the approach surface originates at the outer edge of the safety area.*

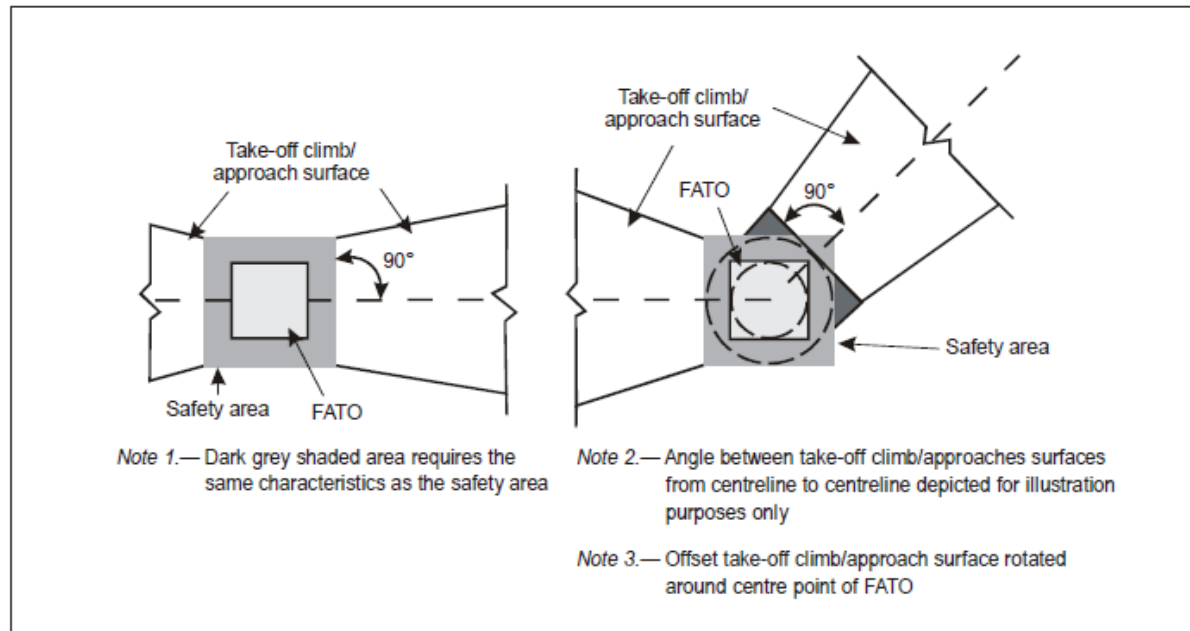


Figure 4-1. Obstacle limitation surfaces — Take-off climb and approach surface



## Take-off Climb Surface – Inner/Outer Limits

All of the surfaces aligned with the take-off pathway have the same descriptions, limits, characteristics, slopes as the approach surfaces. All elements were aligned with the major amendment in 2011.

Only additional standard applicable to the take-off climb surface.

- Where a clearway is provided the elevation of the inner edge of the take-off climb surface shall be located at the outer edge of the clearway at the highest point on the ground based on the centre line of the clearway.

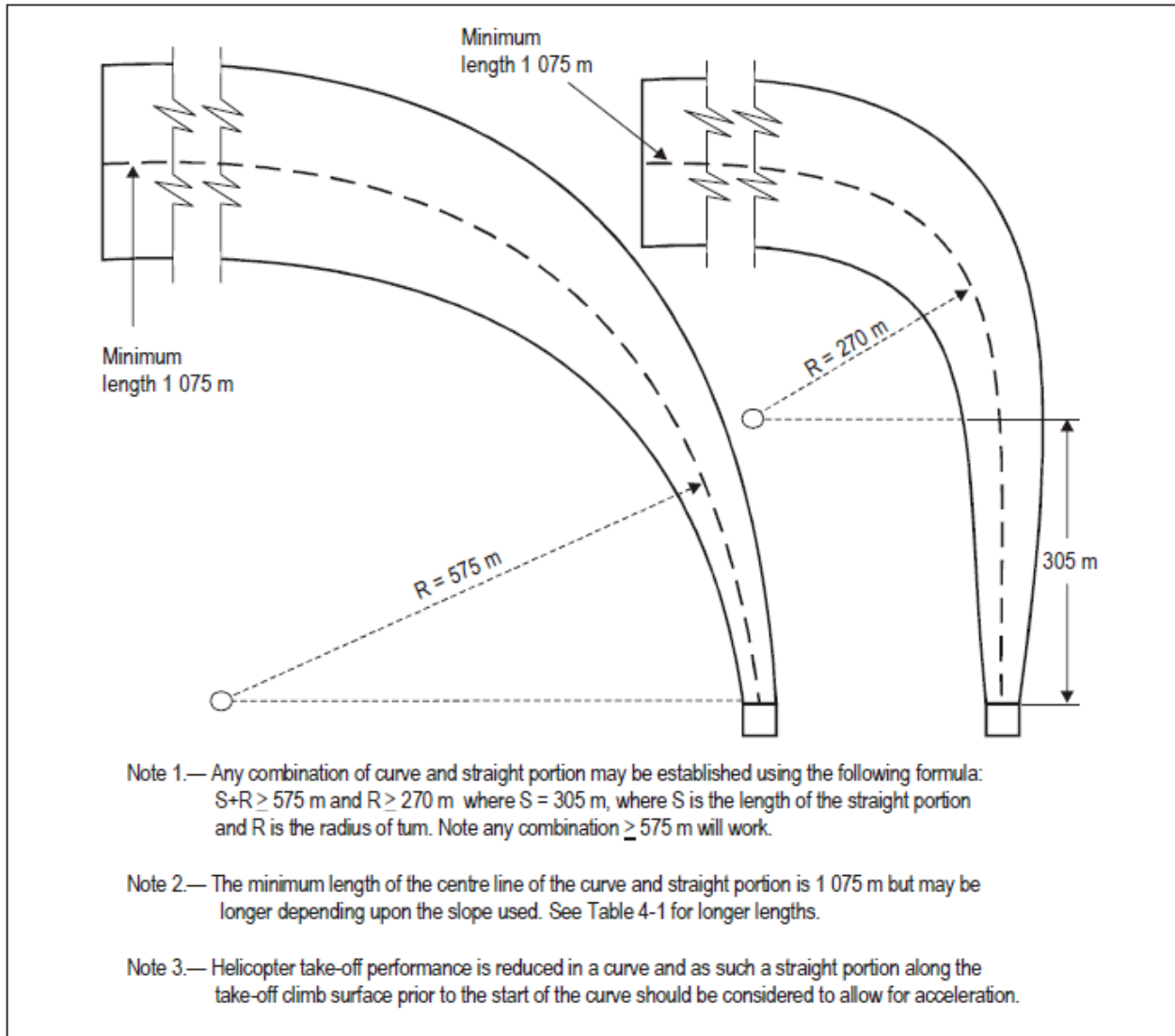
*The following Note appears for both approach and take-off climb surface characteristics.*

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



## Approach & Take-off Climb Surface – Curve Description

- Approach & take-off climb surfaces involving a turn, the surface shall be a complex surface containing the horizontal normals to its centre line and the slope of the centre line shall be the same as that for a straight approach surface.
- Approach & take-off climb surfaces involving a turn, the surface shall not contain more than one curved portion.
- Where a curved portion of an approach & take-off climb surface is provided, the sum of the radius of arc defining the centre line of the approach & take-off climb surface and the length of the straight portion originating at the inner edge shall not be less than 575 m.
- Any variation in the direction of the centre line of an approach & take-off climb surface shall be designed so as not to necessitate a turn radius less than 270 m
- *It is a good practice to have a straight portion immediately originating from the outer edge of the safety area. This allows for a stabilized final portion of the approach or initial take-off.*



**Figure 4-5. Curved approach and take-off climb surface for all FATOs**





## Transitional Surface (when required)

*For a FATO at a heliport without a PinS approach incorporating a visual segment surface (VSS) there is no requirement to provide transitional surfaces.*

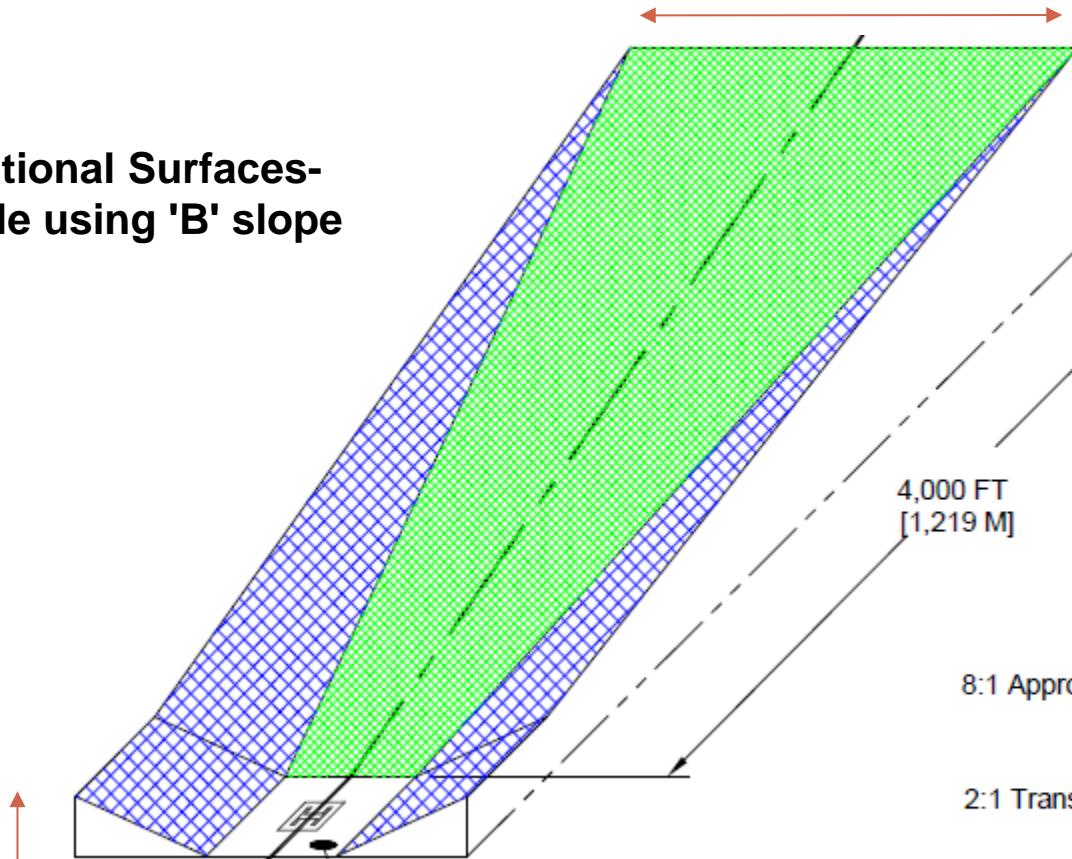
A complex surface along the side of the safety area and part of the side of the approach/take-off climb surface, that slopes upwards and outwards to a predetermined height of 45 m (150 ft).

- Lower edge beginning at a point on the side of the approach/take-off climb surface at a specified height above the lower edge extending down the side of the approach/take-off climb surface to the inner edge of the approach/take-off climb surface and from there along the length of the side of the safety area parallel to the centre line of the FATO;
- Upper edge located at a specified height above the lower edge as set out in Table 4-1.
- Elevation of a point on the lower edge shall be:
  - along the side of the approach/take-off climb surface — equal to the elevation of the approach/take-off climb surface at that point;
  - along the safety area — equal to the elevation of the inner edge of the approach/take-off climb surface.

**What does this really mean and why is it so important??**

# Transitional Surfaces- Example using 'B' slope

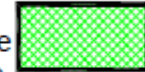
7 RD overall width for Day Ops  
10 RD overall width for night Ops



4,000 FT  
[1,219 M]

### LEGEND

8:1 Approach/Departure  
Surface



2:1 Transitional Surface



45 m out from safety area  
& 45 m in height

Italian F1 G.P. Location intentionally designed with one specific approach pathway and a different take-off climb pathway to help facilitate traffic flow.



Como Hospital has multiple approach and take-off surfaces to accommodate most wind conditions.

## Option 'Raised' Incline Plane for PC1 Operations

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

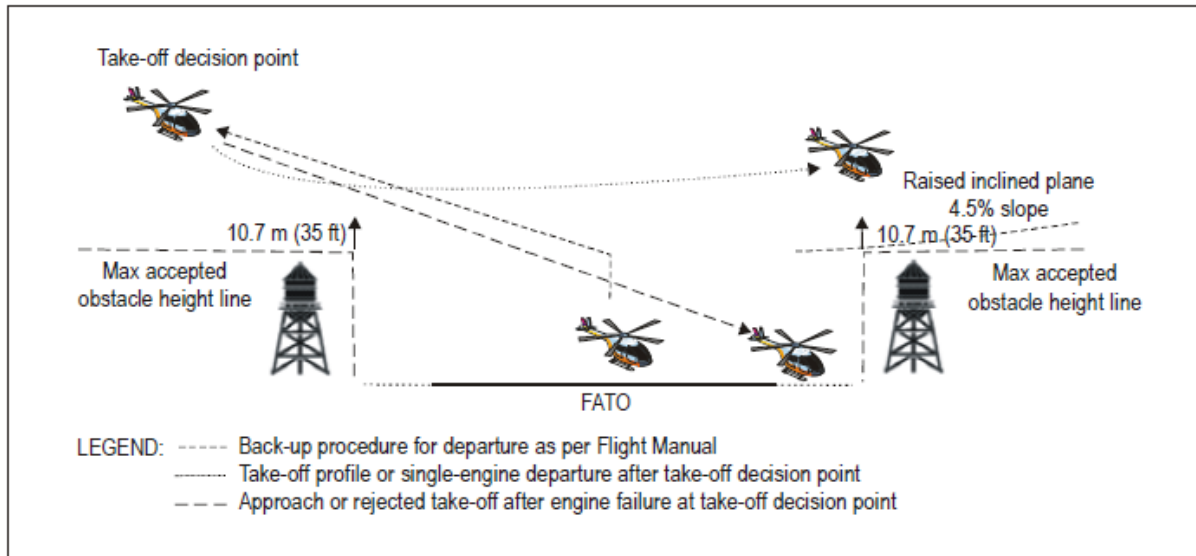


Figure 4-4. Example of raised inclined plane during operations in Performance Class 1

*Note 2.— The approach/landing profile may not be the reverse of the take-off profile.*

*Note 3.— Additional obstacle assessment might be required in the area that a back-up procedure is intended. Helicopter performance and the Helicopter Flight Manual limitations will determine the extent of the assessment required.*

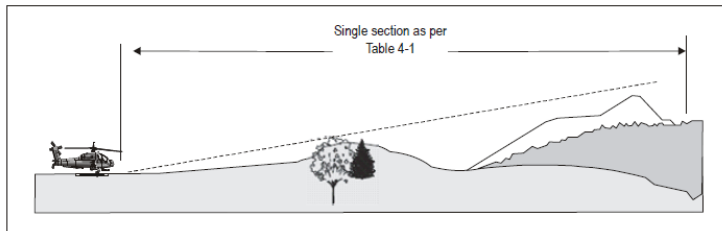
*Note 1.— This example diagram does not represent any specific profile, technique or helicopter type and is intended to show a generic example. An approach profile and a back-up procedure for departure profile are depicted. Specific manufacturers operations in performance class 1 may be represented differently in the specific Helicopter Flight Manual. Annex 6, Part 3, Attachment A provides back-up procedures that may be useful for operations in performance class 1.*

## Raised Inclined Plane for PC1 Operations developed to deal with Queen's Helicopter.

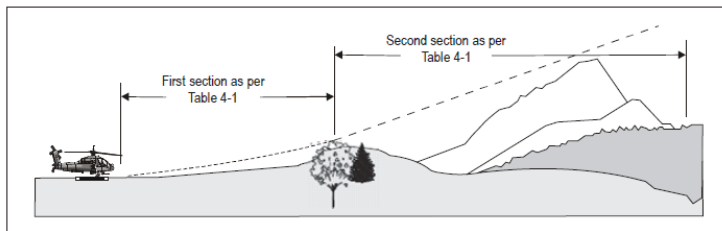


## Slope Design Categories

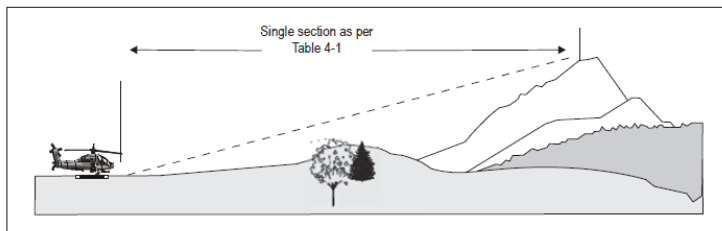
The slopes of the obstacle limitation surfaces shall not be greater than, and their other dimensions not less than, those specified in Table 4-1 and shall be located as shown in Figures 4-1, 4-2 and 4-6.



a) Approach and take-off climb surfaces - "A" slope profile - 4.5% design



b) Approach and take-off climb surfaces - "B" slope profile - 8% and 16% design



c) Approach and take-off climb surfaces - "C" slope profile - 12.5% design

Figure 4-6. Approach and take-off climb surfaces with different slope design categories

*The slope design categories in Table 4-1 may not be restricted to a specific performance class of operation and may be applicable to more than one performance class of operation. The slope design categories depicted in Table 4-1 represent minimum design slope angles and not operational slopes.*

*Slope category "A" generally corresponds with helicopters operated in performance class 1; slope category "B" generally corresponds with helicopters operated in performance class 3; and slope category "C" generally corresponds with helicopters operated in performance class 2.*

*Consultation with helicopter operators will help to determine the appropriate slope category to apply according to the heliport environment and the most critical helicopter type for which the heliport is intended.*

**Table 4-1. Dimensions and slopes of obstacle limitation surfaces for all visual FATOs**

SURFACE and DIMENSIONS	SLOPE DESIGN CATEGORIES		
	A	B	C
<b>APPROACH and TAKE-OFF CLIMB SURFACE:</b>			
Length of inner edge	Width of safety area	Width of safety area	Width of safety area
Location of inner edge	Safety area boundary (Clearway boundary if provided)	Safety area boundary	Safety area boundary
<b>Divergence: (1st and 2nd section)</b>			
Day use only	10%	10%	10%
Night use	15%	15%	15%
<b>First Section:</b>			
Length	3 386 m	245 m	1 220 m
Slope	4.5% (1:22.2)	8% (1:12.5)	12.5% (1:8)
Outer Width	(b)	N/A	(b)
<b>Second Section:</b>			
Length	N/A	830 m	N/A
Slope	N/A	16% (1:6.25)	N/A
Outer Width	N/A	(b)	N/A
Total Length from inner edge (a)	3 386 m	1 075 m	1 220 m
<b>Transitional Surface: (FATOs with a PinS approach procedure with a VSS)</b>			
Slope	50% (1:2)	50% (1:2)	50% (1:2)
Height	45 m	45 m	45 m

- (a) The approach and take-off climb surface lengths of 3386 m, 1075 m and 1220 m associated with the respective slopes, brings the helicopter to 152 m (500 ft) above FATO elevation.
- (b) Seven rotor diameters overall width for day operations or 10 rotor diameters overall width for night operations.



## Final Comments about the Obstacle Limitation Requirements

*If a visual approach slope indicator (VASI) is installed, there are additional obstacle protection surfaces, detailed in Chapter 5, that need to be considered and may be more demanding than the obstacle limitation surfaces prescribed in Table 4-1.*

For heliports that have an approach/take-off climb surface with a 4.5 per cent slope design, objects shall be permitted to penetrate the obstacle limitation surface, if the results of an aeronautical study approved by an appropriate authority have reviewed the associated risks and mitigation measures.

- *The identified objects may limit the heliport operation.*
- *Annex 6, Part 3, provides procedures that may be useful in determining the extent of obstacle penetration.*

New objects or extensions of existing objects shall not be permitted above any of the surfaces in 4.2.1 and 4.2.2 except when shielded by an existing immovable object or after an aeronautical study approved by an appropriate authority determines that the object will not adversely affect the safety or significantly affect the regularity of operations of helicopters.

*Existing objects above any of the surfaces in 4.2.1 and 4.2.2 should, as far as practicable, be removed except when the object is shielded by an existing immovable object or after an aeronautical study approved by an appropriate authority determines that the object will not adversely affect the safety or significantly affect the regularity of operations of helicopters.*

*The application of curved approach or take-off climb surfaces as specified in 4.1.5 or 4.1.18 may alleviate the problems created by objects infringing these surfaces.*



# Questions?



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