



## Annex 14, Volume II - Chapter 3 – Physical Characteristics

- **Surface-level Heliports**

- Final approach and take-off area (FATO)
- Touchdown and lift-off area (TLOF)
- Safety Area
- Ground & Air Taxiways & taxi-routes, clearways, aprons and stands (parking)

- **Elevated Heliports**

- FATO
- TLOF
- Safety Area
- Taxiways & taxi routes



## Chapter 3 – Physical Characteristics

*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 Chapter 4, do not overlap.*

### **This chapter for the most part has:**

- A description or general statement – "the why"
  - - usually in the form of a *standard* or *recommendation*;
- This might also state an *Application (applicability)* – "when";
- *The Location* – "where"; and
- *Characteristics* – the specific technical details – "how".

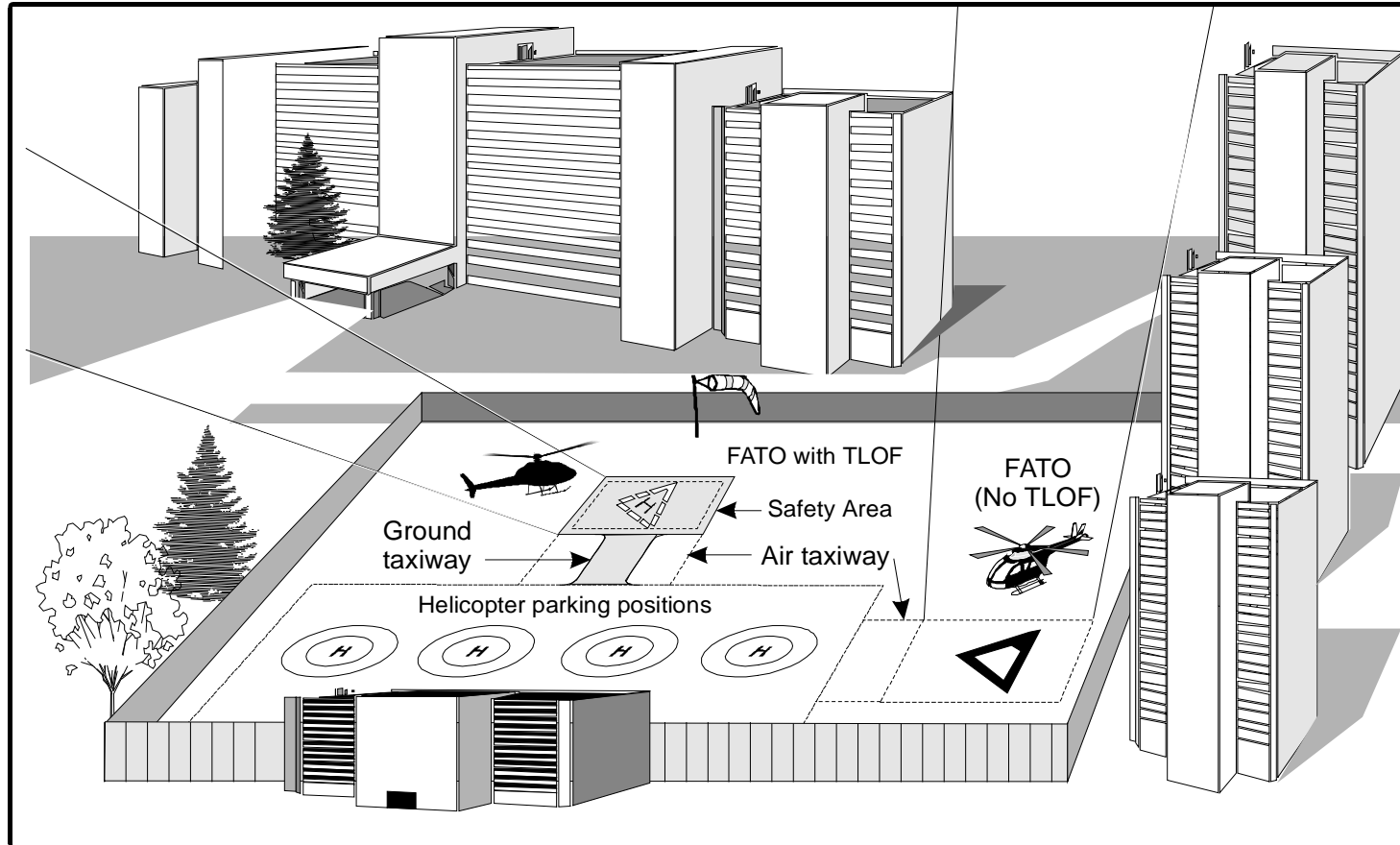


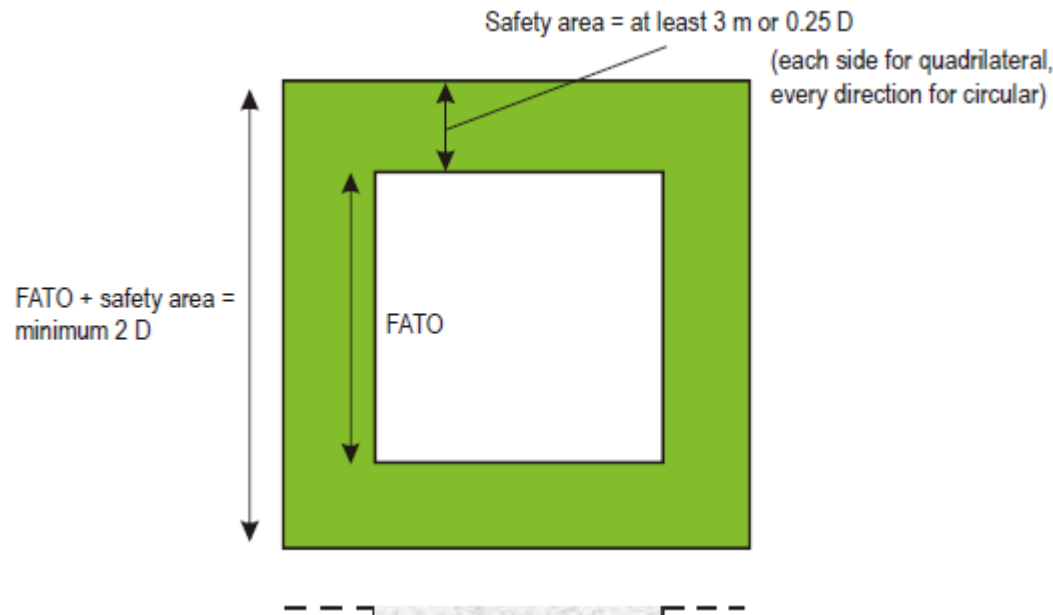
Figure 3-1. Illustration of a heliport general layout

## Final Approach and Take-off Area (FATO) at a Surface Level Heliport

A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by helicopters operated in performance class 1, the defined area includes the rejected take-off area available. Intended for containment of the helicopter during normal operations.

A surface-level heliport shall be provided with at least one final approach and take-off area (FATO).

- This is the point of the heliport used for initial acquisition and approach
- A FATO may have an aiming point or
- The FATO may have a TLOF or
- The FATO may include a rejected take-off area for PC1 operations





- **Shall be obstacle Free**
- **For PC1 – as per HFM (RFM) or at least 1D**
- **For PC2 & PC3**
  - **More than 3175 kg (7000 lbs) at least 1D**
  - **3175 kg or less at least .83D – *Recommendation - 1D***

*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 1 D.*

### **Further FATO Characteristics**

- **Rapid drainage – mean slope- 3%**
- **Local slope 5% - PC1, 7% - PC2 or PC3**
- **Sufficient strength for rejected take-off for PC1**
- **Static load-bearing for PC2 & 3**
- ***Should provide ground effect***
- ***Should be located to minimize influence of turbulence***

## ***AW (AB) 139 at a surface level heliport***





## ***Text from AW-139 RFM (HFM) – Supplement for Cat A operations***

### **Take-Off**

The Category A procedures are constructed to allow different Take-off sites to be used.

For a Ground Level or Elevated Heliport/Helideck, without obstacles in the take off flight path, the Vertical procedure with TDP fixed at 35ft can be used.

If, however, there are obstacles in the take off flight path, then the Vertical procedure with an Extended TDP (TDPE) can possibly be used up to a TDP height of 70ft ATS to obtain the required clearance over the obstacle.

If the maximum TDPE is not sufficient to clear the obstacle then the Heliport Back Up technique could possibly be used as this has a higher maximum TDPE of 400ft ATS.

### **HELIPORT / HELIDECK SIZE**

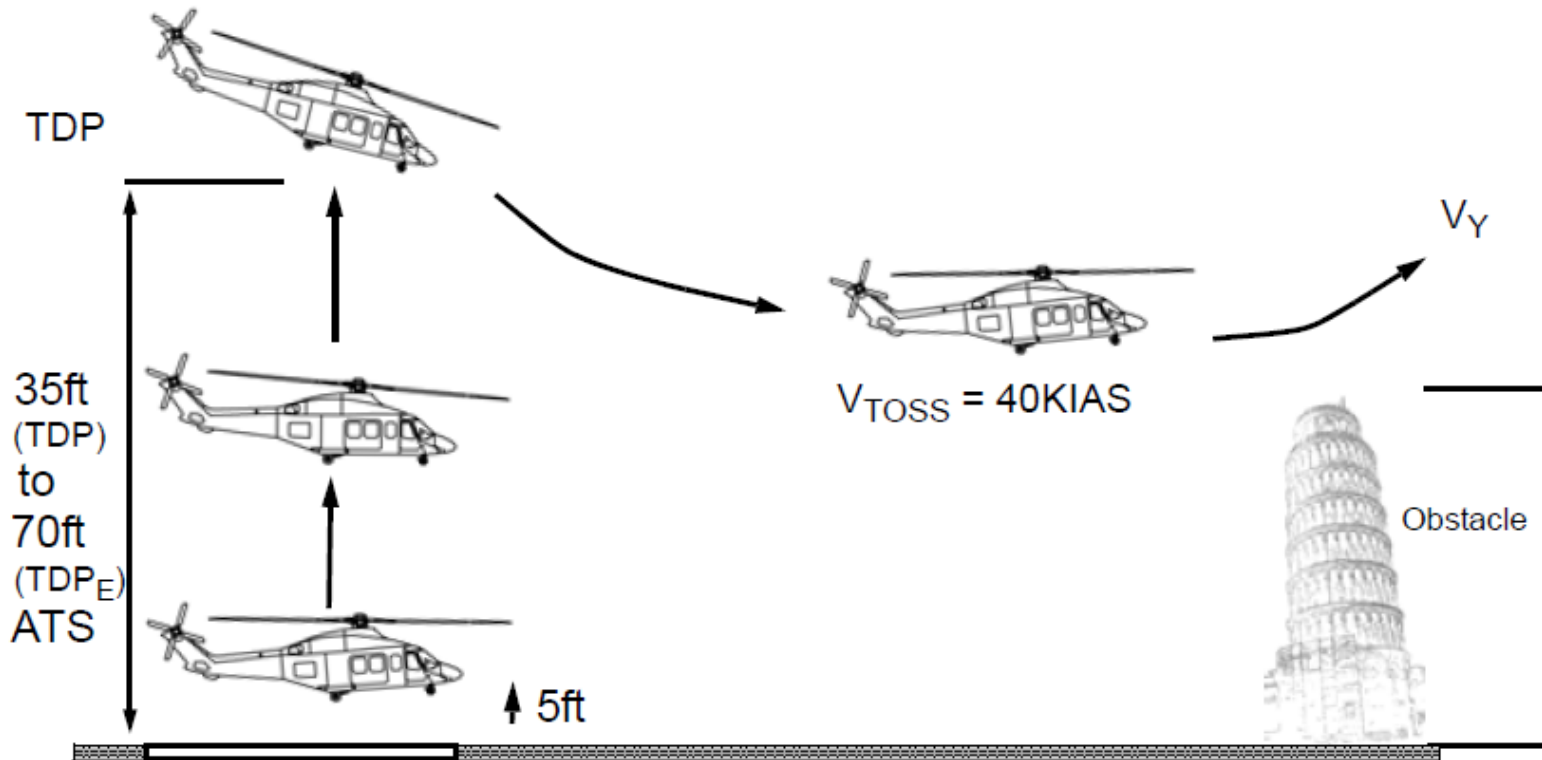
Minimum demonstrated heliport/helideck size ..... 15m x15m (50ftx50ft)

### **TAKE-OFF DECISION POINT HEIGHT (TDP)**

TDP ..... 35ft ATS

TDP<sub>E</sub>..... 35ft to 70ft ATS

# VERTICAL TAKE-OFF PROCEDURE FOR GROUND LEVEL, ELEVATED HELIPORT/HELIDECK



**Figure 2A-1 Take-Off Profile Ground Level, Elevated Heliport/ Helideck**



## S76 A – Rooftop Heliport





## ***Text from S76 C+ RFM (HFM) – Supplement # 8 & 9 for Cat "A" operations***

Operations using TDP heights of 71 to 110 feet are limited to ground level heliports measuring 100 X 100 feet and larger. Operations using TDP heights of 70 feet and lower are limited to heliports measuring 70 X 70 feet and larger.

### **Additional conditions for Cat A operations:**

- Pilot training
- 2 Pilot Min Crew
- Radar Altimeter- Ascending or TDP tone
- AFCS (stabilization)
- Night ops – sufficient perimeter lighting
- High visibility door window

*Special Note: This Cat "A" supplement is for the S76 C+ or C++.  
The S76 A is NOT certified for Cat "A" operations*

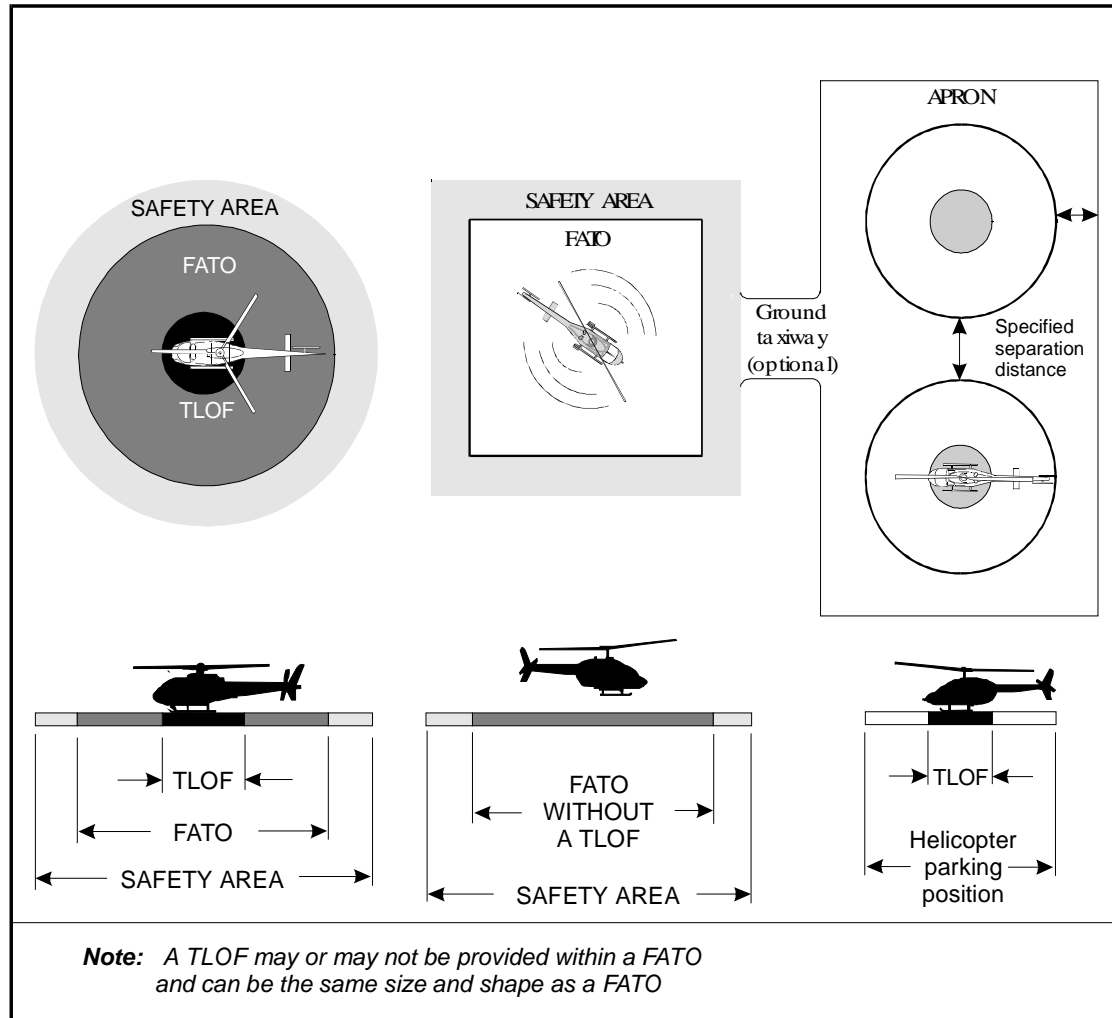


Figure 3-5. Surface level heliport operational areas



## Helicopter (Heliport) Clearways

*A helicopter clearway would need to be considered when the heliport is intended to be used by helicopters operating in performance class 1.*

Clearways are only required when identified in the RFM. Very few helicopter manufacturers require a clearway. The clearway can be over ground or water, is not load supporting and is normally used for acceleration.

- When a helicopter clearway is provided, it shall be located beyond the end of the FATO.
- *The width of a helicopter clearway should not be less than that of the associated safety area.*
- *The ground in a helicopter clearway should not project above a plane having an upward slope of 3 per cent, 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 clearway, which may endanger helicopters in the air, should be regarded as an obstacle and should be removed.*

## Touch-down and Lift-off Area (TLOF) at a Surface Level Helipoint

A defined area intended for touchdown and containment of the undercarriage.

At least one TLOF shall be provided at a heliport.

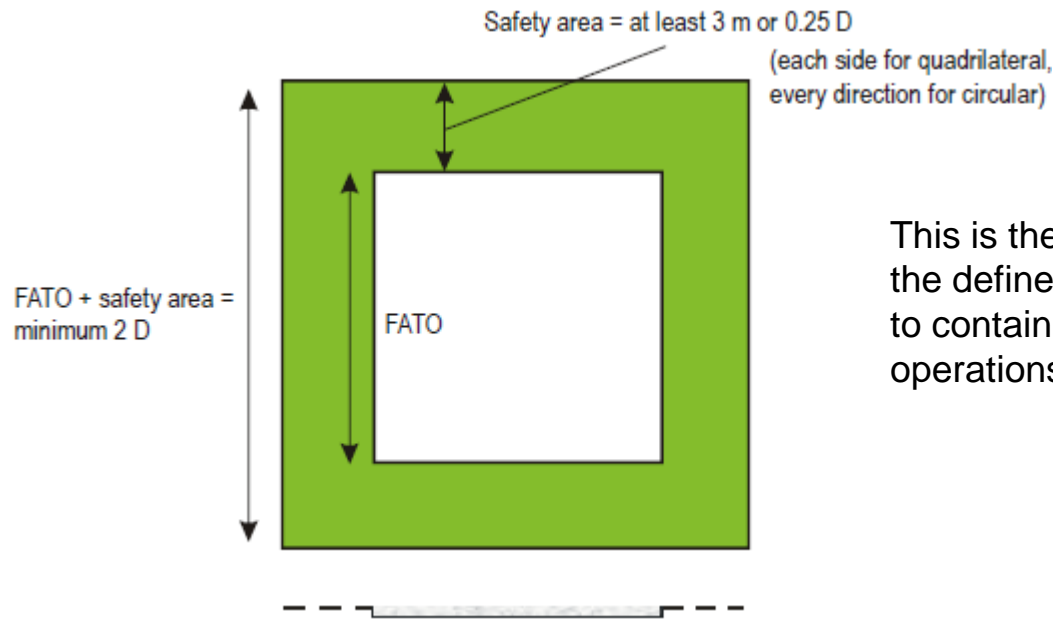
One TLOF shall be located within the FATO or one or more TLOFs shall be collocated with helicopter stands.

For runway-type FATOs, additional TLOFs located in the FATO are acceptable.



- Circular size of .83D
- 2% max slope in any direction
- Dynamic load-bearing when within FATO
- Static load-bearing for stands

## Safety Area (SA) for a Surface Level Heliport



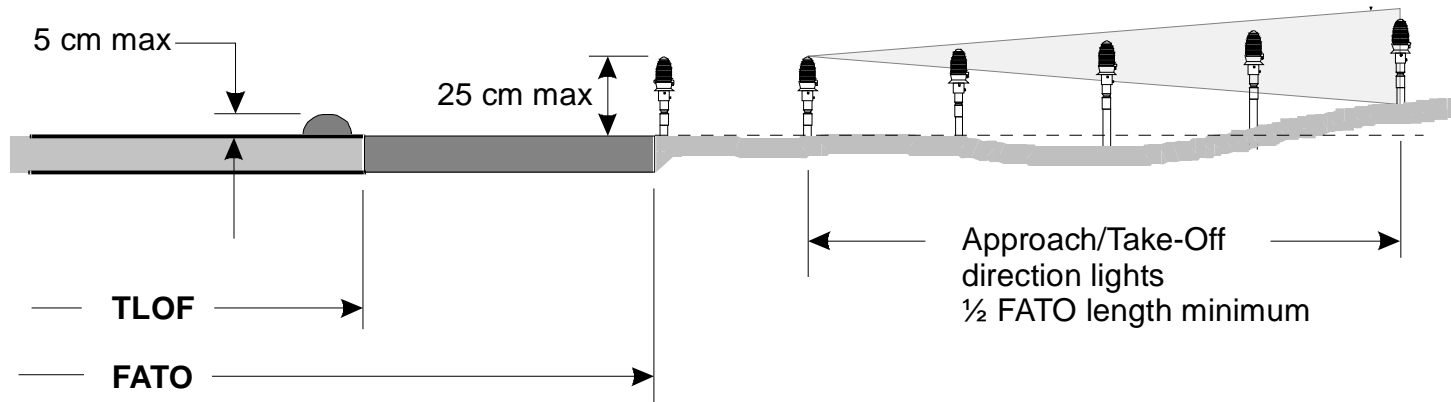
This is the single most important area around the defined area of the FATO and is intended to contain the helicopter during abnormal operations.

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

- At least 3 m or 0.25 D (added to all sides) in all cases never less than 2 D if square or circular
- If SA is solid maximum upward slope of 4%, surface treated to prevent flying debris
- No objects allowed in SA except for frangible and required because of function (lights, navy aids)
- Max height 5 cm when within 0.75 D from center of FATO
- Outside of 0.75 D from center of FATO height of 25 cm on upward plan of max 5% gradient
- Protected side slope at 45 deg from outer edge of SA out to 10 m on at least one side
- If only one approach & take-off climb surface state should undertake an aeronautical study

## Height of Obstacles within TLOF – FATO & SA

Maximum slope from the first approach/take-off direction light  $\pm 5\%$



## Example of Safety Area sloping away from FATO





## Ground Taxiways and taxi-routes

A ground taxiway is intended for the ground movement of wheeled undercarriage helicopters.

- The width of ground taxiway not less than 1.5 times the width of the undercarriage (UCW)
- The longitudinal slope not to exceed 3 per cent
- Static load-bearing
- Centered on ground taxi-route symmetrically
- 0.75 times width of helicopter (0.75 RD)
- No fixed objects on taxi-route, except frangible (lights, signs)
- No objects within 50 cm of taxiway edge
- Objects beyond up to 25 cm plane rising at 5%
- Provide rapid drainage, transverse slope max 2%

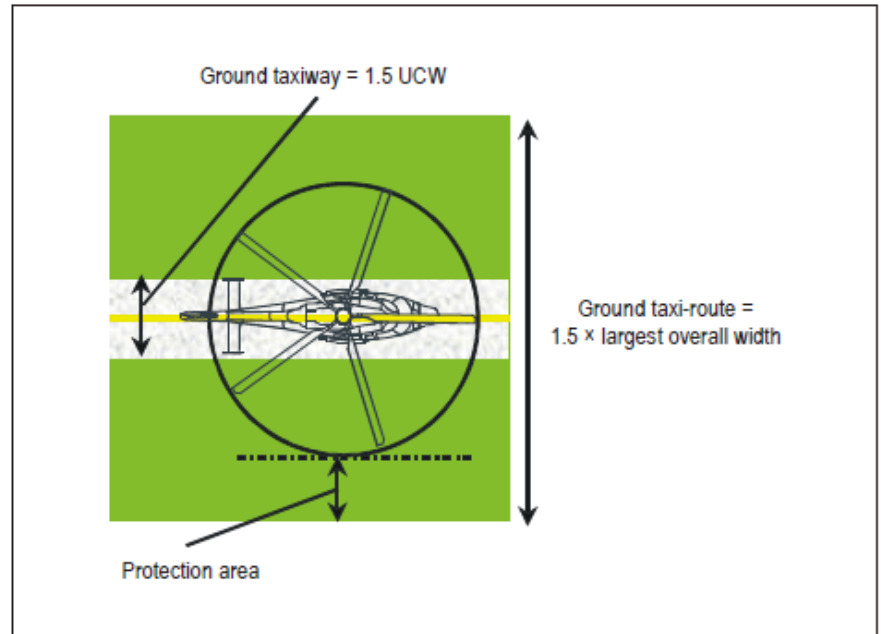


Figure 3-2. Helicopter ground taxi-route/taxiway

## Helicopter Ground Taxiway



## Air Taxiways and air taxi-routes

An air taxiway is intended for the movement of helicopters above the surface normally associated with ground effect at ground speeds less than 37 km/h (20 kt).

- The width of air taxiway not less than 2 times the width of the undercarriage (UCW)
- *The longitudinal slope should not to exceed 7 per cent*
- *Should be static load-bearing*
- Centered on air taxi-route symmetrically  
1 times width of helicopter (1 RD)
- No fixed objects on air taxi-route, except frangible (lights, signs)
- *No objects should be inside of protection area (PA)*
- *Objects in PA up to 25 cm plane rising at 5%*
- *Transverse slope should not exceed 10%*

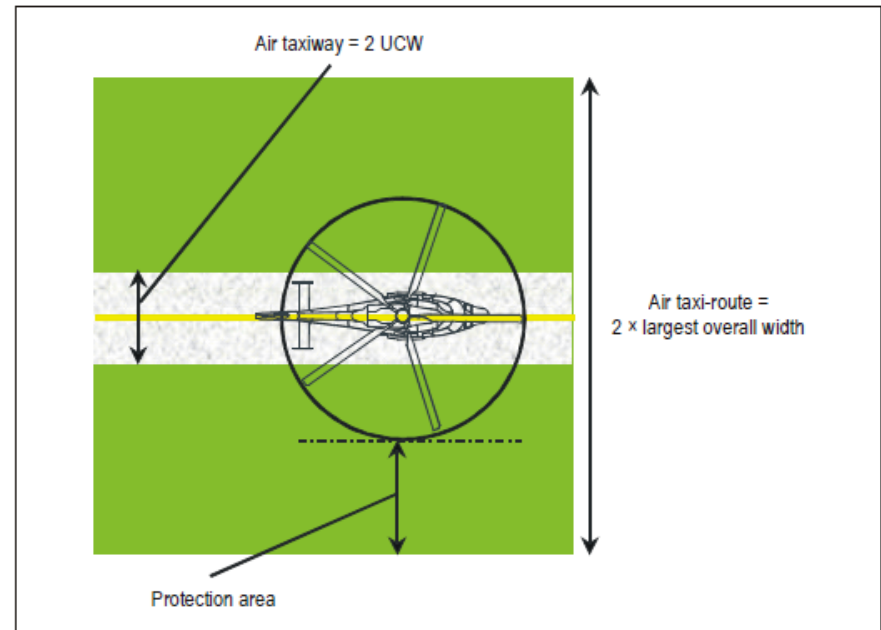


Figure 3-3. Helicopter air taxi-route/taxiway

## Helicopter Stands (Parking Pads)

Helicopter stand is intended for containment of the helicopter turning in the hover or on the ground, within the center of the stand.

Shall have a Circle of diameter at least  $1.2 D$  when used by helicopters turning in hover.

- Rapid drainage, max slope 2%
- Taxi-through only min width of taxi-route
- Protection area  $0.4 D$  added to all sides
- Stand & PA at least  $2 D$  for turning heli (same as FATO + SA)
- No overlap of PA for simultaneous Ops
- Provide ground effect
- No fixed objects on helicopter stand
- Objects in PA inside  $0.75 D$  from center max height 5 cm
- Objects outside  $0.75 D$  up to 25 cm plane rising at 5%
- Central zone of stand static load-bearing
- Central zone diameter  $0.83 D$
- Taxi-through only width – ground taxiway

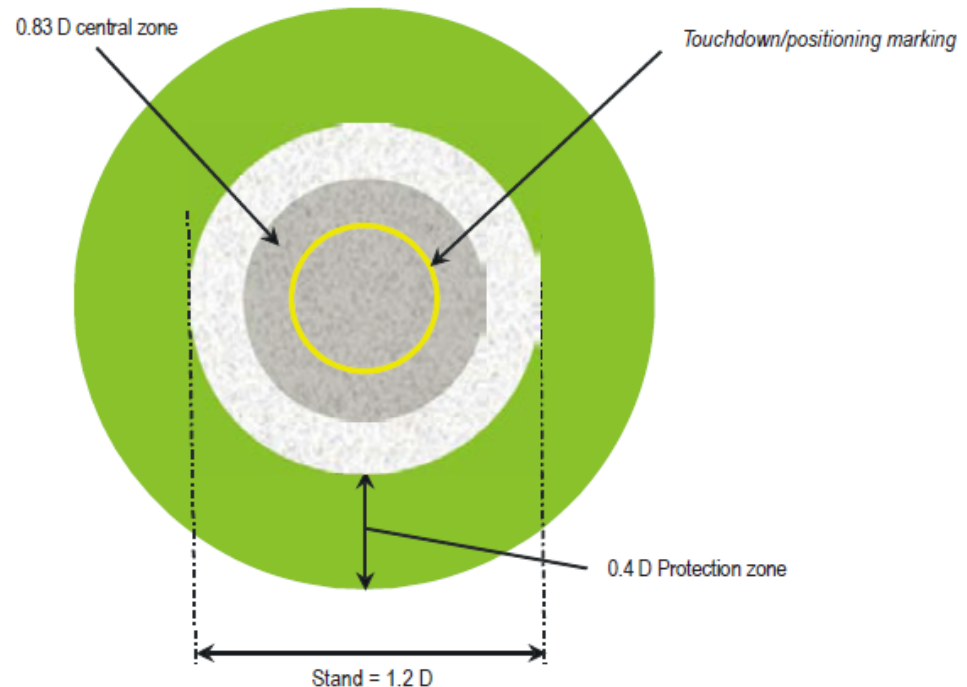
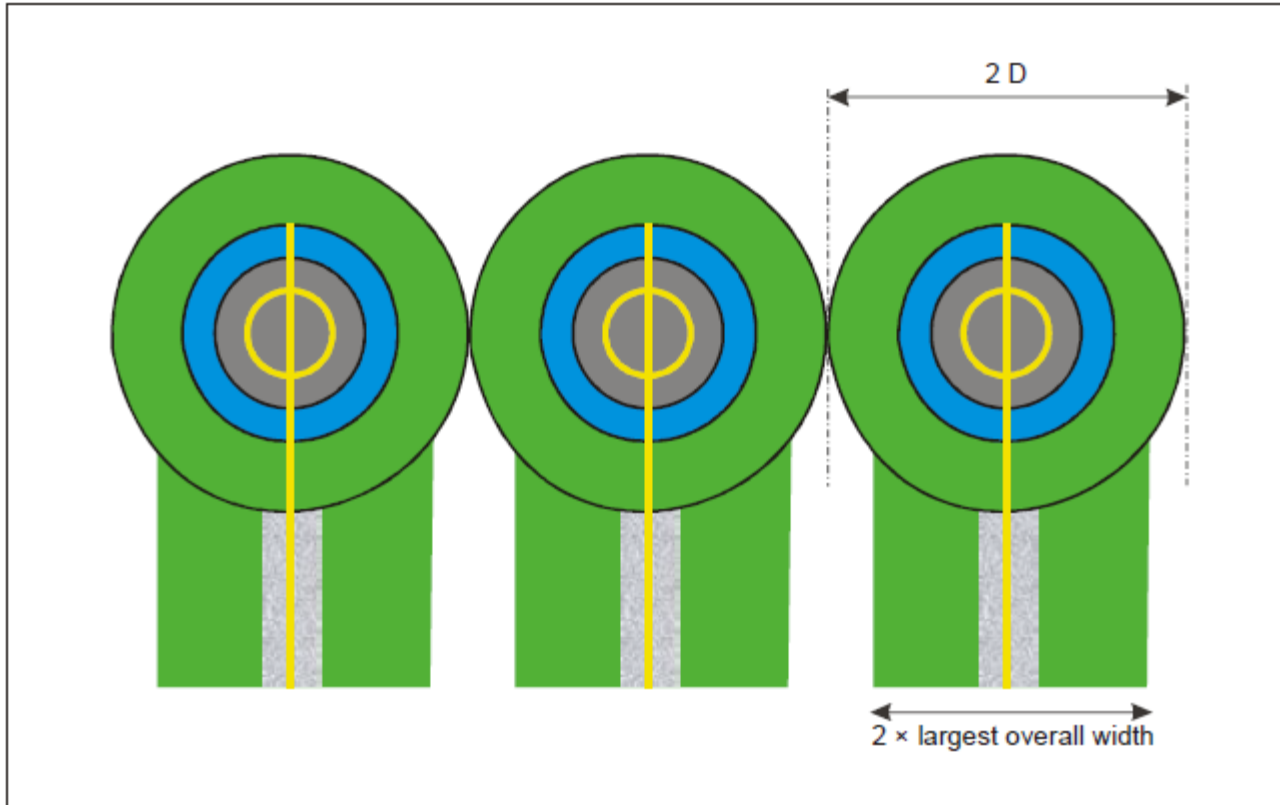
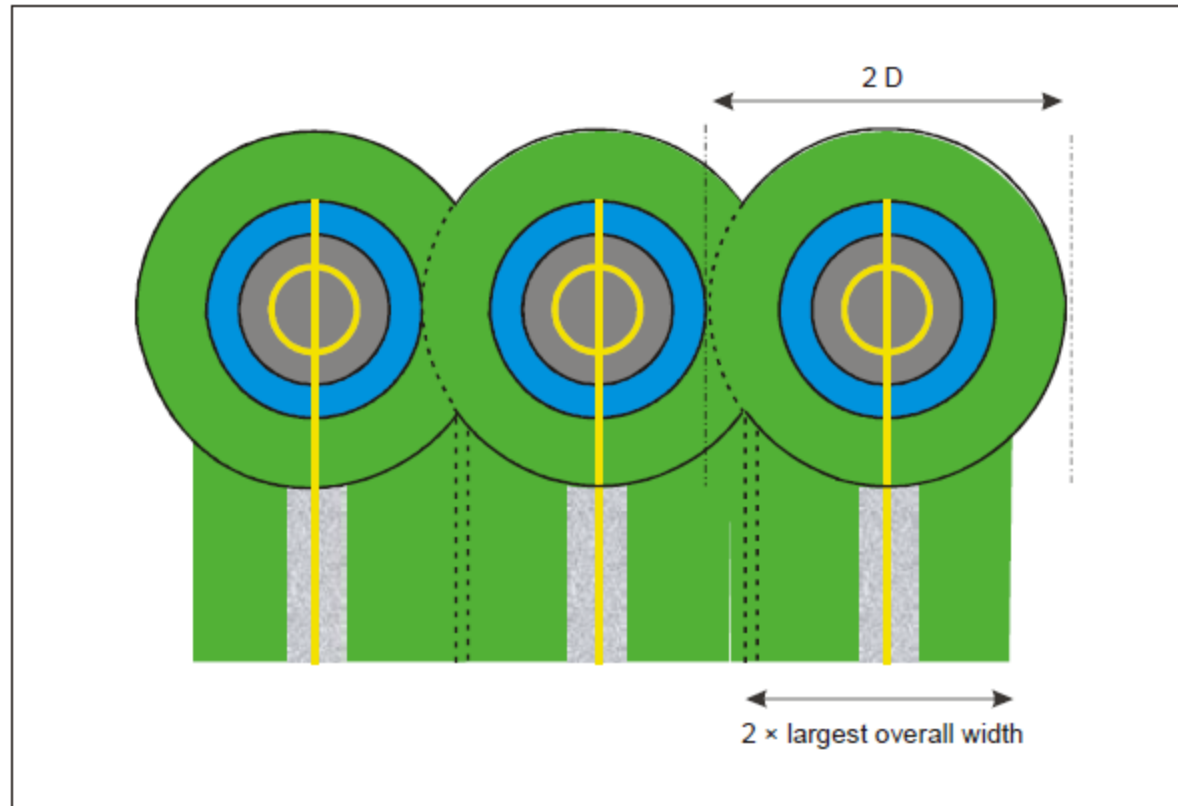


Figure 3-4. Helicopter stand and associated protection area



**Figure 3-5. Helicopter stands designed for hover turns with air taxi-routes/taxiways — simultaneous operations**



**Figure 3-6. Helicopter stands designed for hover turns with air taxi-routes/taxiways — non-simultaneous operations**

## Example of Ground Taxiways, Simultaneous and non-Simultaneous operations at Helicopter Stands and Apron Areas Den Helder Airport – North Holland



## Italian F1 G.P. 2015 - Helicopter Stands + 2 X FATO







## Final Approach and Take-off Area (FATO) for an Elevated or Rooftop Heliport

A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced.

**Elevated heliport.** A heliport located on a raised structure on land. This can be raised above the ground, usually at least 75 cm or more, or it can be on a rooftop of a building or parking structure.

*Note.* – On elevated heliports it is presumed that the FATO and TLOF will be coincidental.

An elevated heliport shall be provided with at least one final approach and take-off area (FATO).

- Design consideration for additional loading of personnel, snow, freight, refueling, fire fighting, etc.
- Shall be obstacle Free
- Dynamic load-bearing
- For PC1 – as per HFM (RFM) or at least 1D
- For PC2 & PC3
  - More than 3175 kg (7000 lbs) at least 1D
  - 3175 kg or less at least .83D – *Recommendation - 1D*
- Surface slope not to exceed 2%, free of irregularities

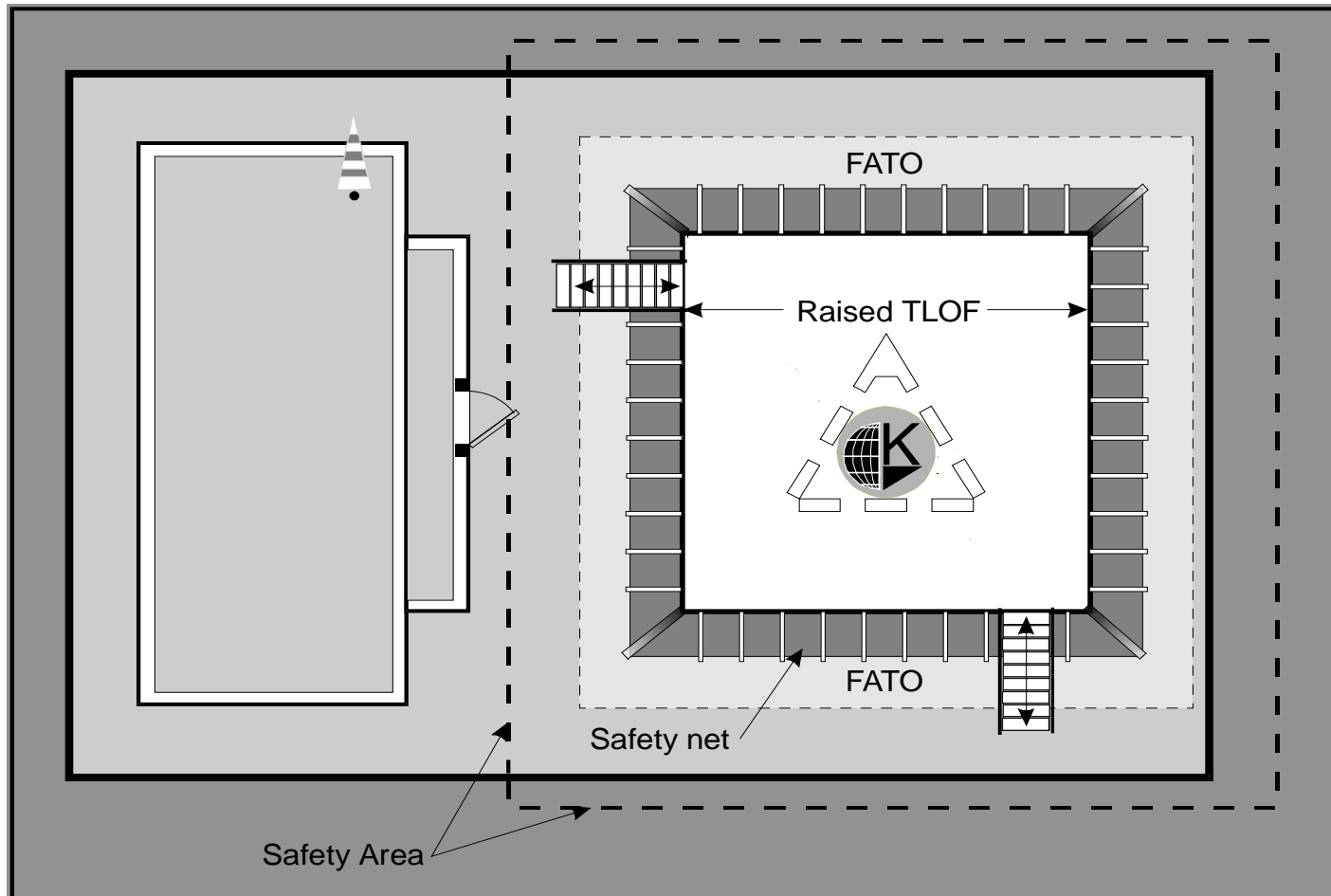


Figure 3-7. Elevated / Rooftop Heliport



## Mater Hospital- Brisbane



# Mater Hospital- Brisbane



## Touch-down and Lift-off Area (TLOF) for an Elevated or Rooftop Heliport

One TLOF shall be coincidental with the FATO. The dimensions and the characteristics of the TLOF shall be the same as those of the FATO.

- Shall be dynamic load-bearing
- Shall not exceed 2% slope in any direction
- When collocated with stand shall be 0.83 D in diameter or larger
- When collocated with stand used for ground taxi shall be static load-bearing
- When collocated with stand used for air taxi shall be dynamic load-bearing





## Safety Area (SA) For Elevated or Rooftop Heliports

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

- For PC1 VMC operations
  - At least 3 m or 0.25 D (added to all sides) in all cases never less than 2 D if square or circular
- For PC2 or 3 VMC operations
  - At least 3 m or 0.5 D (added to all sides) in all cases never less than 2 D if square or circular
- If SA is solid maximum upward slope of 4%, surface treated to prevent flying debris
- No objects allowed in SA except for frangible and required because of function (lights, navy aids)
- Max height 25 cm when located alone outer edge of FATO (Note this is different than surface level)
- *In the case of a FATO of diameter less than 1 D, the maximum height of the objects whose functions require them to be located on the safety area should not exceed a height of 5 cm.*
- Outside outer edge of FATO height of 25 cm on upward plan of max 5% gradient
- Protected side slope at 45 deg from outer edge of SA out to 10 m on at least one side

## Como Hospital, Lombardy, Italy Built to current Annex 14 Volume II SARPS

Night VMC Rooftop - 25 meter diameter, 8 tons heliport.

Design helicopter- AW139. TLOF/FATO built to 1.5 D size.

Safety area is provided as in the Annex and is not solid.

The surface made of aluminum, heated with water used to heat the main building.

2 meter stainless steel safety net

The two approach paths are 160° degree apart

Two monitors remotely activated placed aside platform

Main exit presents litter elevator and stairs; emergency exit provided on opposite side.







## Ground & Air Taxiways and Taxi Routes for Elevated or Rooftop Heliports

- The width of ground taxiway not less than 2 times the width of the undercarriage (UCW)
- The longitudinal slope not to exceed 3 per cent
- Static load-bearing
- Centered on ground taxi-route symmetrically

1 times width of helicopter (1 RD)

- No fixed objects on taxi-route, except frangible (lights, signs)
- Provide rapid drainage, transverse slope max 2%

- The width of air taxiway not less than 3 times the width of the undercarriage (UCW)
- The transverse slope shall not exceed 2% and longitudinal shall not to exceed 7 per cent
- Shall be dynamic load-bearing
- Centered on air taxi-route symmetrically

## Sky Shuttle Heliport Hong Kong – Macau Ferry Terminal





## Many photos and 'Defined Area' text kindly provided by the following:

- Mr. Pierluigi Fumagalli – Studio di Progettazione e Consulenza Aeronautica
  - EHA Member of the HDWG
  
- Mr. Jim Lyons, MBE – Independent Aviation Consultant
  - RAeS Member of the HDWG
  
- Mr. Dave Brown – President – GroundEffects Aerodrome Consulting
  
- Mr. Neelesh Uppal – CEO - Aluminum Offshore

# Questions?



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