

HELIPORT DESIGN
AND
PLANNING FOR EMERGENCY
SERVICES

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Introduction

Everyone knows the importance of technological development in the world, including air transport in all regions of life and it's effective on social activity and economic, making the aircraft compete with other types of transportation by providing many services to passengers and goods as well as emergency patients.

Helicopters one of the air transportation that take place in this field.

In large cities, a heliport can serve people needing to a quickly move within the city or to outlying regions.

Generally heliports can be situated closer to a town or city centre . The advantage in flying by helicopter to a destination is that travel can be much faster than driving.

Helipads are important for air ambulance by accepting and taking care of patients from remote areas without local hospitals or facilities.

The Aim of Research:

Making a simple research to know about heliports (planning & design) with a proposal of heliports design .

Heliport definition:

A heliport is a small airport suitable only for use by helicopters. Heliports typically contain one or more helipads and may have limited facilities such as fuel, lighting, a windsock, or even hangars. In larger towns and cities, customs facilities may be available at a heliport.

The early advocates of helicopters hoped that heliports would become widespread, but they have become contentious in urban areas due to the unpleasant noise caused by helicopter traffic.

Heliports services:

Helicopter has proven to be useful in the following fields:

1. Disaster Relief :

Natural disasters often result in the breakdown of ground transport systems. Helicopters are able both to bring in response teams and supplies and to evacuate injured people during the critical period before ground transportation is restored.

2. Air Ambulance Services :

For an injured or critically ill person, time is life. Helicopters can provide high-speed, point-to-point transportation without being constrained by the limitations of the ground infrastructure.

3. Police Services :

Many municipalities consider their police services helicopters vital force multipliers in carrying out search and rescue, chase, and surveillance.

4. Moving High-Value Assets :

High-value or time-sensitive cargo because this transportation is very fast and flexible .Companies use helicopters as an invaluable part to connect the office with various job sites. Newspapers and Radio /TV stations use helicopters for onsite news gathering, taking photos, and airborne reporting of rush hour traffic conditions.

Facilities:

The most effective way for a community to realize the benefits of helicopter services is by developing or permitting the development of places where helicopters can land and take off .

While heliports can be large and elaborate, most are not. The basic elements of a heliport are clear approach / departure paths , a clear area for ground maneuvers, and a wind study .

Location:

The optimum location for a heliport is in close proximity to the desired origination and / or destination of the potential users.

Industrial, commercial, and business operations in urban locations are demand generators for helicopter services, even though they often compete for the limited ground space available. A site permitting the shared aeronautical and commercial usage at a viable alternative to non - aeronautical use alone.

Heliport sites may be adjacent to a river or a lake, a railroad, a freeway, or a highway, all of which offer the potential for multi - functional land usage. These locations also have the advantage of relatively unobstructed airspace ,which can be further protected from unwanted encroachment by properly enacted zoning.

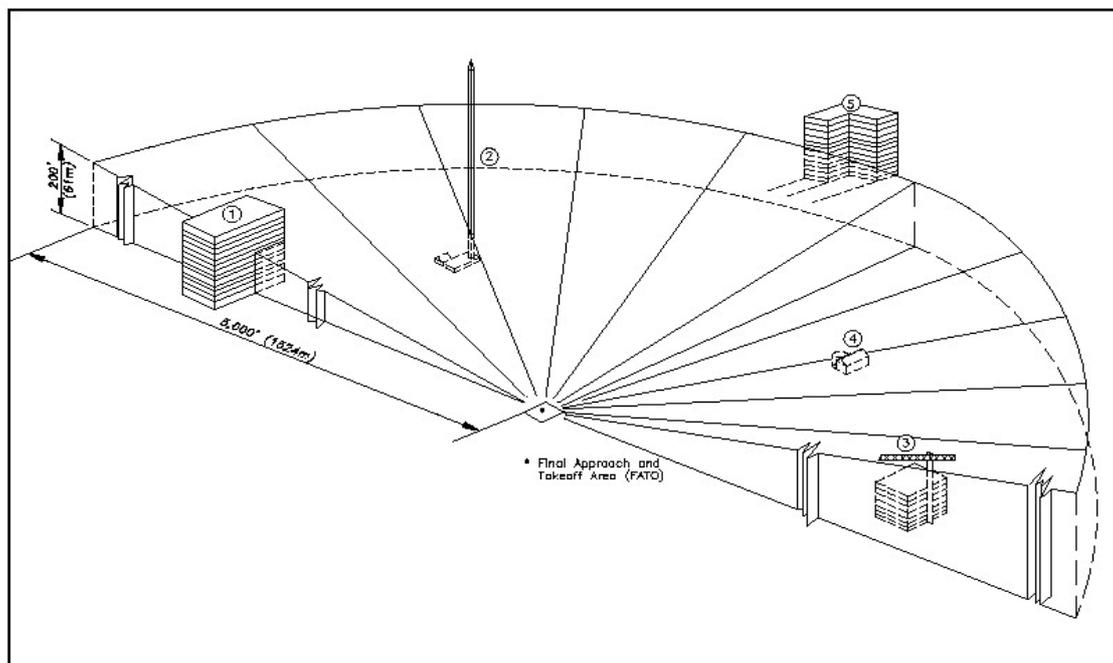


Figure (1) The ground helipad approach and takeoff (near city or town)

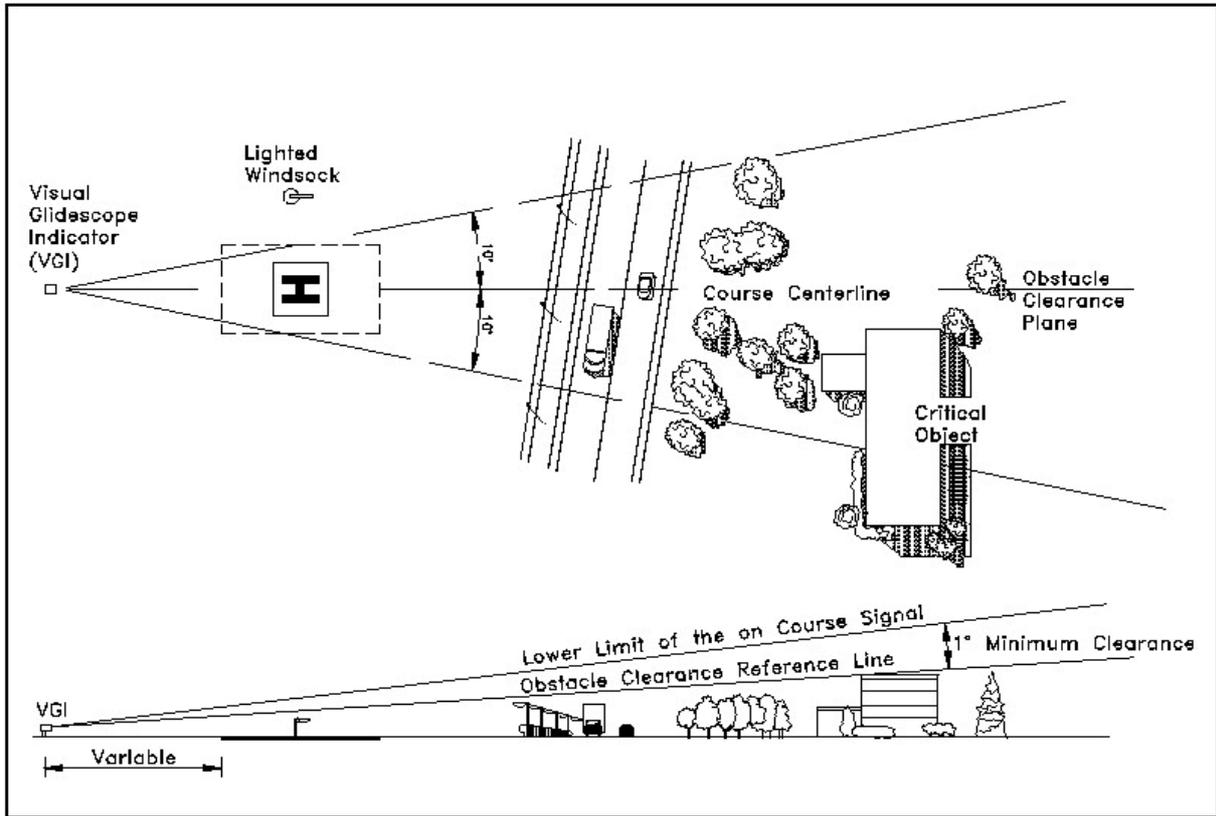


Figure (2) site and clearing criteria

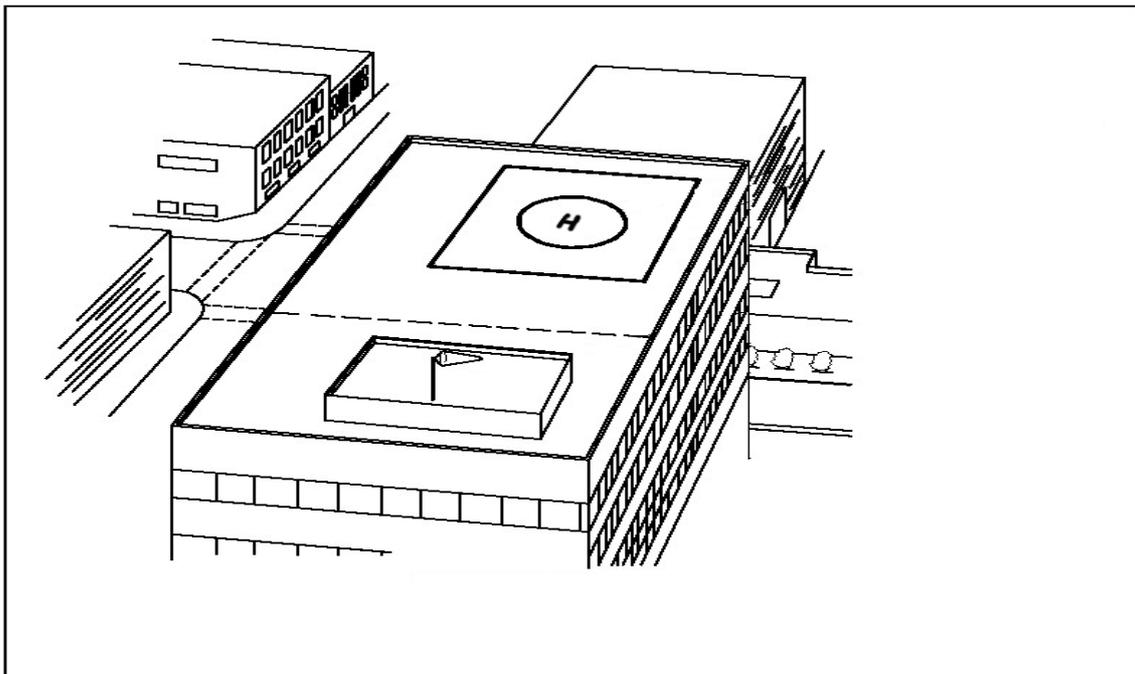


Figure (3) The drawing shows helipad above the roof of any building

Heliport Planning:

The plan of heliports is very simple but must include the following main elements:

1. Helipad : the helicopter landing area (H) letter .
2. Hangar : the maintenance building for helicopter .



Figure (4) Hangar elevation and main door



Figure (5) Simple perspective of hangar inside structure



Figure (6) Helicopter standing inside hanger

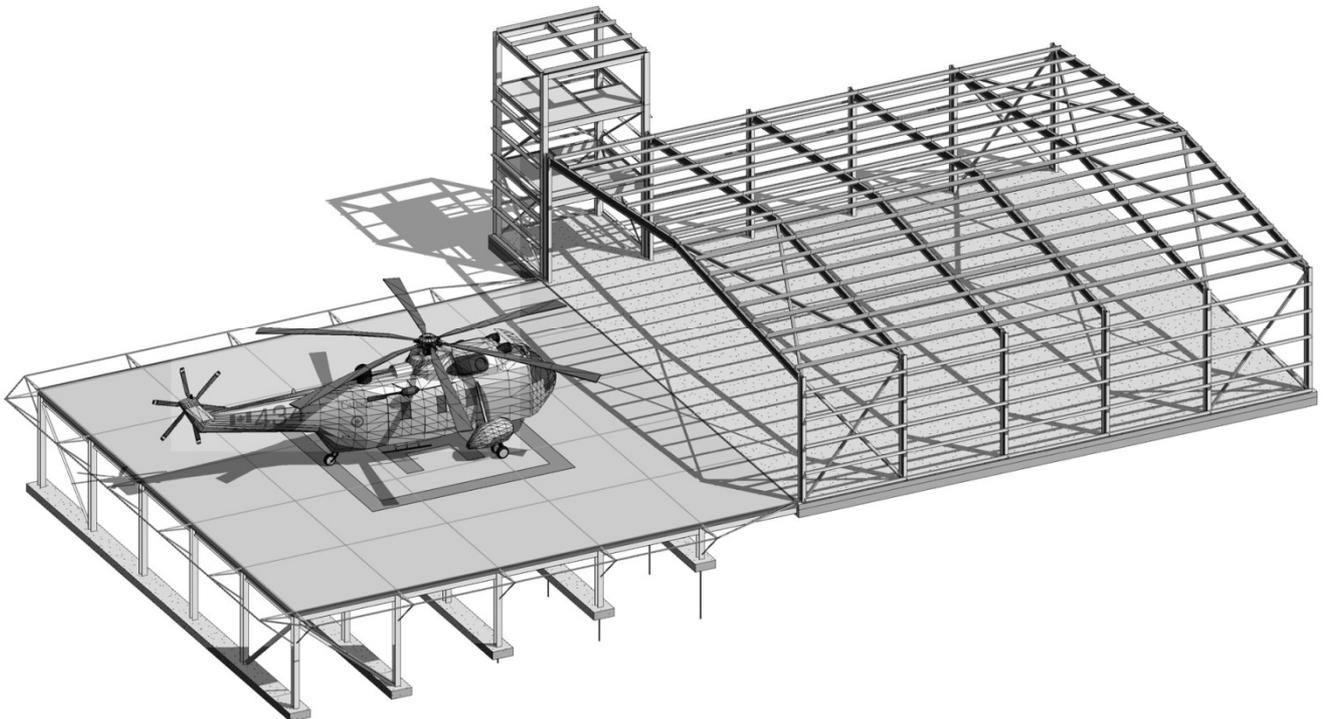


Figure (7) Perspective shows helipad , hangar and the following tower

Construction :

1. Helipad construction :

Helipads are usually constructed out of concrete and are marked with a circle and/or a letter "H", so as to be visible from the air. However, they are not always constructed out of concrete; sometimes forest fire fighters will construct a temporary helipad out of wood to receive supplies in remote areas. Rig mats may be used to build helipads. Landing pads may also be constructed in extreme conditions such as on ice.

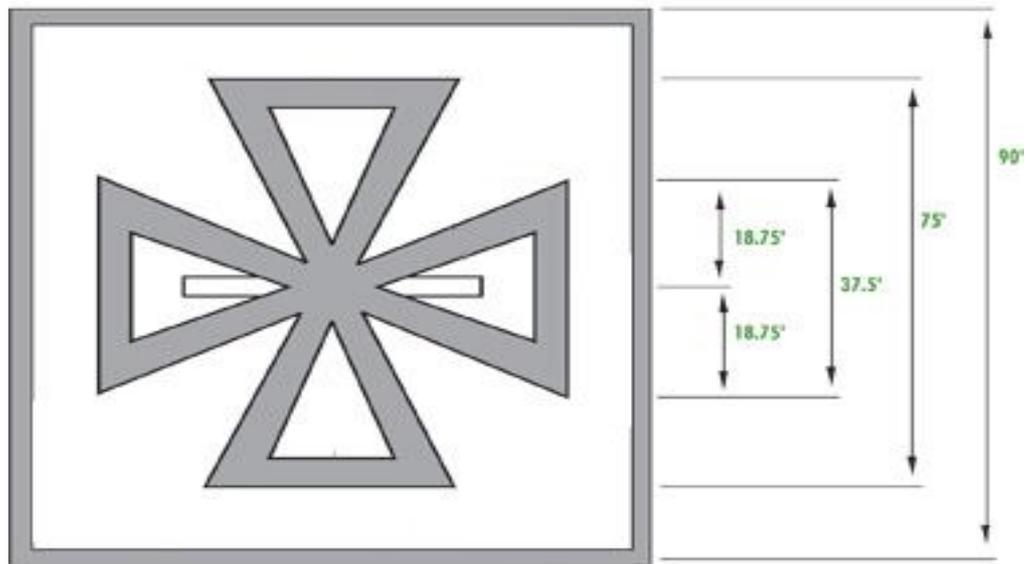


Figure (8) The drawing shows the dimensions of helicopter fan and helipad



Figure (9) Samples of rig and square helipad (landing area)

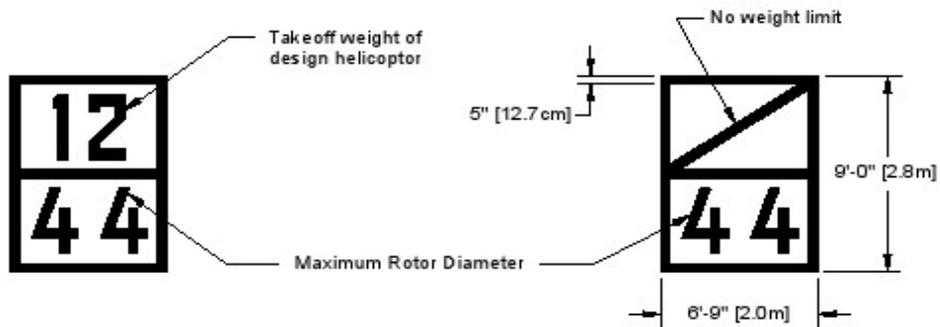
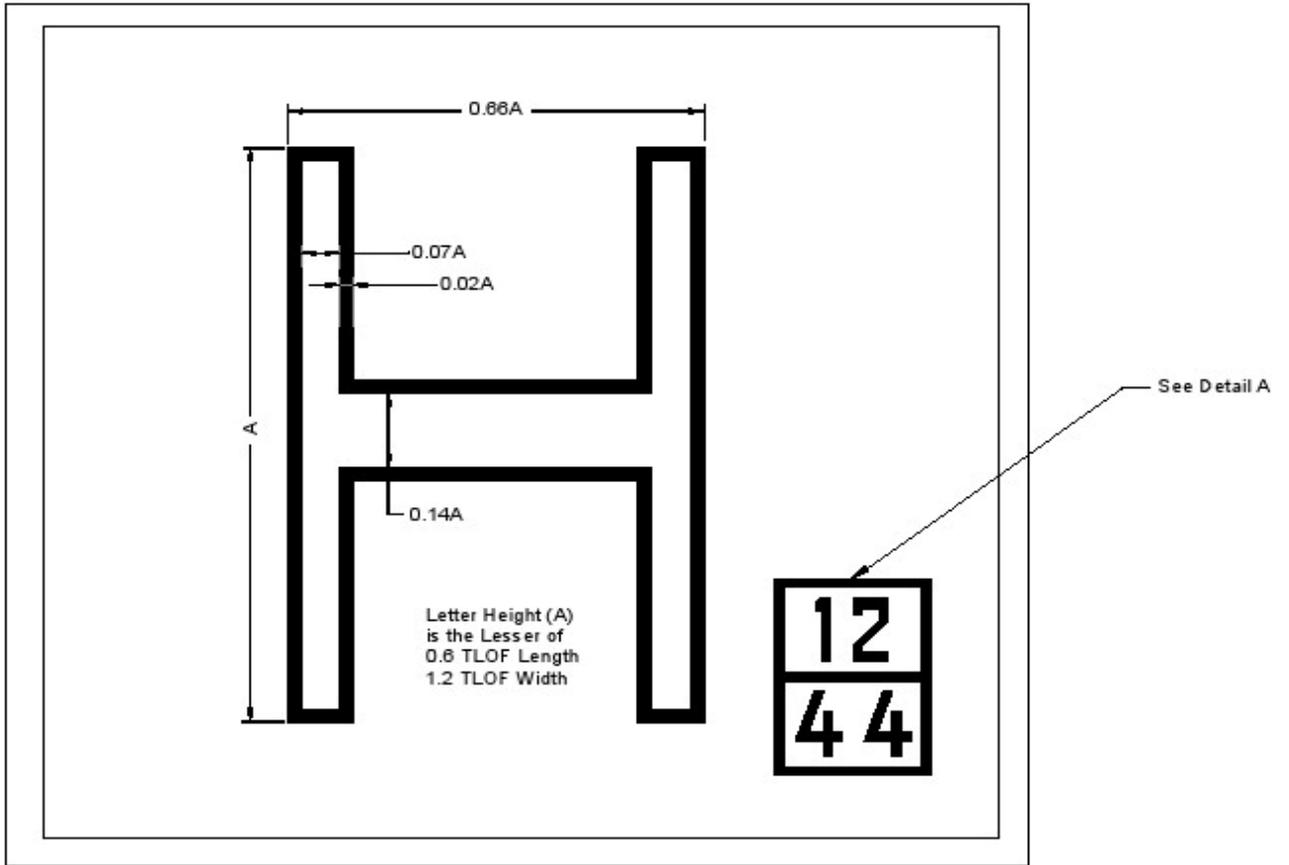
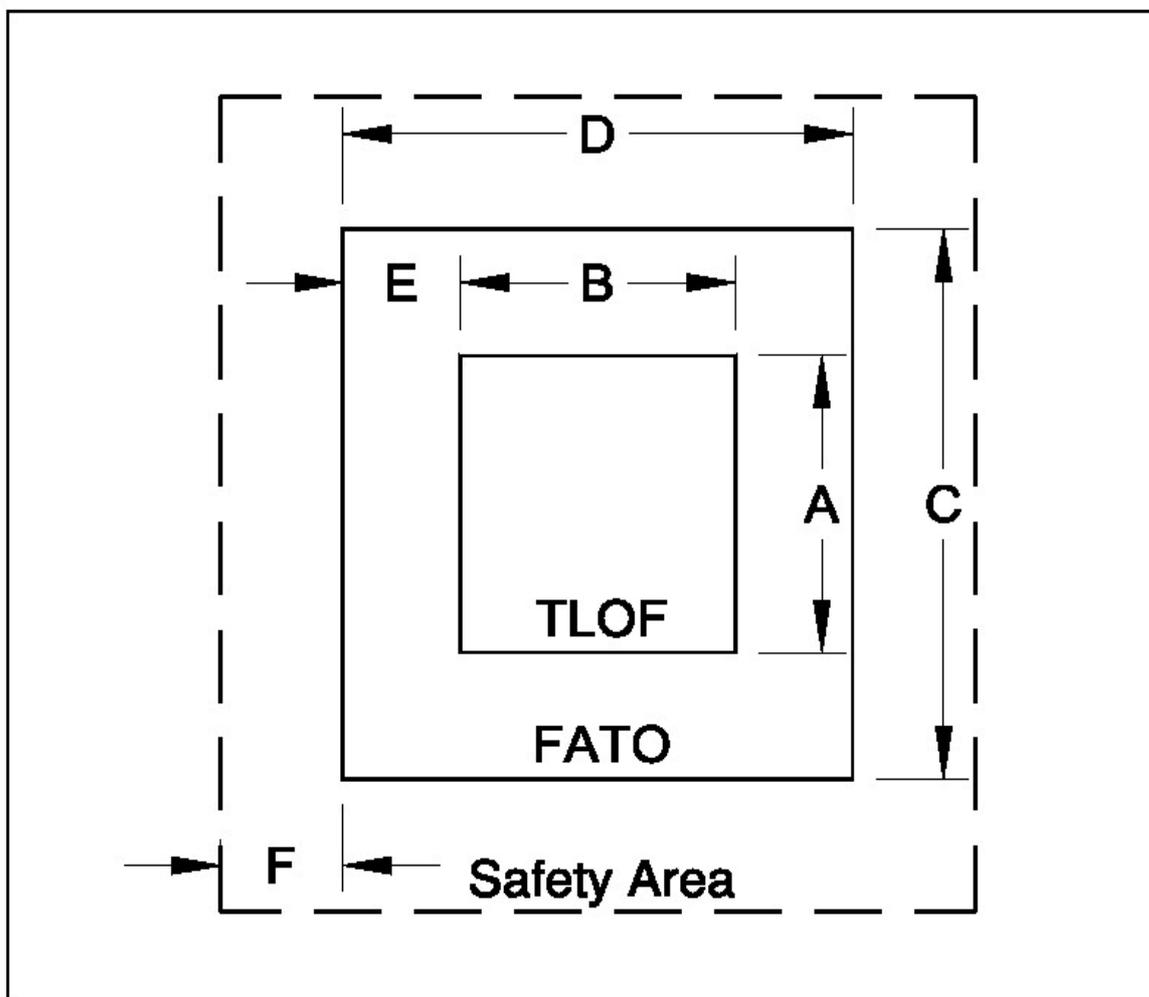


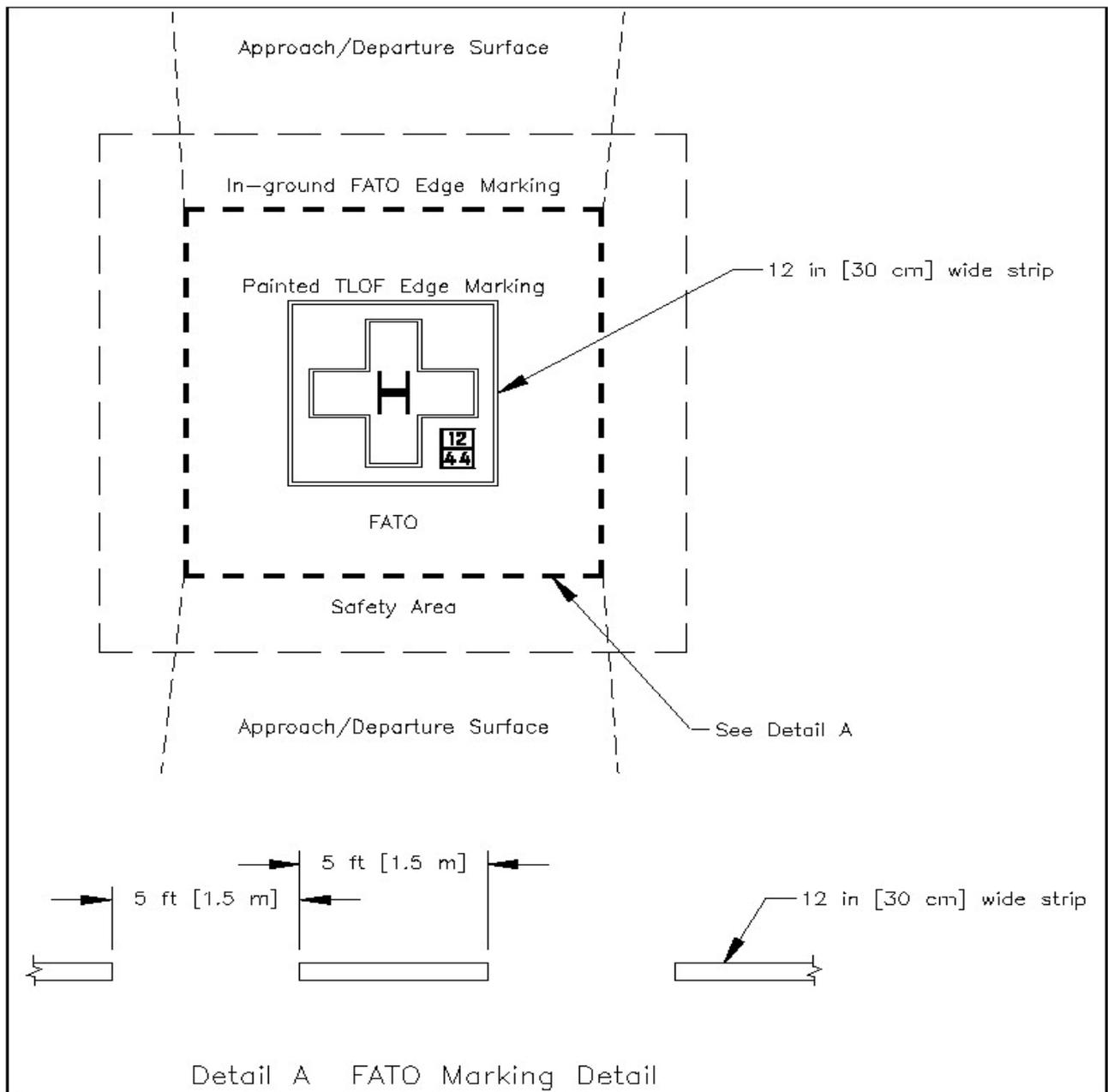
Figure (10) TLOF size and weight limitation box



- A - Minimum TLOF Width: 1.0 RD but not less than 40 ft. (12 m)
- B - Minimum TLOF Length: 1.0 RD but not less than 40 ft. (12 m)
- C - Minimum FATO Width: 1.5 OL
- D - Minimum FATO Length: 1.5 OL
- E - Minimum separation between the perimeters of the TLOF and the FATO [$0.5(1.5 OL - 1.0 RD)$]
- F - Minimum Safety Area Width: See Table 4-1

RD: Rotor diameter of the design helicopter
 OL: Overall length of the design helicopter

Figure (11) TLOF & FATO safety area relationship and minimum dimensions



NOTES:

1. The H should be oriented on the axis of the preferred approach/ departure path.
2. The perimeter of a paved or hard- surfaced TLOF should be defined with a continuous, 12-inch wide (30 cm) white line.
3. The perimeter of an unpaved FATO should be defined with flush, in-ground markers. (See detail A) The corners of the FATO should be defined.
4. See Figure 4-12 for markings for weight and rotor diameter limitations.

Figure (12) FATO marking details

2. Hangar construction :

A hangar is a closed structure to hold aircraft or spacecraft in protective storage. Most hangars are built of metal, but other materials such as wood and concrete are also used.

Hangars are used for protection from weather, protection from direct sunlight, maintenance, repair, manufacture, assembly and storage of aircraft on airfields aircraft carriers and ships.

Pavement of hangar floors must be designed to support aircraft loads (rigid floor) . Clearance must be provided between the aircraft and the door opening, walls and ceiling of the hangar .

Aircraft Element	Aircraft Element Dimension	Minimum Clearances from Hangar Elements					
		Door		Walls		Roof Framing ²	
		m	ft	m	ft	m	ft
Wingtip	Under 30 m (100 ft) span	3	10	3	10	--	--
Fuselage	Under 30 m (100 ft) span	3	10	3	10	3	10
Wingtip	Over 30 m (100 ft) span	3	10	4.5	15	--	--
Fuselage	Over 30 m (100 ft) span	3	10	4.5	15	3	10
Tail	Vertical	2	7	--	--	3	10
Tail	Horizontal	3	10	3	10	3	10

NOTES:

1. Clearances between aircraft components should be at least 3 m (10 ft) where two or more aircraft are housed. Existing hangars must be evaluated for these clearances and a waiver requested in accordance with Appendix B, Section 1, for facilities that do not provide the minimum clearances. The clearance data in this table are also applicable to alert and hardened aircraft shelters.
2. Clearance to the lowest non-movable facility component over the aircraft when pulled into a hangar

Figure (13) aircraft clearance inside hangar

There are three types of hangar construction:

1. Steel Construction :

Steel rigid hangars are the some of the largest hangars in the world.

2. Wood Construction :

Including alight shelter of wood material.

3. Fabric Construction.

An alternative to the hangar is a portable shelter that can be used for air craft storage and maintenance. Portable fabric structures can be built up to 150 feet wide, 100 feet high and any length.

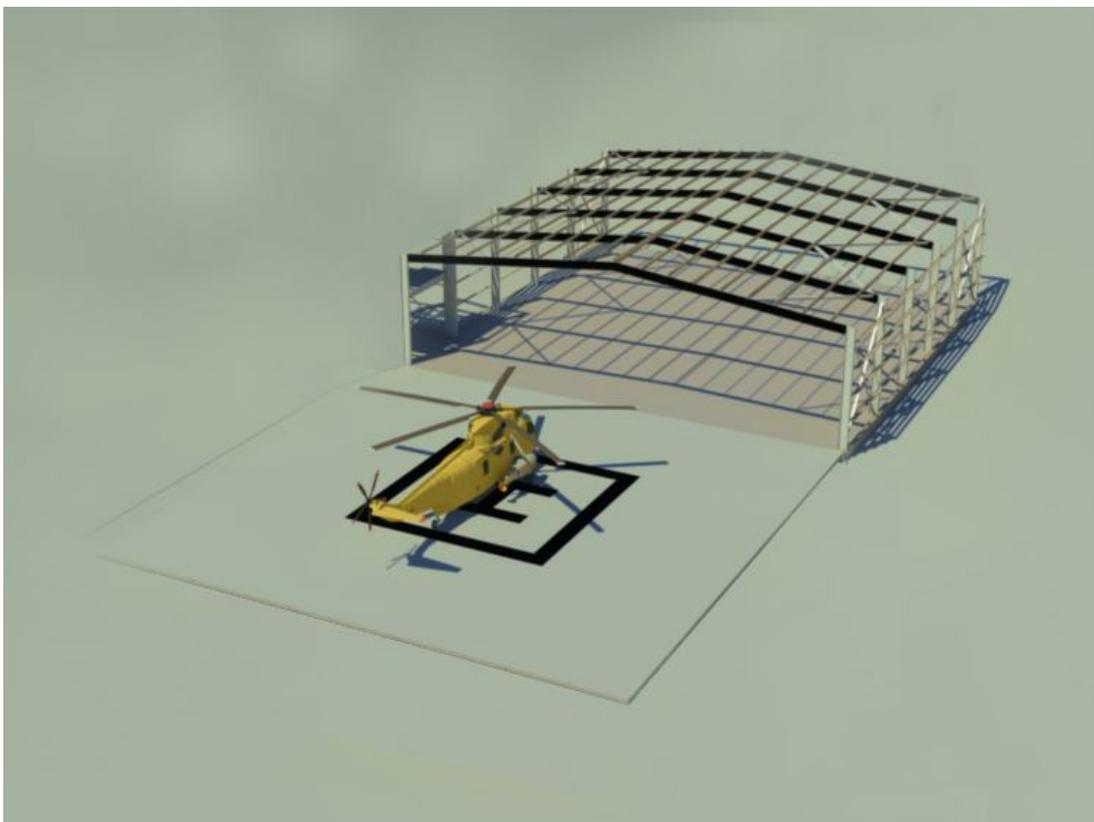


Figure (14) Steel structure hangar and it's relationship with the helipad

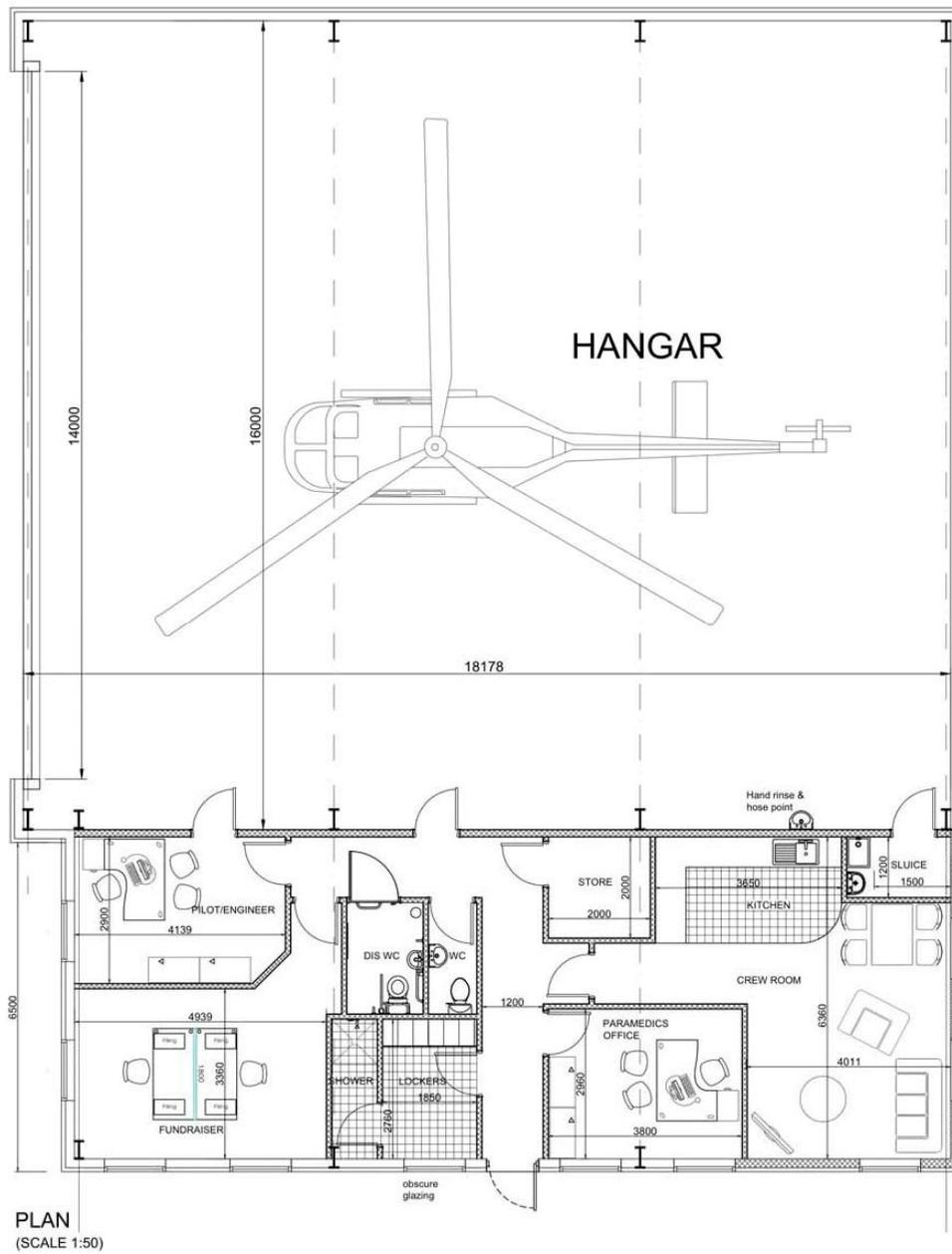


Figure (15) Sample for typical hangar plan and main gate dimensions Including engineers offices and services rooms

Lighting system :

Heliport lighting normally consists of a circle or square of inset lights around the surface called the TLOF (touchdown and lift-off area) and another around the overall landing area called the FATO (final approach and takeoff area). The later encompasses the TLOF as well and the lights may be elevated or inset. Both sets of lights are now recommended to be green by the International Civil Aviation Organization and Federal Aviation Administration .

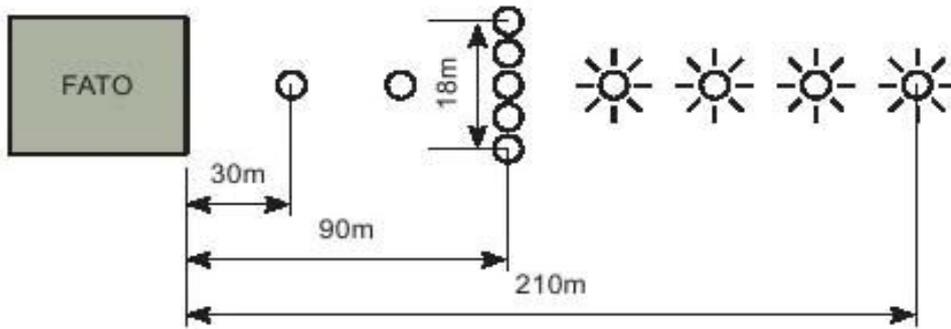
Yellow (amber) was the former standard and is still preferred in many locations. There is a great deal of variance in color depending on the owner and jurisdiction. These lights were traditionally incandescent but are now increasingly light-emitting diodes with brightness control.

The TLOF and FATO lights may be supplemented with surface flood lights. A lighted wind cone is necessary.

At ground-based locations, a row of lead-in lights in the preferred direction of approach is sometimes used. Visual slope guidance systems (such as HAPI,PAPI, etc.) are recommended in both ICAO(International Civil Aviation Organization) and FAA (Federal Aviation Administration) documents but are rarely deployed due to the high cost relative to the rest of the lighting system . While airports commonly use 6.6A direct current power, heliport lighting is normally AC powered. Radio control of the lighting by the pilot via an automated ground - based controller is also common.

An approach lighting system should be provided at a heliport where it is desirable and practicable to indicate a preferred approach direction. An approach lighting system should consist of a row of three lights spaced uniformly at 30 m intervals and a crossbar 18 m in length located at a distance of 90 m from the perimeter of the Final Approach and take Off area (FATO). The lights forming the crossbar should be at right angles to, and bisected by the line of the approach lights, and spaced at 4.5m intervals. Where there is the need to make the final approach course more conspicuous, additional lights spaced uniformly at 30m intervals should be added beyond the crossbar . The light beyond the crossbar may be steady or sequenced flashing, depending upon the environment.

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



Both the steady & flashing lights should be omnidirectional white lights

Figure (16)

The final approach and take-off area lights should be placed along the edges of the final approach and take - off area as follows:

- a. For an area in the form of a square or rectangle, at intervals of not more than 50m with a minimum of four lights on each side including a light at each corner.
- b. For any other shaped area, including a circular area, at intervals of not more than 5m with a minimum of ten lights.

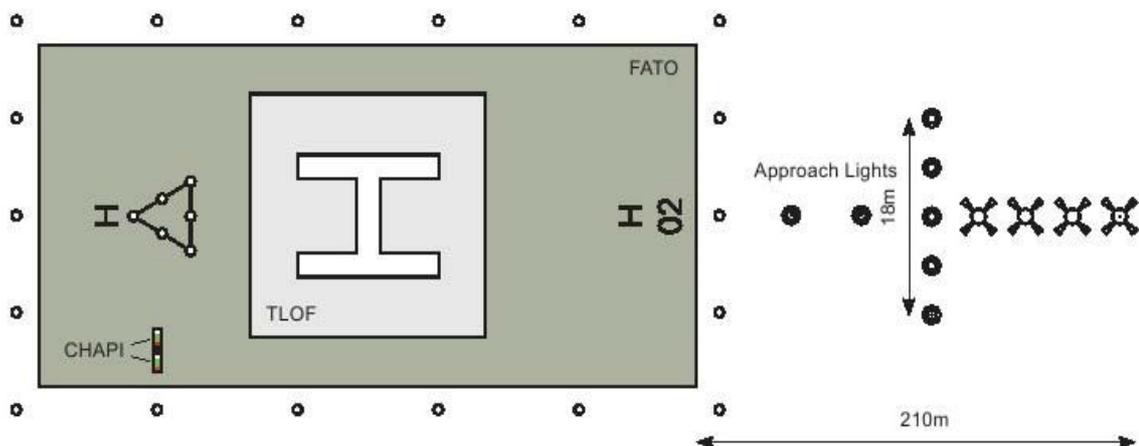
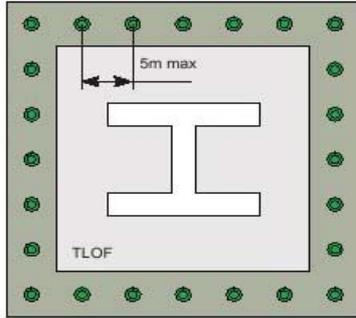
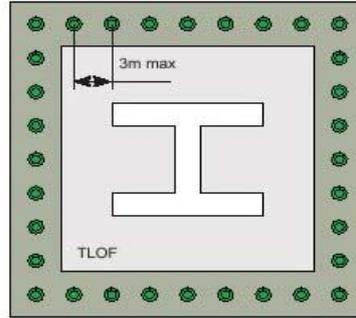


Figure (17) The approach lighting , FATO lighting .



Ground Level Heliport



Elevated Heliport/Helideck

Figure (18) The TLOF lighting



green, 69W, 14" height, A21 lamp, 1.5" frangible coupling .



Green omni-directional light: LED, anodized, with power converter , 7.25" BC .



Green omni - directional light: 50W, 120V, anodized, 7.25" BC .



Heliport Elevated Perimeter: green, 120V LED

Figure (19) sample lighting fittings

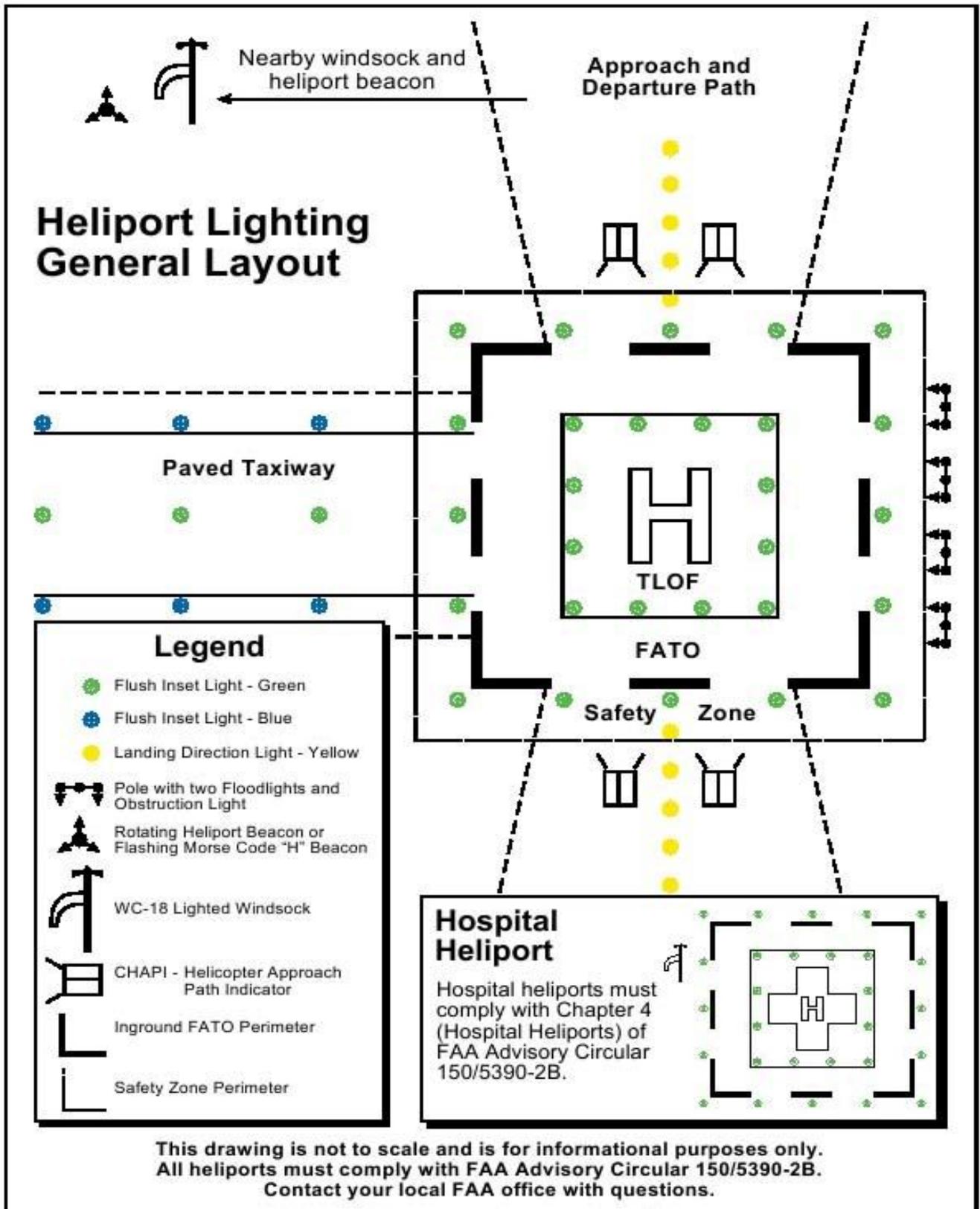


Figure (20)
The lighting distribution for helipad (landing area)

Summary

A heliport substantially smaller than airport providing comparable services. The main Element of designing heliport is the landing area of helicopter.

The location of helipad can be near town to pickup patient during accident or at the top of some elevated structure . The touchdown and lift off area is Called (TLOF) , the final approach and takeoff is called (FATO) . A load - bearing , generally paved area normally located in the center of (TLOF) . Hangar is a large building for helicopter maintenance and must located near the helipad, the most structure used for hangar is steel .

Heliport plan can include other buildings according to the design requirement. Helicopter is the easier way to serve people during emergency to prevent the crowd of traffic and reach in the certain time .

Proposal of heliport for emergency services

The following is proposal heliport plan for emergency used . The total land area is 13000m² .

Functional requirement:

- 1. Main entrance.**
- 2. A statue for helicopter in the center.**
- 3. Information building.**
- 4. Main building (Hangar).**
- 5. Four following towers.**
- 6. Two square helipad.**
- 7. Medical center.**
- 8. Resting, restaurant and visitor building.**
- 9. Fire station.**



Figure (22) Perspective of the proposal design of heliport

References:

- 1- Heliport Lighting General Layout – ICAO , Flight Light Inc. USA , 2-3-2012 .
- 2- Heliport Design and Lighting Packages , Flight Light Inc. USA , 8-20-2009 .
- 3- Heliport Inspection / Certification , Federal Aviation Administration , By : Mike Webb , June 25 /2009 .
- 4- Airfield and Heliport Planning and Design , Unified Facilities Criteria (UFC), By : James C. Dalton , P.E. , 17-November-2008 .
- 5- Advisory circular, US Department of Transportation , Federal Aviation Administration , By : David L.Bennett , 9 -3-2004 .
- 6- Construction of a temporary Helipad at Yung Shue Wan , North Lamma , project profile , By : David L.Bennett , August 2003 .
- 7- Emergency Helicopter Landing Facilities , By : Bill Sanderson , 2003 .
- 8- Heliport Manual –ICAO , Third Edition , Flight Light Inc ,USA , 1995 .