



# **HSAC Recommended Practice (RP) 2016-1**

**Revision 2**

## **New Build Helideck Design Guidelines**

**2 November 2017**

Recommended Practices (RP) are published under the direction of the Helicopter Safety Advisory Conference (HSAC). RPs are a medium for discussion of aviation operational safety pertinent to the transmission of product, energy exploration and production industry in the United States. RPs are not intended to replace individual engineering or corporate judgment or to replace instruction in company manuals or government regulations. Suggestions for subject matter are cordially invited.

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## 1 Scope

This Recommended Practice (RP) provides a basis for planning and designing new helidecks (including facilities currently without helidecks), commonly called “new builds”, for all offshore facilities except mobile offshore drilling units (MODUs) and ships that have defined codes/guidance. It includes safety guidelines, design load criteria, helideck size, marking and lighting recommendations, and other design recommendations. [These guidelines were effective with the publication of first edition of this document issued May 2016.](#)

This document does not propose a standard helideck, but recommends basic criteria to be considered in the design of new build helidecks. It is not to be construed as being applicable to existing helidecks as of the date of publication of this document. Criteria for existing helidecks and modification or replacement of helidecks on existing facilities should refer to HSAC RP 2016-2 and other industry guidance.

[American Petroleum Institute \(API\) Helideck Design documents \(API 2L\) is not recognized by HSAC as acceptable for either design of new build or marking / upgrade of legacy helidecks.](#)

*Note 1: The requirements for mobile offshore drilling units (MODUs) are given in the International Maritime Organization (IMO) Code for the Construction and Equipment of Mobile Offshore Drilling Units (MODU CODE) and for ships in International Chamber of Shipping (ICS) Guide for Helicopter / Ship Operations.*

*Note 2: Changes from previous edition (other than [minor editing, grammar, and format changes](#)) are shown [in blue](#).*

## 2 References

[The following publications, recommended practices, and industry best practices have been taken into account / reviewed in the development of these guidelines and in some cases are cited herein. The most recent edition of the documents listed should be used, unless otherwise specified.](#)

ORGANIZATION	REFERENCE	TITLE
Helicopter Safety Advisory Conference (HSAC)	HSAC RP 2016-2	Recommended Practice for Assessment, Upgrades, Modification, Replacement and Marking of Existing Helidecks  <a href="http://www.HSAC.org">http://www.HSAC.org</a>
	HSAC Table Helicopter Design Criteria	Helicopter size and loading criteria (weight/mass, dimensions, etc.) for helidecks is available on the HSAC Web Site "Documents Library" with title "Tables of Helideck Design Data"
Aluminum Association (AA)	AA ADM	Aluminum Design Manual  <a href="http://www.aluminum.org/news/aluminum-association-releases-2017-editions-american-national-standards-aluminum">http://www.aluminum.org/news/aluminum-association-releases-2017-editions-american-national-standards-aluminum</a>
American Bureau of Shipping (ABS)	ABS Guide	Rules for Building and Classing Mobile Offshore Drilling Units
American Petroleum Institute (API)	API RP 2 SIM	Recommended Practice for Structural Integrity Management of Fixed Offshore Platforms  For all API Documents: <a href="http://www.api.org/products-and-services/standards/purchase">http://www.api.org/products-and-services/standards/purchase</a>
	API RP 2A-WSD	Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms
	API RP 2-FPS	Planning, Designing, and Constructing Floating Production Systems
	API RP 2A-LRFD	Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms - Load and Resistance Factor Design
	API RP 2-TOP	Planning, Designing and Constructing Tension Leg Platforms
	API RP 2-MET	Derivation of Metocean Design and Operating Conditions
	API RP 14-J	Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities
	API RP 500 or 505	Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division I and Division 2, Division 3

ORGANIZATION	REFERENCE	TITLE
Energy Institute (EI)	EI 1529	Aviation Fueling Hose and Hose Assemblies  For all EI documents: <a href="https://www.energyinst.org/information-centre/ei-publications">https://www.energyinst.org/information-centre/ei-publications</a>
	EI 1550	Handbook on Equipment used for the Maintenance and Delivery of Clean Aviation Fuel
	EI 1542	Identification Markings for Dedicated Fuel Manufacturing and Distribution Facilities, Airport Storage and Mobile Fueling Equipment
European Codes (Eurocode)	EN 1999 – Eurocode 9	Design of Aluminium Structures Part 1.5 – Shellstructures  <a href="http://www.techstreet.com/standards/bs-en-1999-set?product_id=1649533">http://www.techstreet.com/standards/bs-en-1999-set?product_id=1649533</a>
Federal Aviation Administration (FAA)	FAA Advisory Circular 150/5345-43G	Specification for Obstruction Lighting Equipment  <a href="http://www.faa.gov/documentlibrary/media/advisory_circular/150_5345_43g.pdf">http://www.faa.gov/documentlibrary/media/advisory_circular/150_5345_43g.pdf</a>
	FAA Engineering Brief No. 87	Heliport Perimeter Light for Visual Meteorological Conditions  <a href="https://www.faa.gov/airports/engineering/engineering_briefs/media/eb-87.pdf">https://www.faa.gov/airports/engineering/engineering_briefs/media/eb-87.pdf</a>
	Advisory Circular 150/5390-1B	Heliport Design Guide  <a href="https://www.faa.gov/documentLibrary/media/Advisory_Circular/150_5390_2c.pdf">https://www.faa.gov/documentLibrary/media/Advisory_Circular/150_5390_2c.pdf</a>
International Maritime Organization (IMO)	IMO MODU Code	Code for Construction and Equipment of Mobile Offshore Drilling Units (MODU Code)  <a href="http://www.imo.org/en/Publications/Documents/Newsletters%20and%20Mailers/Mailers/I810E.pdf">http://www.imo.org/en/Publications/Documents/Newsletters%20and%20Mailers/Mailers/I810E.pdf</a>
International Chamber of Shipping (ICS)	ICS Guide	ICS Guide to Helicopter/Ship Operations  <a href="http://www.ics-shipping.org/docs/default-source/publications/safety-security-and-operations/ics-guide-to-helicopter-ship-operations.pdf?sfvrsn=10">http://www.ics-shipping.org/docs/default-source/publications/safety-security-and-operations/ics-guide-to-helicopter-ship-operations.pdf?sfvrsn=10</a>
International Civil Aviation Organization (ICAO)	ICAO Annex 3	Annex 3 - Meteorological Information for International Air Navigation  <a href="https://www.icao.int/publications/catalogue/cat_2016_en.pdf">https://www.icao.int/publications/catalogue/cat_2016_en.pdf</a>

ORGANIZATION	REFERENCE	TITLE
International Civil Aviation Organization (ICAO)	ICAO Annex 14 Vol II	Annex 14 Volume II – Heliports <a href="http://store1.icao.int/index.php/annex-14-aerodromes-volume-ii-heliports-4th-edition-july-2013-volume-2-english-printed.html">http://store1.icao.int/index.php/annex-14-aerodromes-volume-ii-heliports-4th-edition-july-2013-volume-2-english-printed.html</a>
	ICAO 9261-AN/903	Heliport Design and Services Manual (Part I) - DRAFT
National Fire Protection Association (NFPA)	NFPA 407	Standard for Aircraft Fuel Servicing <a href="http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards?mode=code&amp;code=407">http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards?mode=code&amp;code=407</a>
National Fire Protection Association (NFPA)	NFPA 418	Standard for Heliports <a href="http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards?mode=code&amp;code=418">http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards?mode=code&amp;code=418</a>
Society of Automotive Engineers (SAE)	SAE AS 25050	Colors, Aeronautical Lights and Lighting Equipment, General Requirements <a href="http://standards.sae.org/as25050/">http://standards.sae.org/as25050/</a>
UK Civil Aviation Authority (CAA)	CAA Paper 2008/03	Helideck Design Considerations – Environmental Effects <a href="https://publicapps.caa.co.uk/docs/33/2008_03.pdf">https://publicapps.caa.co.uk/docs/33/2008_03.pdf</a>
UK Civil Aviation Authority (CAA)	CAP 437	Standards for Offshore Helicopter Landing Areas <a href="http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=523">http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=523</a>

### 3 Terms, Definitions, and Abbreviations

The following terms and associated definitions are used in this document. Additional detailed guidance is covered later in the document.

#### 3.1 Terms and Definitions

Term	Definition
<b>D-Value</b>	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 rearward extension of

Term	Definition
	the helicopter structure.
<b>Design Helicopter</b>	<p>A composite helicopter used in design of the helideck having the largest set dimensions and the maximum take-off weight/mass (MTOM/MTOM) of the range of helicopters for which the helideck is being designed.</p> <p><i>Note: The maximum design weight (mass) of the helideck may limit the usable weight (mass) of a helicopter, (See Design Load section 5.2 and Weight (Mass) / Size Limitation Markings section 6.5).</i></p>
<b>Deck integrated firefighting system(s) (DIFFS)</b>	A fire suppression system integrated into the helideck surface structure using pop-up foam/water nozzles.
<b>Final Approach and Takeoff Area (FATO)</b>	<p>A defined area over which the final phase of the approach to hover or a landing is completed, and from which the takeoff maneuver is <b>initiated and to compensate for permitted maneuvering</b>.</p> <p><i>Note: The minimum size of the FATO is 1D and the FATO shape should match the shape of the TLOF.</i></p>
<b>Ground Effect</b>	An improvement in helicopter lift capability that develops whenever the helicopter flies or hovers at a <b>height of 1 rotor diameter or less</b> over the touchdown or liftoff area (TLOF). <b>It a result of the interference of the surface with the airflow pattern of the rotor system and it is more pronounced the nearer the ground is approached resulting in increased blade efficiency while operating in ground effect. Ground effect results from the cushion of denser air built up between the surface and helicopter by the air displaced downward by the rotor.</b>
<b>Ground Effect Area</b>	<p>The solid area that provides ground effect.</p> <p><i>Note: This area can be provided by the touchdown or liftoff (TLOF) area <b>or the touch down and liftoff (TLOF) plus a safety shelf (if installed)</b>.</i></p>
<b>Helicopter</b>	<p>A rotary wing aircraft that depends principally for its support and motion in the air upon the lift generated by one or more power-driven rotors, rotating on substantially vertical axes.</p> <p><i>Note: This document provides requirements and guidance for the design of a helideck for helicopters with a single main rotor only.</i></p>
<b>Helideck</b>	An area on a fixed or floating offshore facility designated for the landing and takeoff of helicopters, which includes, as applicable, some or all of the supporting facilities/equipment necessary for helicopter operations, such as personnel/cargo handling, parking, tie-down, fueling, maintenance, etc.
<b>0.83D Helideck</b>	A helideck on which the TLOF is of sufficient size to contain a circle of diameter of 0.83D of the largest helicopter that will use the helideck.
<b>1.0D Helideck</b>	A helideck on which the TLOF is of sufficient size to contain a circle of diameter of 1.0D of the largest helicopter that will use the helideck.

Term	Definition
<b>Maximum Takeoff Mass (Weight)</b>	A maximum allowed helicopter mass (weight) on the helideck (TLOF) based on dynamic loads incurred during take-off and landings. <b>MTOM is used interchangeably in many documents as MTOW.</b>
<b>Limited Obstacle Sector (LOS)</b>	An area on the structure side of the helideck in which obstacles <b>may be permitted within the 150 degree or less sector</b> , provided the height of the obstacles above the level of the TLOF is limited and <b>within a prescribed profile.</b>
<b>Limited Parking Area (LPA)</b>	A parking area of less than 1.0D separated from the TLOF by a parking transition area (PTA) that is designed to accommodate a parked helicopter where restrictions/limitations may apply (i.e. size of helicopter, parking area dimensions, weight (mass) or obstacles).
<b>Metocean</b>	The discipline concerned with the establishment of relevant environmental conditions for the design and operation of offshore structures.
<b>Minimum Structure</b>	A structure with one or more of the following attributes: <ul style="list-style-type: none"> <li>a) Structural framing which provides less reserve strength and redundancy than a typical well braced, three-leg template type platform;</li> <li>b) Free-standing and guyed caisson platforms which consist of one large tubular member supporting one or more wells;</li> <li>c) Well conductor(s) or free-standing caisson(s), which are utilized as structural and/or axial foundation elements by means of attachment using welded, non-welded, or nonconventional welded connections;</li> <li>d) Threaded, pinned, or clamped connections to foundation elements (piles or pile sleeves);</li> <li>e) Braced caissons and other structures where a single element structural system is a major component of the platform, such as a deck supported by a single deck leg or caisson.</li> <li>f)</li> </ul>
<b>Obstacle</b>	<b>All fixed (including temporary and permanent) and moveable objects or parts of these that are located in an area intended for the safe movement of helicopters or extend above a defined surface intended to protect the helicopter or are located outside of those defined surfaces and have been assessed as a hazard to helicopters.</b>

Term	Definition
<b>Obstacle-Free Dropdown Sector (OFDS)</b>	An obstacle clear area provided below the helideck (TLOF) surface measured from the outer edge of the safety shelf or perimeter netting located around the landing area down to water level for an arc of not less than 180° that passes through the center of the landing “H” and outwards to a distance that will allow for safe clearance from obstacles below the helideck in the event of an engine failure for the type of helicopter the helideck is intended to serve.
<b>Obstacle-Free Sector (OFS)</b>	An area free of all obstacles above helideck level outwards to a distance that will allow for an unobstructed arrival and departure path to/from the helideck for the helicopter(s) it is intended to serve.
<b>Parking Area (PA)</b>	An area, designed to accommodate a parked helicopter, separated from the TLOF by a parking transition area (PTA).
<b>Parking Protection Area (PPA)</b>	A parking protection area (PPA) designed to accommodate rotor infringement beyond the combined parking transition area (PTA) and parking area or limited parking area (LPA) that extends beyond the combined PTA and LPA areas.
<b>Parking Transition Area (PTA)</b>	An area that separates the TLOF and parking area.
<b>Push-In Parking Area (PIPA)</b>	A restricted parking area separated from the TLOF by a parking transition area (PTA) designed to accommodate only a fully shut down helicopter, which is ground handled to/from the TLOF and to/from the PIPA.
<b>Reference Point</b>	The apex/point-of-origin of the obstacle-free sector (OFS) located on the FATO edge and the limited obstacle sector (LOS) perimeter.
<b>Return Period</b>	The average period between occurrences of an event or of a particular value being exceeded.
<b>Rotor Diameter (RD)</b>	The diameter of a circle made by the rotor blades while rotating.
<b>Safety Net</b>	A netting section around the perimeter of the TLOF, and if applicable, the parking area and parking transition area, used to provide fall protection for personnel.  <i>Note: Safety nets do not provide ground effect.</i>
<b>Safety Shelf</b>	A solid surface capable of providing ground effect around the perimeter of the TLOF and to provide fall protection for personnel.
<b>System International Units (SI)</b>	SI units are a system of physical units based on the meter, kilogram, second, ampere, kelvin, candela, and mole, together with a set of prefixes to indicate multiplication or division by a power of ten.

Term	Definition
<b>Touchdown and Liftoff Area (TLOF)</b>	The load bearing area of the helideck on which a helicopter may touchdown or liftoff.  <i>Note: The minimum size of the TLOF is 0.83D: 0.83D is approximately 1 RD.</i>
<b>Touchdown Parking Circle Marking (TDPC)</b>	A parking area marking in the shape of a yellow circle used by the pilot for guidance and obstacle clearance information.
<b>Touchdown / Positioning Marking (TDPM)</b>	A yellow circle marking on the TLOF used by the pilot for guidance and obstacle clearance information while landing, taking off, or maneuvering.  <i>Note: The TDPM is described as the aiming circle in some previous design documents.</i>

### 3.2 Abbreviations

Abbreviation	Description
<b>cd</b>	Candela
<b>CFD</b>	Computational Fluid Dynamics
<b>DIFFS</b>	Deck Integrated Firefighting System
<b>DLB</b>	Dynamic Load Bearing
<b>FATO</b>	Final Approach And Take-Off Area
<b>FMS</b>	Fixed Monitor System
<b>HMS</b>	Helideck Monitoring or Motion System
<b>IFR</b>	Instrument Flight Rule
<b>LED</b>	Light Emitting Diode
<b>LOS</b>	Limited Obstacle Sector
<b>LPA</b>	Limited Parking Area
<b>MTOM</b>	Maximum Takeoff Mass (Weight)
<b>NLB</b>	Non Load Bearing
<b>NUI</b>	Normally Unmanned Installation
<b>OFS</b>	Obstacle-Free Sector

Abbreviation	Description
OFDS	Obstacle-Free Dropdown Sector
PA	Parking Area
PCF	Post Crash Fire
PCOM	Parking Circle Orientation Marking
PIPA	Push In Parking Area
PPA	Parking Protection Area
PTA	Parking Transition Area
Psf	Pounds per Square Foot
RD	Rotor Diameter Of The Main Rotor
RFF	Rescue and Firefighting
SHR	Significant Heave Rate
SI	System International (physical units of measurement)
TDPC	Touchdown Parking Circle
TDPM	Touchdown/Positioning Marking
TLOF	Touchdown And Lift-Off Area
UPS	Uninterruptible Power Supply

## 4 Helideck Planning

### 4.1 General

**4.1.1** This section provides a guide for the design of helidecks. Consideration should be given to the potential design life of the facility/field and possible future requirements, including potential of larger helicopters and/or combinations thereof, increased personnel, facilities upgrades, etc. Initial planning should include all criteria pertaining to the design of the helideck. Valuable assistance during the planning and design phase can be provided by the aviation professionals of the helicopter operators, manufacturers and the oil and gas exploration and production companies.

**4.1.2** In planning the helideck, consideration should be given to the helicopter's gross weight (mass), landing load distribution, rotor diameter, overall length, and landing gear configuration of the one design helicopter planned to use the helideck.

**4.1.3** For extreme cold weather operations, the design of heated helidecks, snow/ice removal and provision of electrical power in the proximity of the helideck to use helicopter ground power units should be considered.

## 4.2 Design Helicopter Selection

Design criteria presented herein include operational requirements, safety considerations, and environmental aspects that can affect the design of the helideck. The following are considerations for selecting the helicopter for helideck design:

4.2.1 Distance from onshore staging areas or helicopter bases;

4.2.2 Proximity to other offshore helidecks, on either satellite structures or adjacent field structures;

4.2.3 Status as to whether the facility is manned, or a normally unmanned installation (NUI) without living quarters, [or a minimal structure](#);

4.2.4 Helicopter transportation requirements for the facility ([number of landings/takeoffs, numbers of personnel onboard the facility, etc.](#));

4.2.5 Crew change requirements;

4.2.6 Requirements for night operations, medical evacuation, or other emergency flights;

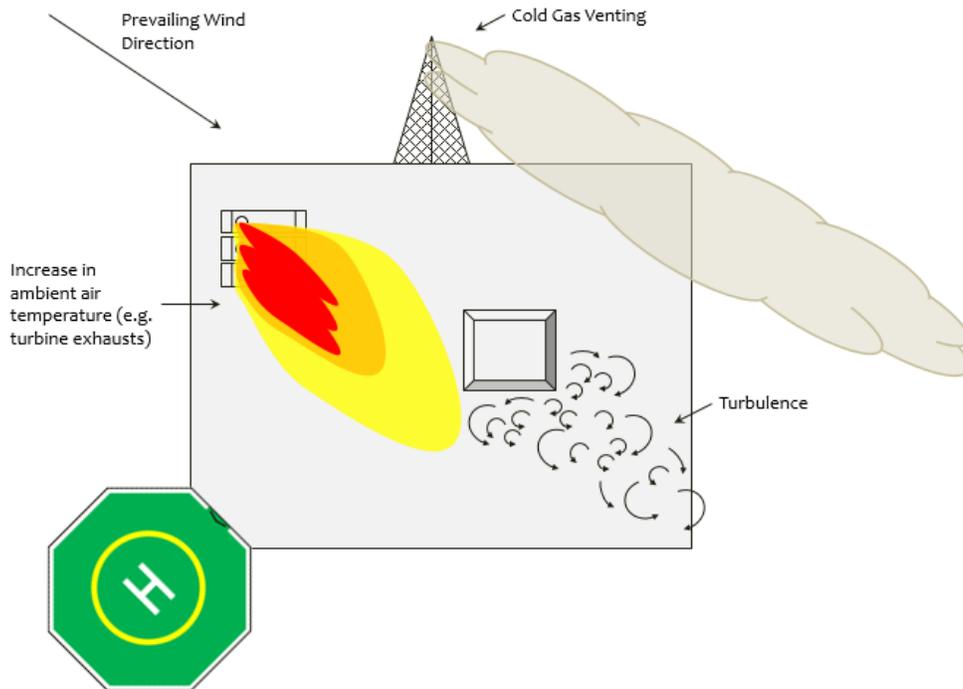
4.2.7 **Environmental** conditions.

On any given day, helicopter performance is a function of many factors including the actual all-up weight (mass); ambient temperature; pressure altitude; effective wind speed component; and operating technique. Other factors concerning the physical and airflow characteristics of the helideck and associated or adjacent structures have an impact. These factors should be taken into account in the determination of specific and general limitations, which may be imposed in order to ensure adequate performance and safe operations. It should also be noted that, following the instance of a helicopter engine failure, it may be necessary for the helicopter to descend below helideck level to gain sufficient speed to safely fly away or to land on the water; in both cases without striking the safety net/shelf or facility obstacles below the TLOF level. In certain circumstances it may be necessary to reduce helicopter operating weight (mass) (fuel or payload) to provide a safe operating area for the helicopter unless the issues above are addressed during the helideck design phase.

## 4.3 Helideck Design Considerations

### 4.3.1 Location

Before final location of the helideck is selected, obstruction clearances, personnel safety, and Metocean conditions, as well as proximity of the obstacle-free sector relative to flammable materials, hot and cold gas discharges, flare or vent booms, and cooler discharges should be considered. As illustrated in Figure 4.3.1, the helideck should be located so that the TLOF and associated flight paths are as far as possible outside the influence of the hot and cold gas discharges, and turbulence effects in prevailing wind conditions. [See 4.4, 4.7 and 4.8 for additional guidance.](#)



**Figure 4.3.1 Helideck Orientation Based on Wind, Direction/Exhaust Discharges**

#### 4.3.2 Helideck (FATO, TLOF) Size

**4.3.2.1** A helideck should be provided with one final approach and take-off area (FATO) co-located with a touchdown and liftoff area (TLOF). The TLOF may be any shape, but shall be of sufficient size to contain:

a) A circle of diameter of not less than 1.0D of the largest helicopter the helideck is intended to serve **providing the TLOF is surrounded with a 5 ft (1.5 m) safety net;**

**or**

b) A circle of diameter of not less than 0.83D (see footnote <sup>1</sup>) of the largest helicopter the helideck is intended to serve providing the TLOF is surrounded with a safety shelf. The TLOF together with the safety shelf must provide an area which can accommodate a circle with a diameter not less than 1.0D. For design loading, see 5.2.

*Note 1: The size of the safety shelf or safety net and structure shall be 5 ft. (1.5 m) wide (measured horizontally from the outside of the perimeter to the outer edge of the net frame) around the perimeter, see figure 4.3.5.G: For design loading, see 5.2.7.*

*Note 2: If the design 1.0D value is more than 58.2 ft. (17.9 m) the minimum design size of the TLOF may need to be increased so it is larger than 0.83D.*

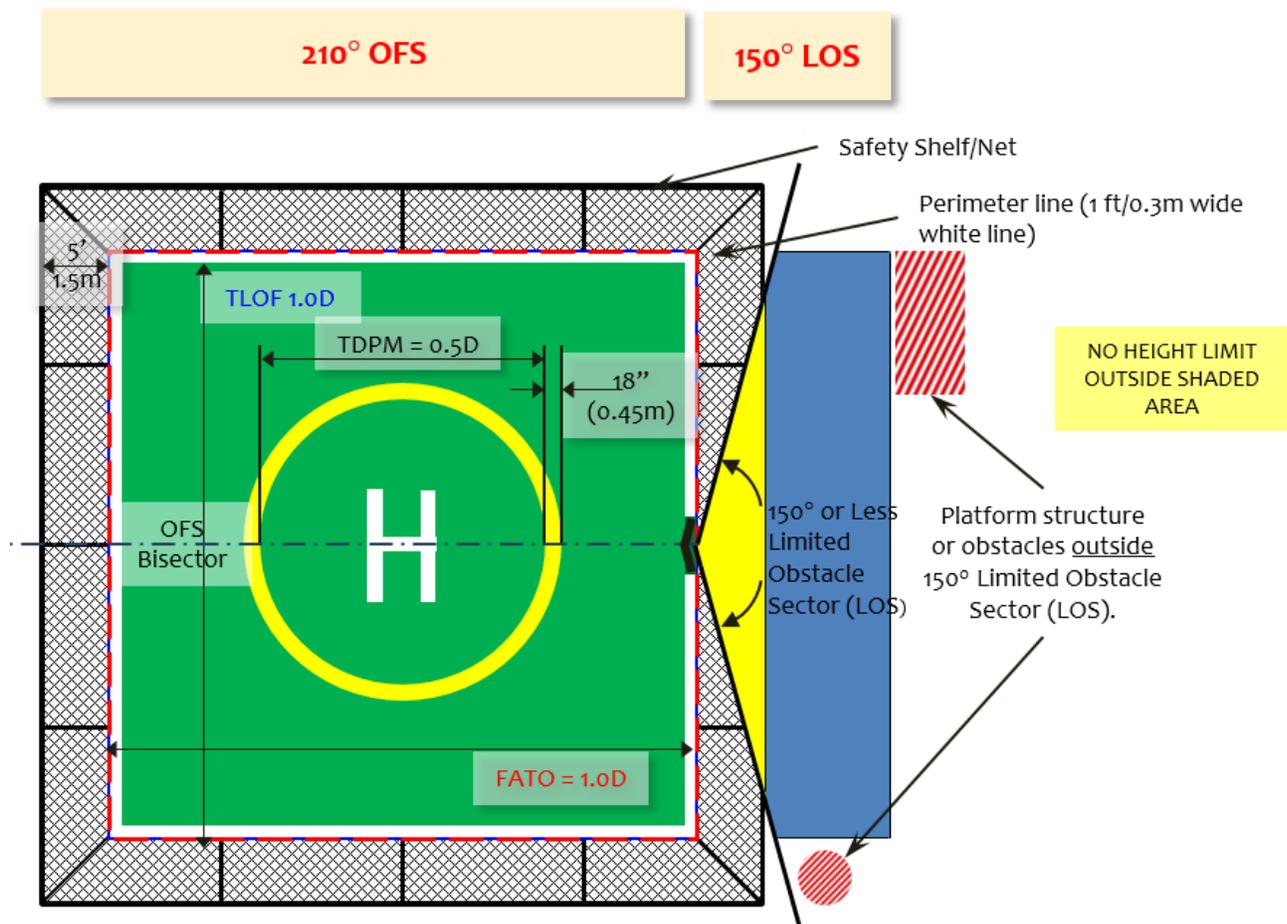
**4.3.2.2** Figure 4.3.2.A shows a square helideck with a 1.0D FATO and 1.0D TLOF and Figure 4.3.2.B shows a square helideck with a 1.0D FATO and 0.83D TLOF. In the figures, in addition to the positions of the FATO, TLOF, and the limited obstacle sector (LOS) the TDPM, TLOF perimeter marking, and "H" are shown.

**4.3.2.3** The “H” should be co-located with the touchdown/positioning marking (TDPM) with the crossbar of the “H” lying along the bisector of the obstacle-free sector (OFS) (see Figures 4.3.2.A and 4.3.2.B). If the OFS and the LOS are swung (by up to 15°) from the norm, the bisector of the OFS need not lie on crossbar of the “H” and the “H” shall also be swung (rotated) by a corresponding amount, **but should remain in the center of the TLOF**. The “H” crossbar should remain in the center of the FATO/TLOF and parallel to the bi-sector of the OFS as illustrated in Figure 4.3.5.H. See 4.3.5.1 and Figure 4.3.5.H.

*Note: The bi-sector is not displayed on all figures in this document.*

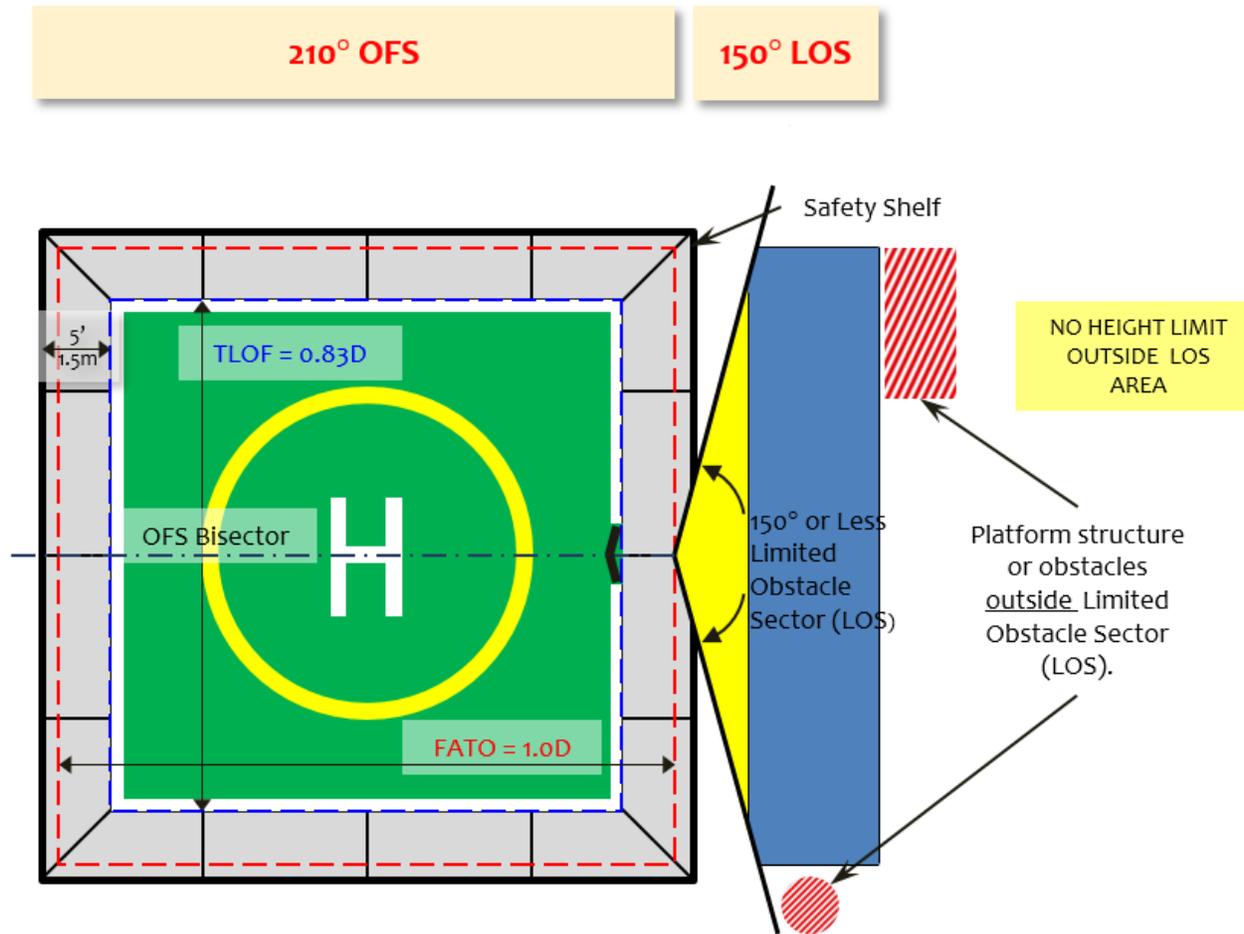
**4.3.2.4** For helidecks that have TLOF of 1.0D or larger, the FATO and the TLOF should be coincidental i.e. be the same size and always occupy the same space. For helidecks that have a TLOF of less than 1.0D, the portion of the FATO outside the TLOF perimeter need not be load bearing.

**4.3.2.5** The TLOF shall provide ground effect and be **designed for appropriate loads** (See section 5). The safety shelf on helidecks with a TLOF of less than 1.0D shall also provide ground effect.



*Note: A safety shelf may be used in place of a safety net*

**Figure 4.3.2.A Square Helideck with 1.0D FATO and 1.0D TLOF**



**Figure 4.3.2.B Square Helideck with 1.0D FATO and 0.83D TLOF**

#### 4.3.3 Helideck for a Helicopter Based Offshore

**4.3.3.1** If a helideck is being designed to accommodate a helicopter routinely based offshore, it should be large enough to allow a mechanic performing routine maintenance to safely reach all parts of the helicopter. The TLOF should be of sufficient size to contain a circle of diameter of not less than 1.0D of the largest helicopter the helideck is intended to serve; see Figure 4.3.2.A.

*Note: A 0.83D square TLOF with the helicopter parked diagonally provides an adequate area to reach all components of the helicopter, in which case proper tie-down points for this configuration should be added (see Section 5.8 and Figures D.1 and D.2).*

**4.3.3.2** For cold environments, a hangar for maintenance, sheltering the helicopter from snow, ice, etc. adjacent to the helideck in which the helicopter can be towed should be considered. This can be located in the area described for helicopter parking (see 4.3.4).

### 4.3.4 Parking Area / Parking Transition Area

**4.3.4.1** A parking area (PA), connected to the TLOF via a parking transition area (PTA), should be considered when practicable and helicopter support requirements warrant. A suitable alternative is to locate a secondary helideck in another location on the facility for this purpose.

**4.3.4.2** A PA provides the ability to park one helicopter, which has been shut down, and safely land a second helicopter on the TLOF. The ability to park a helicopter on an offshore installation and to be able to use the helideck for other helicopter operations at the same time provides greater operational flexibility.

**4.3.4.3** The PA should be located outside the obstacle-free sector (OFS) and outside the LOS of the helideck so that a helicopter parked on the PA is outside the LOS height limitations.

**4.3.4.4** The PA, if included in the design, may be any shape and should be of sufficient size to contain a circle of diameter of not less than 1.0D of the largest helicopter the parking area is intended to serve as illustrated in Figures 4.3.4.A and 4.3.4.B for a 1.0D TLOF and 0.83D TLOF respectively. If a PA of 1.0D cannot be provided due to space or structural limitations, a limited parking area (LPA) or push-in parking area (PIPA) may be provided as outlined in Annex A.

**4.3.4.5** A parking protection area (PPA), as indicated in Figures 4.3.4.A and 4.3.4.B shall also be provided. The PPA extends beyond the outer perimeter of the PTA and 1.0D circle of the PA by a minimum distance of 0.33D. See Figure 4.3.4.A The PPA area may contain objects whose presence are essential for the safe operation of the helicopter to a maximum height of 10 in. (25 cm).

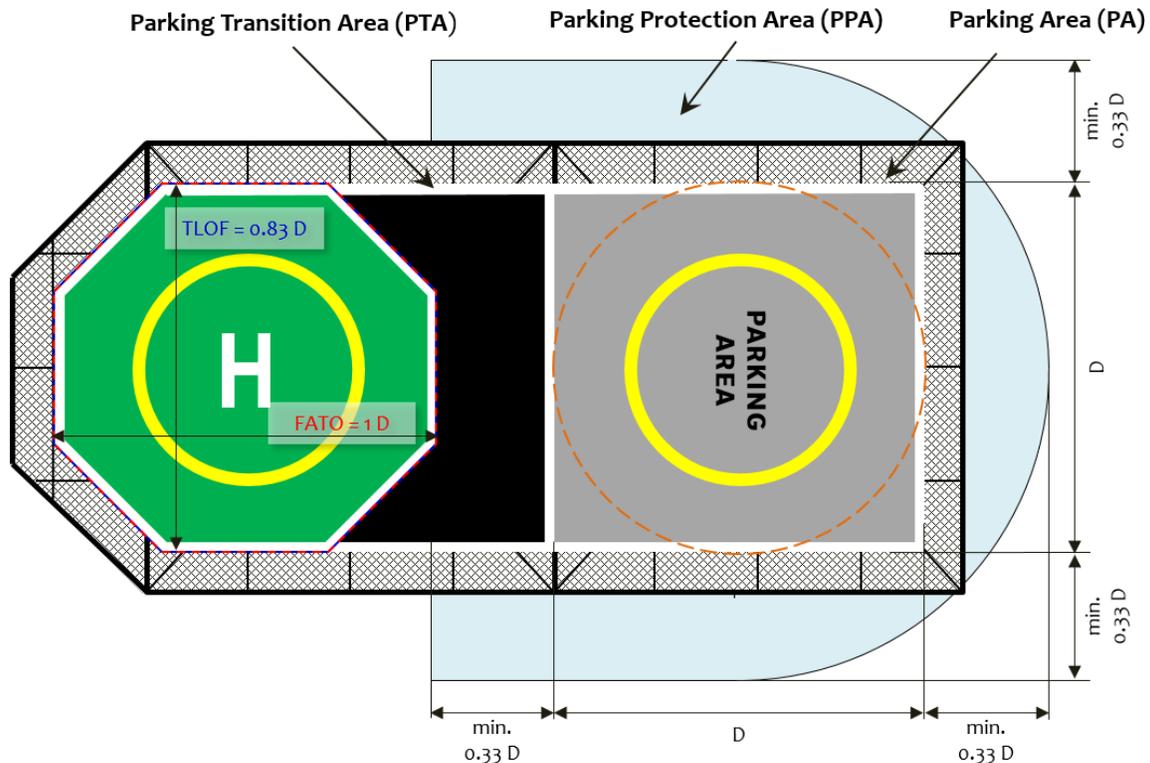
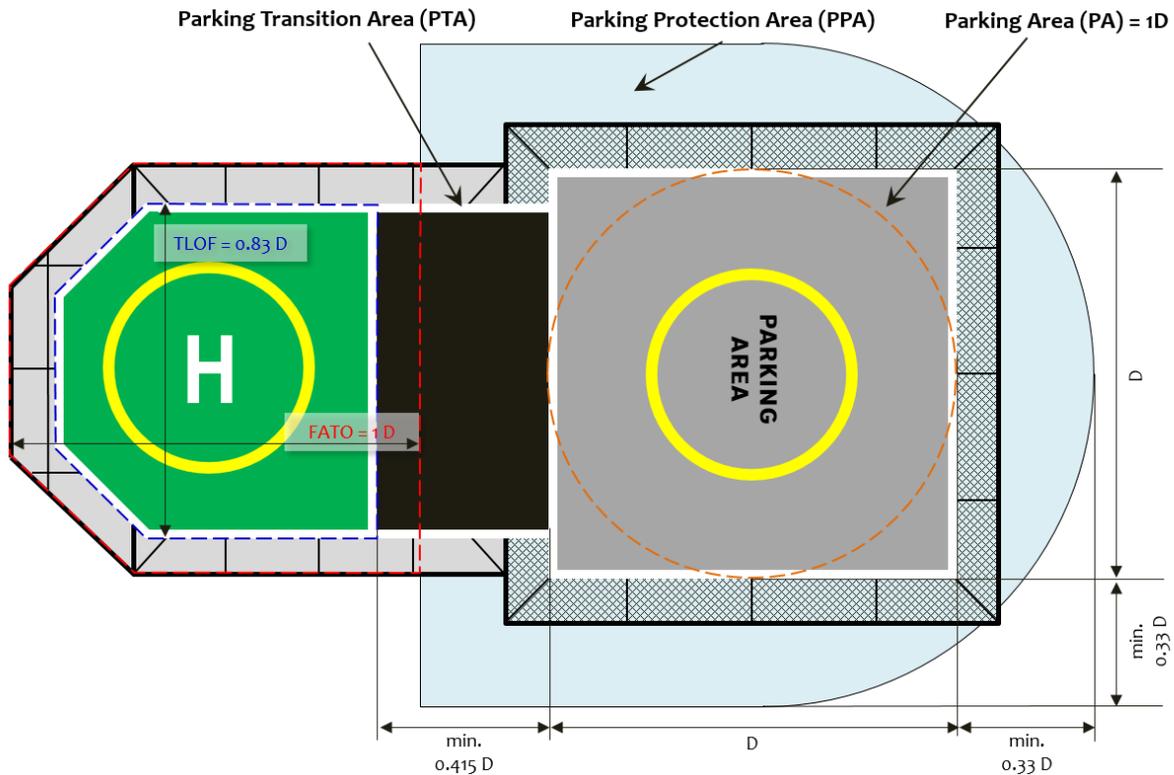


Figure 4.3.4.A 1.0D FATO and 1.0D TLOF with a 1.0D Parking Area.



**Figure 4.3.4.B 1.0D FATO and 0.83D TLOF with a 1.0D Parking Area.**

*Note: If a LPA or PIPA is provided, see Annex A for additional marking guidance.*

**4.3.4.6** PA and PTA design shall include surface drainage (see 4.6.3), a skid-resistant surface, and perimeter safety nets/shelves. In addition, the PA should have tie-downs (see 5.8) equivalent to that of the TLOF design.

**4.3.4.7** PAs should be provided with one or more access points to allow personnel to move to and from the parking area without having to pass through the PTA to the TLOF.

**4.3.4.8** A PTA should be provided for the transition of the helicopter to/from the PA. The PTA divides the helideck TLOF and the PA and provides obstacle clearance between the parked helicopter and a helicopter operating on the helideck TLOF (see Figure 4.3.4.A).

**4.3.4.9** The PA should be separated from the 1.0D FATO of the helideck by a PTA. The PTA shall have with a minimum width of 0.33D (see Figure 4.3.4.A) and be separated from 0.83D TLOF by a minimum width of 0.415D (see Figure 4.3.4.B).

*Note 1: The length (longest dimension) of the PTA should be the same as the maximum width of the TLOF (see Figures 4.3.4.A and 4.3.4.B).*

*Note 2: For TLOF sizes less than 1.0D and greater than 0.83D, the TLOF/PA separation will need to be reviewed/calculated in the design phase.*

## 4.3.5 Obstacle Protection Sectors

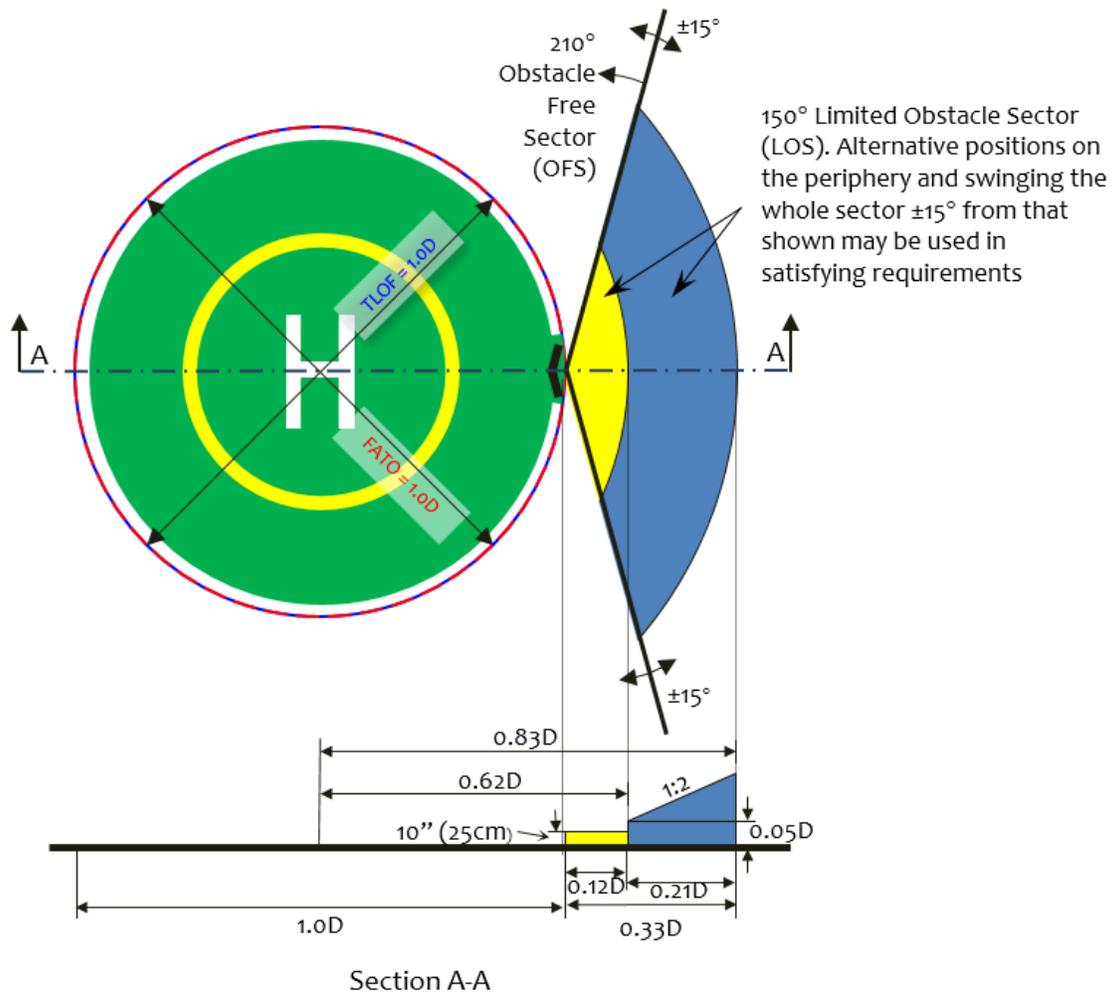
### 4.3.5.1 General

**4.3.5.1.1** A helideck shall have an obstacle-free sector (OFS), an obstacle-free dropdown sector (OFDS), and a LOS. When objects are required to be located on the TLOF or in the FATO outside the TLOF, they should be limited in height (see 4.3.5.2, 4.3.5.3, and 4.3.5.4) and of a suitable frangible construction when assessed against the undercarriage design of helicopters operating to the helideck.

*Note: For helidecks mounted on top of a single leg (toadstool configuration) or minimum structures in accordance with API 2A-WSD, with a 360 degree unobstructed access above the TLOF, a LOS is not required, but a 180 degree OFDS shall still be provided.*

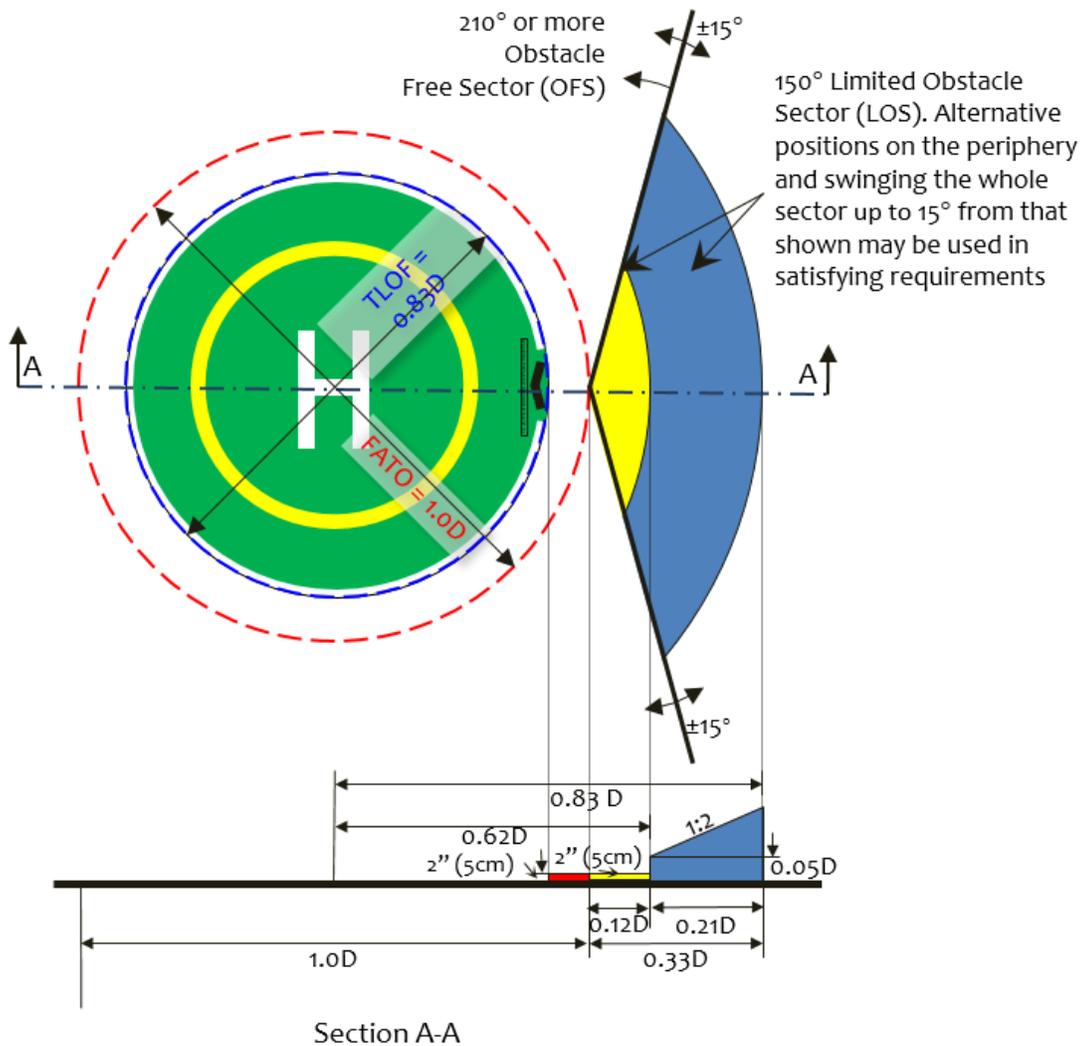
**4.3.5.1.2** Figures 4.3.5.A and 4.3.5.B show a plan view and section height requirements for the OFS and the LOS for a helideck with a circular 1.0D FATO with 1.0D TLOF and a 1.0D FATO and 0.83D TLOF respectively.

**4.3.5.1.3** Although the extent of the LOS segments are arcs (see Figures 4.3.5.A and 4.3.5.B), these may be represented as arcs or as straight lines. If the TLOF perimeter has straight lines, the LOS segments should also be straight lines parallel to the TLOF perimeter (see Figures 4.3.5.C and 4.3.5.D).



*Note: For clarity Safety Net or Safety Shelf not shown*

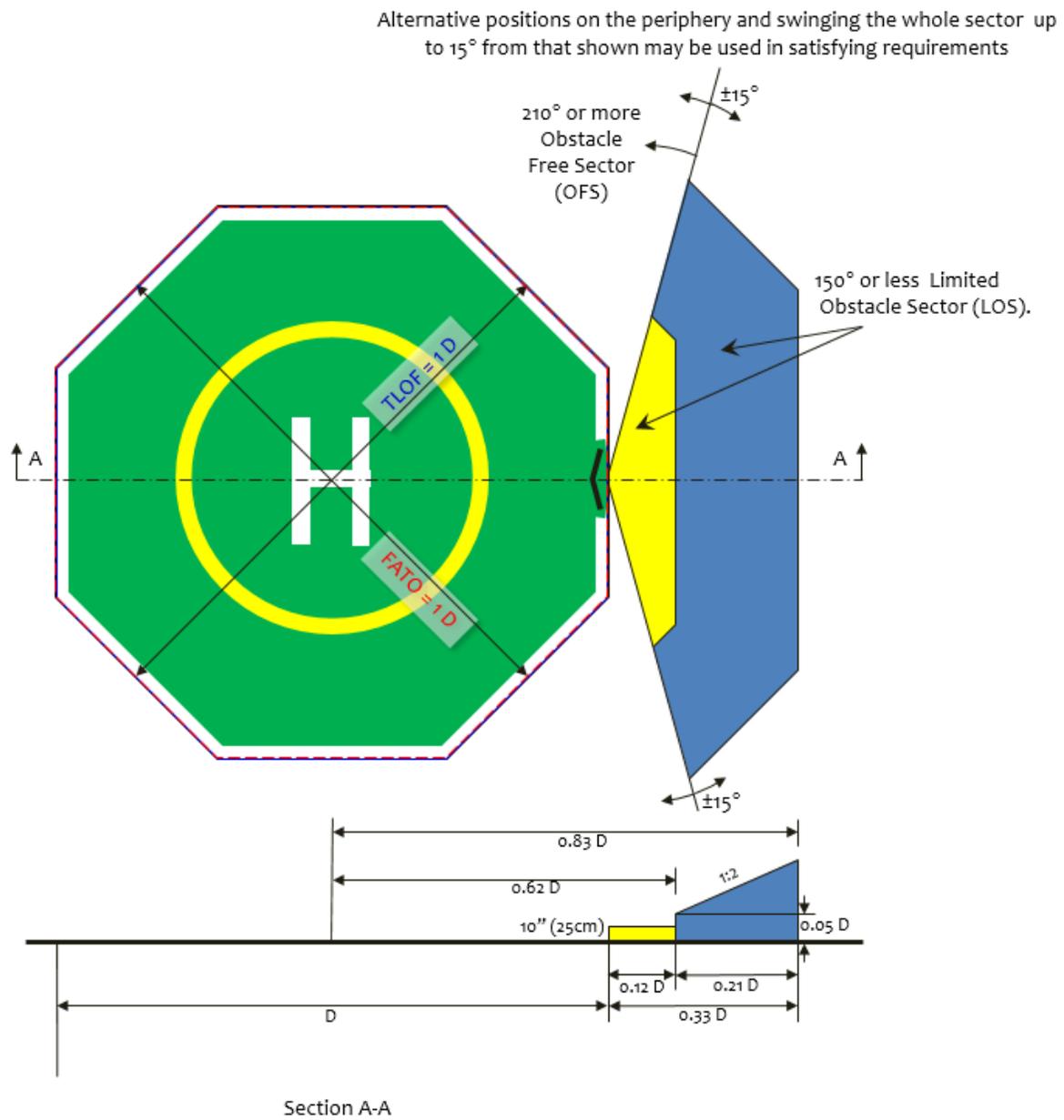
**Figure 4.3.5.A Obstacle Limitation Sector and Obstacle-free Sector for Helideck with a Circular 1.0D FATO and 1.0D Circular TLOF**



*Note: For clarity Safety Net or Safety Shelf not shown*

**Figure 4.3.5.B Obstacle Limitation Sector and Obstacle-Free Sector for Helideck with a Circular 1.0D FATO and 0.83D Circular TLOF**

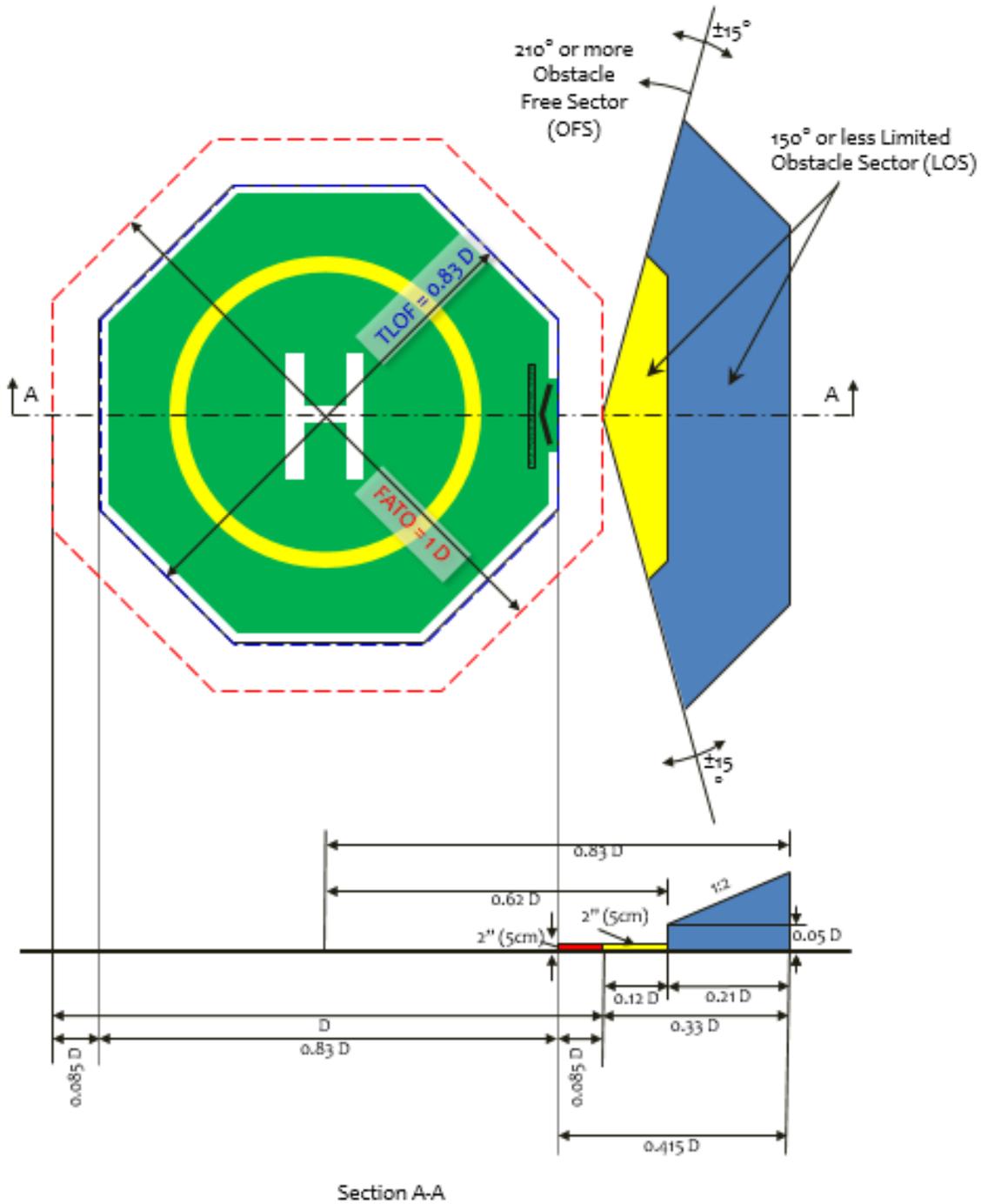
**4.3.5.1.4** Figures 4.3.5.C and 4.3.5.D show the same as in Figures 4.3.5.A and 4.3.5.B for an eight-sided/octagonal shaped helideck (TLOF) and Figures 4.3.5.E, 4.3.5.F, and 4.3.5.G the corresponding plan and elevation requirements.



*Note: For clarity Safety Net or Safety Shelf not shown*

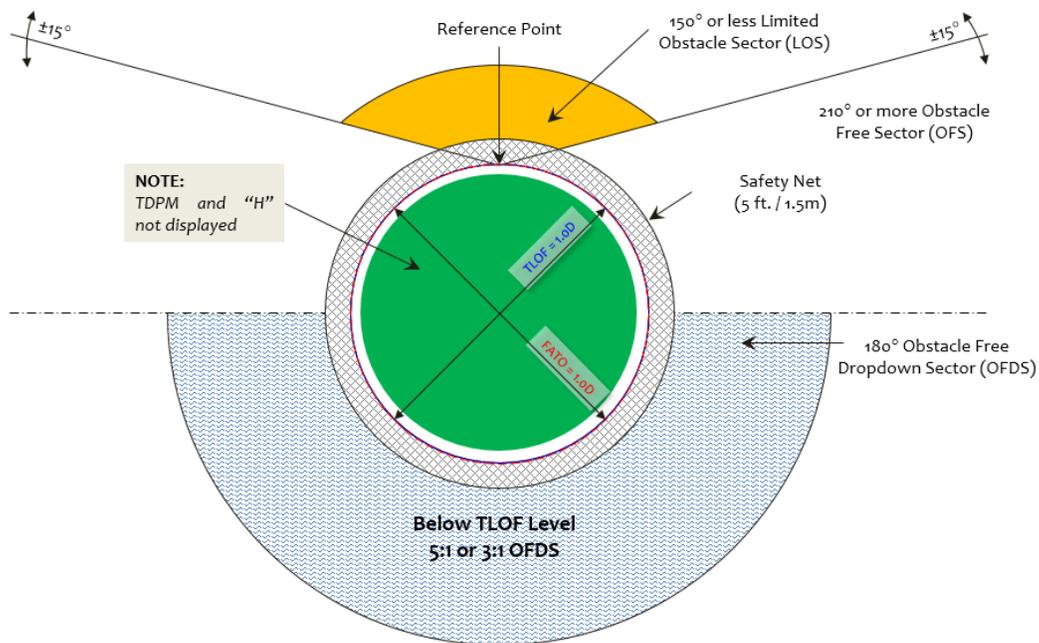
**Figure 4.3.5.C Obstacle Limitation Sector and Obstacle-Free Sector for Octagonal Helideck with a 1.0D FATO and 1.0D TLOF**

Alternative positions on the periphery and swinging the whole sector up to  $15^\circ$  from that shown may be used in satisfying requirements

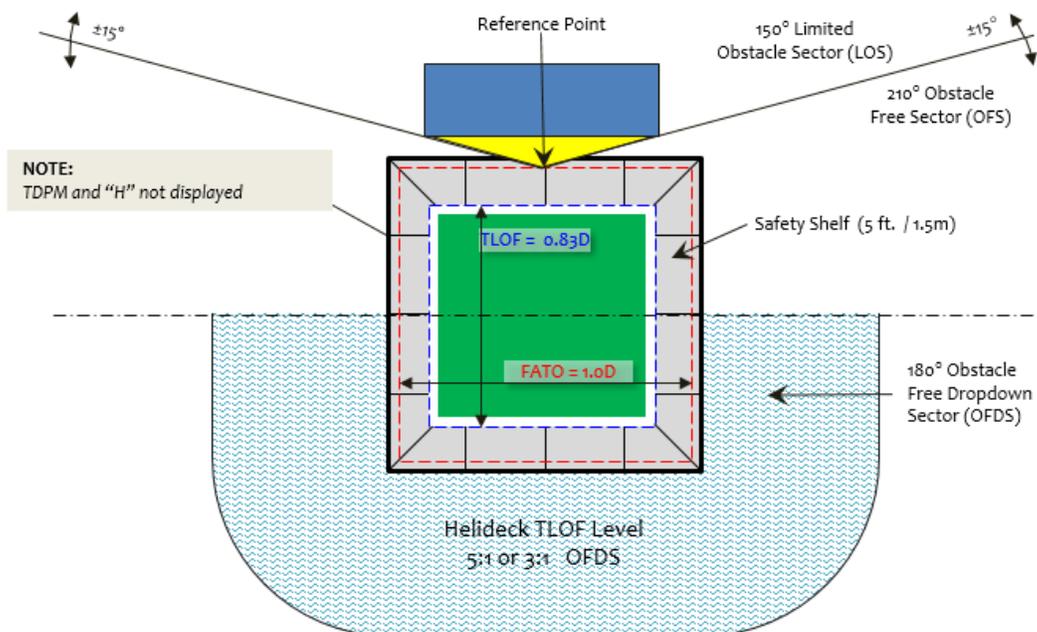


Note: For clarity Safety Net or Safety Shelf not shown

Figure 4.3.5.D Obstacle Limitation Sector and Obstacle-Free Sector for Helideck with a 1.0D FATO and 0.83D Octagonal TLOF



**Figure 4.3.5.E Obstacle-free Sector, Limited Obstacle Sector and Obstacle-Free Dropdown Sector below a Helideck with 1.0D Circular TLOF**



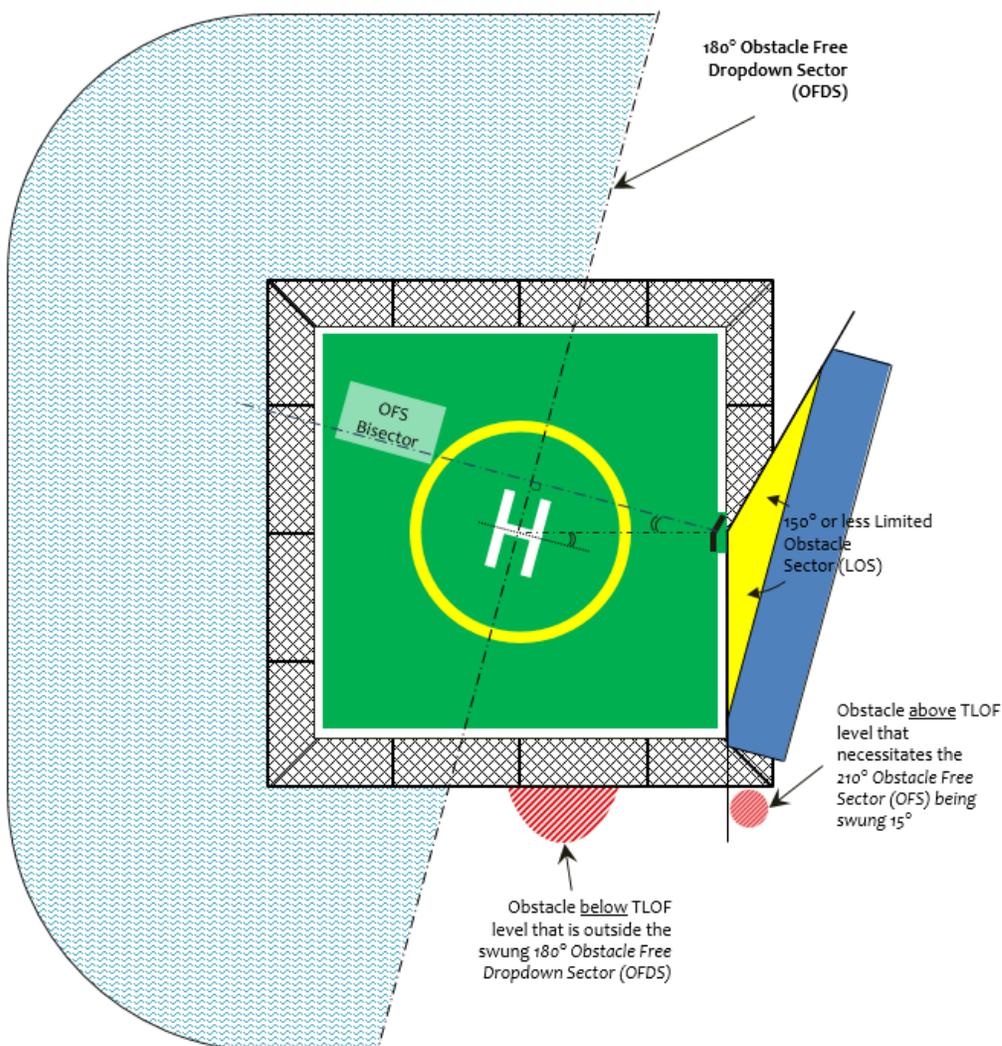
**Figure 4.3.5.F — Obstacle-Free Sector, Limited Obstacle Sector and Obstacle-Free Dropdown**



be applied by helicopter operator in consult with the facility owner. The helideck orientation in relation to adjacent facilities should be considered in the design process.

**4.3.5.2.2** The bisector of the OFS should pass through the center of the TLOF and “H”; see Figure 4.3.5.A through Figure 4.3.5.D.

**4.3.5.2.3** The OFS may be swung (rotated) to avoid obstacles above or below the helideck (TLOF) by up to 15 degrees in either direction (a 15 degree clockwise swing is illustrated in Figure 14.3.5.H), but the LOS shall be maintained at 150° or less (see 4.3.5.3. and 6.6). If the 210° OFS is swung, then the 180 degree OFDS with a 3:1 or 5:1 falling gradient (see 4.3.5.2) shall also be swung the same amount to align with the swung OFS. This also changes the location of the LOS as shown in Figure 4.3.5.H, but in all cases the chevron will be at the apex of the LOS. If the OFS is swung the “H” shall also be swung by a corresponding amount, and the “H” crossbar should remain parallel to the bi-sector of the OFS as illustrated in Figure 4.3.5.H.



**Figure 4.3.5.H — OFS Sector Swung by 15 Degrees**

**4.3.5.2.4** There should be no fixed obstacles within the obstacle-free sector (OFS) unless their function requires them to be located as follows:

a) On the TLOF perimeter such as drainage guttering (see 4.6.6), lighting (see 7.1), and firefighting equipment (see 4.6.3. and 4.6.4);

b) Just outside the TLOF perimeter i.e. foam monitors (where provided);

c) Tie-down points, handrails and other items associated with the TLOF which are incapable of complete retraction or lowering for helicopter operations.

d) When such objects are required to be located within the TLOF, the height above the TLOF surface should be limited to 2 in. (5 cm).

**4.3.5.2.5** For a helideck with a 1.0D FATO/TLOF or larger, objects which are required to be located outside the FATO/TLOF, such as foam monitors (where provided), lights (see 7.1), etc., the height shall be limited to 6 in. (15 cm).

**4.3.5.2.6** For a helideck with a less than 1.0D TLOF, objects which are required to be located just outside the TLOF, such as foam monitors (where provided), lights (see 7.1), etc., the height above the TLOF surface shall be limited to 2 in. (5 cm).

### **4.3.5.3 Obstacle-Free Dropdown Sector**

**4.3.5.3.1** Below the TLOF level, within the same arc as the OFS, the obstacle-free dropdown sector (OFDS) should extend downward from the outer edge of the safety net or safety shelf at an elevation corresponding to that of the TLOF to the water level; within an arc of not less than 180° with the origin at the center of the TLOF and outwards to a distance that will allow for safe clearance from the obstacles below the helideck; see Figures 4.3.5.E, 4.3.5.F, and 4.3.5.G.

*Note: The “shape” of the OFDS at water level is the same as the safety shelf/net shape.*

**4.3.5.3.2** The obstacle-free dropdown sector (OFDS) should have a falling gradient having a ratio of one unit horizontally to five units vertically (5:1) from the outer edge of the safety net or safety shelf within the 180 degree sector.

**4.3.5.3.3** For helidecks designed for the use of only multi-engine helicopters, the horizontal component of the falling gradient within the 180° sector may have a less demanding ratio of one unit horizontally to three units vertically (3:1); see Figure 4.3.5.G.

*Note 1: The obstacle-free dropdown sector properties may need adjustment depending upon the performance of the selected helicopter and height of the helideck above the sea. The aircraft manufacturer should be able to provide the necessary technical data and in most cases this is included in the helicopter flight manual.*

*Note 2: Raising the helideck elevation as high as practicable above the sea level will enhance the capability of the helicopter to safely land or fly away in the event of an engine failure.*

### **4.3.5.4 Limited Obstacle Sector**

**4.3.5.4.1** The limited obstacle sector (LOS) is a complex sector originating at the reference point, located on the perimeter of the FATO and extending over the arc not covered by the

obstacle free sector within which the height of obstacles above the level of the TLOF are limited. The LOS should not subtend an arc greater than 150 degrees. The dimensions and location of the LOS should be as indicated in Figure 4.3.5.A and 4.3.5.C for a 1.0D FATO with a coincidental 1D TLOF and as in Figure 4.3.5.B and 4.3.5.D for a 1D FATO and 0.83D TLOF.

**4.3.5.4.2** Figures 4.3.5.D, 4.3.5.B, 4.3.5.C and 4.3.5.D show the two segments of the LOS and how these are measured from the center of the D-circle and the reference point on the D-circle. The first segment extends out to 0.62D from the center of the D-circle or 0.12D from the reference point. The second segment of the LOS is a rising 1:2 slope (1 vertical to 2 horizontal) originating at a height of 0.05D above the TLOF surface and extending out to 0.83D from the center of the D-circle (i.e. a further 0.21D from the edge of the first segment of the LOS or an overall distance of 0.33D from the reference point).

*Note: If the LOS is made less than 150 degrees, the OFS should be increased by the same amount so that the LOS and OFS angle is 360°. Such a decrease in the LOS will provide a larger clear area for the helicopter to operate. If the LOS angle is reduced, the chevron marking (see paragraph 6.6) should also be reduced by the same angle.*

**4.3.5.4.3** For a TLOF of 1.0D or larger, objects within the first segment of the LOS should not exceed a height of 10 in. (25 cm) above the TLOF surface. In the second segment the LOS sector surface rises at a rate of one unit vertically for each two units horizontally originating at a height 0.05D above the level of the TLOF (see Figure 4.3.5.C).

**4.3.5.4.4** For a TLOF of 0.83D, objects within the first segment of the LOS, objects should not exceed a height of 2 in. (5 cm) above the TLOF surface. In the second segment the limited obstacle surface rises at a rate of one unit vertically for each two units horizontally originating at a height 0.05D above the level of the TLOF (see Figure 4.3.5.D).

*Note: The height limit of 2 in. (5 cm) above the TLOF surface for objects whose function require them to be located on the TLOF perimeter, applies to the complete area between the TLOF and 1.0D FATO: it also applies to the OFS sector (see 4.3.5.1).*

## 4.4 Orientation

**4.4.1** Orientation of the helideck should be determined by reviewing the platform configuration, equipment arrangement, and prevailing wind direction (see 4.3.5.2 for additional details). The helideck should be oriented so the helicopter can takeoff/land into the prevailing winds and any gas discharge booms should be located on the opposite end of the facility or in a location that has the least impact on helicopter operations; see 4.7, 4.8 and Figure 4.3.1.

*Note: The orientation of the helideck in relation to the main structure(s) of the offshore facility and the direction of the strongest prevailing winds is a critical factor in the ability to operate helicopters safely and efficiently. Every attempt should be made to minimize crosswind and eliminate the need for 'tail wind' approaches/departures. See the Facility Checklist in API 14J for additional guidance.*

**4.4.2** Topside arrangements, which could potentially have an adverse environmental effect on the helideck area and the helicopter performance/maneuverability (see 4.7 and 4.8), shall be subject to wind flow studies using wind tunnel testing and/or Computational Fluid Dynamics (CFD) analysis to establish the wind environment in which helicopters will be expected to operate if helideck location and the anticipated venting discharges for the facility may present a hazard to flight operations. As a general rule, a limit for the vertical airflow velocity of 5.75 ft/s (1.75 m/s) should not be exceeded.

## 4.5 Personnel Access and Egress

**4.5.1** The location of access and egress stairways for use by personnel using the helideck should be determined from the facility configuration, equipment arrangement, and safety objectives. Two personnel access and egress routes, one primary and one secondary, shall be provided as a minimum. When possible, the personnel access and egress routes should be outside the TLOF. The use of steep stairways or ladders should be limited, where possible, to minimum structures. *There should be a protected passenger waiting area at a minimum of 7 ft. (2.0m) below the elevation of the helideck surface, away from any refueling equipment and fire firefighting access platforms.*

**4.5.2** One route should be located remotely from the other; limited to emergency use and so marked to prohibit normal passenger flow.

**4.5.3** Handrails should not protrude above the height of the TLOF surface; if they cannot be completely retracted or lowered for helicopter operations the height above the TLOF surface should be limited to 2 in. (5 cm) (see 4.3.5.2.4 c). The handrails should *be retractable, collapsible, or removable and not impede access and egress. Handrails which are retractable, collapsible or removable should be painted or marked using other visual materials in contrasting (preferably black and yellow) color scheme.* A safety net or safety shelf shall be provided to protect personnel from falling overboard during handrail foldup/fold down operations.

*Note: It may not be possible to provide two access/egress routes for helidecks mounted on top of minimum structures and may have to be limited to one, in which case this should be documented in the helideck's limitation listing facility operational procedures.*

## 4.6 Fire Protection

### 4.6.1 General

**4.6.1.1** A risk assessment shall be completed to determine the level of fire protection necessary to contain a post-crash fire (PCF) in the event of a helicopter crash which in a worst case scenario the largest helicopter using the helideck has rolled onto its side with a full passenger load. The fire protection system should provide adequate time to evacuate all occupants from the helicopter and helideck.

**4.6.1.2** When conducting the risk assessment, many parameters should be considered to determine the scope of the fire protection equipment required for each helideck. At a minimum, parameters that should be considered include: whether the platform is fixed or floating, size of helideck, presence of a fueling station, helicopter models that are expected to service the platform including personnel and fuel capacity of such helicopters, whether the platform is manned or unmanned and, typical number of personnel on board the helicopter if the platform is manned.

**4.6.1.3** The requirements and fire protection system performance shall, as a minimum, be in accordance with NFPA 418, in particular Chapters 5 and 8, and when fueling systems are provided NFPA 407. Additional Information is available in API 2A-WSD.

*Note 1: The principal objective of rescue and firefighting equipment 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 helideck 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 mitigating, a fire which may occur either immediately following a helicopter accident or incident or at any time during operations.*

*Note 2: 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 respond and the effectiveness of that response.*

*Note 3: The portable fire extinguishing equipment shall be readily accessible to the TLOF and parking area (if installed) and ramps may be necessary to allow the equipment to be easily moved from the firefighting access platforms or other storage areas to the TLOF/PA surface.*

#### **4.6.2 Firefighting Personnel Access**

The two personnel access and egress routes (see 4.5 for further detail) should be designed as access points for fire-fighting/rescue personnel.

As part of each access route, a firefighting access platform shall be provided 5 ft. (1.5 m) below the TLOF surface, outside the TLOF perimeter and with direct access to the helideck. This platform is used to house firefighting equipment such as hydrants, monitors and/or rescue equipment, as well as providing a staging area for the HLO and/or firefighting/rescue crews.

If a firefighting access platform is to be located within the 180° OFDS, the firefighting access platform should be designed to remain within the width of the safety net/shelf (5 ft./1.5 m) or as close as practically possible.

*Note: For a minimum structure in accordance with API 2A-WSD, it may not be possible to provide two access/egress routes: this should be risk assessed in the design process.*

#### **4.6.3 Helideck Surface and Drainage**

**4.6.3.1** The TLOF surface should be designed with adequate surface drainage arrangements and a free-flowing collection system that will quickly and safely direct any standing water, fuel spillage and/or firefighting media away from the helideck surface to a safe place on the facility and to prevent liquids from spreading to, or spilling onto, accommodation spaces or working spaces.

**4.6.3.2** The drainage system can be a totally enclosed system designed to minimize access to oxygen and therefore minimize chances of combustion and fire. Burning liquids, which reach the drainage gutter, extinguishes by itself after very short time due to lack of oxygen.

*Note 1: These systems are an integrated part of the load-bearing surface of the aluminum helideck and the inlet openings provide safe drainage of fuel and firewater/foam*

*Note 2: DIFFS nozzles can present a hazard to skid equipped helicopters, and this should be considered in the risk analysis/design of the fire protection system.*

##### **4.6.3.3 The design shall have**

- a) A provision for diversion of any fuel that may be spilled due to a helicopter accident,
- and
- b) A provision for containment of any fuel spillage for facilities that have a fuel system.

##### **4.6.3.4 The design should have**

- a) Provision to keep helideck tie-down points (see 5.8 for tie-down point design requirements) from holding liquids,

- b) A TLOF surface slope of no more than 2 % to prevent the standing collection of liquids,
- c) A drainage system constructed of metal or other materials providing adequate resistance to fire, and
- d) A design of the drainage system that precludes blockage by debris and the TLOF surface curbed (if necessary) and sealed so that spillage will only route into the drainage system.

**4.6.3.5** The capacity of the drainage system should be sufficient to contain the maximum likely spillage of fuel on the helideck plus fire protection media. The calculation of the amount of spillage to be contained should be based on an analysis of the fuel capacity, typical fuel loads and fuel uplifts of the helicopter types anticipated to use the helideck.

*Note 1: Some regulatory authorities may have environmental requirements requiring zero discharge outside the helideck.*

*Note 2: Designs can be used that capture spilled liquids using a recessed drainage system for safe collection and discharge of water/fuel and passively extinguish any fire.*

*Note 3: A diverter valve may be provided in the drainage system to temporarily disallow rain water diversion during flight operations. The valve should be closed during helicopter approach and take-off so that a fuel release may be captured and contained.*

#### **4.6.4 Key Design Characteristics for Fire Protection at Manned Facilities Using Principal Agent Foam**

**4.6.4.1** A key aspect in the successful design for providing efficient, integrated helideck rescue and fire suppression is a complete understanding of the operational requirements for its use. A helicopter accident, which results in a fuel spillage with wreckage and/or fire and smoke, has the capability to render some of the response equipment unusable or preclude the use of some passenger escape routes.

**4.6.4.2** Delivery of firefighting media to the helideck surface at the appropriate application rate is specified in Annex B. The foam system should have a delay of less than 15 seconds using foam that is suitable for use with salt water, measured from the time the system is activated until the start of production of foam at the required application rate. The foam system should be designed to bring a helideck fire under control within 30 seconds measured from the time the system is producing foam at the required application rate. See Annex B for further details on foam firefighting requirements.

**4.6.4.3** The foam system should be capable of delivering foam solution to the entire helideck surface.

*Note 1: The amounts of water required to support the fire system do not have to be stored on or adjacent to the helideck if there is a suitable adjacent pressurized water main system capable of sustaining the required discharge rate.*

*Note 2: See 4.3.5.1 and 4.3.5.3 for limitations on height restrictions for any firefighting equipment located on the TLOF perimeter.*

#### **4.6.5 Fire Protection Manned Facilities Using Complementary Dry Chemical and Gaseous Agents**

*Note 1: While foam is considered the principal medium for dealing with fires involving fuel spillages, the wide variety of fire incidents likely to be encountered during helicopter operations – e.g. engine, avionic*

bays, transmission areas, hydraulic systems, etc. may require the provision of more than one type of complementary agent. Dry powder and gaseous agents are generally considered acceptable for this task. The complementary agents selected should comply with appropriate specifications. Systems should be capable of delivering the agents through equipment which will ensure effective application. Because of prevalent weather conditions, complementary agents can be adversely affected during application and training should take this into account.

Note 2: See 4.3.5.1 and 4.3.5.3 for limitations on height restrictions for any firefighting equipment located on the TLOF perimeter. Ideally, this equipment will be solely located in the LOS.

**4.6.5.1** The use of foam compatible dry powder as the primary complementary agent is recommended. The minimum total capacity should be 100 lbs. (45 kg) delivered from extinguishers of not less than 20 lbs. (9 kg) each. The dry powder system should have the capacity to deliver the agent anywhere on the landing area and the discharge rate of the agent should be selected for optimum effectiveness of the agent. Containers of sufficient capacity to allow continuous and sufficient application of the agent should be provided. All applicators are to be fitted with a mechanism which allows them to be hand controlled.

**4.6.5.2** The use of a gaseous agent (CO<sub>2</sub>) in addition to the use of dry powder as the primary complementary agent is recommended and should be provided with a suitable applicator for use on engine fires (long lance). The appropriate minimum quantity delivered from one or two extinguishers is 40 lbs. (18 kg).

**4.6.5.3** The discharge rate of the agent(s) should be selected for optimum effectiveness of the agent and the extinguishers should be located so that they are readily available at all times. Reserve 100% on-hand stocks of complementary media to allow for replenishment as a result of activation of the system during an incident, or following training or testing, should be provided.

#### **4.6.6 Key Design Characteristics for Fire Protection at Normally Unmanned Installations (NUIs)**

**4.6.6.1** Consideration should be given to the selection and provision of foam as the principal agent. For an NUI, where helideck rescue and firefighting (RFF) equipment will be unattended during certain helicopter movements, the pressurized discharge of foam through a manually operated fixed monitor system is not recommended. For installations which are at times unattended the effective delivery of foam to the whole of the TLOF area may best be achieved by means of a deck integrated firefighting system (DIFFS). As a minimum, NUIs shall have two (2) 40 lb. (18 kg) dry powder fire extinguishers available in close proximity of the helideck (i.e. stairwell landing). See Annex B for additional details.

**4.6.6.2** Other combination solutions may also be considered where these can be demonstrated to be effective in dealing with a fuel fire. For example, the selection of a seawater-only DIFFS used in tandem with a passive or self-extinguishing fire-retarding helideck system described previously which demonstrated to be capable of removing significant quantities of unburned fuel from the surface of the helideck in the event of a fuel spill from a ruptured aircraft tank.

**4.6.6.3** DIFFS where provided on NUIs should be integrated with platform safety systems such that the pop-up nozzles are activated automatically in the event of an impact of a helicopter on the helideck.

#### **4.6.7 Additional Key Design Considerations**

**4.6.7.1** Consideration should be given to automated fire protection systems now available that can replace the manned systems; these include a passive fire-retarding helideck system with a recessed drainage system for safe collection and discharge of water/fuel below the deck, ring type systems,

automated oscillating fire monitor systems, and deck-integrated firefighting systems (DIFFS) in which nozzles pop-up from the helideck to extinguish a fire.

#### **4.6.8 Parking Area (PA) and Parking Transition Area (PTA) Firefighting**

This section describes the minimum requirements for firefighting equipment for PA inclusive of the PTA.

**4.6.8.1** If the PA has one or more shared access locations with the TLOF area, with their own firefighting provisions, these can be used for both the TLOF and PA/PTA provided that these systems have capability to cover both areas.

**4.6.8.2** If separate systems are installed for the TLOF and PA/PTA that the activation/deployment of firefighting systems they should be activated independently. Although it is unlikely that the firefighting systems for both the TLOF and PA will have to be activated at the same time, it should be considered that a helicopter incident could occur while transitioning from the TLOF to the PTA and the system(s) shall be designed accordingly.

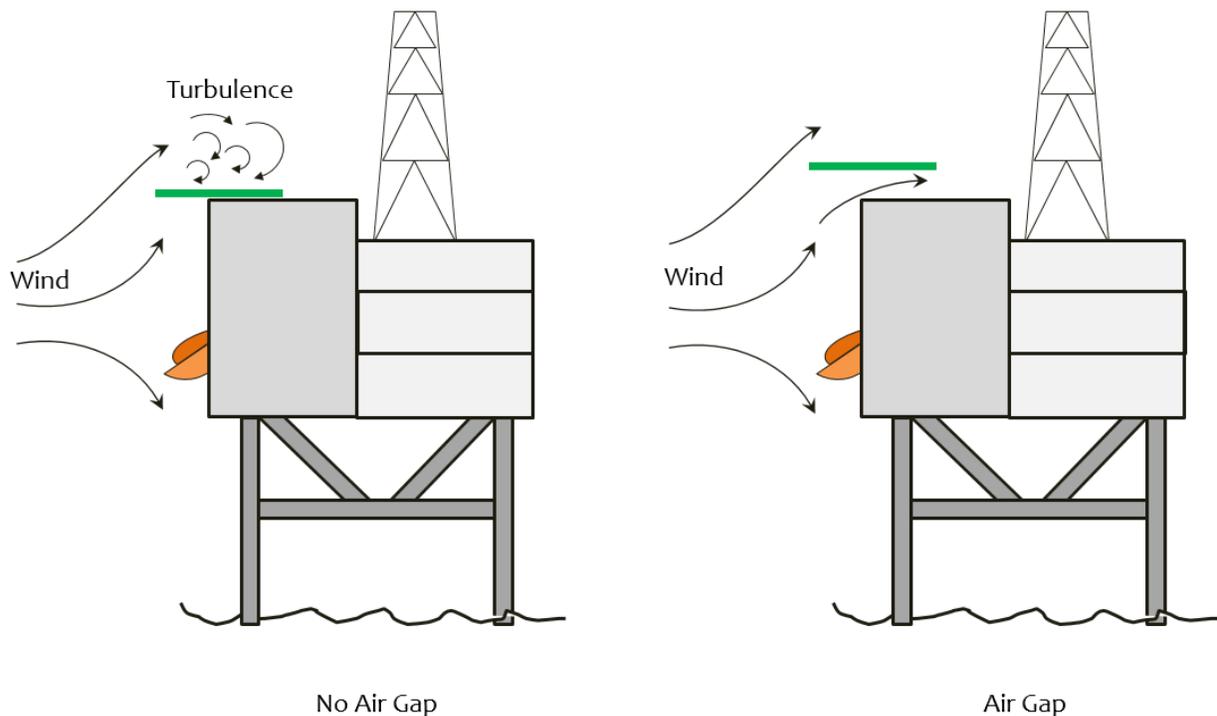
**4.6.8.3** The PA shall have two sets of fire extinguishers with Complementary Dry Chemical and Gaseous Agents (per para 4.6.5) which shall be readily accessible from the PA.

**4.6.8.4** The PA shall, at a minimum, have two water hydrants with a preference for a combined foam/water hydrant. A hydrant shall be placed on each side of the PA and must have a hose with sufficient length to cover the entire PA/PTA.

**4.6.8.5** If the PA is designed to enable a helicopter to fly or hover into it, it is recommended that in addition to the water/foam hydrants, that additional fixed firefighting systems be considered. These can be additional foam monitors or (water only) DIFFS (per Annex B). Alternatively, a passive firefighting (recessed drainage) system can be installed to self-extinguish a post-crash fire.

#### **4.7 Air Turbulence**

**4.7.1** Helidecks adjacent to or above large raised structures and buildings can experience turbulence in certain wind conditions. Turbulence is also encountered when helidecks are part of a building roof when air is compacted against the building's side and forced over the helideck surface; see Figure 4.6.7. See 4.4 and UK CAA Paper 2008/03, for additional guidance.



**Figure 4.6.7 — Turbulence with and without a Helideck Air Gap**

**4.7.2** The following shall be incorporated in the design to reduce turbulence over the TLOF.

**4.7.2.1** The helideck should be located as far as practicable from other buildings, derricks, cranes, etc. See API 14J for additional guidance.

**4.7.2.2** An unobstructed minimum air gap of 10 ft. (3 m) shall be provided between the TLOF and any building roof, so the turbulent air can flow under the TLOF: this will minimize adverse effect to helicopter operations.

**4.7.2.3** A helideck shall be designed and arranged to ensure that an unobstructed air-gap is provided which encompasses the full dimensions of the TLOF

*Note: This unobstructed air gap can include necessary helideck support structure, piping, and other necessary helideck support equipment such as foam tanks, but in no case should the obstructions allowed exceed 70 % of the available air space.*

**4.7.2.4** A solid safety shelf instead of a safety net can reduce the turbulence problems from adjacent structures located near helidecks. The safety shelf should be at least 5 ft. (1.5 m) wide: this will serve to disperse the burble effect of the wind and in addition to provide an increased ground effect area.

**4.7.3** The helideck design should be subject to an airflow study (see 4.4) if any obstructions other than helideck supporting structure is placed in the air gap or when gas discharges could affect helicopter operations (see 4.9) and it may be necessary to establish, other turbulence mitigating design measures and/or operational limitations under certain wind conditions.

**4.7.4** Some objects such as supporting structure, foam supply tanks may be installed in the air gap. These obstructions to airflow should be minimized and any deviations should be listed in the helideck's documented limitation listing.

## **4.8 Hot Air, Raw Gas, and Hydrogen Sulfide (H<sub>2</sub>S) Discharge**

**4.8.1** Raw gas discharges or hot air discharges from compressors and cooling systems adjacent to helidecks may be hazardous to helicopter operations and can drastically affect helicopter performance and appropriate restrictions should be imposed on the use of the helideck where either of the above exists. [As a general rule, a limit for the vertical airflow velocity of 5.75 ft/s \(1.75 m/s\) should not be exceeded.](#)

**4.8.2** Hydrogen sulfide (H<sub>2</sub>S) gas discharge in higher concentrations (300 ppm to 500 ppm) can cause loss of consciousness within a few seconds.

**4.8.3** When designing helidecks that have been identified to have any of the above conditions that may be hazardous to helicopter operations a visual warning system ([e.g. Helideck Status lights](#)) should be provided to alert pilots of the hazard. See 4.4 for additional guidance on wind tunnel testing and/or computational fluid dynamics ([CFD](#)) and 7.4 for status light guidance.

**4.8.4** Sources of discharges should be located as far as practicable away from the helideck, flight path, and oriented so the typical prevailing wind will carry the discharges away from the helideck area.

*Note: [Gas detectors](#) / Sniffers (generic term used to describe automated vapor detection devices) or other detection devices (infrared, etc.) may be used to detect these discharges and to automatically activate status lights (see 7.4) when discharges present a hazard to flight operations.*

## **4.9 Helideck Equipment and Material Handling**

**4.9.1** Lights, refueling equipment, fire extinguishers, wind indicators, and personnel access and egress routes should be located deliberately to avoid becoming an obstruction.

**4.9.2** Access to and egress from the TLOF (helideck) for handling material or equipment transported by the helicopter should be addressed. For material handling, steep stairways or ladders should be avoided and inclusion of a crane that can reach the TLOF should be considered but it should meet, when not in use, helideck obstacle clearance requirements.

*Note: See 4.3.5.1 and 4.3.5.3 for limitations on height restrictions for any equipment, railings, etc. located on the TLOF perimeter. Ideally, equipment will be solely located in the LOS.*

# **5 Design Procedures for Offshore Helidecks**

## **5.1 General**

The design procedures are limited to helidecks of steel or aluminum construction located on fixed and floating offshore [facilities](#). However, the design procedures [should not](#) be construed as a recommendation of steel over other suitable building materials. The helideck design drawings and specifications as well as the fabrication, installation, inspection, and surveys for fixed offshore platforms and floating facilities are defined (as applicable) in API 2A-WSD, API 2FPS, API 2T, and [in](#) additional regulatory requirements i.e. USCG regulations, ABS Rules for Building and Classing Mobile Offshore Drilling Units and AA ADM, as applicable.

## 5.2 Helideck Design Load

As an overall design philosophy, the design should be calculated based on either API 2A-WSD or API 2A-LRFD, but not a combination of more than one of the above cited references.

### 5.2.1 Dead Weight (Mass)

The dead weight (mass) is the weight (mass) of the complete helideck decking structure including the TLOF, safety shelf or safety net, stiffeners, supporting structure, and accessories/appurtenances.

### 5.2.2 Live Load / Overall Superimposed Load

The term "overall superimposed load" is used in design documents to replace "live load". All areas of the helideck accessible to a helicopter, including any separate parking area, shall be designed to resist an imposed load equal to the MTOM of the design helicopter. This load should be distributed between all the landing gear. It should be applied in any position on the helideck to produce the most severe loading on each element considered.

**5.2.2.1** To allow for personnel and cargo transfer or rotor downwash, a minimum 42 psf (2.01 kN/m<sup>2</sup>) live load shall be uniformly distributed over the entire TLOF, including parking, parking transition areas, and safety shelves.

**5.2.2.2** Areas of the helideck that have loading that exceeds that of the global helideck and global topsides loading (such as fueling stations, firefighting stations, etc.) shall be accounted for in the helideck design.

### 5.2.3 Wind Load

Wind loading shall be used in the design of the platform, parking and parking transition area. The 100-year return period wind actions on the helicopter landing area structure should be applied in the direction which, together with the imposed horizontal and lateral loading, produces the most severe load condition on each structural element being considered

**5.2.3.1** Storm and operational wind speed should be applied omni-directionally (all directions) in a minimum of 8 directions. Return period, wind speed variation with height and wind load calculation shall be in accordance with API 2A-WSD.

**5.2.3.2** Operational wind loading should be determined based on the projected areas of the helideck and helicopter silhouette, including helicopters on landing and parking areas and the projected area of the framing.

**5.2.3.3** Site-specific operational and storm wind loads are preferred; however, API 2MET wind loading may be used if site-specific loading is not available.

**5.2.3.4** The wind area of the helideck framing shall be used to determine the extreme storm wind loading on the helideck. For operational load cases, the projected area of the helicopter(s) should be included with that of the framing to determine the wind loading on the helideck.

### 5.2.4 Helicopter Landing Load Considerations

#### 5.2.4.1 General

a) The TLOF and its supporting structure shall be designed to withstand all the loads/forces likely to act when a helicopter lands. Helicopter parameters for the design are listed in HSAC

“*Tables of Values for Common Helicopter Types*” located on the HSAC website or any latest update from the manufacturers.

b) The TLOF shall be designed to comply with the one case that produces the most conservative stress ratios per API 2A-WSD or any other recognized calculation method or standard that applies to it – i.e. API 2A-LRFD or AA ADM).

#### **5.2.4.2 Contact Area**

The maximum contact area per landing gear, used to design deck plate bending and shear, should conform to values listed in the HSAC “*Tables of Helideck Design Data*” located on the HSAC website or any latest update from the manufacturers.

#### **5.2.4.3 Load Distribution**

The load distribution per landing gear in terms of percentage of maximum takeoff weight (mass) should conform to values listed in the HSAC “*Tables of Helideck Design Data*” located on the HSAC website or any latest update from the manufacturers.

#### **5.2.4.4 Design Landing Load**

a) For the purpose of design, use the load distribution as determined in 5.2.4.3. The loads imposed on the structure should be applied over the contact areas for the undercarriage or wheels.

b) The design landing shall cover both a heavy landing and an emergency landing. For the former an impact load of 1.5 x MTOM (MTOW) of the design helicopter shall be used while for an emergency landing an impact load of 2.5 x MTOM (MTOW) shall be applied in any position on the landing area. Normally the emergency landing case will govern the design of the structure.

c) When specific dynamic loading distribution data is not available it shall be assumed that the weight (mass) of the design helicopter is applied equally through the two contact areas of the main undercarriage (normally the two rear wheel assemblies) of a wheel-equipped helicopter and equally through the two aft skid contact areas of the skid equipped helicopter listed in the HSAC “*Tables of Values for Common Helicopter Types*” located on the HSAC website or any latest update from the manufacturers, provided that the impact loads as per paragraph 5.2.4.4.b are considered.

d) When designing the helideck plate for the design-landing load, beam theory, large deflection theory (membrane concept), or other accepted design practice may be used as long as the stresses are within the allowable stress limits and do not cause permanent deformation.

e) A lateral inertial load of 0.5 x MTOM (MTOW) shall be used in the helideck design.

### **5.2.5 Parking Area (PA) / Parking Transition Area (PTA) Load Considerations**

**5.2.5.1** For the load considerations for a hover into PA / PTA, the loads shall be developed in accordance with 5.2.4, except: the dynamic impact factor from 5.2.4.2 should be 1.5 x MTOM (MTOM) as a minimum.

**5.2.5.2** For PA / PTA where no hover into possibilities exists (push in parking area only), the loads should be developed in accordance with 5.2.4, except: the dynamic impact factor from 5.2.4.2 should be 1.0 x MTOM (MTOM) as a minimum.

### 5.2.6 Dynamic Loads

There are potentially additional dynamic loads imposed on the platform (landing parking and parking transition area) due to platform response or reaction to impact that may be caused by waves, wind, earthquake or machinery. Unless specific values are available based upon particular undercarriage behavior and deck frequency, a minimum value of 1.3 shall be assumed.

### 5.2.7 Punching Shear

For a TLOF where wheeled helicopters may be operated, a check shall be made for the punching shear from a wheel of the landing gear with a contact area of 2.56 x 4.06 in<sup>2</sup> (65 x 103 mm<sup>2</sup>) acting in any probable location. Particular attention to the design of the junction between the supports and the platform deck should be given.

### 5.2.8 Safety Net/Safety Shelf Loads

Safety nets or safety shelves and supporting structure shall be designed as a minimum to support dead loads plus a minimum concentrated load of 300 lbs. (136 kg/1.33 kN) at any point.

Safety shelves and supporting structure shall also be designed to support dead loads plus the live loading as shown in section 5.2.2.

For additional design requirements see paragraph 5.7.

## 5.3 Installation

Additional Loads/ load combinations experienced during helideck construction and installation, including but not limited to the static and dynamic forces that occur during lifting, loadout, and transportation, shall be reviewed in the design.

## 5.4 Material

All structural materials should conform (as applicable) to API RP 2A-WSD, API RP 2LRFD or AA ADM-1 or Eurocode 9.

## 5.5 Helideck (TLOF) Surface

The helideck (TLOF) surface should be a leak free solid deck or a deck with built in sub-surface passive fire protection, so that a ground cushion is created by the rotor downwash. All materials, coverings, or coatings used should provide a non-skid surface. The minimum average surface friction coefficient of 0.65 should be achieved on the TLOF surface and including the paint markings. It is important that adequate friction exists in all directions and in worst case conditions, i.e. when the deck is wet.

Extruded section or grid construction aluminum (or other similar material) surfaces may provide adequate resistance to sliding without painting, but they should be coated with a non-slip material unless friction properties have been confirmed by measurement.

*Note 1: For proper testing and demonstration of frictions values, guidance can be found in UK CAP437.*

*Note 2: When painting any helideck surface, maintain the minimum friction coefficient of 0.65.*

## 5.6 Safety Nets and Safety Shelves

The helideck should be fitted with a safety net or safety shelf for protection of personnel 5 ft. (1.5 m) wide (measured horizontally) around the perimeter, and around stairwells where the safety net or safety shelf should surround the entire opening. The safety net or safety shelf need not extend around stairways oriented perpendicular to the helideck perimeter. The safety net or safety shelf should produce an outward and upward inclined surface a minimum of 3 degrees beginning below the helideck (TLOF). The outer edge should not protrude above the helideck (TLOF).

Safety shelves shall be provided in lieu of safety nets for helidecks with (TLOF) sizes less than 1.0D. See 5.2.8 for surface loading requirements for safety nets and safety shelves.

## 5.7 Tie-down Points

5.7.1 Typical tie-down configurations for a helideck are shown in Figure 5.8.3. The number of tie-down point circles on the figure should be used relative to the  $D$  size of the TLOF and should be concentric to the "H" marking. During the design, the tie-down configuration should be configured for the full range of helicopters that may use the helideck. The tie-down points should be to secure the helicopter to the center area of the TLOF. Tie-down point arrangements will be required in a parking area.

5.7.2 Tie-down points should be recessed, may be equipped with covers that do not present a flyaway hazard, and have adequate side wall clearances to allow straps to be attached. The maximum diameter or thickness of the tie-down bar attachment point should be 1.0 in. (2.5 cm) and should be of sufficient thickness to maintain adequate security of the helicopter.

5.7.3 For helideck smaller than 40 ft., eight tie-down points instead of six should be considered to allow a parked helicopter to be reoriented for maintenance purposes, etc.; see Annex C, Figure C.1 and Figure C.2.

5.7.4 The tie-down points should be designed to secure the design helicopter to the helideck or parking area during the maximum anticipated environmental condition, as determined by the platform and helicopter operators.

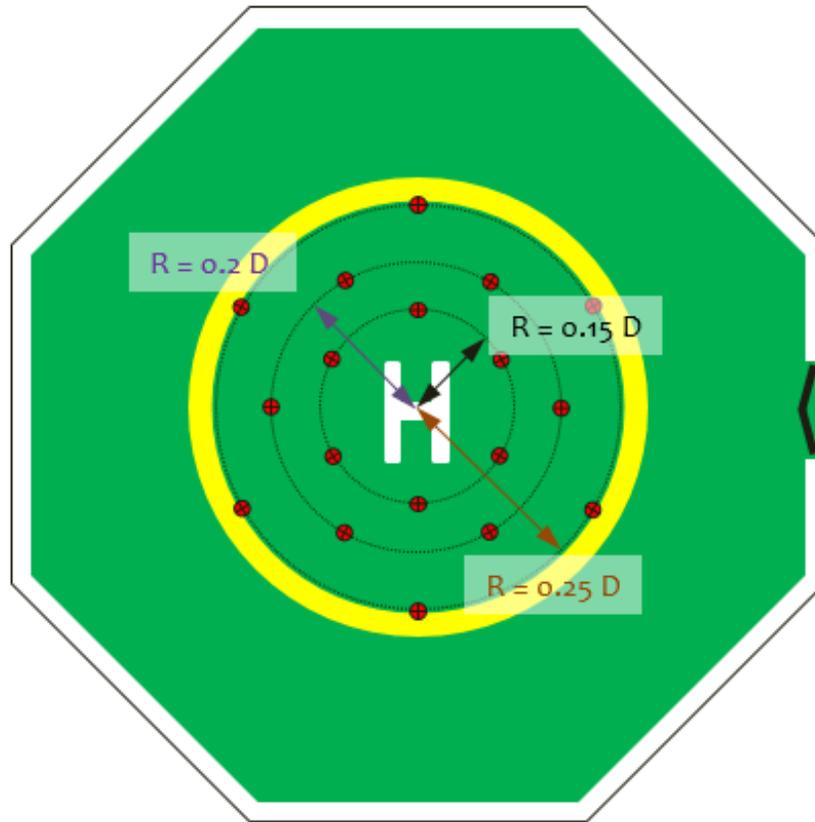


Figure 5.8.3 — Tie-down Locations

## 6 Helideck Markings

### 6.1 General

TLOF perimeter, touchdown/positioning and other markings for normal helicopter operations should be provided. The conspicuity of the white or yellow lines can be improved by outlining it, on one or both sides, in black or some other contrasting color. Any contrasting color can be used except when a specific color is defined; however, red is reserved for markings of the weight/size box, the “EXIT” and “No Nose” marking as well as general obstruction markings. [See 6.10 for information on painting of aluminum helidecks.](#)

### 6.2 TLOF Perimeter Marking

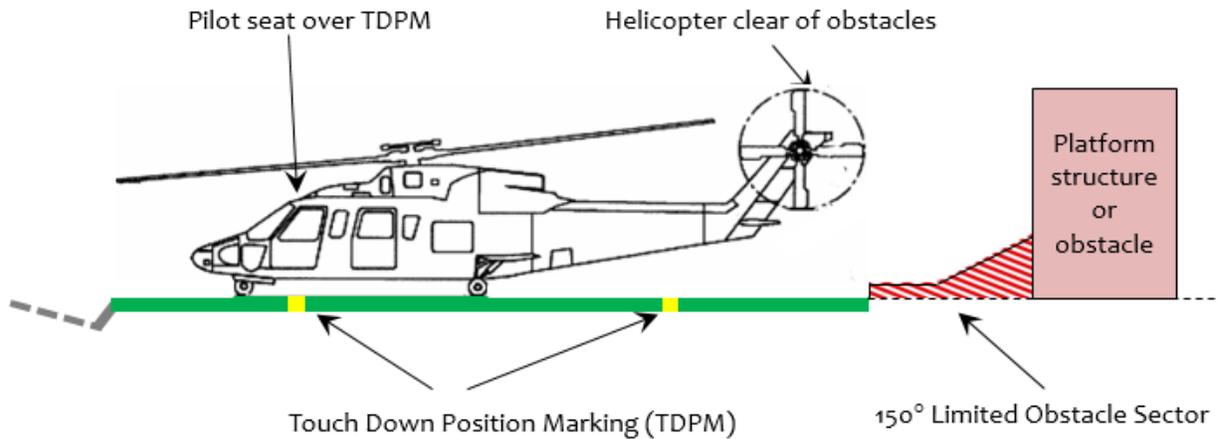
A 12 in. (30 cm) wide solid white line should be used to mark the boundary of the TLOF.

### 6.3 Touchdown/Positioning Marking (TDPM)

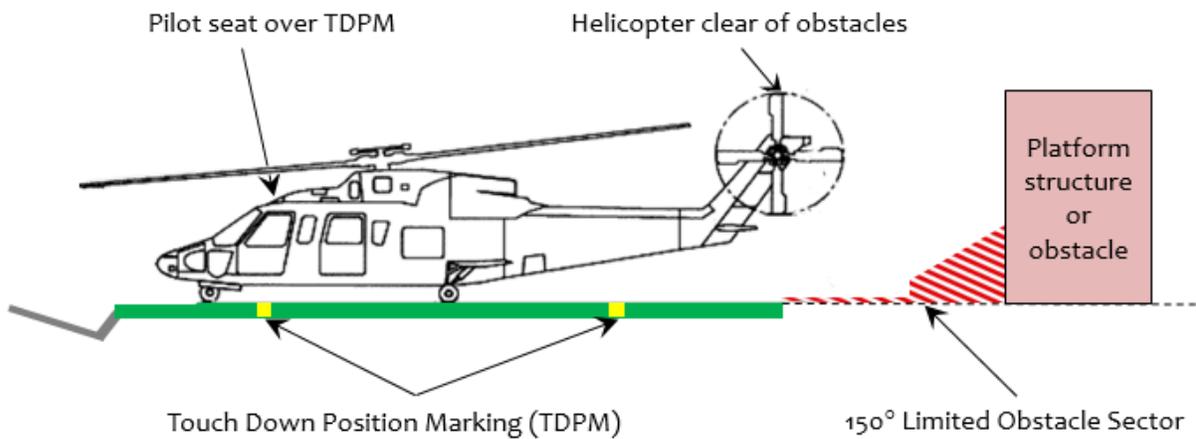
The touchdown/positioning [marking \(circular\)](#) is the aiming point for a normal touchdown (landing) so located that when the pilot’s seat is over the marking, the whole of the undercarriage will be within the TLOF and all parts of the helicopter will be clear of any obstacles by a safe margin. The TDPM also provides the same protection (clearance) when maneuvering/turning on the TLOF. The relationship of the TDPM to the

LOS when a helicopter is occupying the TLOF is shown in Figures 6.3.A and 6.3.B for a 1D TLOF and 0.83D TLOF respectively.

**Figure 6.3**

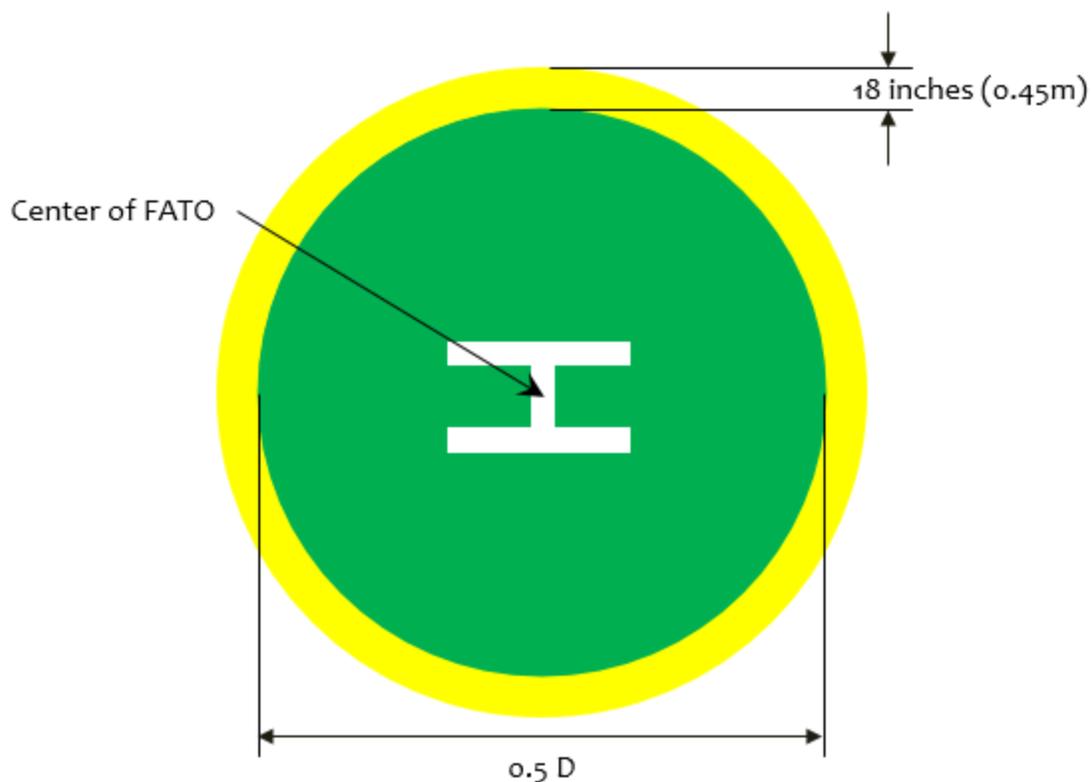


**6.3.A Relationship of the TDPM to LOS for a 1.0D TLOF**



**Figure 6.3.B Relationship of the TDPM to LOS for a 0.83D TLOF**

The TDPM should be located in the center of the TLOF. The TDPM is a yellow circle with an inner diameter of 0.5D (i.e. radius of 0.25D) and a line width 18 in. (0.45 m). The TDPM is illustrated on Figures 4.3.2.A through 4.3.5.D and Figure 6.3.C. The conspicuity of the yellow TDPM may be enhanced by outlining the marking with a thin black line (typically 6 in. [15 cm]): this is particularly important if the TLOF surface is not a dark green.

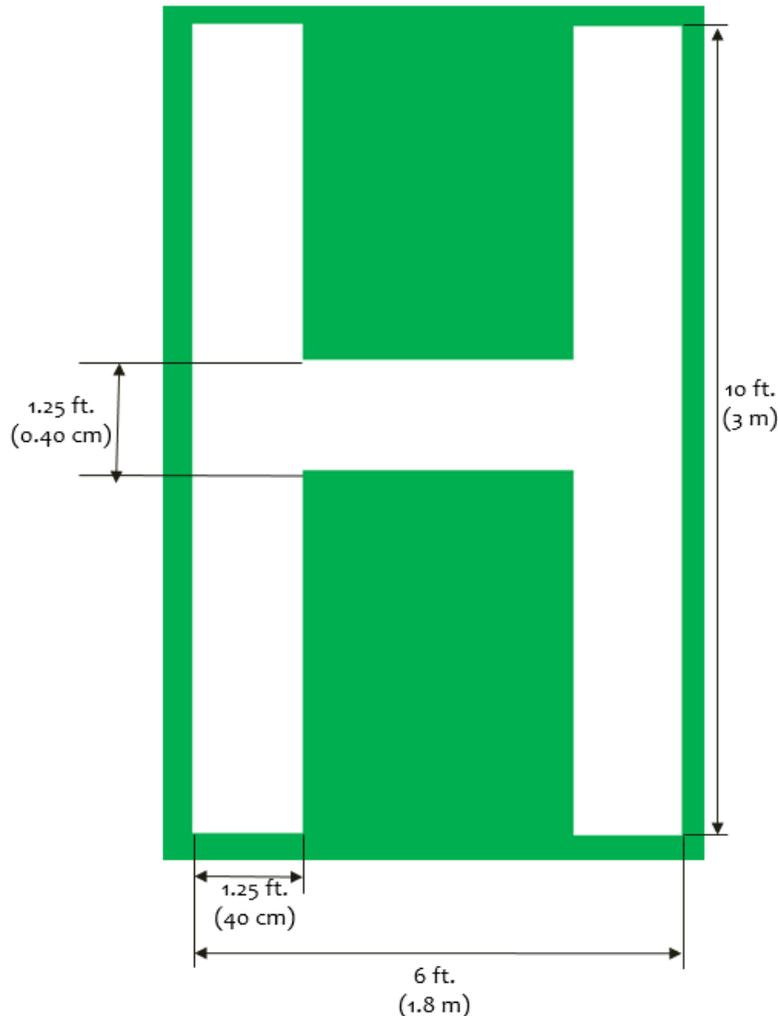


**Figure 6.3.C TDPM and “H” Marking**

#### **6.4 “H” Marking**

**6.4.1** The “H” marking (international identification symbol) should be marked in the center of the TLOF. Since the TDPM is located in center of the TLOF (see 6.3), the “H” should be centered in the middle of the TDPM.

**6.4.2** The marking consists of the letter “H”, 10 ft. high × 6 ft. wide (3 m × 1.8 m) painted white. The width of the legs and the cross bar of the “H” should be 16 in (40 cm) as shown in Figure 6.4. The “H” may be outlined with a 6 in. (15 cm) wide line of a contrasting color to enhance conspicuity.



**Figure 6.4 Helideck “H” Marking**

**6.4.3** The “H” should be marked co-located with the TDPM-with the crossbar of the “H” lying along the bisector of the obstacle-free sector as shown in Figures 4.3.2.A through 4.3.5.D.

**6.4.4** Where the OFS is swung in accordance with 4.3.5.1, the positioning of the TDPM and “H” should comply with the swing criteria and positioning as specified in 4.3.5.2.3. The “H” crossbar should be orientated so that the bar is parallel to the bisector of the swung sector. See Figure 4.3.5.H and 4.3.5.1 and 4.3.5.3 for additional detail.

## **6.5 Weight (Mass) and Size Limitation Markings**

### **6.5.1 Textual Marking Font Requirements for Helidecks**

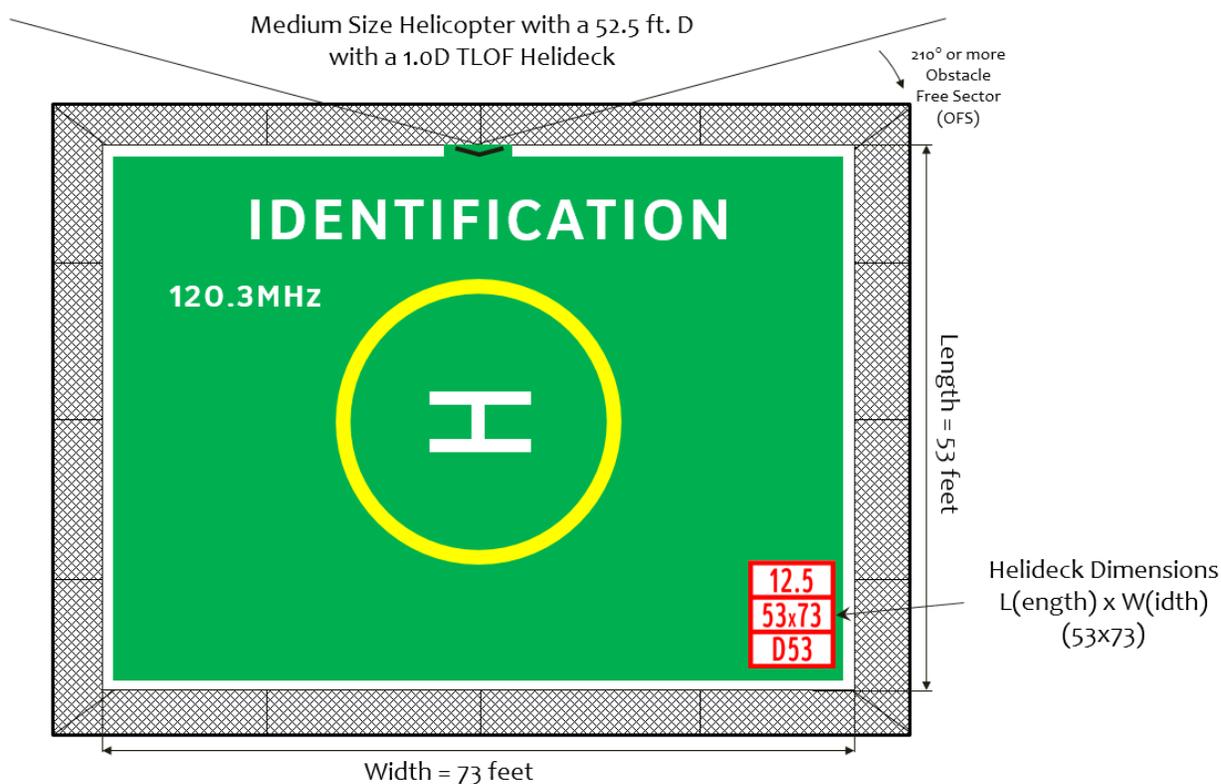
**6.5.1.1** Helideck textual markings require maximum legibility while minimizing the area being occupied by the lettering and numbers on the helideck and should be in contrasting color to the background color. All textual markings on helidecks should use the Clearview Hwy 5-W as the standard font type. However, where horizontal spacing has to be reduced in order to keep helideck markings from

overlapping, the horizontal width restricted variant Clearview Hwy 5-W(R) may be used. Details and diagrams regarding the Clearview Hwy 5-W and 5-W(R) font type are provided in Annex D.

*Note: The letters and numbers in the Annex D charts are based on upper case letter height of 4 in. (10 cm) and should be scaled (adjusted) to the height defined in this document for the various markings.*

**6.5.1.2** Since a helideck is limited to helicopters of a certain gross weight (mass) and “D” size, the TLOF should be marked to indicate the design weight (mass) and D-value limitations. The actual size of the TLOF, which provides useful information to the pilots using the helideck, should also be marked.

**6.5.1.3** The size of a non-rectangular (i.e. square, octagonal, hexagonal, pentagonal, or circular) TLOF should be indicated by a single number representing the diameter of the largest circle which can be contained within the TLOF. Dimensions of rectangular TLOFs should be indicated by the length (*L*) times the width (*W*) where *L* is measured from the TLOF edge marked with the chevron to the opposite TLOF edge and *W* is measured between the TLOF edges perpendicular to the *L* measurement as shown in Figure 6.5.1. These dimensions should not include the safety net or solid safety shelf.



**Figure 6.5.1 Size and Weight Markings for 1.0D 52.5 ft. Medium Helicopter Rectangular Helideck in U.S. Customary Units**

## 6.5.2 U.S. Customary Units

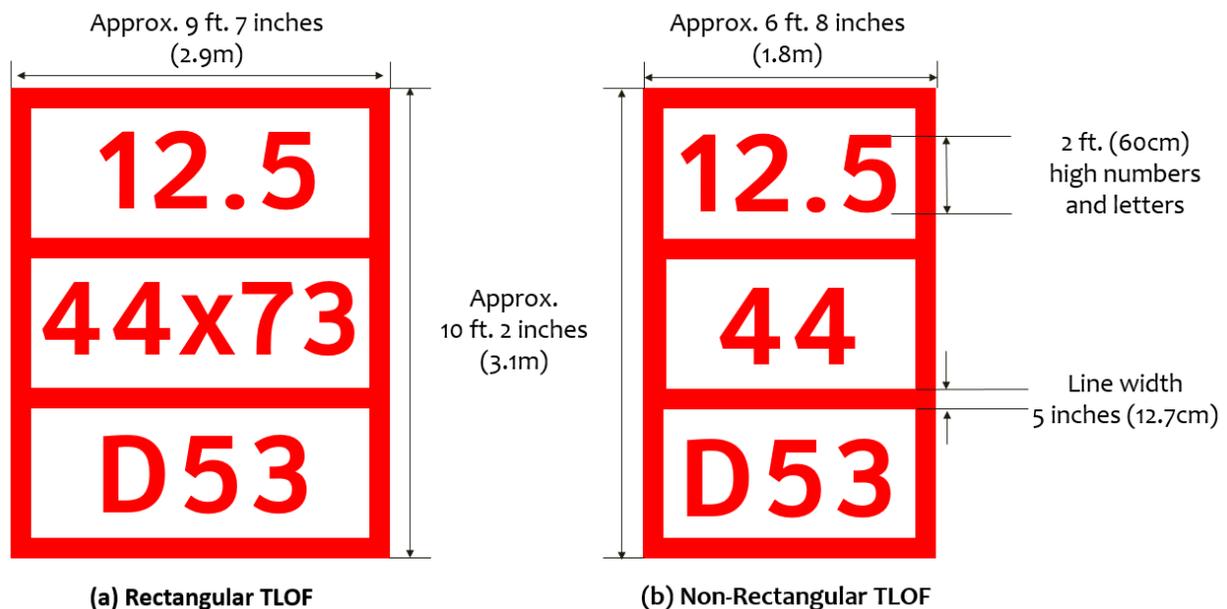
**6.5.2.1** [System of International](#) (SI) unit equivalents should only be used for marking the weight (mass) limit or size limitation in locations where SI units are used (see 6.5.3).

**6.5.2.2** The recommended method of designating the helideck (TLOF) limitations is to indicate the maximum design load and the design D-value, together with the actual TLOF size (see 6.5.1), in a three-tiered box as shown in Figure 6.5.2.A.

**6.5.2.3** The maximum design load of the helideck should be indicated in terms of 1000 lbs. by a two or three digit number with one decimal point rounded down to the nearest 100 pounds i.e., 15,675 lbs. should be marked as “15.6”. Below this design weight (mass) the actual TLOF size should be indicated with the dimension rounded down to the nearest one foot and below this the allowable helicopter size in terms of the “D” dimension rounded up to the nearest one foot should be marked with a letter “D” in front of the D-value.

*Note: A helideck with a 15,000 lb. design load should be marked as “15.0” and not “15”*

**6.5.2.4** The box and numerals should be of such size as to be readily discernible by the pilot of the approaching helicopter in sufficient time to affect a go-around if necessary. To achieve this, the design load and D size limitations and the actual TLOF size rounded down to the nearest foot should be marked in a box, outlined in red, in red numerals on a white background as shown in Figure 6.5.2.A. The height of the numbers and letters should be 2 ft. (0.6 m) with the line width of the box and the minimum separation between the numbers/letters and the frame of box, approximately 5 in. (12 cm). For smaller helidecks (less than 40 ft. [12 m]) where space may be limited, the height of the figures may be reduced to 18 in. (45 cm). The width of the box will depend on the actual numbers since although the height is defined the width varies depending on the actual number.



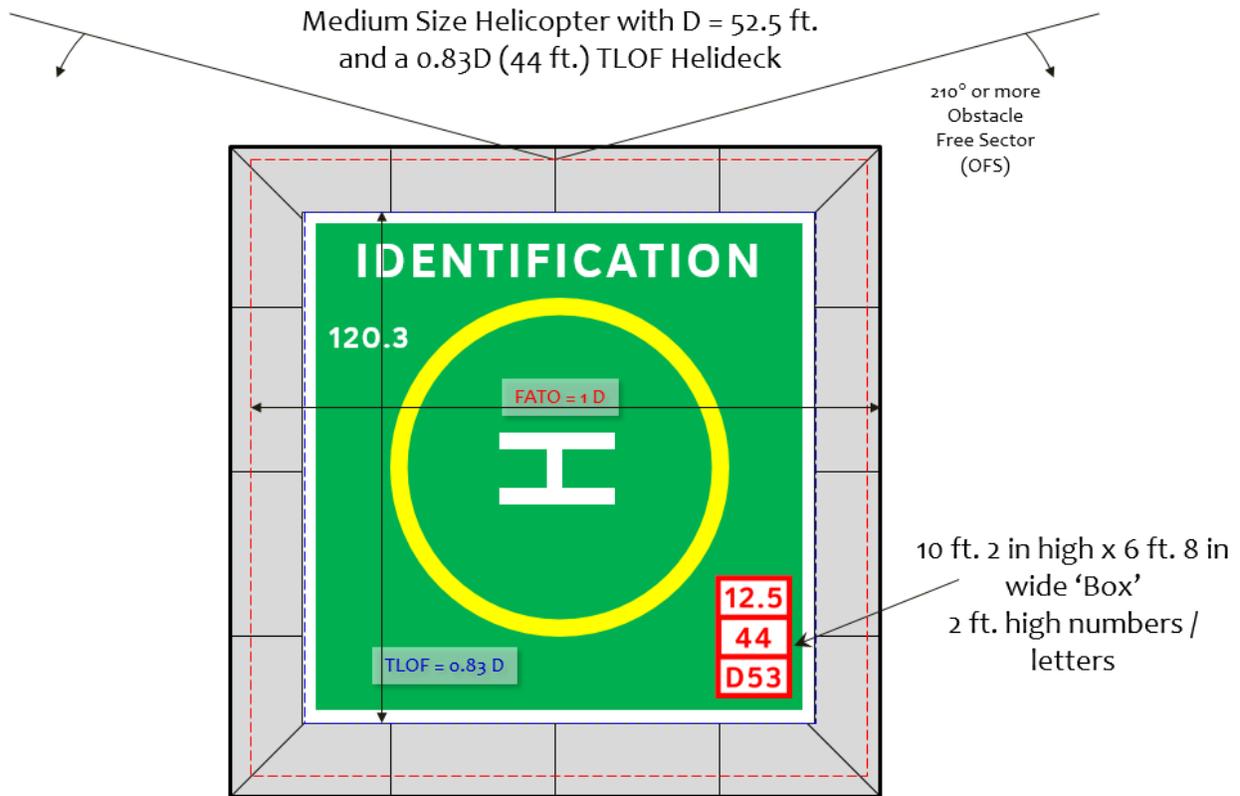
*Note: Dimensions illustrated refer to 0.83D TLOF designed for a 52 ft. diameter medium helicopter.*

**Figure 6.5.2.A Helideck Size and Weight Markings in U.S. Customary Units**

The weight/size limitation and the actual TLOF size box marking should be visible from the principal direction of approach and oriented in the same direction as the helideck name. It is recommended that on a square or rectangular helidecks the box should be located on right-hand side relative to the principal direction of approach (when facing the helideck) as illustrated in Figure 6.5.2.B. For circular, hexagonal and

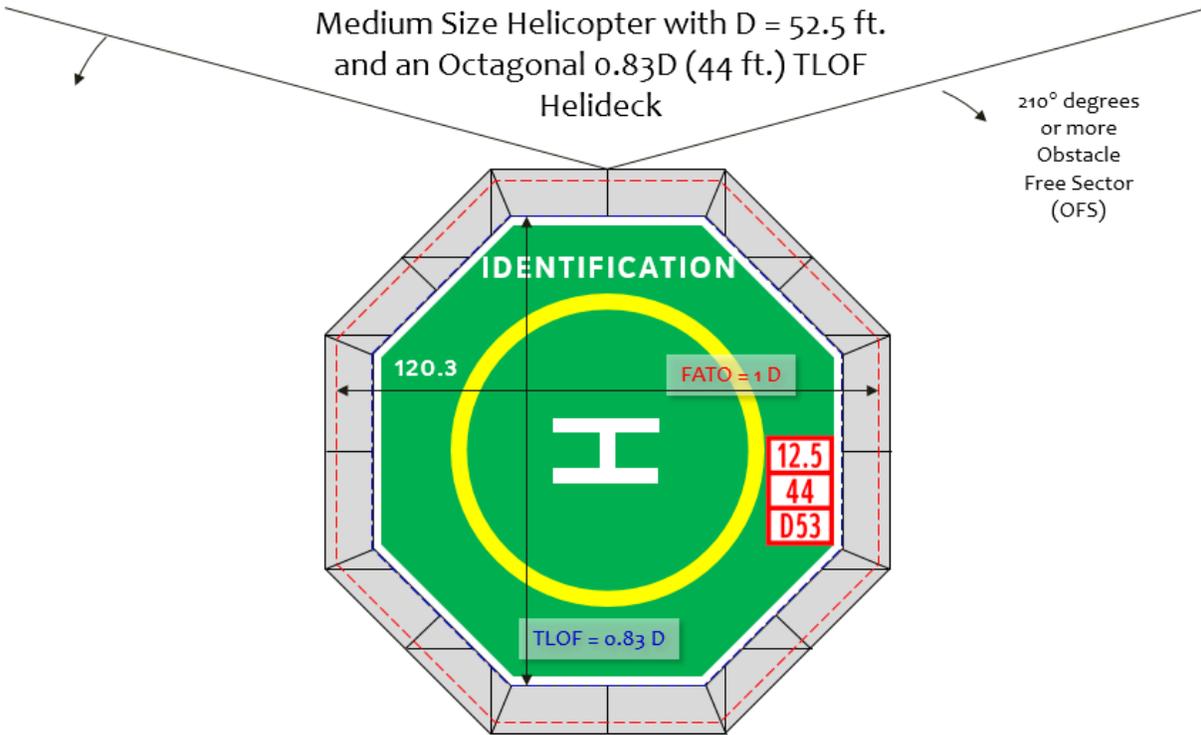
similar shapes the box should be located on right-hand side of the TLOF and if feasible outside the TDPM, when viewed from the preferred approach direction as shown in Figure 6.5.2.C.

*Note: On a small TLOF the size/weight box may overlap the TDPM.*



*NOTE - Chevron markings not depicted.*

**Figure 6.5.2.B Size and Weight Markings for a 0.83D Square Helideck in U.S. Customary Units**



NOTE - Chevron markings not depicted

**Figure 6.5.2.C Size and Weight Markings for Medium Helicopter 0.83D Octagonal Helideck in U.S. Customary Units**

it is suggested that at least text is added to indicate that the 'box' marking can overlap (interrupt) the TDPM as allowed foot heliports by the FAA on heliports (see AC150/5390-2C). [Note: A number of alternate marking arrangements (including use of a separate marking for "actual TLOF size") and size were addressed but rejected by the API Working Group.] In addition the Note on Figure 21 should be changed to read "NOTE: Dimensions illustrated refer to 0.83D TLOF designed for a medium helicopter with a D-value of 53 ft.

### 6.5.3 SI Units

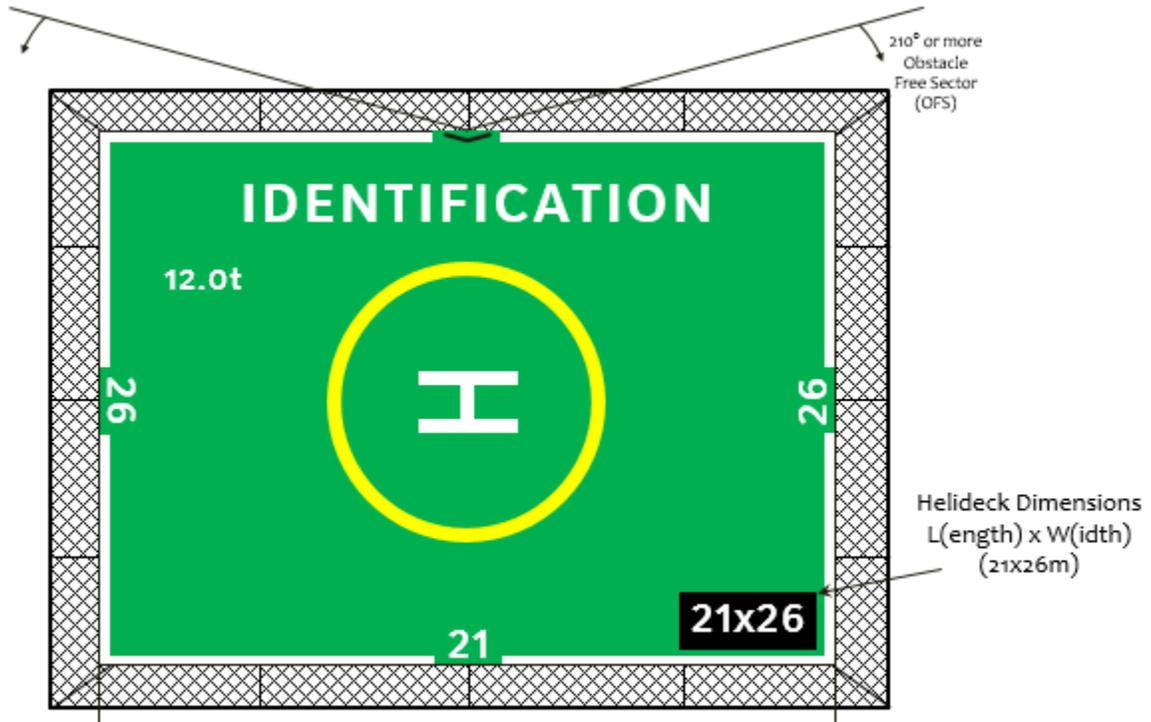
**6.5.3.1** U.S. Customary unit equivalents should not be used for marking the mass (weight) limit or size limitation in locations where SI units are used.

**6.5.3.2** The recommended method of designating the helideck limitations is to indicate the maximum design load of the helideck in terms of 1000 kg (tonnes) by a two or three digit number with one decimal point rounded down to the nearest 100 kg followed by the letter "t" i.e. 7250 kg should be marked as 7.2 t. The maximum design load marking should be marked in white, located on the upper left-hand section of TLOF and so arranged as to be readable from the preferred final approach direction.

*Note: A helideck with a 12,000 kg design load should be marked as 12.0t and not 12t as shown in Figure 6.5.3.*

**6.5.3.3** The allowable helicopter size in terms of the D dimension rounded to the nearest one metre with 0.5 rounded down. The D dimension should be marked on the perimeter of the TLOF so it

can be seen from the preferred approach direction. The D-value marking should be white with a contrasting background.



**Figure 6.5.3 Size/Weight Markings for SI Units**

**6.5.3.3** The mass limit should be marked in white numerals (followed by a letter “t”) on the TLOF surface or a contrasting background in the upper left hand area as shown in Figure 6.5.3.

**6.5.3.4** The actual TLOF size dimensions, rounded to the nearest one metre with 0.5 rounded down, should be marked on the TLOF surface, outlined in white with white numerals on a black background: the marking should be located in the bottom right hand corner as shown in Figure 6.5.3.

**6.5.3.5** For each marking, the height of the numbers/letter should be 0.6 m (2 ft.). For smaller helidecks where space may be limited, the height of the figures may be reduced to 45 cm (18 in.).

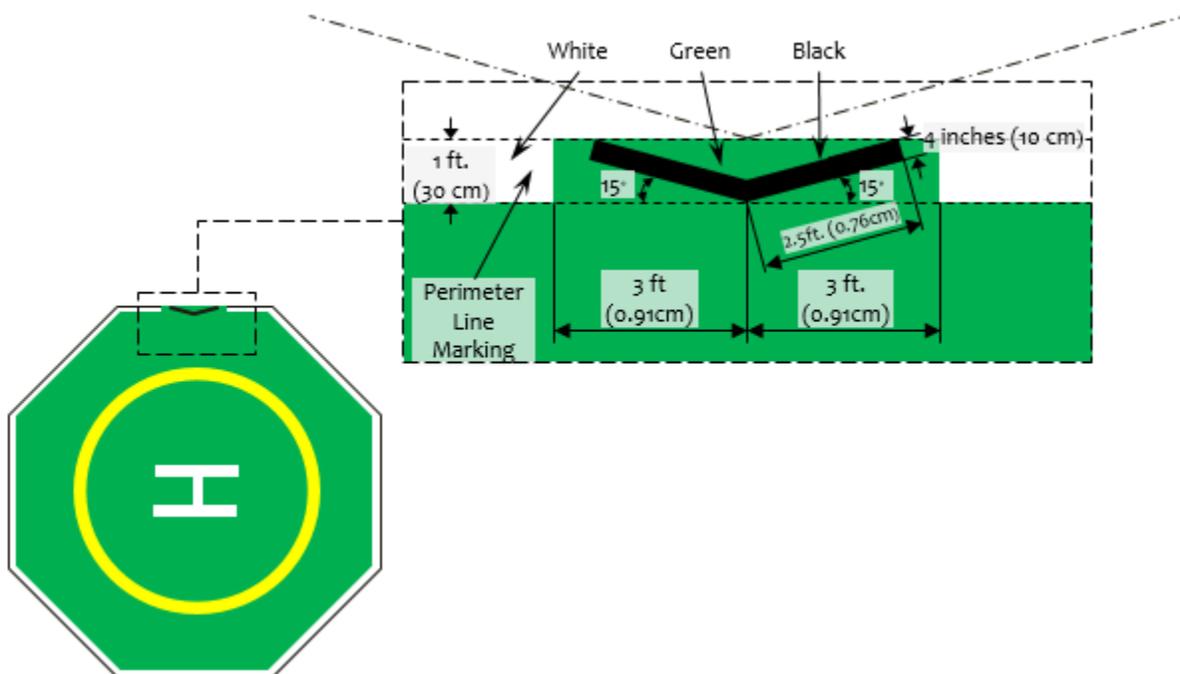
**6.5.3.6** The design load marking, actual TLOF size and D-value marking in white may be enhanced, if required to improve conspicuity, by overlaying the white marking on a black painted background.

## **6.6 Helideck Obstacle Free Sector (OFS) Chevron Marking**

**6.6.1** A helideck obstacle-free sector (OFS) marking, a chevron, should be located on the FATO perimeter: unless the TLOF is the same size as the FATO this will not be on the perimeter of the TLOF.

The marking should indicate the reference point/point origin of the obstacle-free sector and the directions of the limits of the sector. Each leg of the chevron should be a minimum of 2.5 ft. (0.76 m) long and 4 in (10 cm) wide, forming an angle that indicates the direction of the limits of the sector. See Figure 6.6.A. The chevron should be marked in black color on the FATO surface, or a contrasting background, as shown in Figure 6.6.A.

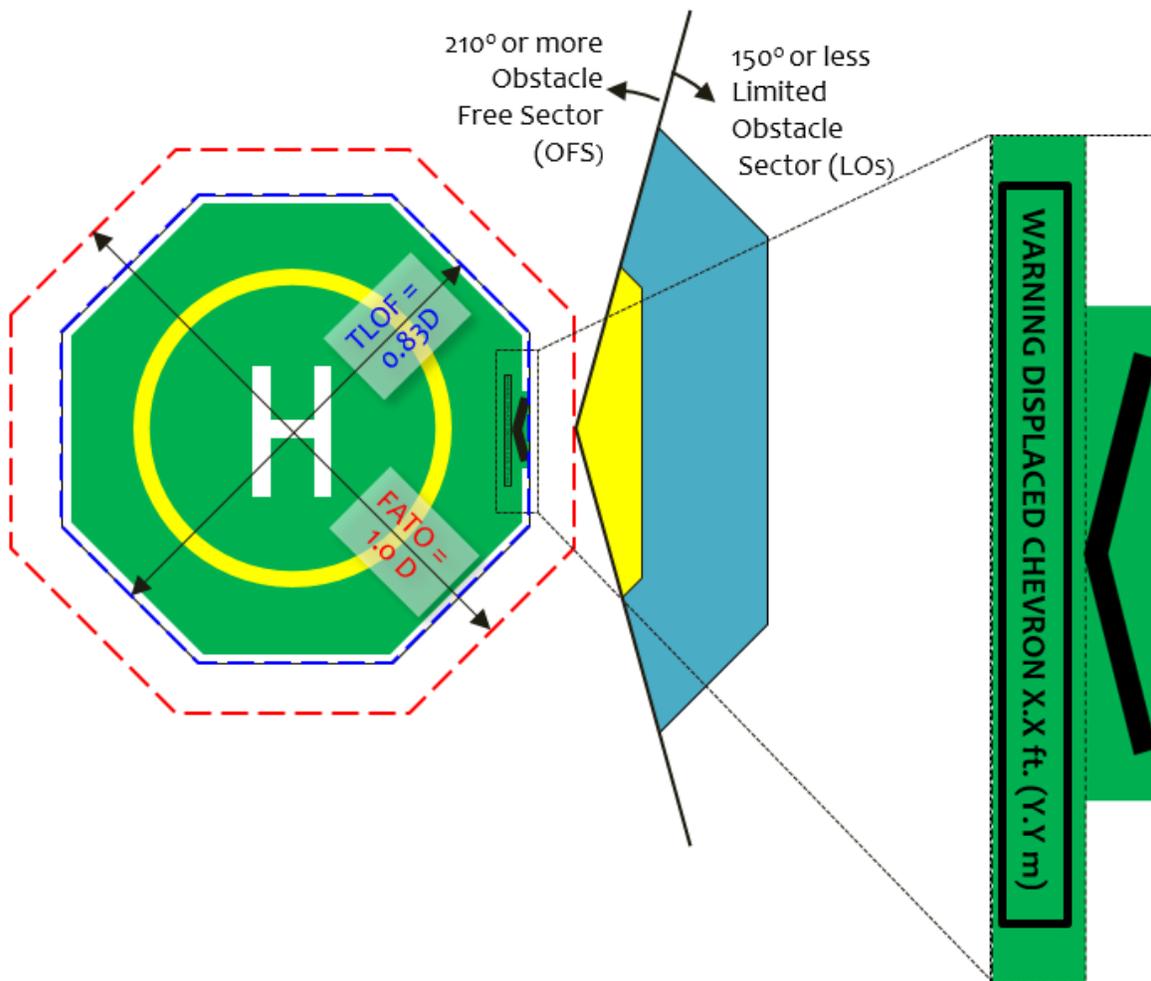
**6.6.2** Where there is no room to place the chevron on the edge of the FATO or the FATO edge is non-load bearing (i.e. not a solid surface), the chevron marking, but not the reference point/point of origin, may be displaced towards the FATO center: the distance displaced should be indicated as shown in Figure 6.6.B for a TLOF less than  $1.0D$ . The marking should be a black box (thin black line) around the black wording “WARNING DISPLACED CHEVRON  $X.X$  ft. ( $Y.Y$  m)” where  $X$  is the displaced distance. On helidecks where there are no obstacles for  $360^\circ$ , no chevron is required.



*Note 1: Placing the chevron marking on the FATO perimeter line will actually displace the apex of the chevron approximately 1 foot from the outer edge of the FATO perimeter where the reference point of the OFS and LOS actually begins. Thus the actual placement of allowable obstacles begins at the LOS reference-and not at the apex of the chevron as depicted on the actual LOS chevron marking.*

*Note 2: The actual OFS reference point/point of origin will in most cases be located on the safety shelf (see Figures 4.3.2.B, 6.3.B and 6.3.C).*

**Figure 6.6.A Standard Chevron Marking**



**Figure 6.6.B Displaced Chevron Marking**

### 6.7 Parking Area and Parking Transition Area Markings.

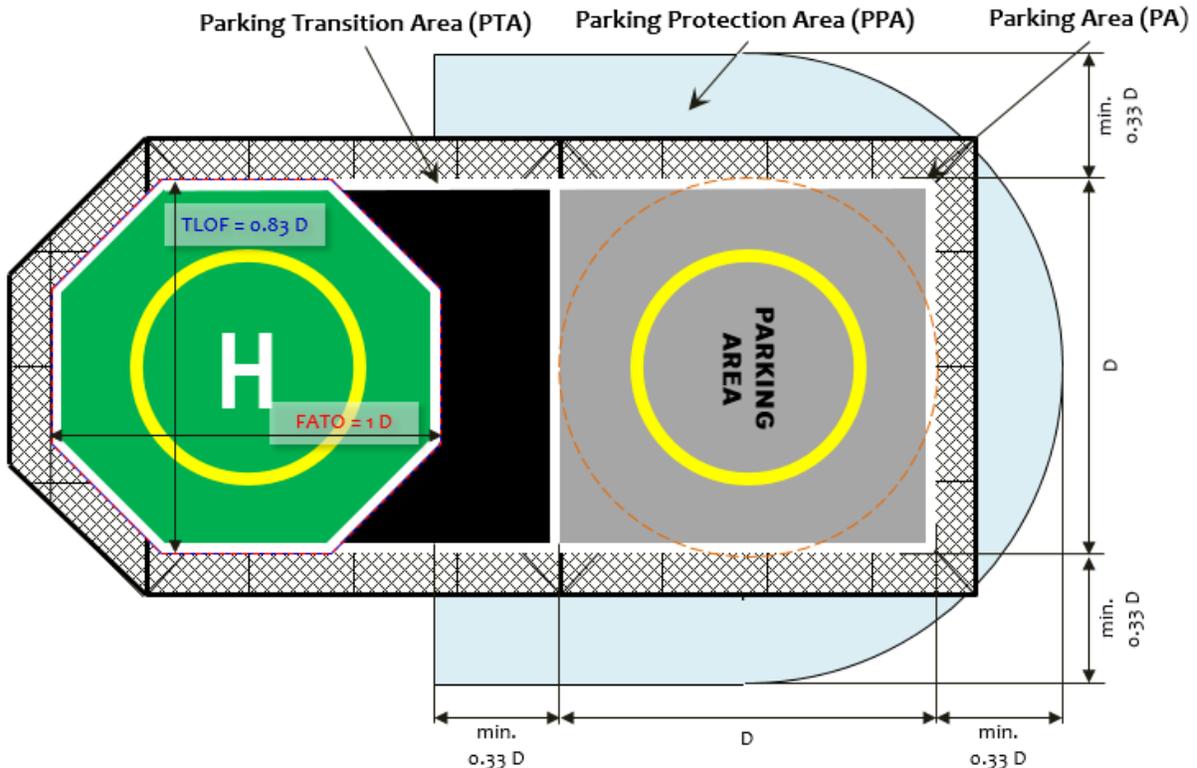
**6.7.1** The parking area (PA) should be clearly distinguished from the TLOF surface and surface markings by the use of light gray color on the PA surface. The perimeter of the PA should be marked with a 12 in. (30 cm) wide solid white line. [See 6.10 for information on painting aluminum helidecks.](#)

**6.7.2** The parking transition area (PTA) surface should be painted in a black color, starting from the perimeter line of the TLOF to the PA perimeter line. The perimeter of the PTA not in contact with the TLOF perimeter, or not in contact with the PA, should be marked with a 18 in (45 cm) wide solid white line.

*Note 1: If a limited parking area (LPA) or push-in parking area (PIPA) is provided, see Annex A for additional marking guidance.*

*Note 2: For hover transition areas, other methods of movement via ground taxi, push in, etc. are also allowed.*

**6.7.3** A yellow touchdown parking circle (TDPC) marking should be marked on PA to provide proper obstacle clearance when the pilot's seat is over the TDPC. The TDPC should have an inner diameter of  $0.5D$ , line width of 18 in. (45 cm), and the center of the TDPC should be located  $0.5D$  from the PA perimeter nearest to the TLOF as illustrated in Figure 6.5.3. In the center of the TDPC, the words "Parking Area" should be marked in black as indicated in Figure 6.7.



*NOTE - The TLOF weight (mass)/size markings and Chevron not shown on the figure.*

**Figure 6.7 Parking Area and Transition Area Markings for 1D FATO, 1D TLOF and 1D PA**

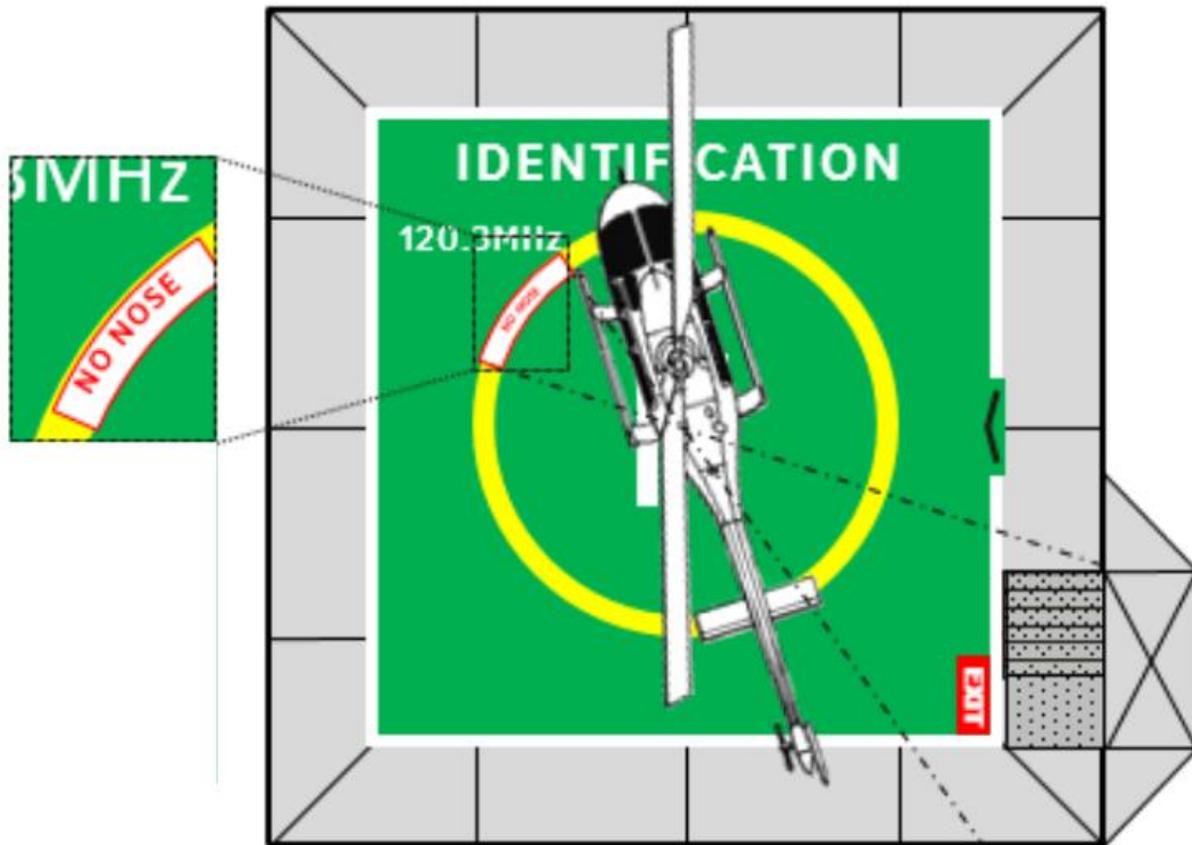
**6.7.4** If there are any restrictions to the method of movement from the TLOF to the PA, any other PA restrictions, or if the PA is not designed as previously described, refer to Annex A for further guidance.

**6.7.5** For a helideck with a  $1.0D$  TLOF or a  $0.83D$  TLOF and a  $1.0D$  PA, no weight (mass) and size markings are necessary for the PTA.

## 6.8 Prohibited Landing Sector Markings

**6.8.1** On a helideck where the number of personnel access points is limited, a "No Nose" prohibited landing heading sector marking may be used to avoid placing the tail rotor in close proximity to the stairs, etc.

**6.8.2** The sector of the TDPM, opposite from the personnel access points should be bordered in the color red, with the words "No Nose" clearly marked in red, on a white background as shown in Figure 6.8. When positioning over the TDPM, helicopters should be maneuvered so as to keep the aircraft nose clear of the "No Nose" marked sector of the TDPM at all times. The minimum prohibited "No Nose" marking should be  $30^\circ$ .



**Figure 6.8 “No Nose” Marking**

### **6.9 Helideck Name and Radio Frequency Markings**

The TLOF should be marked with a [facility identification \(name or block number\) marking](#) and radio frequency number. The facility identification (name) should be marked on the TLOF surface between the perimeter of the TLOF and the TDPM in letters and/or numbers of not less than 3 ft. (1.0 m) high and in a color (normally white) which contrasts with the helideck surface. The radio frequency should be marked in the upper left in numbers and letters of 2 ft. (0.6 m) and the same color as the identification marking as shown in Figures 6.5.1, 6.5.2.C, and 6.8. These markings should be located so they can be seen from the preferred approach direction.

### **6.10 TLOF Surface Colors**

The surface bounded by the TLOF perimeter shall be of a dark color, preferably dark green, with a non-skid coating. Where the surface coating may have a degrading effect on friction qualities or is not practical since the surface incorporates for example a fire protection system, it may be necessary to leave the helideck surface untreated. Aluminum helidecks are a natural light grey color and may present painting difficulties. The natural grey color of aluminum [is acceptable for the TLOF surface \(inclusive of PA and PTA\)](#), provided it has sufficient friction and the conspicuity of the markings [are enhanced](#) by outlining those

markings with a contrasting color or by overlaying white or yellow markings on a black background. See paragraph 5.5 for additional details on painting of aluminum helidecks.

### 6.11 Exit markings

Exits that provide egress by ladder shall be marked as “EMERGENCY EXIT.” The emergency exit marking shall be identified by a red box on the perimeter line as shown in Figure 6.12.A and 6.12.B. This box should be 4 ft. (1.2 m) wide by 2 ft. (0.6m) high with the word EMERGENCY above the word EXIT with 6 in. (15 cm) high lettering.

### 6.12 Walkway Markings

For manned facilities, a walkway marking is optional. For NUIs, a walkway/direction marking to the exit, see Figure 6.12.B, should be painted on the helideck surface, although it should be noted that this may present a hazard for single egress decks if the pilot is forced by wind direction to land with the tail rotor close to this marked walkway. The walkway markings 3 ft. (1.0 m) wide shall start 1 ft. (30cm) from the TDPM and it should be marked in a color that contrasts with the surface, such as white. Yellow should not be used.

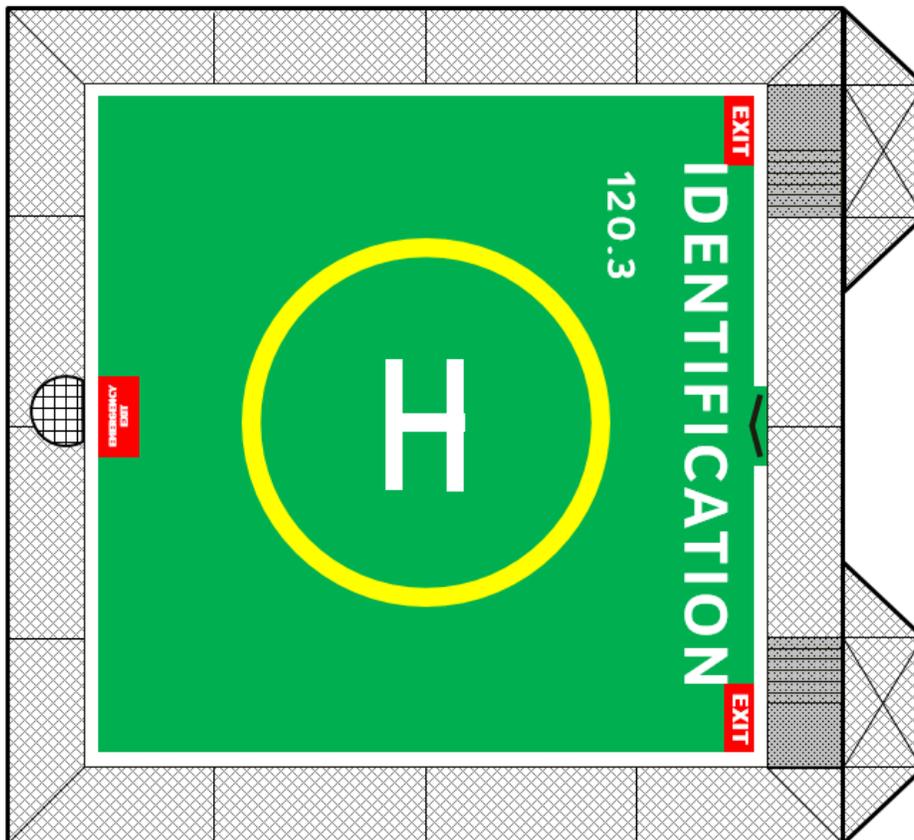


Figure 6.12.A Manned Facility Exit Marking

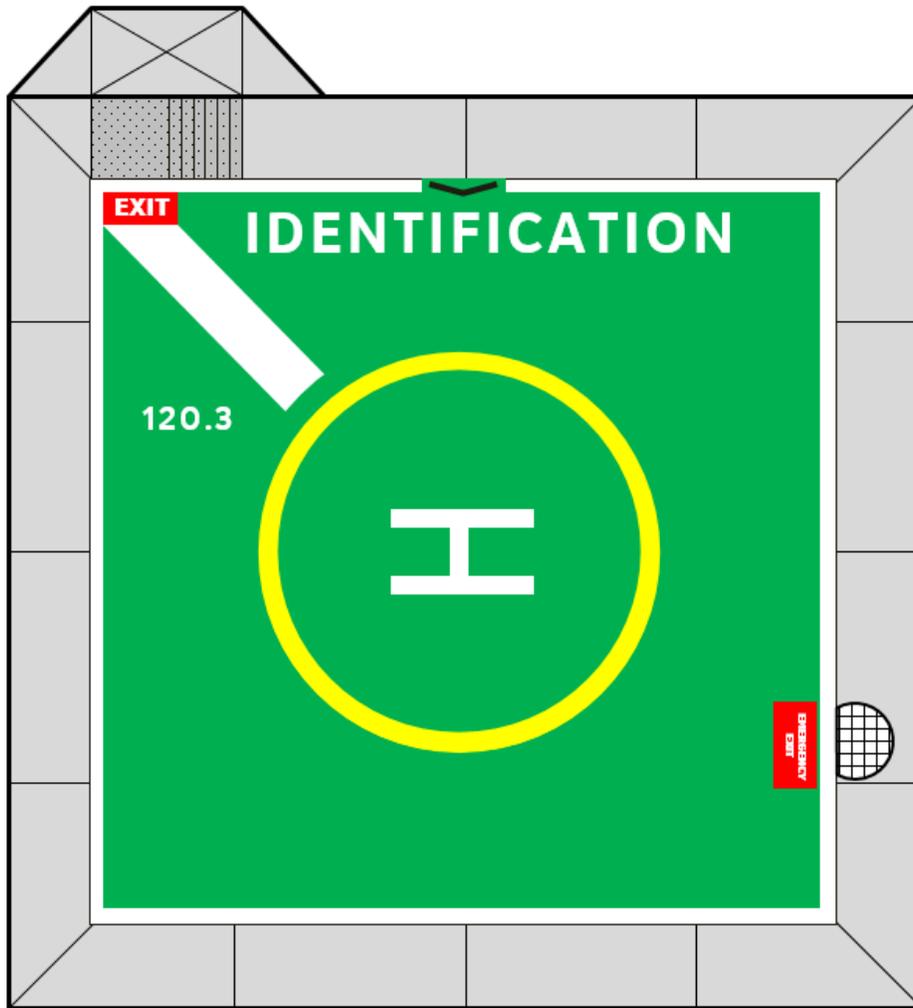


Figure 6.12.B Unmanned Exit Facility Marking

## 7 Lighting

### 7.1 General

7.1.1 Lights shall be installed on manned facilities or other facilities where the possibility of use at night / low ambient light or during instrument flight conditions.

7.1.2 New technology lighting such as strip light emitting diodes (LED) for the TLOF perimeter or TDPM should be considered as these become more available, reliability is proven, and they meet the equivalent lighting specifications for existing lighting systems.

*Note 1: The system for securing the LEDs to the TLOF surface should be carefully reviewed to ensure the method of attachment will not cause damage to the helicopter landing gear.*

*Note 2: The LED system design should be reviewed to ensure it will not present a roll over hazard for helicopters in the event the landing gear snags the LED system.*

**7.1.3** Specifications for perimeter lights for the TLOF, parking area, and parking transition area, are given in Annex E.

## **7.2 TLOF Perimeter Lighting**

**7.2.1** Perimeter lights shall be used to delineate the TLOF. Aviation green omni-directional lights shall be used. Alternatives to omni-directional such as strip lights may be considered with appropriate national authority approvals.

**7.2.2** The omni-directional perimeter lights should have an intensity and intensity distribution (beam spread) corresponding to the values defined in FAA Engineering Brief No. 87. See Annex E for additional information on perimeter lighting.

*Note: FAA Engineering Brief No. 87 applies to heliports but the intensity and intensity distribution (beam spread) requirements are equally applicable to helidecks.*

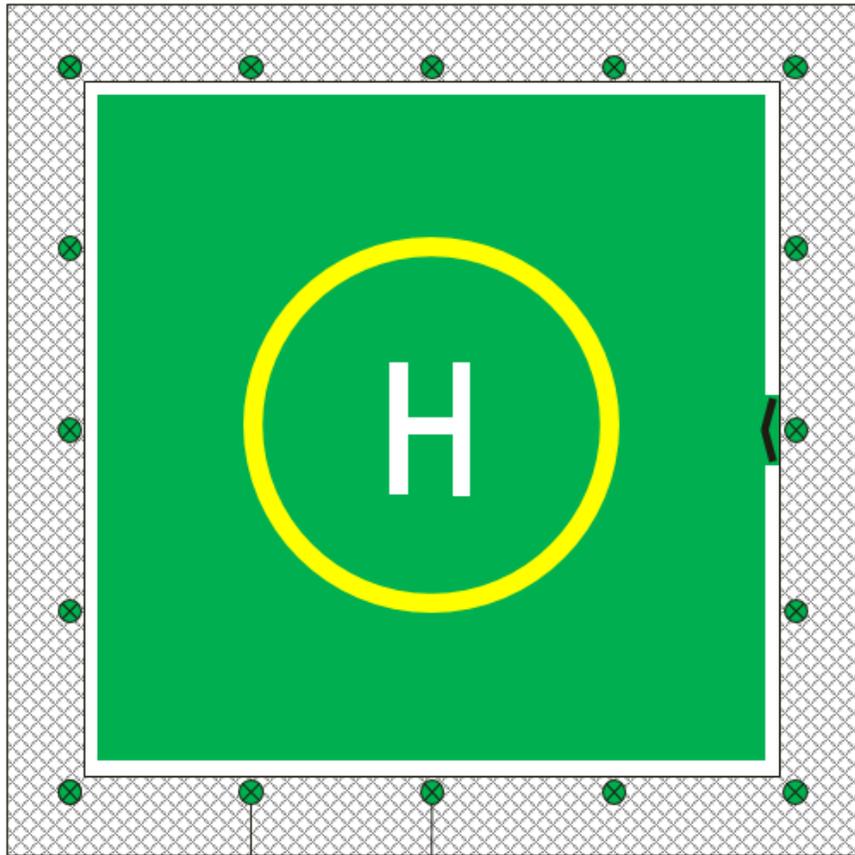
**7.2.3** The perimeter lights shall be uniformly spaced at intervals of not more than 10 ft. (3.0 m).

**7.2.4** For square or rectangular shaped TLOFs there should be a minimum number of four lights on each side including one light at each the corner as shown in Figure 7.2.5.A. For circular, [hexagonal or octagonal shaped TLOFs](#), there should be a minimum of eight lights as shown in Figure 7.2.5.B. For hexagonal or octagonal shaped TLOFs, there should be at least one light at [or near as practicable to](#) each corner [and lights between the corners must be equally spaced as](#) in Figure 7.2.5.B.

**7.2.5** [Perimeter lights should be outboard and adjacent to the TLOF edge. These lights should not protrude more than 6 in. \(15 cm\) above the elevation of the TLOF surface for a 1.0D TLOF or 2 in. \(5 cm\) for a 0.83D TLOF or any TLOF smaller than 40 ft. For designs where the perimeter lights cannot be outboard and adjacent then they may be mounted on the TLOF perimeter marking but shall be flush mounted.](#)

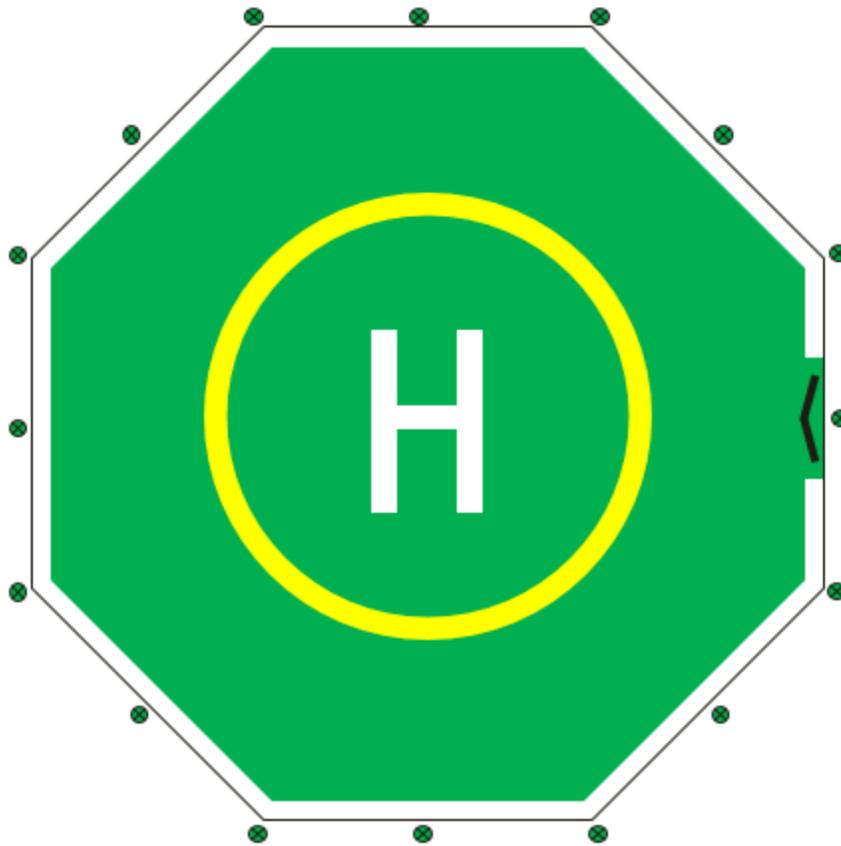
*Note 1: All lighting components and fitment should meet safety regulations relevant to a helideck environment as prescribed in API 500 or API 505 for lighting requirements, and as a minimum be rated for Class 1, Division 2.*

*Note 2: If night vision goggle (NVG) approaches are anticipated the lights shall be NVG compatible.*



Maximum width  
between lights  
10 ft. (3m)

**Figures 7.2.5.A Lighting Square Helideck**



*Note: Safety net/shelf not depicted.*

**Figure 7.2.5.B Lighting Octagonal Helideck**

### **7.3 TLOF Flood Lighting**

**7.3.1** Flood lighting may be required to improve the ability of the pilot to see the TLOF markings (TDPM, 'H', size/weight (mass) limits) during approach and landing and to illuminate the TLOF and surrounding area for helideck "ground" operations (passenger movements, refueling operations, freight handling etc.), Figure 7.3 below provides a typical flood lighting arrangement.

**7.3.2** For helideck ground operations, it may be possible to site additional high-mounted flood lighting away from the TLOF perimeter, such as on nearby structure outside the LOS. This additional flood lighting should not cause a source of glare to a pilot, especially when lifting in the hover to transition into forward flight, and should not present a competing source to the green TLOF perimeter lights.

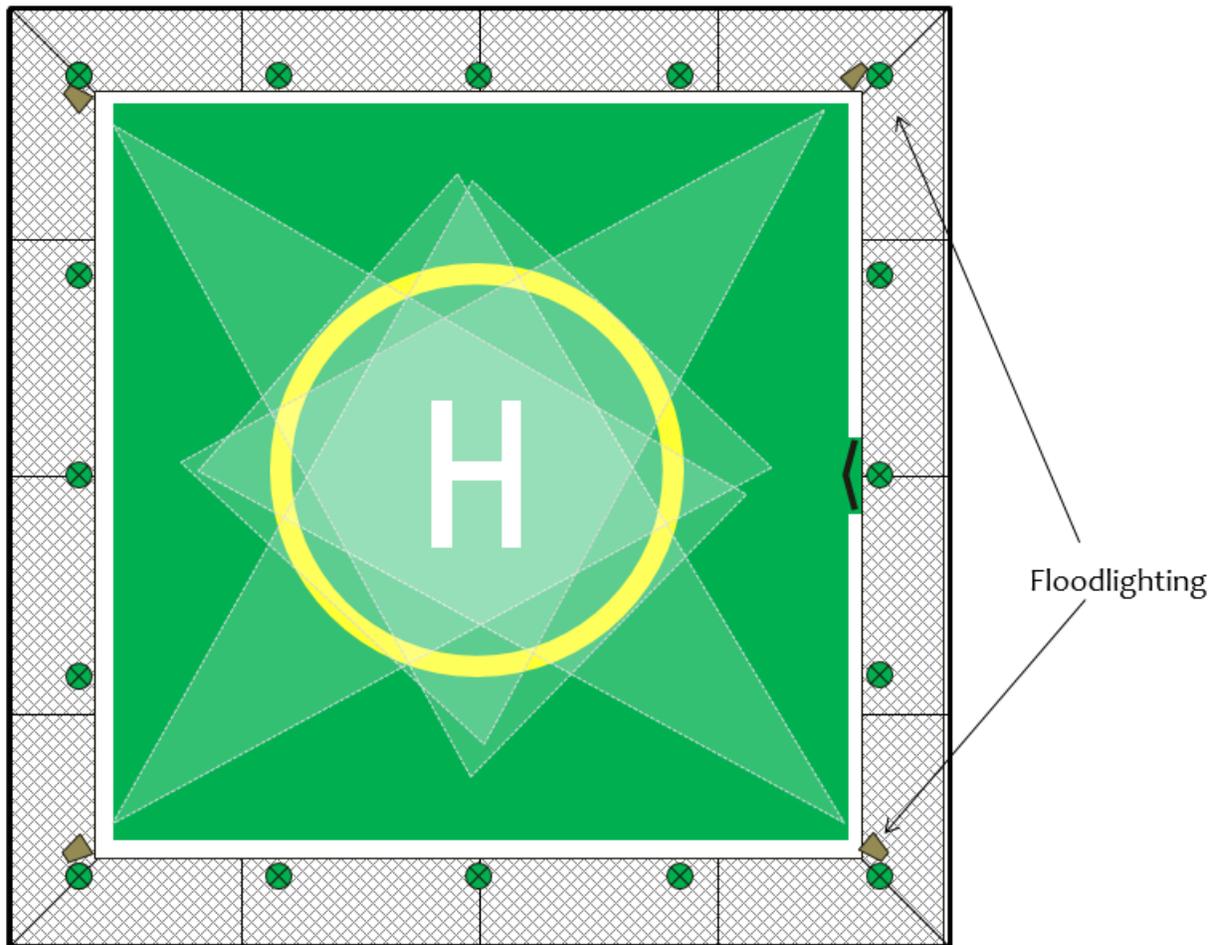
*Note: When flood lights are provided solely for ground handling reasons or parking areas they shall be capable of being switched off during landing and takeoff of the helicopter.*

**7.3.3** Between 4 and 6 flood lights should be sufficient for most helidecks. In the case of a helideck with a parking area lighting as shown in Figure 7.4, 3 lights around the perimeter may be used.

**7.3.4** To mitigate glare, flood lights should be mounted so that the centerline of the floodlight beam is at an angle of 45 degrees to the reciprocal of the prevailing wind direction. The height of the installed TLOF floodlights shall not exceed the heights prescribed in 4.3.5.2.5 and 4.3.5.2.6.

**7.3.5** Flood lighting should provide an average horizontal illuminance of the flood lighting of at least 10 lux, with a uniformity ratio (average to minimum) of not more than 8:1, measured on the surface of the TDPM. The spectral distribution of TLOF area floodlights should ensure adequate illumination of the surface markings (especially the touchdown/ positioning marking), the helideck name, and any obstacle markings.

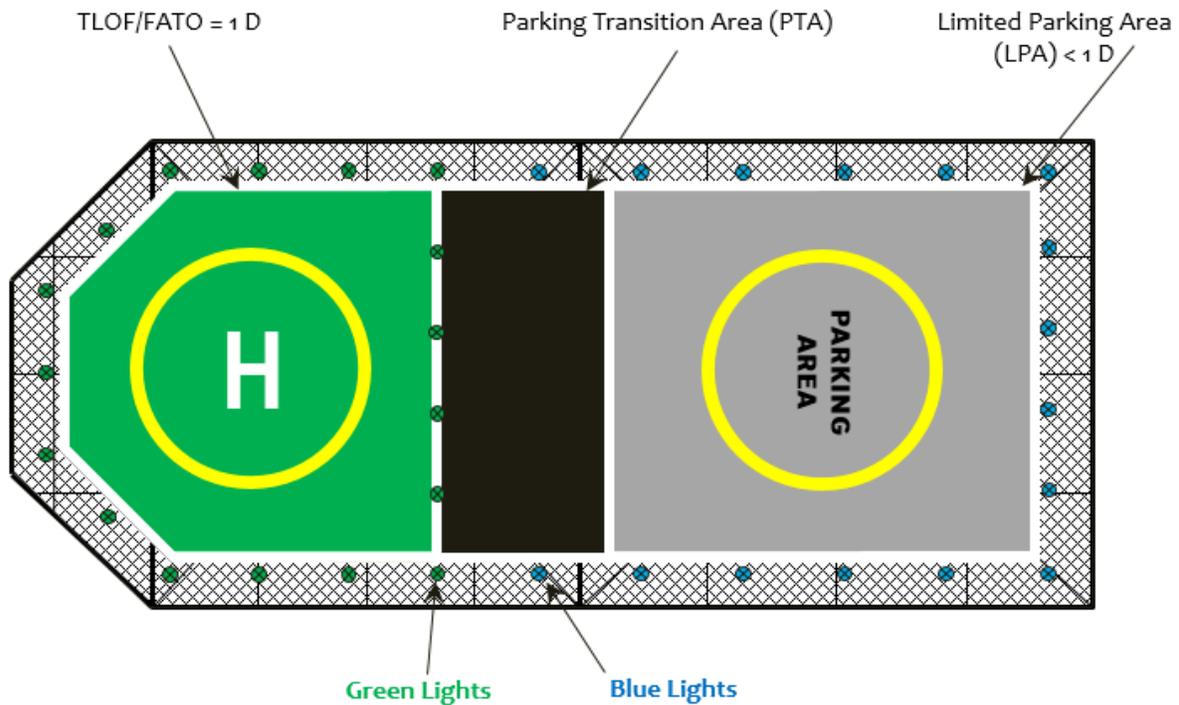
**7.3.6** Adequate shielding should be used on any flood lighting that could dazzle or disorientate the pilot during an approach for landing and the arrangement / aiming of flood lights should be such that shadows are kept to a minimum



**Figure 7.3 Typical Flood Lighting Arrangement**

#### **7.4 Parking Area and Parking Transition Area Lights**

The TLOF perimeter lights, see 7.1, should be used for the parking area perimeter and parking transition area, but the color of the lights shall be aviation blue. The blue lights on the inboard section of the parking transition area and parking area shall be flush mounted as shown in Figure 7.4.



**Figure 7.4 Parking Area Lighting**

*Note: FAA Engineering Brief No. 87 only refers to 'aviation green lights': the intensity and intensity distribution (beam spread) is applicable to aviation blue lights.*

## 7.5 Status Light(s)

**7.5.1** The intent of the status light(s) is to indicate an unsafe landing area. Red status light(s) shall be provided for all manned facilities. When the status light is off, the helideck is cleared for flight operations and the illumination of a status light indicates the helideck is closed to helicopter operations.

**7.5.2** The status light(s) should be located near the primary personnel access and egress stairway to the helideck and be visible to the pilot of an approaching aircraft. When this location does not ensure approaching pilot visibility, include the outboard corners of the TLOF. The light(s) should not exceed 2 in. (5 cm) above the level of the TLOF surface unless located in the LOS and not exceeding the obstacle height limitations in that sector. The status light should be visible from all approach directions, i.e. 360° in azimuth.

**7.5.3** A rotating beacon or flashing status light shall be operating during conditions hazardous to helicopter operation as listed in section 4.8. (hot air, raw gas, H<sub>2</sub>S, etc.) and shall be automatically triggered and remain on until the hazard is cleared. Additionally, the light shall be left on and flashing in the manual mode at all other times until the helideck is cleared for helicopter operations. Examples of these hazardous situations include but are not limited to the following: facility not prepared to accept helicopter operations, crane operations, helideck not cleared as green, wind conditions exceed helicopter limitations, etc.).

**7.5.4** The effective intensity of the status light should be a minimum of 700 cd between 2° and 10° above the horizontal and at least 176 cd at all other angles of elevation. Back-up lights should be provided in the event of failure of the primary status light(s). The flashing status light(s) should have a

minimum flash rate of 60 flashes per minute, and where multiple lights are installed the lights should be synchronized to increase visual cueing for flight crews.

*Note: Where one light / automated activation system can be technically designed to perform all the functions required, one status light can be used.*

## **7.6 Lighting of Obstructions**

**7.6.1** Elevated obstructions that are not **clearly visible** should be marked with omni-directional red lights of at least 10 cd. Where the highest point on the platform exceeds the elevation of the TLOF by more than 50 ft. (15 m), an omni-directional red light should be fitted at that position, with additional lights fitted at 35 ft. (10 m) intervals extending to the elevation of the TLOF.

**7.6.2** Specifications for obstruction lights are given in FAA Specification for Obstruction Lighting Equipment, FAA Advisory Circular 150/5345-43G.

*Note: At a helideck used at night with obstacles on which it is not possible or practicable to display obstacle lights, the obstacles should be flood lighted.*

## **7.7 Uninterrupted Power Supply (UPS)**

**7.7.1** Arrangements should be made so that there is no loss of critical (specified) lighting due to loss of the primary power system on the facility.

*Note: A critical lighting analysis should require at least 50 % of perimeter lighting and 100% of the access and egress routes, obstruction, status and windsock lights will remain operational.*

**7.7.2** This lighting may be supplied from the emergency power bus power so that power to the lighting is maintained, and be provided from an UPS sufficient to power the specified lighting for the period required for the emergency generator/bus to assume the load after the loss of primary power.

**7.7.3** In the event that the facility is not equipped with an emergency generator/bus as noted above, the specified lighting should be connected to a UPS capable of powering the lighting for a period of at least 18 hours.

# **8 Fueling Stations**

## **8.1 General**

Helicopter fueling stations and equipment should be located to avoid obstructing any personnel access or egress route serving the TLOF (helicopter flight deck) and should not infringe required obstacle-free surfaces.

Piping for fuel systems should be stainless steel with welded connections. All tanks, sumps, and filtration unit shall have low point drains for the removal of contaminants.

## **8.2 Fuel Tanks**

Helicopter fuel storage tanks shall be installed as far as practicable from the TLOF area, accommodation spaces, escape routes embarkation stations and sources of vapor ignition. Marine portable fuel stowage tanks must meet the requirements 46 CFR Part 64 and each marine portable fuel stowage tank must have a means to contain fuel spills or leaks. All steel tanks should be lined with an approved epoxy liner unless the tanks are constructed of stainless steel and the tank design should incorporate a floating suction.

### **8.3 Fuel Transfer Equipment**

**8.3.1** All fuel delivery systems, including portable systems, should be fitted with water blocking (ie a system designed to stop fuel flow from the fuel delivery when water contamination is present in the filtration shall meet the requirements of EI 1550 both into and out of the storage tank.

**8.3.2** Each nozzle must be a dead man type resulting in the stopping of fuel flow when released. Each hose shall have a storage reel meeting the requirements of EI 1529. A Static bonding cable, which attaches to the aircraft and the fueling nozzle, shall be provided.

**8.3.3** Each electric fuel transfer pump must have a control with a fuel transfer pump operation indicator light at the pump. There must be a fuel pump shut off at each of the helideck access routes. Each tank, pump unit, filter, each hose reel must have a means to contain fuel spills or leaks

**8.3.4** All components of the fuel system should be electrically bonded. Each hose shall meet the requirements of NFPA 407, Chapter 3.

### **8.4 Marking of Fuel Systems**

Required markings should be applied during system manufacture as prescribed in EI 1542.

## **9 Weather Reporting Equipment**

### **9.1 Windsack**

**9.1.1** An offshore facility shall be equipped with at least one windsack to provide a visual indication of the wind conditions prevailing over the facility during helicopter operations. The location of the primary wind direction indicator should be in an undisturbed air-stream avoiding any effects caused by nearby structures, and unaffected by rotor downwash from the helicopter. The location of the windsack should not compromise the established obstacle protected surfaces.

**9.1.2** The windsack should be easy visible to the pilot on the approach (at a height of at least 600 ft. (200 m), in the hover and whilst touched down on the surface of the TLOF, and prior to take-off. Where these operational objectives cannot be fully achieved by the use of a single windsack, consideration should be given to locating a second windsack in the vicinity of the helideck, which could also be used to indicate a specific difference between the local wind over the TLOF and the free stream wind at the installation (which the pilot will reference for an approach).

**9.1.3** A windsack made of fabric of orange color and should be illuminated internally or by external lights where night flights are anticipated. This windsack lighting should not be a glare hazard to pilots. A windsack should be a truncated cone made of lightweight (mass) fabric and should have the following minimum dimensions: length 4 ft. (1.2 m), diameter (larger end) 14 in. (0.3 m) and diameter (smaller end) 8 in. (0.15 m).

### **9.2 Weather Measuring Equipment**

**9.2.1** In addition to the windsack outlined in 9.1, a manned facility designed for visual flight rule and day only operations should be minimally equipped with a weather station with the following:

**9.2.1.1** Wind speed, direction and gust spread;

**9.2.1.2** Temperature;

**9.2.1.3** Barometric pressure;

**9.2.1.4** A means to provide cloud ceiling height and visibility which may be estimated visually or by using measurement equipment; and

**9.2.1.5** The ability to report sea state which may be estimated visually or by using wave measurement equipment.

**9.2.2** For facilities where instrument flight rules (IFR) or night operations are to be conducted, the weather station must provide all the items in 9.2.1 above and the dew point.

*Note: For instrument operations, the weather systems must be certified, calibrated, and maintained as required by the manufacturer or authority and automated systems preferred.*

**9.2.3** Where an existing manned facility is in close proximity to the planned new manned facility ('close' as determined by regulatory authority) it may be deemed that the new facility does not have to provide the above equipment, provided those existing facilities which are equipped can share their information routinely to the new facilities. For these new facilities, a manual means of verifying and updating the visual elements of an observation, i.e. cloud amount and height of base, visibility and present weather, may be used.

**9.2.4** Additional guidance relating to the provision of meteorological information from offshore facilities is contained in ICAO Annex 3.

### **9.3 Floating Facilities Additional Weather Reporting Equipment and Systems**

**9.3.1** Floating installations experience dynamic motions due to wave action which can present a potential hazard to helicopter operations. Operational limitations are therefore set by the helicopter operators which are promulgated in the facility's helideck operations manual when the helideck is commissioned and incorporated in the helicopter operator's operations manuals.

**9.3.2** Floating helidecks will have limitations established regarding the movement of the helideck in pitch and roll, helideck inclination, significant heave rate (SHR) and facility heading (if applicable) and this information will be recorded by the vessel's helideck monitoring or motion system (HMS) and be available as part of the overall facility offshore weather reporting system.

**9.3.3** The accelerometers for such measurements should be located as close to helideck level and centerline as possible to provide accurate readings. The accelerometer readings may be processed by sophisticated software that can produce accurate helideck level measurements of pitch, roll and heave (PRH) regardless of the accelerometer location.

**9.3.4** Pitch and roll reports to helicopters should include values, in degrees, about both axes for the true vertical datum (i.e. relative to the true horizon) and be expressed in relation to the vessel's heading. Roll should be expressed in terms of "left" and "right" in degrees; pitch should be expressed in terms of 'up' and 'down' in feet or meters (as applicable); helideck inclination is the angle measured in degrees between the absolute horizon and the plane of the helideck. SHR, being twice the root mean square (RMS) heave rate measured over a 20-minute period, should be reported in meters or feet (as applicable) per second. Values of pitch and roll, helideck inclination and SHR should be reported to one decimal place.

## **10 Emergency Response Equipment**

Equipment should be immediately available in a weather proof container to respond to a helicopter mishap on the helideck at a manned facility.

## **11 Communications Equipment**

All manned offshore facilities should have an Aviation VHF radio capable of communicating with the pilots during any flight operation.

## Annex A

# Guidance for Helideck Limited Parking Areas and Push-in Parking Areas

### A.1 General

If a parking area of 1.0D cannot be provided due to space or structural limitations, a limited parking area (LPA) or push-in parking area (PIPA) outlined in this Annex may be provided. Like the parking area discussed in 4.3.4, the limited parking area or push-in area should be located outside the obstacle-free sector (OFS) and outside the limited obstacle sector (LOS) of the helideck so that a helicopter parked on the LPA or PIPA is outside the LOS height limitations as shown in Figure A.2.5.

### A.2 Limited Parking Area

**A.2.1** An LPA may be provided when a 1.0D parking area (see 4.3.4) cannot be provided because one or more of the following conditions exists:

- a) an infringement of the 0.33D protection area surrounding the D-circle of the parking area is present;
- b) a weight (mass) limitation exists for helicopters allowed onto the LPA due to structural constraints;
- c) the dimensions of the LPA are insufficient to accommodate the helicopter type allowed onto the TLOF.

**A.2.2** The minimum LPA should be of sufficient size to contain a circle of diameter of not less than 0.83D of the largest helicopter the parking area is intended to serve, surrounded by a 0.33D protection area. Infringements of the 0.33D additional protection area are allowed if be adequately marked and written documentation and procedures are made available to air operators to identify obstruction(s) or limitation(s).

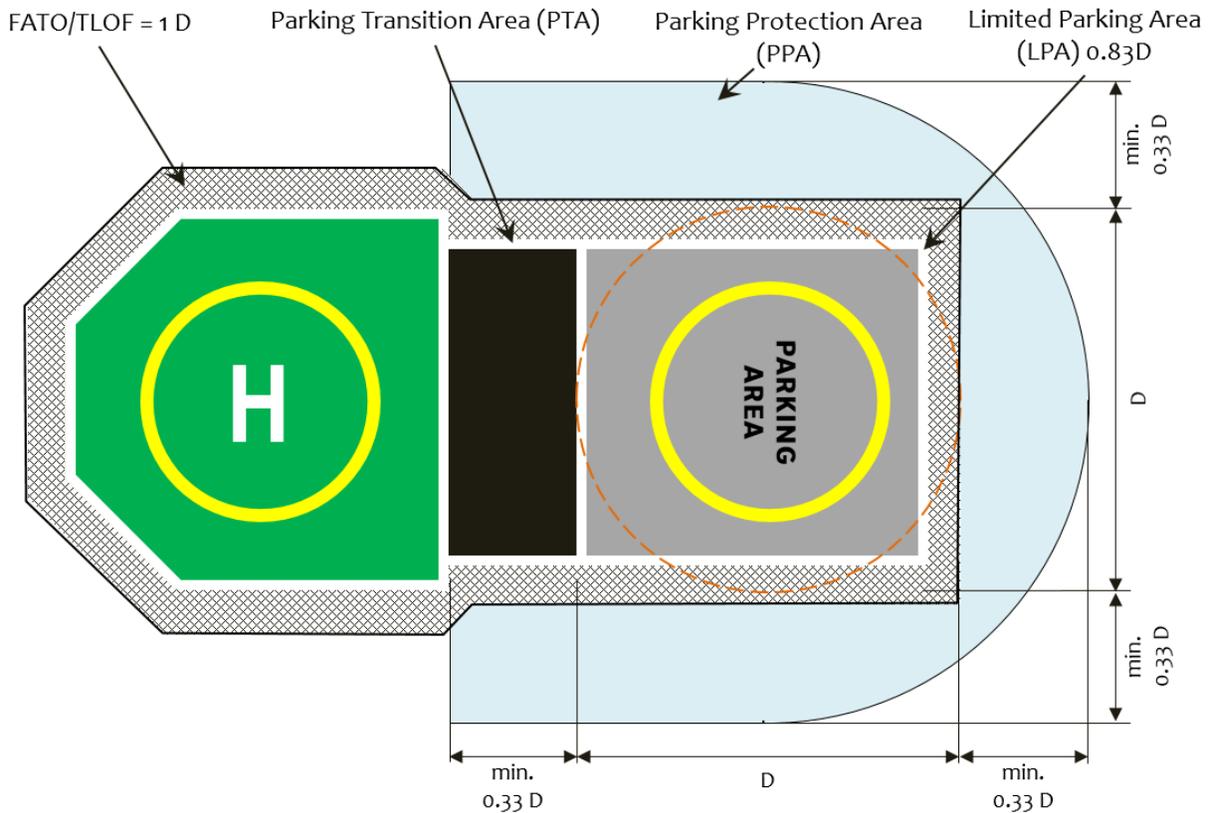
**A.2.3** A helideck layout with a 1.0D TLOF and adjacent 0.83D parking area<sup>1</sup> with an obstacle clearance area of 1.0D and a 0.33D parking protection area (PPA) is shown in Figure A2.5. The TDPC on the PA may be offset to a maximum distance of 0.33D provided the 0.33D clearance is still guaranteed and no part of the helicopter undercarriage is closer than 3 ft. (0.9 m) from the LPA deck edge (see Figure A.2.5 for offset diagram example and figures A.4.4.2.A, A.4.4.2.B and A.4.4.2.C for depiction of the undercarriage 3 ft. helideck edge clearance requirement).

**A.2.4** The LPA area may contain objects whose presence is essential for the safe operation of the helicopter with a maximum height of 2 in. (5 cm).

**A.2.5** An LPA may be down-sized to accommodate a helicopter with a lesser D-value then associated with the TLOF in order to achieve the 1.0D obstacle clearance area and 0.33D PPA for the smaller helicopter. In this case, the D-value of the LPA shall be marked in the PTA together with the weight (mass) limit and the LPA dimension(s), if applicable (see 6.7).

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<sup>1</sup> 0.83D = Approximately 1.0 RD



**Figure A.2.5 — 1D FATO, 1D TLOF, and Limited Parking Area of 0.83D**

**A.2.6** The PTA is an area between the TLOF and the LPA/PIPA used to transition the helicopter to/from the parking area by hover, ground taxi, or ground handling. The PTA divides the TLOF and LPA/PIPA in order to provide a minimum of 0.33D clearance between the parked helicopter and the TLOF perimeter. The PTA surface should be painted in a black color, starting from the perimeter line of the TLOF to the LPA/PIPA perimeter line. The minimum distance from the 1.0D circle to the LPA/PIPA should be 0.33D. Thus, the parking area should be separated from a 1.0D TLOF by a parking transition area (PTA) with a minimum width of 0.33D (see Figure A.2.5) and from a 0.83D TLOF by a minimum width of 0.415D.

**A.2.7** Restrictions on the method of transition and any parking area restrictions should be marked on the PTA (see Figure A.4.5.2.A).

**A.2.8** PTAs and PAs shall be surrounded with a safety net or shelf.

*Note 1: During normal operations no part of either a helicopter tied down or operating on the helideck should intrude into the PTA except during transition to and from the LPA/PIPA.*

*Note 2: On Figures A.2 through A.4.5.1 and Figure A.5.2 the dark areas surrounding the TLOF, PTA's and PA's are the required safety net or shelves, although this is not shown in the text on the individual figures.*

### **A.3 Touchdown Parking Circle Marking**

A touchdown parking circle (TDPC) should be marked on LPA to provide proper obstacle clearance when the pilot's seat is over the yellow portion of the TDPC. The TDPC should have an inner diameter of 0.5D,

line width of 18 in. (45 cm), and the center of the TDPC should be located 0.5D from the LPA perimeter nearest to the TLOF.

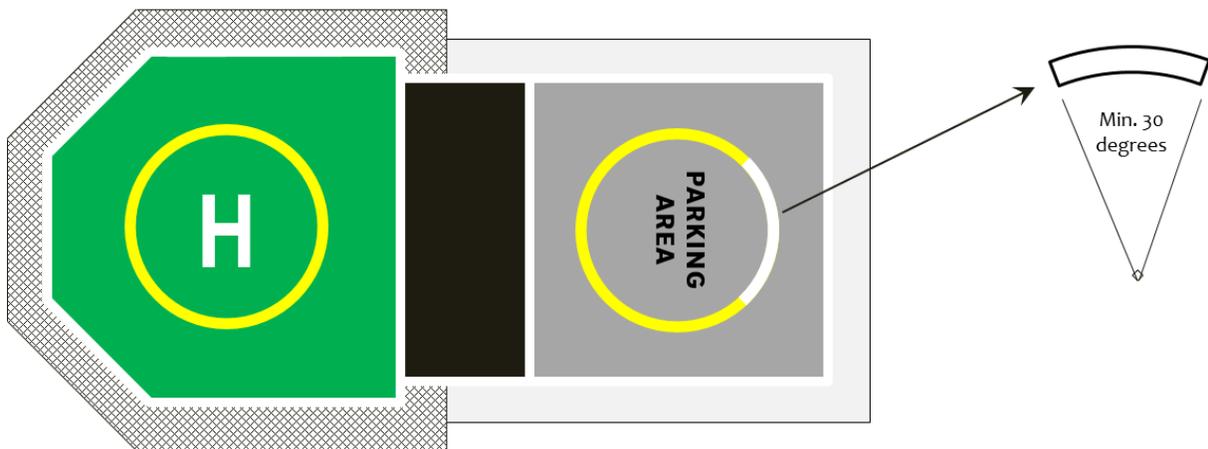
## A.4 Parking Area Markings

### A.4.1 General

As indicated in A.4.2 and A.4.3 there are two parking circle markings that may be added to the TDPC to provide clearances for obstacles that may be adjacent to the parking area.

### A.4.2 Parking Circle Orientation Marking

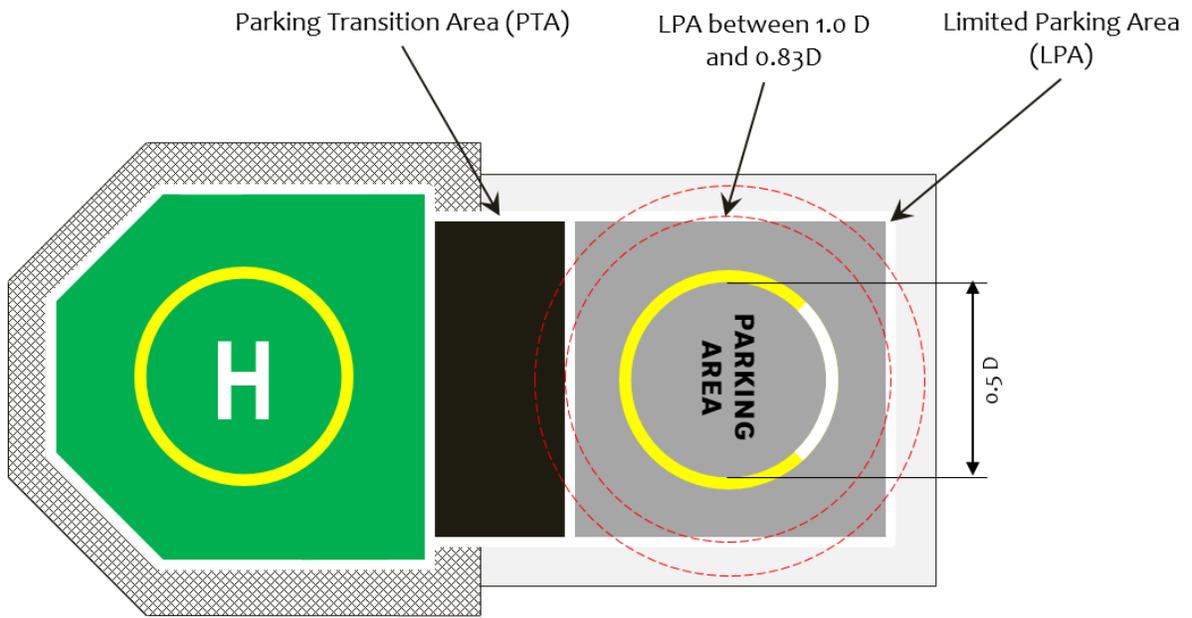
**A.4.2.1** The parking circle orientation marking (PCOM) should be a white colored marking on the yellow TDPC as shown in Figure A.4.2.1.



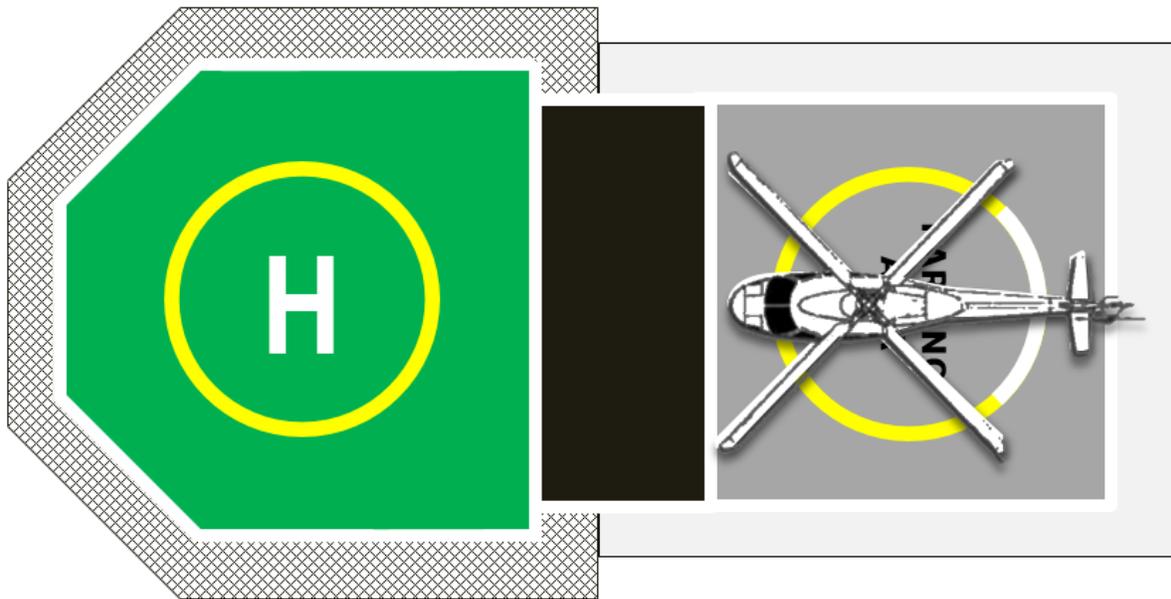
**Figure A.4.2.1 — Touchdown Parking Circle and Parking Circle Orientation Marking**

**A.4.2.2** A parking orientation restriction due to an infringement of a clearance area should be marked with a parking circle orientation marking (PCOM). The PCOM is located on the TDPC and provides visual cues to the flight crew that the helicopter needs to be oriented in specific directions before helicopter shutdown (see Figures A.4.2.2.A and A.4.2.2.B).

*Note: A PCOM is only required if there is an infringement of the 0.33D PPA.*



**Figure A.4.2.2.A Limited Parking Area of  $0.83D$  with Parking Circle Orientation Marking**



**Figure A.4.2.2.B Helicopter Parked using Parking Circle Orientation Marking after Maneuvering via Hover Taxi**

**A.4.2.3** The nose of the helicopter shall be located over the yellow portion of the circle during or while shutdown as shown in Figure A.4.2.2.B.

**A.4.2.4** Maneuvering in the LPA using hover or ground taxi is acceptable. The nose of the helicopter should be located over the yellow portion of the TDPC circle when shutdown i.e. the nose of the helicopter should not be located over the white portion of the PCOM circle during or while shutdown. A PCOM marking may be used to avoid the tail rotor being positioned in the vicinity of an exit or emergency exit.

**A.4.2.5** The size of the PCOM will depend on the size of the obstacle to be avoided but when used. It is recommended the minimum (angular) size should be  $30^{\circ}$ .

*Note: The PCOM provides visual cues to the flight crew that the helicopter needs to be re-oriented before the helicopter is shutdown.*

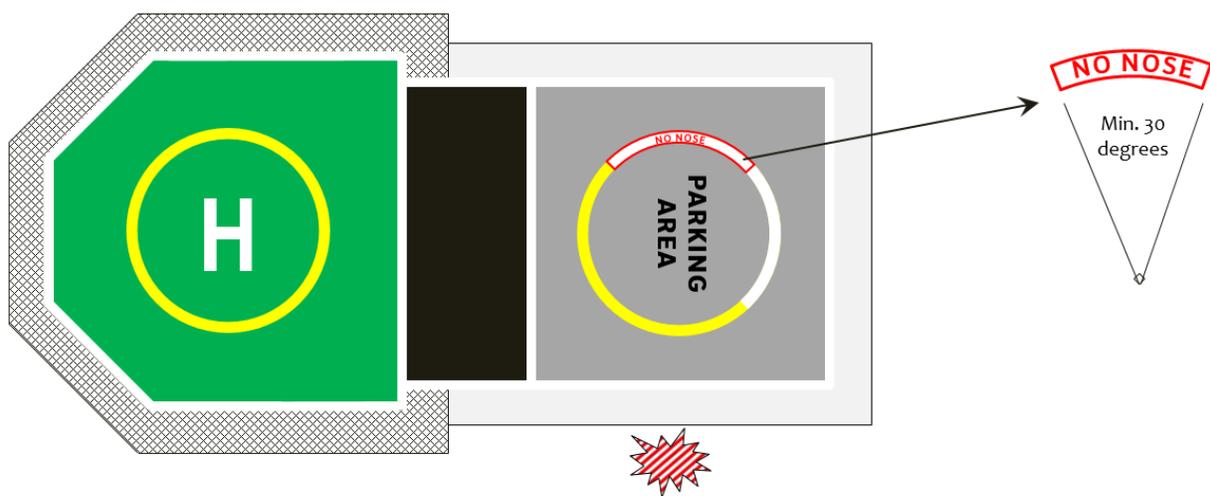
**A.4.2.6** Figure A.42.2.B shows a helideck layout with adjacent 0.83D parking area, 1.0D obstacle clearance and 0.33D PPA. The PCOM provides orientation information that prevents a helicopter's tail rotor from being positioned in the parking transition area and infringing on the 0.33D PPA from the TLOF which would limit the use of the TLOF.

### **A.4.3 No Nose Marking**

**A.4.3.1** A No Nose marking can be used to avoid the tail rotor being positioned in the vicinity of an exit or emergency exit (see 6.11) or if an obstacle is very near to or infringes the 0.33D PPA.

**A.4.3.2** A No Nose marking provides visual cues that the helicopter's nose should not be parked or maneuvered in particular direction. Figures A.4.3.3 through A.4.3.3.D show a helicopter maneuvering and parking orientation restriction, to avoid infringement of the transition area by use of the PCOM marking and use of the No Nose marking to avoid a tail rotor hazard.

**A.4.3.3** A No Nose marking should be on a white background with a red border and the words "No Nose" located on the TDPC as shown in Figures A.4.2.2.B, A.4.3.3.A, and A.4.3.3.B. The No Nose marking section on a TDPC should be a minimum of  $30^{\circ}$  but may be expanded depending on the size of the obstacle. One or multiple obstacles may be covered by this sector.



**Figure A.4.3.3.A No Nose and Parking Circle Orientation Marking**

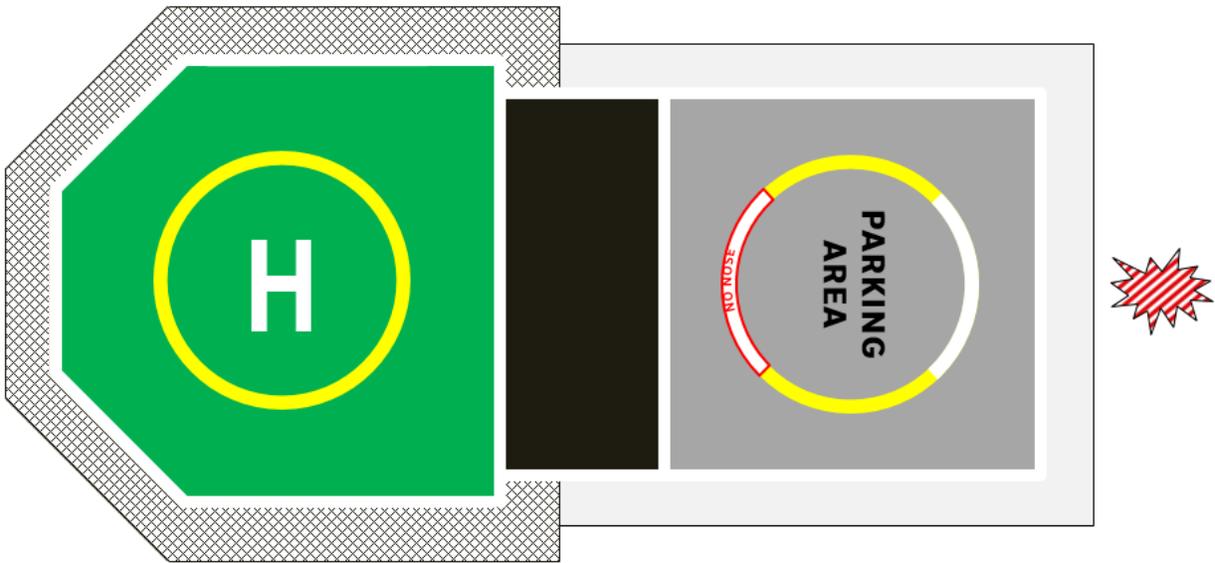


Figure A.4.3.3.B "No Nose" Marking and PCOM on TDPC Marking

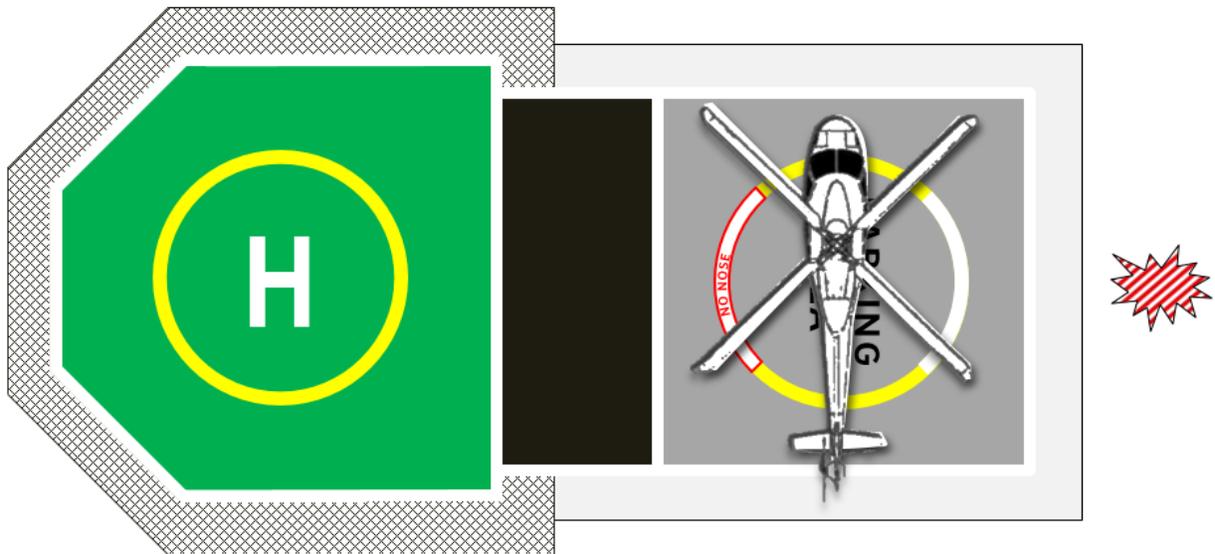


Figure A.4.3.3.C No Nose Marking and PCOM on TDPC Marking

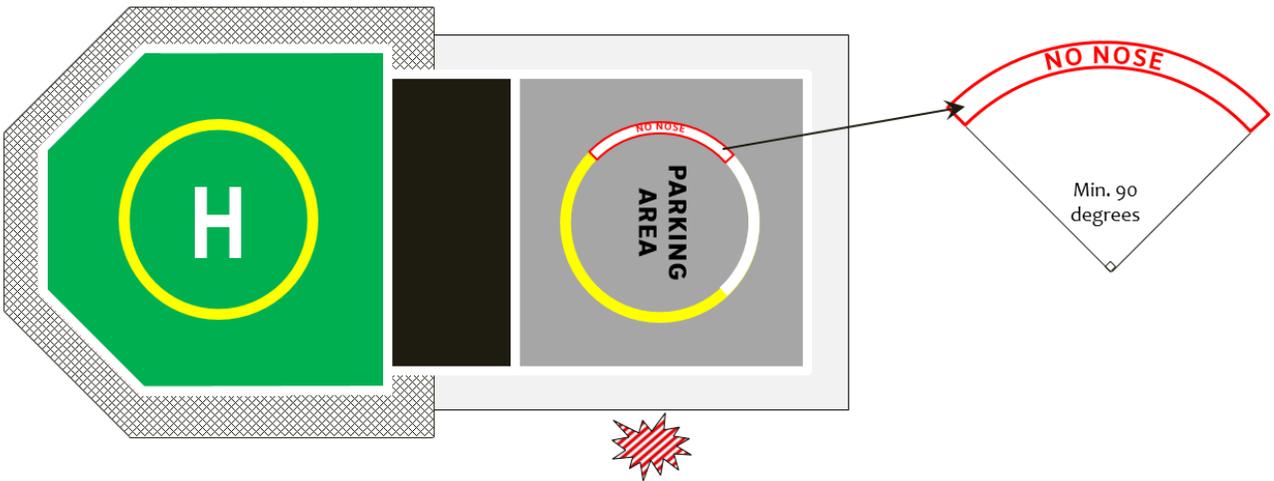


Figure A.4.3.3.D No Nose Marking and PCOM on TDPC Marking

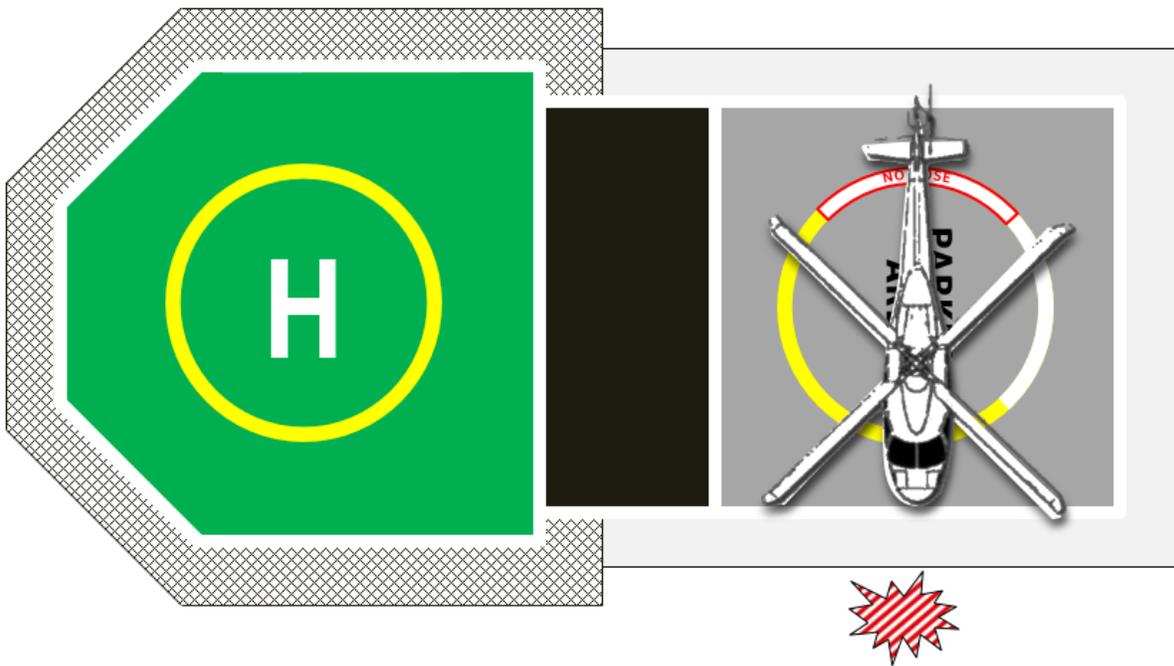


Figure A.4.3.3.E No Nose Marking and PCOM on TDPC Marking

**A.4.3.4** The size of the 'No Nose' marking will depend on the size of the area or obstacle to be avoided by the tail rotor/tail boom. It is recommended the minimum (angular) size should be 30°.

**A.4.3.5** When positioning over the TDPC, helicopters should be maneuvered to keep the aircraft nose clear of the "No Nose" marked sector of the TDPC at all times.

## A.4.4 Limited Parking Area and Push-in Parking Area Markings

### A.4.4.1 General

Information on the markings required on the parking transition area (PTA) for a limited parking area (LPA) and push-in parking area (PIPA) are given in Figure A.4.5.1. The "PARKING AREA" marking should be 24 in. (60 cm) high letters black in color. The words shall be stacked and centered within the touchdown parking circle (TDPC) as illustrated in Figures A.4.2.2.A, A.4.2.2.B, etc.

A PIPA will not have a parking circle and the lettering will be a minimum of 12 in. (30 cm) high letters white in color with a 4 in. (10 cm) brush stroke and a 1.5 in. (4 cm) black outline stating "PUSH-IN AREA". The words shall be stacked as illustrated in Figure A.4.4.2.A.

### A.4.4.2 Push-in Parking Area

The push-in parking area (PIPA) should be a minimum area that will provide un-obstructed clearance for a helicopter (rotors when not turning) to be ground handled to and from the TLOF and the PIPA.

The ability of maintenance personnel to access the helicopter, i.e. work stands, ladders, tools and equipment should be considered when determining the overall size of the push-in parking area. Illustrations of possible push-in parking areas (PIPAs) are shown in Figures A.4.4.2.A to A.4.4.2.C.

A 3 ft. (0.9 m) wide, solid white edge (buffer) line shall be painted along all three free sides of a push-in parking area and sides of the parking transition area (PTA) to aid ground handlers in safely moving the aircraft. Keeping the landing gear (under carriage) at least 3 ft. (0.9 m) inside of the edge of the PIPA. See Figures A.4.4.2.A to A.4.4.2.C.

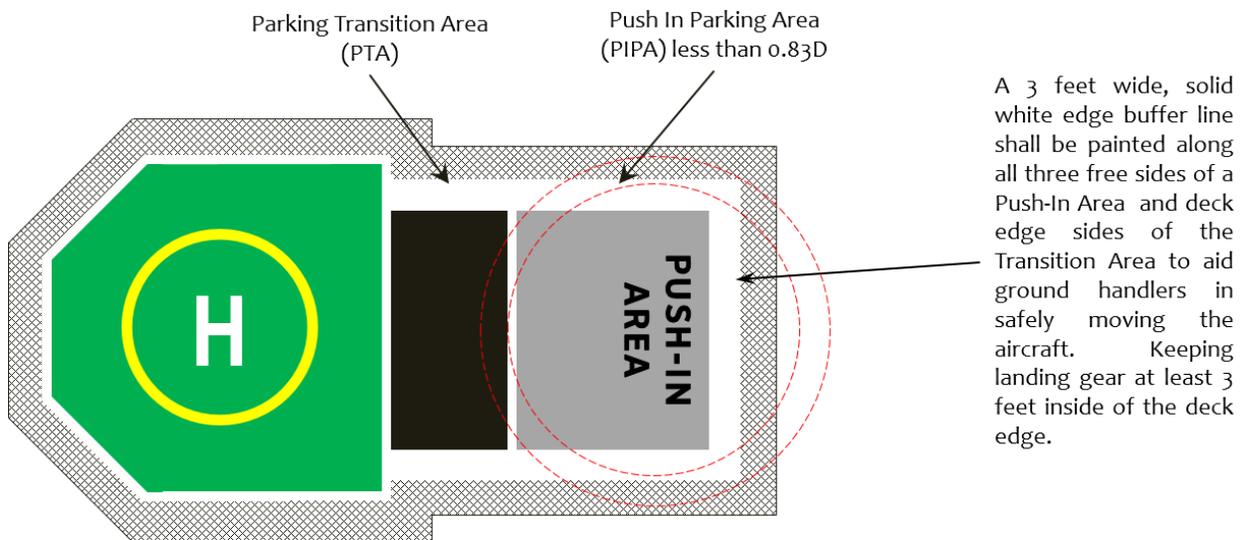


Figure A.4.4.2.A Push-In Parking Area

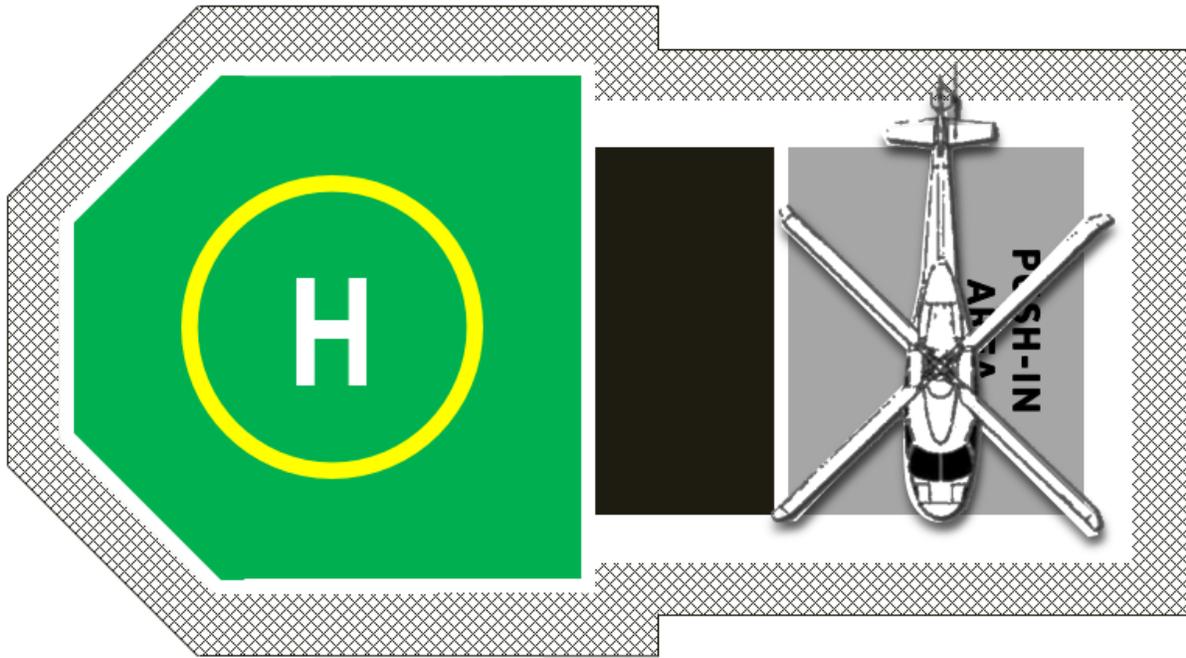


Figure A.4.4.2.B Push-In Parking Area

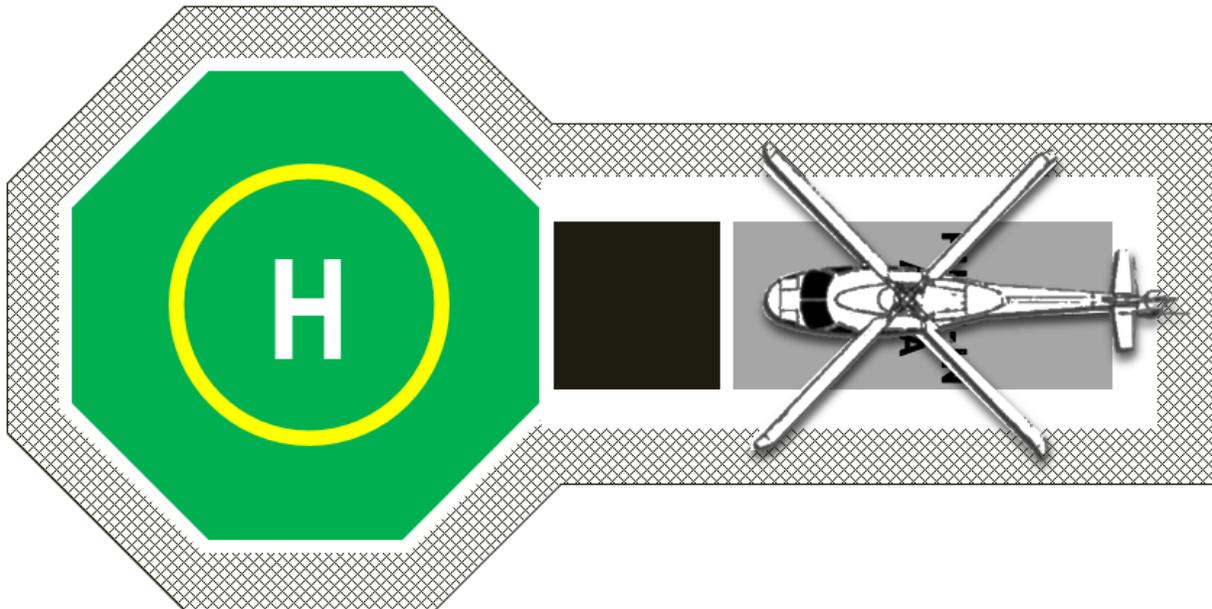
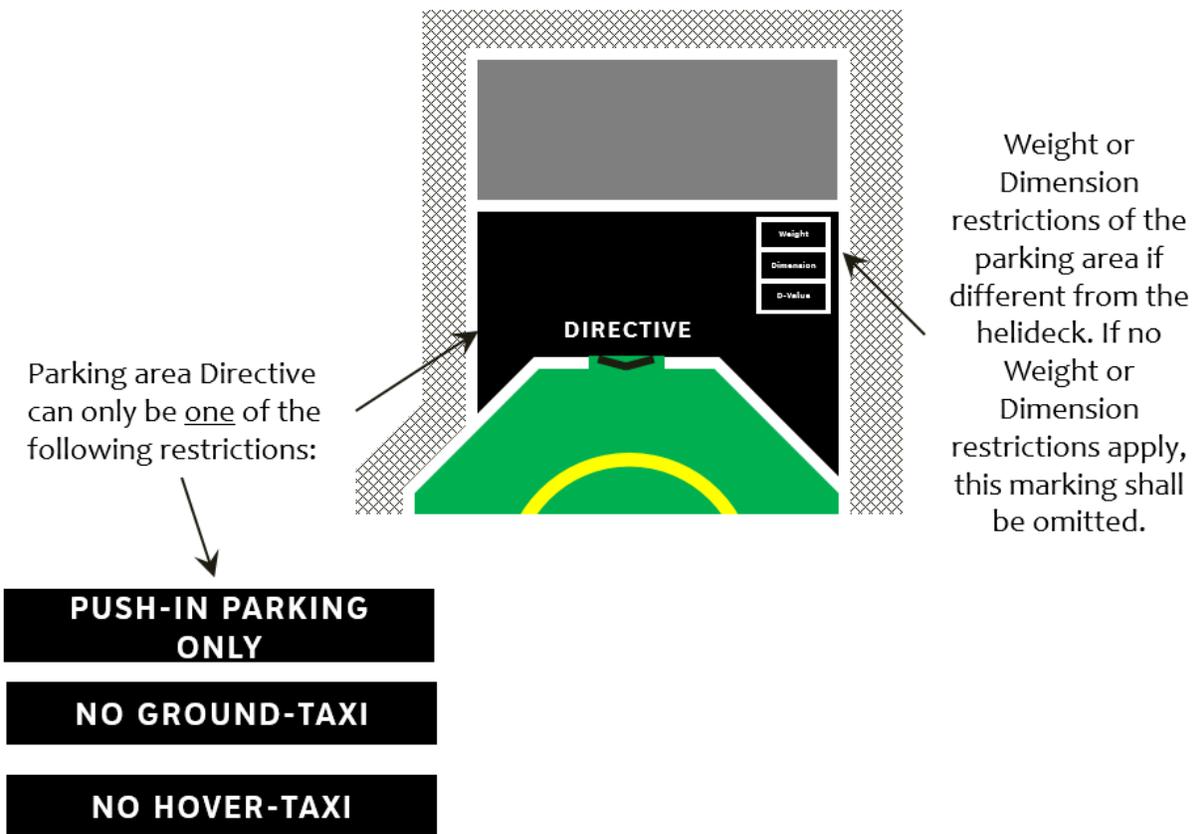


Figure A.4.4.2.C Push-In Parking Area

## A.4.5 Parking Transition Area Markings

**A.4.5.1** One of the following directives should be used to identify the allowed method of transition into the LPA/PIPA. “Push-in Only”, “No Hover Taxi” or “No Ground Taxi”, should be marked on the PTA as shown in Figure A.4.5.1. The applicable directive should be marked in text in a white color in the center of the PTA 12” from the TLOF perimeter line with letters 18 in. (0.45 m) high white letters located on a black background as shown in Figure A.4.5.1.

*Note: If the parking area can accommodate the same size helicopter as allowed on the TLOF without limitations, no markings are necessary*



**Figure A.4.5.1** Parking Transition Area Markings

**A.4.5.2** A limited parking area can be down-sized to accommodate a helicopter with a lesser D-value than then associated with the TLOF (see A.1). In this case, the ‘D-value’ of the LPA should be marked on the PTA together with, if applicable, the weight (mass) limit and the LPA dimension(s). All three values should be marked in a parking area limitations box, has shown in Figures A.4.5.2.A and A.4.5.2.B for imperial units and metric units respectively. The limitations box should be marked on the right hand side of the PTA at a distance of 12 in. (30 cm) from the TLOF perimeter line as shown in Figures A.4.5.1 with 18-inch high white letters on a black background with a 4-inch white border located as shown in Figures

A.4.5.2.A and A.4.5.2.B. This serves as a visual warning to the flight crew that is about to transition a helicopter from the TLOF into the LPA.

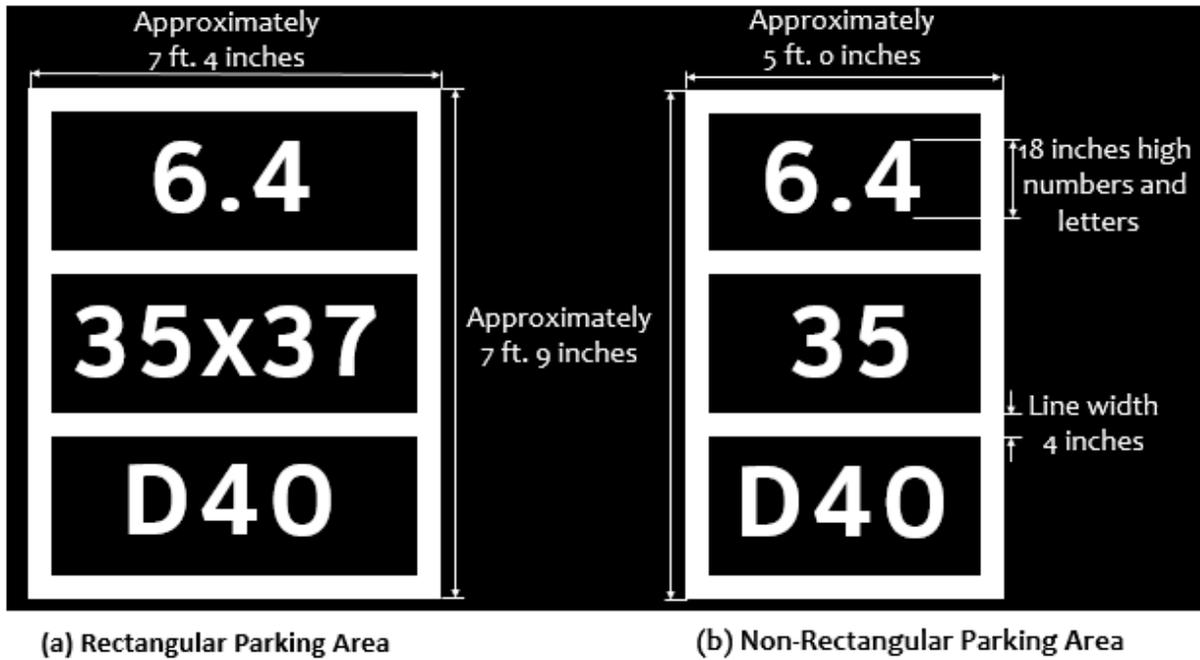


Figure A.4.5.2.A Parking Area Size/Weight Markings (U.S. Customary Units)

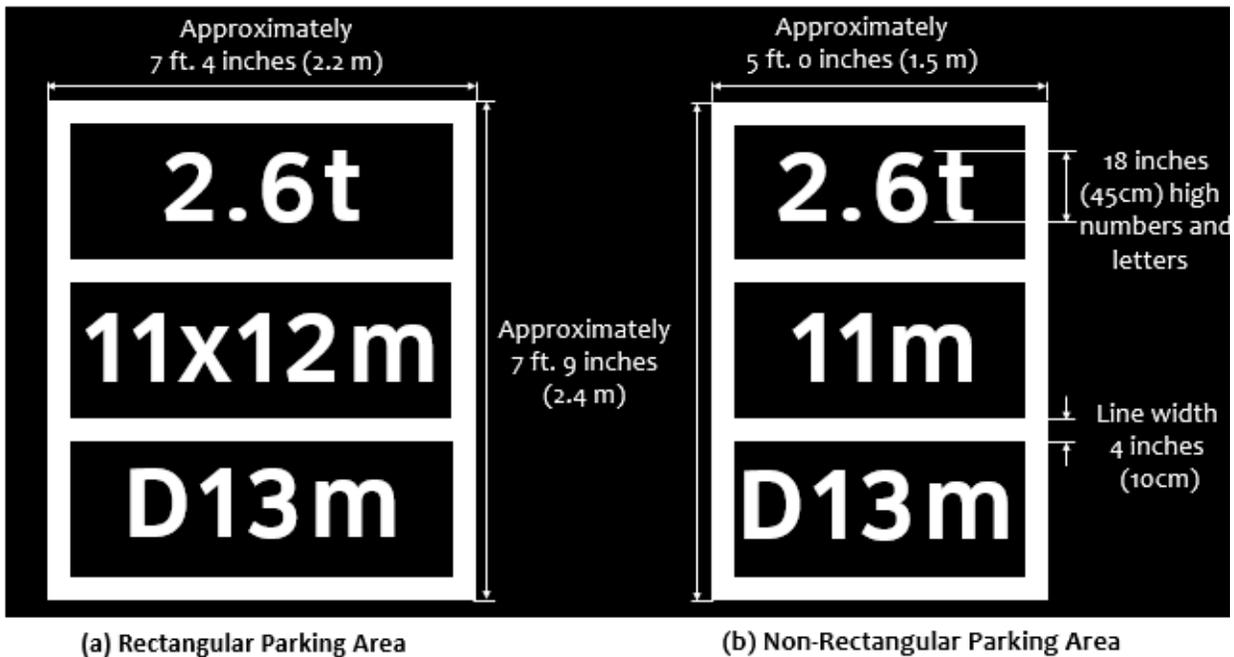


Figure A.4.5.2.B Metric Parking Area Size/Weight Markings

## A.5 Lighting of Parking Transition Areas with Limited Parking Areas and Push-in Parking Areas

A.5.1 See 7.2 for lighting of a LPA with hover and/or ground taxi.

A.5.2 For PIPA-only areas, the area shall be lit with floodlighting as shown in Figure A.5.2.

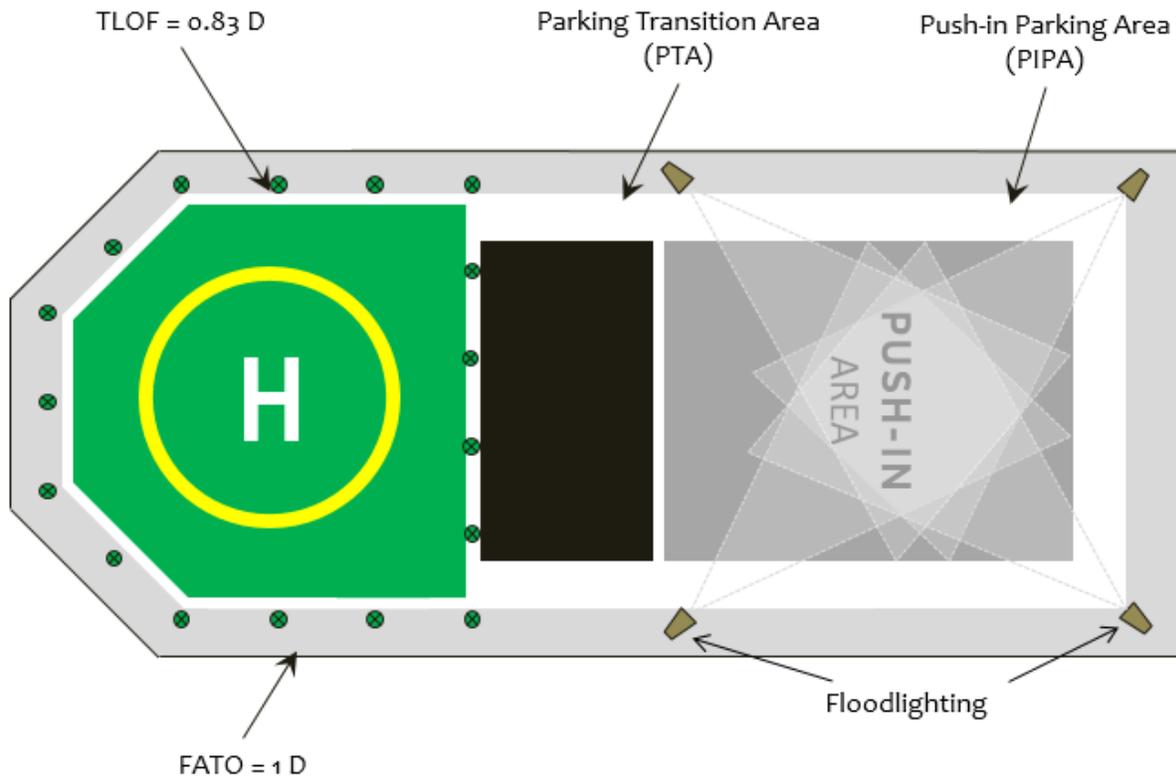


Figure A.5.2 Push-in Parking Area Lighting

# Annex B

## Firefighting Foam Systems

### B.1 Siting of Systems

**B.1.1** Foam-making equipment should be of adequate performance and be suitably located to ensure an effective application of foam to any part of the landing area irrespective of the wind strength/direction or accident location when all components of the system are operating in accordance with the manufacturer's technical specifications for the equipment.

**B.1.2** For a fixed monitor system (FMS), consideration should also be given to the loss of a downwind foam monitor either due to limiting weather conditions or a crash situation occurring. The design specification for an FMS should ensure remaining monitors (minimum of 2) are capable of delivering finished foam to the landing area at or above the minimum application rate (see B.2). For areas of the helideck or its appendages which, for any reason, may be otherwise inaccessible to an FMS, it is necessary to provide additional hand-controlled foam branches.

**B.1.3** Consideration should be given to the effects of the weather on static equipment. All equipment forming part of the facility should be designed to withstand protracted exposure to the elements or be protected from them. Where protection is the chosen option, it should not prevent the equipment being brought into use quickly and effectively. The effects of condensation on stored equipment should be considered.

**B.1.4** It is essential that all equipment should be ready for immediate use on, or in the immediate vicinity of, the helideck whenever helicopter operations are being conducted. All equipment should be located at points having immediate access to the landing area and the location of the storage facilities should be clearly indicated. The design placement/layout of all such equipment shall take into consideration the additional space needed to maintain and service equipment.

### B.2 Foam Quantities and General Information on Application Rates

**B.2.1** The minimum capacity of the foam production system will depend on the D-value of the helideck, the foam application rate, discharge rates of installed equipment and the expected duration of application. It is important to ensure that the capacity of the main helideck fire pump is sufficient to guarantee that finished foam can be applied at the appropriate induction ratio and application rate and for the minimum duration to the whole of the landing area when all helideck monitors are being discharged simultaneously. The foam storage containers and tanks must be correctly labeled.

**B.2.2** The application rate is dependent on the types of foam concentrate in use and the types of foam application equipment selected. For fires involving aviation kerosene (jet fuel), ICAO has produced a performance test which assesses and categorizes the foam concentrate. A minimum of five minutes' discharge capability is required.

**B.2.3** Most foam concentrate manufacturers will be able to provide the performance of their concentrate against this test. The decision regarding selection of the foam concentrate and type should take into account the design characteristics of the foam system and that mixing of different concentrates in the same tank, i.e. different either in make or strength is not acceptable and there are many different strengths of concentrate available.

### B.3 Calculation of Application Rate

Given the remote location of helidecks the overall capacity of the foam system should exceed that necessary for initial extinction of any fire. Foam concentrates compatible with seawater and meeting at least Performance Level B are used. Level B foams should be applied at a minimum application rate of **1.33 gallons per square yard** (6.0 L / m<sup>2</sup>) per minute.

The formula for calculating the application rate is as follows.

$$\text{Application rate US customary units} = 1.3 \times \pi \times r^2$$

$$\text{Application rate metric units} = 6.0 \times \pi \times r^2$$

An example calculation for a D-value 22.2 m helideck is as follows.

$$\text{Application rate} = 1.3 \times \pi \times (11.1)^2 = 502 \text{ G/min} \quad \text{or} \quad ((6.0 \times \pi \times (11.1)^2) = 2,322 \text{ L/min}$$

### B.4 Calculation of Minimum Operational Stocks

Using the 22.2 meter example as shown in B.4, a 1 % foam solution discharged over five minutes at the minimum application rate will require **502 gallons x 1% x 5 = 25.1 gallons of foam concentrate** (2,322 × 1 % × 5 = 116 L of foam concentrate). A 3 % foam solution discharged over five minutes at the minimum application rate will require **502 gallons x 3% x 5 = 75.3 gallons of foam concentrate** (2,322 × 3% × 5 = 348L of foam concentrate).

### B.5 Foam Aspiration:

Low expansion foam concentrates can generally be applied in either aspirated or unaspirated form. It should be recognized that while unaspirated foam may provide a quick knockdown of any fuel fire, aspiration, i.e. induction of air into the foam solution by monitor or by hand-controlled foam branch (see below), gives enhanced protection after extinguishment.

*NOTE - Wherever non-aspirated foam equipment is selected during design, additional equipment capable of producing aspirated foam for post-fire security/control should be provided.*

### B.6 Hose Lines and Hand Controlled Monitors:

**B.6.1** Not all fires are capable of being accessed by FMS and on some occasions the use of monitors may endanger passengers. Therefore, in addition to FMS, there should be the ability to deploy at least two deliveries with hand-controlled foam branch pipes for the application of aspirated foam at a minimum rate of **60 gallons/min** (225 liters/min) through each hose line.

**B.6.2** A single hose line, capable of delivering aspirated foam at a minimum application rate of **60 gallons/min** (225 liters/min), may be acceptable where it is demonstrated that the hose line is of sufficient length, and the hydrant system of sufficient operating pressure, to ensure the effective application of foam to any part of the landing area irrespective of wind strength or direction.

**B.6.3** The hose line(s) provided should be capable of being fitted with a branch pipe capable of applying water in the form of a jet or spray pattern for cooling, or for specific firefighting tactics.

## B.7 Deck Integrated Firefighting System

### B.7.1 General

**B.7.1.1** As an effective alternative to an FMS, facility owners are strongly encouraged to consider the provision of a deck integrated firefighting system (DIFFS). These systems typically consist of a series of pop-up nozzles, with both a horizontal and vertical component, designed to provide an effective spray distribution of foam to the whole of the landing area and protection for the helicopter for a range of weather conditions.

*Note: DIFFS may pose a roll-over or skid damage hazard to skid equipped helicopters, and the skids may also damage the DIFFS nozzles and this should be considered in the fire protection design risk assessment.*

**B.7.1.2** Although a DIFFS is capable of delivering foam and/or seawater in a spray pattern to the whole of the landing area, the provision of at least one additional hand-controlled foam branch pipe / hose reel is required to address any residual fire(s).

**B.7.1.3** A DIFFS should be capable of supplying performance level B or level C foam solution to bring under control a fire associated with a crashed helicopter within the time constraints stated in paragraph 4.6.3 of the 2L1 base document achieving an average (theoretical) application rate over the entire landing area (based on the D-circle) of 1.33 gallons per square yard (6.0 L / m<sup>2</sup>) per minute for level B foams or 0.83 gallons per square yard (3.75 L / m<sup>2</sup>) per minute for level C foams, for a duration which at least meets the minimum requirements stated in paragraph D 2.

**B.7.1.4** The overall design of a DIFFS should incorporate a method of fire detection and be configured to avoid spurious activation. It should be capable of manual over-ride by the personnel transported to the facility and from the “mother” installation or from an onshore control room.

**B.7.1.5** Similar to a DIFFS provided for manned installation, a DIFFS provided on an NUI needs to consider the eventuality that one or more nozzles may be rendered ineffective by a helicopter crash. The basic performance assumptions stated in this document should also apply for a DIFFS located on an NUI.

### B.7.2 Deck Integrated Firefighting System Nozzles

**B.7.2.1** The precise number and layout of pop-up nozzles will be dependent on the specific helideck design, particularly the dimensions of the critical area.

**B.7.2.2** Nozzles should not be located adjacent to helideck egress points as this may hamper quick access to the helideck by trained rescue crews and/or impede occupants of the helicopter escaping to a safe place beyond the helideck. The number and layout of nozzles should be sufficient to provide an effective spray distribution of foam over the entire landing area with a suitable overlap of the horizontal element of the spray pattern from each nozzle assuming calm wind conditions.

**B.7.2.3** In meeting the objective for the average (theoretical) application rate specified in B.7.1.3 for Performance Level B or C foams that there may be some areas of the helideck, particularly where the spray patterns of nozzles significantly overlap, where the average (theoretical) application rate is exceeded in practice. Conversely for other areas of the helideck the application rate in practice may fall below the average (theoretical) application rate specified in B.7.1.3. This is acceptable provided that the actual application rate achieved for any portion of the landing area does not fall below two-thirds of the rates specified in B.7.1.3 for the critical area calculation.

*Note: Where a DIFFS is used in tandem with a passive fire-retarding system demonstrated to be capable of removing significant quantities of unburned fuel from the surface of the helideck in the event of a fuel spill from a ruptured aircraft tank, it is permitted to select a seawater-only DIFFS to deal with any residual*

*fuel burn. A seawater-only DIFFS should meet the same application rate and duration as specified for a Performance Level B foam DIFFS in B.7.1.3.*

**B.7.2.4** Where an FMS is provided (see B.1.2), the performance specification for a DIFFS needs to consider the likelihood that one or more of the popup nozzles may be rendered ineffective by the impact of a helicopter on the helideck. Any local damage to the helideck, nozzles and distribution system caused by a helicopter crash should not unduly hinder the system's ability to deal effectively with a fire situation. The DIFFS supplier should be able to verify that the system remains fit for purpose, in being able to bring a helideck fire associated with a crashed helicopter under control within 30 seconds measured from the time the system is producing foam at the required application rate for a range of weather conditions (see 4.6.3).

*Note:* Typically, a 15% increase in the number of nozzles and flow rate (1.85 gallons per square yard (6.9 L / m<sup>2</sup>) per minute) is acceptable to meet the requirement to ensure that the DIFFS remains effective in the event of an ineffective nozzle(s).

## **B.8 Foam Equipment Induction Settings and Testing.**

**B.8.1** Induction equipment ensures that water and foam concentrate are mixed in the correct proportions and the settings of adjustable inductors, if installed, should correspond with strength of concentrate in use.

**B.8.2** All parts of the foam production system, including the finished foam from the nozzle, should be tested by a competent person prior to commissioning and the tests should assess the performance of the system against original design expectations while ensuring compliance with any relevant pollution regulations. The documented results of these tests should be supplied to the facility owner.

# Annex C

## Additional Helideck Tie-down Arrangements

Figures C.1 through C.3 depict additional tie-down arrangements.

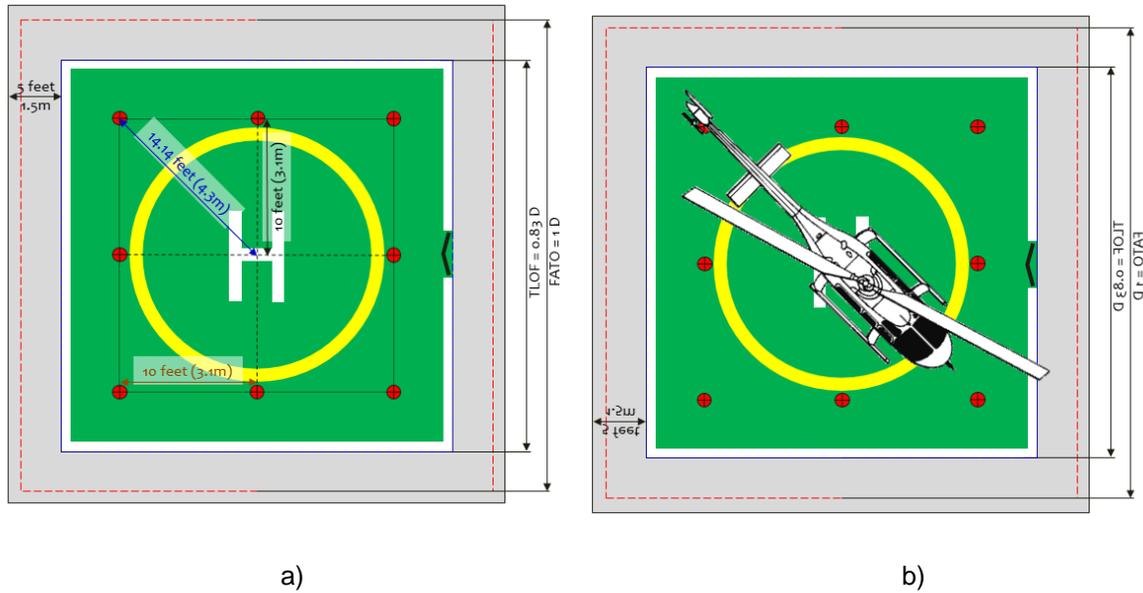
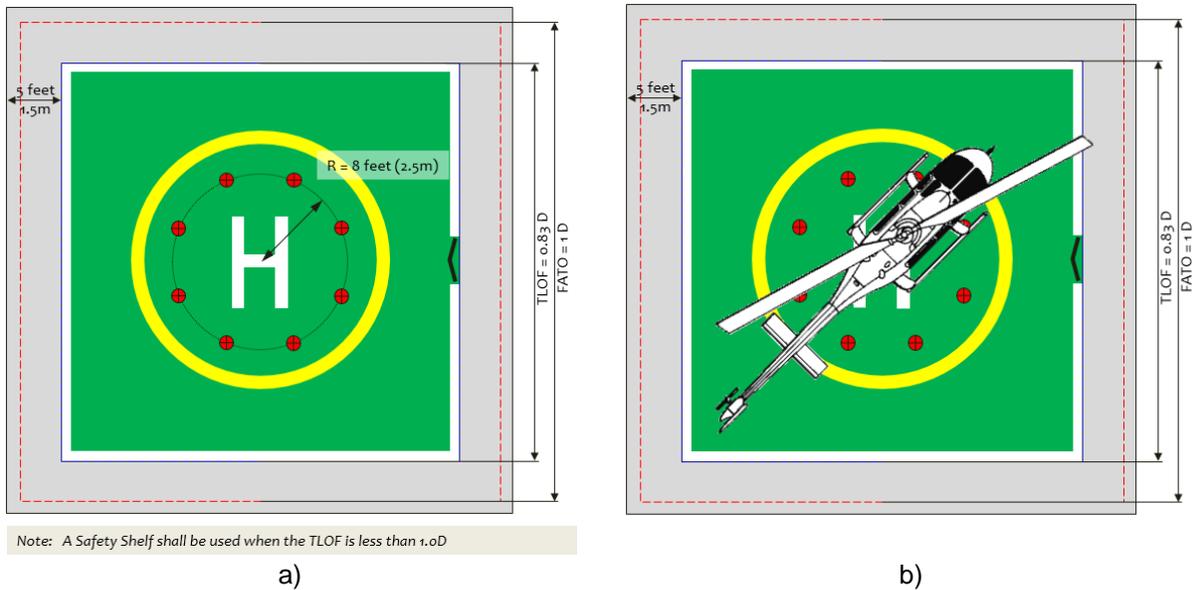


Figure C.1 — Tie-downs for an Offshore-based Helicopter with 0.83D TLOF



Note: A Safety Shelf shall be used when the TLOF is less than 1.0D

Figure C.2 — Tie-downs for an Offshore-based Helicopter with 0.83D TLOF

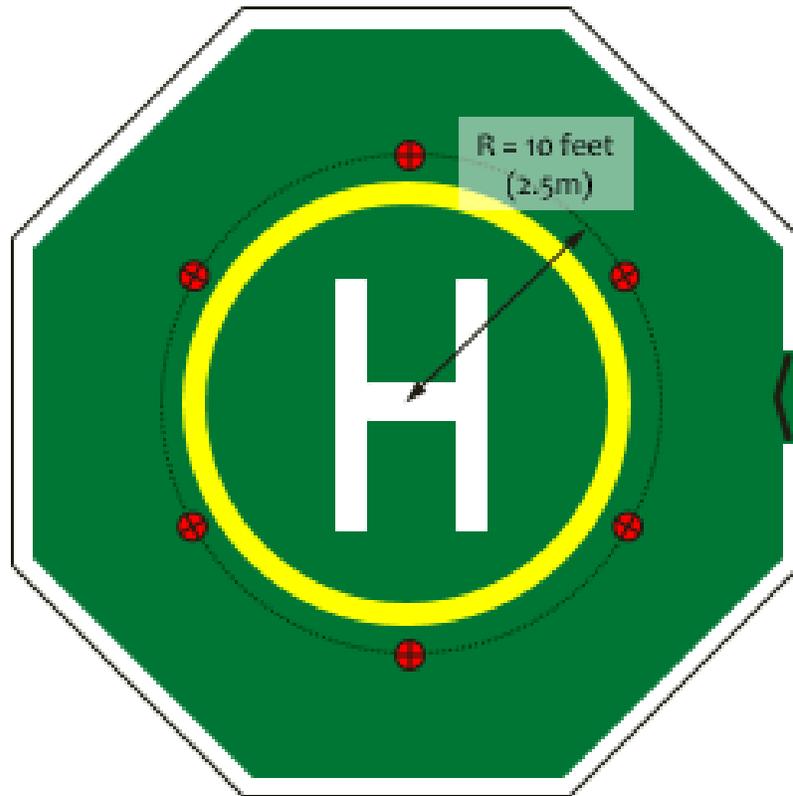


Figure C.3 — Tie-downs for 1.0D TLOF Less Than 40 ft. Diameter

## **Annex D**

### **Helideck Text Fonts**

All textual markings on helidecks should use the Clearview Hwy 5-W(R) font type. The Clearview Hwy 5-W variant should be used as the standard font type; however where horizontal spacing has to be reduced in order to keep helideck markings from overlapping, the horizontal width restricted variant Clearview Hwy 5-W(R) may be used. Details regarding the Clearview Hwy 5-W(R) and Clearview Hwy 5-W font types are shown in Table D.1, Table D.2 and Figure D.1.

**Table D.1 — Clearview Hwy 5-W(R) Font Spacing Chart**

Dimensions in inches

Character	Left	Width	Right	Character	Left	Width	Right	Character	Left	Width	Right	
A	0.24	3.76	0.24	a	0.40	2.96	0.40	1	0.28	1.80	0.68	
B	0.68	3.04	0.48	b	0.64	2.88	0.48	2	0.36	2.76	0.52	
C	0.52	3.28	0.32	c	0.48	2.72	0.28	3	0.32	2.80	0.52	
D	0.68	3.24	0.52	d	0.48	2.92	0.64	4	0.36	3.16	0.40	
E	0.68	2.56	0.44	e	0.48	2.96	0.48	5	0.48	2.76	0.52	
F	0.68	2.44	0.40	f	0.32	1.92	0.28	6	0.52	2.92	0.48	
G	0.52	3.48	0.52	g	0.48	2.92	0.64	7	0.28	2.84	0.28	
H	0.80	3.08	0.80	h	0.64	2.76	0.64	8	0.52	2.92	0.52	
I	0.68	0.80	0.68	i	0.56	0.92	0.56	9	0.48	2.92	0.52	
J	0.20	2.24	0.68	j	- 0.24	1.76	0.56	0	0.56	3.28	0.56	
K	0.68	3.12	0.24	k	0.64	2.84	0.16	&	0.52	3.44	0.28	
L	0.68	2.36	0.36	l	0.64	1.28	0.32	!	0.60	1.0	0.60	
M	0.68	3.68	0.68	m	0.64	4.52	0.64	"	0.44	2.16	0.44	
N	0.68	3.32	0.68	n	0.64	2.76	0.64	#	0.44	3.44	0.44	
O	0.52	3.72	0.52	o	0.48	3.08	0.48	\$	0.36	2.72	0.36	
P	0.68	2.92	0.36	p	0.64	2.92	0.48	¢	0.48	2.60	0.28	
Q	0.52	3.72	0.52	q	0.48	3.20	0.36	/	0.32	2.88	0.32	
R	0.68	3.00	0.48	r	0.64	1.84	0.28	*	0.48	1.92	0.48	
S	0.36	2.88	0.40	s	0.28	2.56	0.40	.	0.44	1.00	0.44	
T	0.28	2.88	0.28	t	0.24	1.96	0.36	,	0.40	1.08	0.40	
U	0.68	3.12	0.68	u	0.64	2.72	0.64	:	0.44	1.00	0.44	
V	0.24	3.40	0.24	v	0.16	3.04	0.16	(	0.48	1.08	0.48	
W	0.28	5.32	0.28	w	0.20	4.64	0.20	)	0.48	1.08	0.48	
X	0.20	3.44	0.20	x	0.12	3.08	0.12	-	0.60	1.56	0.60	
Y	0.16	3.52	0.16	y	0.16	3.12	0.16	@	0.52	4.04	0.52	
Z	0.40	2.88	0.40	z	0.36	2.44	0.36	=	0.60	2.40	0.60	
									+	0.48	2.68	0.48
									?	0.44	2.56	0.44

**Table D.2 — Clearview Hwy 5-W Font Spacing Chart**

Dimensions in inches

Character	Left	Width	Right	Character	Left	Width	Right	Character	Left	Width	Right	
A	0.36	3.76	0.36	a	0.52	2.96	0.52	1	0.40	1.80	0.80	
B	0.80	3.04	0.60	b	0.76	2.88	0.60	2	0.48	2.76	0.64	
C	0.64	3.28	0.44	c	0.60	2.72	0.40	3	0.44	2.80	0.64	
D	0.80	3.24	0.64	d	0.60	2.92	0.76	4	0.48	3.16	0.52	
E	0.80	2.56	0.56	e	0.60	2.96	0.60	5	0.60	2.76	0.64	
F	0.80	2.44	0.52	f	0.44	1.92	0.40	6	0.64	2.92	0.60	
G	0.64	3.48	0.64	g	0.60	2.92	0.76	7	0.40	2.84	0.40	
H	0.80	3.08	0.80	h	0.76	2.76	0.76	8	0.64	2.92	0.64	
I	0.80	0.80	0.80	i	0.68	0.92	0.68	9	0.60	2.92	0.64	
J	0.32	2.24	0.80	j	- 0.12	1.76	0.68	0	0.68	3.28	0.68	
K	0.80	3.12	0.36	k	0.76	2.84	0.28	&	0.64	3.44	0.40	
L	0.80	2.36	0.48	l	0.76	1.28	0.44	!	0.72	1.00	0.72	
M	0.80	3.68	0.80	m	0.76	4.52	0.76	"	0.56	2.16	0.56	
N	0.80	3.32	0.80	n	0.76	2.76	0.76	#	0.56	3.44	0.56	
O	0.64	3.72	0.64	o	0.60	3.08	0.60	\$	0.48	2.72	0.48	
P	0.80	2.92	0.48	p	0.76	2.92	0.60	¢	0.60	2.60	0.40	
Q	0.64	3.72	0.64	q	0.60	3.20	0.48	/	0.44	2.88	0.44	
R	0.80	3.00	0.60	r	0.76	1.84	0.40	*	0.60	1.92	0.60	
S	0.48	2.88	0.52	s	0.44	2.56	0.52	.	0.56	1.00	0.56	
T	0.40	2.88	0.40	t	0.36	1.96	0.44	,	0.52	1.08	0.52	
U	0.80	3.12	0.80	u	0.76	2.72	0.76	:	0.56	1.00	0.56	
V	0.36	3.40	0.36	v	0.28	3.04	0.28	(	0.60	1.08	0.60	
W	0.40	5.32	0.40	w	0.32	4.64	0.32	)	0.60	1.08	0.60	
X	0.32	3.44	0.32	x	0.24	3.08	0.24	-	0.80	1.56	0.80	
Y	0.28	3.52	0.28	y	0.28	3.12	0.28	@	0.64	4.04	0.64	
Z	0.52	2.88	0.52	z	0.48	2.44	0.48	=	0.72	2.40	0.72	
									+	0.60	2.68	0.60
									?	0.56	2.56	0.56

A B C  
D E F  
G H I

J K L  
M N O  
P Q R

S T U  
V W X  
Y Z a

b c d  
e f g h  
i j k l

Figure D.1 — Clearview 5-W and 5-W(R) Font Characters

m n o  
p q r  
s t u v

w x y  
z 1 2 3  
4 5 6

7 8 9  
0 & ! " ' "  
# \$ ¢

/ \* . , :  
( ) - @  
= + ?

Figure D.1 (cont.) — Clearview 5-W and 5-W(R) Font Characters

# Annex E

## Perimeter Light Requirements

### E.1 General

The intensity and intensity distribution (beam spread) requirements in this document are based FAA Engineering Brief No. 87 that gives recommendation for heliports. The intensity and intensity distribution (beam spread) requirements are considered to be equally applicable to helidecks.

### E.2 Light Intensity

The minimum light intensity, as a function of the elevation, is given in Table E.1 and Figure E.1: these values should apply for a full 360° azimuth.

Table E.1 — Light Intensity

Elevation	Minimum Intensity cd	Minimum Average Intensity cd
0° to 15°	10	15
16° to 90°	5	—

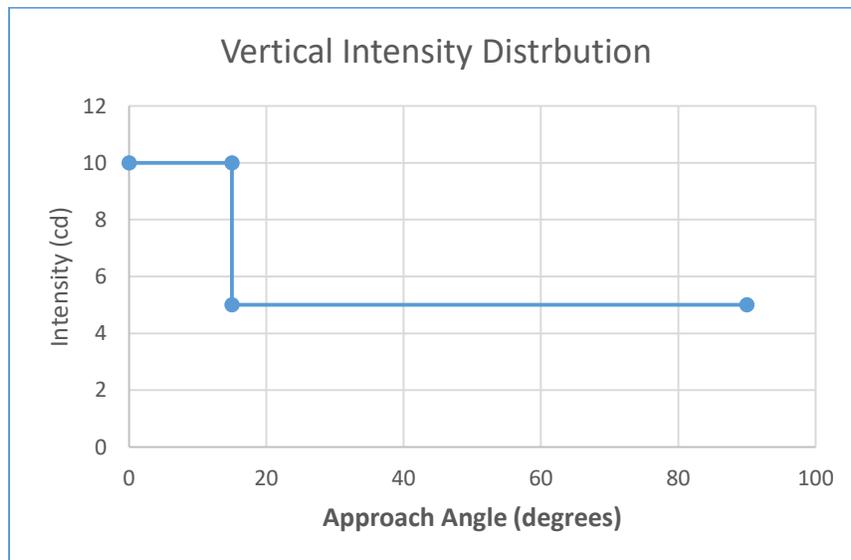


Figure E.1 — Vertical Intensity Distribution

### **E.3 Color**

Perimeter light fixtures that use light emitting diodes (LEDs) must meet the chromaticity requirements for aviation green (TLOF perimeter) and aviation blue (parking area and PTA) requirements in accordance with FAA Engineering Brief No.67. When using incandescent lights the color requirements are defined in SAE AS 25050.

All lighting components and fitments should meet safety regulations relevant to a helideck environment such as explosion proofing and flammability and, as a minimum, be rated Class 1, Division 2 [electrical](#) (see 7.2.5, Note 1).