U.S. Department
of Transportation

Federal Aviation
Administration

Advisory Circular

Subject: HELIPORT DESIGN	Date: DRAFT Initiated by: AAS-100	AC No: 150/5390-2C Change:

1. PURPOSE. This advisory circular (AC) provides recommendations for heliport design, including heliports serving helicopters with single and tandem (front and rear) rotors. Basic concepts may be applied to facilities serving helicopters with dual (side by side) rotors, however standards based on Rotor Diameter will not apply.

2. CANCELLATION. This AC cancels AC 150/5390-2B, *Heliport Design*, dated September 30, 2004.

3. APPLICATION. The Federal Aviation Administration (FAA) recommends the guidelines and specifications in this AC for materials and methods used in the construction of heliports. In general, use of this AC is not mandatory. However, use of this AC is mandatory for all projects funded with Federal grant monies through the Airport Improvement Program (AIP) and with revenue from the Passenger Facility Charge (PFC). See Grant Assurance No. 34, *Policies, Standards, and Specifications*, and PFC Assurance No. 9, *Standards and Specifications*. For information about grant assurances, see http://www.faa.gov/airports/aip/grant_assurances/. The use of terms implying strict compliance applies only to those projects. Other Federal Agencies, states, or other authorities having jurisdiction over the construction of heliports should decide the extent to which these standards apply.

4. PRINCIPAL CHANGES.

a. Changed the term for the helicopter overall length (OL) to ‘D’ or ‘D-value’.

b. Added definitions for design loads for static and dynamic load-bearing areas (LBA).

c. Added guidance for load-bearing areas larger than the TLOF, but less than the size of the FATO.

d. Added guidance for turbulence effects.

e. Added guidance to provide adequate clearance between parking areas and taxi routes and within parking areas.

f. Added guidance for minimum dimensions of curved approach/departure airspace.

g. Added guidance for Touchdown/Positioning Circle (TDPC) Marking.

h. Added guidance for Flight Path Alignment Guidance markings and lights.

i. Added an appendix providing guidance for Emergency Helicopter Landing Facility Requirements (EHLF).

j. Added FATO to FATO separation distance for simultaneous operations.

k. Revised standards for size of "H" for GA heliports.

l. Added Heliport Protection Zone to standards for hospital heliports.

m. Combined Chapter 6, Non-Precision Instrument Operations and Chapter 7, Precision Approach Operations into Chapter 6, Instrument Operations. Reference FAA Order 8620 series.

n. To improve the legibility of the AC, changed the format to a single column and nested the tables in the text.

5. USE OF METRICS. This AC includes both English and metric dimensions. The metric conversions may not be exact equivalents, and the English dimensions govern.

6. COPIES OF THIS AC. This and other advisory circulars published by the Office of Airport Safety and Standards are available on the Federal Aviation Administration (FAA) Office of Airports web page at www.faa.gov/airports.

MICHAEL J. O'DONNELL
Director of Airport Safety and Standards

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CHAPTER 1. INTRODUCTION

101. GENERAL. This chapter provides an explanation of terms used in this AC, describes the notification responsibilities of heliport proponents to FAA, provides general siting guidance, and identifies sources of technical information relating to heliport planning and design of a civil heliport.

102. FACILITIES. While heliports can be large and elaborate, most are not. The basic elements of a heliport are clear approach/departure paths, a clear area for ground maneuvers, final approach and takeoff area (FATO), touchdown and liftoff area (TLOF), safety area, and a wind cone. This minimal facility may be adequate as a private use prior permission required (PPR) heliport, and may even suffice as the initial phase in the development of a public use heliport capable of serving the general aviation segment of the helicopter community.

103. PLANNING. While the heliport itself may be simple, the planning and organization required to properly put one into place can be intimidating. This document describes physical, technical, and public interest matters that should be considered in the planning and establishment of a heliport. While this AC is a technical document intended to help engineers, architects, and city planners design, locate, and build the most effective heliport, it can be used by anyone considering the construction of a heliport.

104. LOCATION. The optimum location for a heliport is near the desired origination and/or destination of the potential users. Industrial, commercial, and business operations in urban locations are demand generators for helicopter services, even though they often compete for the limited ground space available. Heliport sites may be adjacent to a river or a lake, a railroad, a freeway, or a highway, all of which offer the potential for multi-functional land usage. These locations also have the advantage of relatively unobstructed airspace, which can be further protected from unwanted encroachment by properly enacted zoning. As vertical flight transportation becomes more prevalent, requirements for scheduled "airline type" passenger services may necessitate the development of an instrument procedure to permit "all-weather" service.

105. AC ORGANIZATION. This AC is structured to provide communities and persons intending to develop a heliport, or become involved in regulating helicopter facilities, with general guidance on heliport requirements. The AC covers general aviation heliports (including PPR), transport heliports, hospital heliports, and emergency facilities. A heliport proponent should be familiar with the terminology used in this specialized field. This chapter defines terms used in the industry and identifies actions common to developing a heliport.

a. General aviation heliports: The term "general aviation" is technically defined as "flights conducted by operators other than title 14 of the Code of Federal Regulations part 121 or part 135 certificate holders." However, for the purposes of this AC, "general aviation" refers to all helicopter operations other than scheduled passenger service. General aviation heliports are normally privately owned although they can be publicly owned. Design standards for general aviation heliports are found in Chapter 2 on page 15.

b. Transport heliports. Transport heliports are developed to provide the community with a full range of vertical flight services including scheduled service by air carriers (airlines) using helicopters. These operations frequently require a more extensive airside and landside infrastructure with the potential capability to operate in instrument meteorological conditions. Design standards for transport heliports are found in Chapter 3 on page 67.

c. Hospital heliports. Hospital heliports provide a unique public service. They are normally located close to the hospital emergency room or a medical facility. Design standards for hospital heliports are found in Chapter 4 on page 111.

d. Helicopter facilities on airports. When there are a significant number of helicopter operations on an airport, it may be prudent to consider developing separate facilities specifically for helicopter use. Chapter 5 on page 165 addresses helicopter facilities on airports.

e. Instrument operations. With the introduction of the global positioning system (GPS), it is now practical for heliports to have instrument approach procedures. Good planning suggests that heliport proponents should plan for the eventual development of instrument approaches to their heliports. Chapter 6 on page 169 contains recommendations to be considered in contemplating future instrument operations at a heliport. It is wise to consider these issues during site selection and design.

f. Heliport gradients and pavement design. Chapter 7 on page 173 addresses heliport gradients and pavement design issues.

g. The appendices provide information about emergency helicopter landing facilities, helicopter dimensional data, form and proportions of certain heliport markings, and a list of publications and resources referenced in this AC.

106. EXPLANATION OF TERMS. The Pilot/Controller Glossary of the Aeronautical Information Manual (AIM) defines terms used in the Air Traffic System. Copies of the AIM are available from the FAA web site http://www.faa.gov/atpubs. Other terms used in this publication follow:

a. Approach/Departure Path. The flight track helicopters follow when landing at or departing from a heliport. The approach/departure paths may be straight or curved.

b. Design Helicopter. A single or composite helicopter that reflects the maximum weight, maximum contact load/minimum contact area, overall length (D), rotor diameter (RD), tail rotor arc radius (TR), undercarriage dimensions, and pilot's eye height of all helicopters expected to operate at the heliport.

c. D. The overall length of the helicopter, which is the dimension from the tip of the main or forward rotor to the tip of the tail rotor, fin, or other rear-most point of the helicopter. This measurement is made with the rotors at their maximum extension. If only the value of the rotor diameter (RD) is known the value for D can be estimated using the relationship D = 1.2RD (or conversely, RD = 0.83D).

d. Design Loads. The TLOF and any load-bearing surfaces should be designed and constructed to support the loads imposed by the design helicopter and any ground support vehicles.

(1) Static Load. For design purposes, the design static load is equal to the helicopter's maximum takeoff weight applied through the total contact area of the wheels or skids. See paragraph 707.a.

(2) Dynamic Load. For design purposes, dynamic load is assumed at 150 percent of the maximum takeoff weight of the design helicopter applied through the main undercarriage on a wheel-equipped helicopter or aft contact areas of skid-equipped helicopter. See paragraph 707.b.

e. Elevated Heliport. A heliport located on a rooftop or other elevated structure where the TLOF is at least 30 inches (76 cm) above ground level.

f. Emergency Helicopter Landing Facility. A clear area at ground level or on the roof of a building, that is not intended to function as a heliport, yet is capable of accommodating helicopters engaged in fire fighting and/or emergency evacuation operations.

g. Final Approach and Takeoff Area (FATO). A defined area over which the final phase of the approach to a hover, or a landing is completed and from which the takeoff is initiated.

h. Final Approach Reference Area (FARA). An obstacle-free area with its center aligned on the final approach course. It is located at the end of a precision instrument FATO.

i. General Aviation (GA) Heliport. A heliport intended to accommodate individuals, corporations, and helicopter air taxi operators.

j. Ground Taxi. The surface movement of a wheeled helicopter under its own power with wheels touching the ground.

k. Hazard to Air Navigation. Any object having a substantial adverse effect upon the safe and efficient use of the navigable airspace by aircraft, upon the operation of air navigation facilities, or upon existing or planned airport/heliport capacity as determined by the FAA.

l. Heliport. The area of land, water or a structure used or intended to be used for the landing and takeoff of helicopters, together with appurtenant buildings and facilities.

m. Heliport Elevation. The highest point of the FATO expressed as the distance above mean sea level.

n. Heliport Imaginary Surfaces. The imaginary planes defined in 14 CFR part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, centered about the FATO and the approach/departure paths, which is used to identify the objects where notice is required to be evaluated to determine whether the objects should be removed, lowered, and/or marked and lighted – or the approach/departure paths realigned.

o. Heliport Layout Plan (HLP). The plan of a heliport showing the layout of existing and proposed heliport facilities including the approach/departure paths.

p. Heliport Protection Zone (HPZ). An area off the end of the FATO and under the approach/departure path intended to enhance the protection of people and property on the ground.

q. Heliport Reference Point (HRP). The geographic position of the heliport expressed as the latitude and longitude at:

(1) The center of the FATO, or the centroid of multiple FATOs, for heliports having visual and non-precision instrument approach procedures; or

(2) The center of the FARA when the heliport has a precision instrument procedure.

r. Helistop. A term sometimes used to describe a minimally developed heliport for boarding and discharging passengers or cargo. This term is not used in this AC, as the heliport design recommendations and standards in this AC apply to all heliports.

s. Hospital Heliport. A heliport limited to serving helicopters engaged in air ambulance, or other hospital related functions. A designated helicopter landing area located at a hospital or medical facility is a heliport and not a medical emergency site.

t. Hover Taxi. The movement of a wheeled or skid-equipped helicopter above the surface. Generally, this takes place at a wheel/skid height of 1 to 5 feet (0.3 to 1.5 m) and at a ground speed of less than 20 knots (37 km/h). For facility design purposes, a skid-equipped helicopter is assumed to hover-taxi.

u. Landing Position. A load-bearing, generally paved area, normally located in the center of an elongated TLOF, on which the helicopter lands.

v. Large Helicopter: A helicopter with a maximum takeoff weight of more than 12,000 lbs.

w. Load-Bearing Area (LBA). The portion of the FATO capable of supporting the dynamic load of the design helicopter.

x. Medical Emergency Site. An unprepared site at or near the scene of an accident or similar medical emergency on which a helicopter may land to pick up a patient in order to provide emergency medical transport.

y. Medium Helicopter. A helicopter with a maximum takeoff weight of 6,001 to 12,000 lbs.

z. Obstruction to Air Navigation. Any fixed or mobile object, including a parked helicopter, of greater height than any of the heights or surfaces presented in subpart C of 14 CFR part 77 (see also paragraphs 108 below).

aa. Overall Length (OL). See D.

bb. Parking Pad. The paved center portion of a parking position.

cc. Prior Permission Required (PPR) Heliport. A heliport developed for exclusive use of the owner and persons authorized by the owner, about which the owner and operator ensure that all authorized pilots are thoroughly knowledgeable. The features that pilots must be thoroughly familiar with include, but are not limited to: approach/departure path characteristics, preferred heading, facility limitations, lighting, obstacles in the area, and size and weight capacity of the facility.

dd. Public Use Heliport. A heliport available for use by the general public without a requirement for prior approval of the owner or operator.

ee. RD. Rotor Diameter. For a helicopter with two rotors, RD is the maximum dimension from the tip of the forward rotor to the tip of the rear rotor.

ff. Rotor Downwash. The volume of air moved downward by the action of the rotating main rotor blades. When this air strikes the ground or some other surface, it causes a turbulent outflow of air from beneath the helicopter.

gg. Safety Area. A defined area on a heliport surrounding the FATO intended to reduce the risk of damage to helicopters accidentally diverging from the FATO. This area should be free of objects, other than those frangibly mounted objects required for air navigation purposes.

hh. Shielded Obstruction. A proposed or existing obstruction that does not need to be marked or lighted due to its close proximity to another obstruction whose highest point is at the same or higher elevation.

ii. Shoulder Line. A marking line perpendicular to a helicopter parking position centerline that is intended to provide the pilot with a visual cue to assist in parking.

jj. Small Helicopter: A helicopter with a maximum takeoff weight of 6,000 lbs or less.

kk. Tail Rotor Arc Radius (TR). The distance from the hub of the rotor to the outermost tip of the tail rotor.

ll. Takeoff Position. A load bearing, generally paved area, normally located on the centerline and at the ends of an elongated TLOF, from which the helicopter takes off. Typically, there are two such positions on an elongated TLOF, one at each end.

mm. Taxi Route. A taxi route is a defined and obstruction-free corridor established for the movement of helicopters from one part of a heliport/airport to another. A taxi route includes the taxiway plus the appropriate clearances on both sides.

nn. Taxiways. A taxiway is a marked route between the TLOF and other areas on the heliport. This AC defines two types of helicopter taxiways:

(1) Ground Taxiway. A ground taxiway is intended to permit the surface movement of a wheeled helicopter under its own power with wheels on the ground. The minimum dimensions defined for a ground taxiway may not be adequate for hover taxi.

(2) Hover Taxiway. A taxiway intended to permit the hover taxiing of a helicopter.

oo. Touchdown and Liftoff Area (TLOF). A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands and/or takes off.

pp. Transport Heliport. A heliport intended to accommodate air carrier operators providing scheduled or unscheduled service with large helicopters.

qq. Touchdown/Positioning Circle (TDPC) Marking. A circular marking located in the center of a TLOF or a parking position. Note: When the pilot’s seat is over the touchdown/positioning circle marking, the whole of the helicopter undercarriage will be within the TLOF or parking position and all parts of the helicopter rotor system will be clear of any obstacle by a safe margin.

rr. Unshielded Obstruction. A proposed or existing obstruction that may need to be marked or lighted since it is not near another marked and lighted obstruction whose highest point is at the same or higher elevation.

107. SELECTION OF APPROACH/DEPARTURE PATHS. Heliports should be designed to the extent practicable for two approach/departure paths. Items that should be considered in selecting the approach/departure paths include the following:

a. Wind. Approach/departure paths should permit pilots to avoid downwind conditions and minimize crosswind operations. The preferred flight approach/departure path should, to the extent feasible, be aligned with the predominant wind direction. Other approach/departure paths should be based on the assessment of the prevailing winds or when this information is not available the separation between such flight paths and the preferred flight path should be at least 135 degrees.

b. Obstructions. In determining approach/departure paths it will also be necessary to take into account the obstructions in the vicinity of the heliport and in particular those likely to be a hazard to air navigation (See paragraph 109 below.).

c. Environmental Impacts. In environmentally sensitive areas, the final selection of the approach/departure path(s) should minimize any environmental impact, providing it does not decrease flight safety. (See also paragraph 109.)

108. NOTIFICATION REQUIREMENTS. Title 14 CFR part 157; *Notice of Construction, Activation, and Deactivation of Airports;* sets requirements for persons proposing to construct, activate, deactivate, or alter a heliport to give advance notice of their intent to the FAA. This includes changing the size or number of FATOs; adding, deleting, or changing an approach or departure route; or changing heliport status. An example of a heliport status change would be a change from private to public use or vice versa. When notification is required, file Form 7480-1 (see Figure 1–1 on page 7) with the appropriate FAA Airports Regional or District Office at least 90 days before construction, alteration, deactivation, or change in use. See the FAA Airports web site at http://www.faa.gov/airports/ for contact information.

a. The heliport layout diagram should be drawn to scale showing key dimensions, such as the TLOF size, FATO size, safety area size, distance from safety area perimeter to property edges, and approach/departure paths in relation to buildings, trees, fences, power lines, obstructions, schools, churches, hospitals, residential communities, waste disposal sites, and other significant features as specified on Form 7480-1 and as suggested in Figure 1–2 on page 8).

Form approved OMB No. 2120-0036

U.S. Department of Transportation
Federal Aviation Administration

NOTICE OF LANDING AREA PROPOSAL

Name of Proponent, Individual , or Organization	Address of Proponent, Individual , or Organization (No., Street, City, State, Zip Code)
☐ Check if the property owner's name and address are different than above, and list property owner's name and address on the reverse.	

☐ Establishment or Activation ☐ Deactivation or Abandonment ☐ Alteration ☐ Change of Status } OF ☐ Airport ☐ Heliport ☐ Ultraflight Flightpark ☐ Seaplane Base ☐ Vertiport ☐ Other (Specify)

A. Location of Landing Area

1. Associated City/State	2. County/State (Physical Location of Airport)			3. Distance and Direction From Associated City or Town	
4. Name of Landing Area	5. Latitude ° ' "	6. Longitude ° ' "	7. Elevation	Miles	Direction

B. Purpose

Type Use	If Change of Status or Alteration, Describe Change	☐ Establishment or change to traffic pattern (Describe on reverse)	Construction Dates	
☐ Public ☐ Private ☐ Private Use of Public Land/Waters			To Begin/Began	Est. Completion

C. Other Landing Areas	Ref. A5 above: Direction From Landing Area	Distance From Landing Area

E. Obstructions: Type	Height Above Landing Area	Direction From Landing Area	Distance From Landing Area

G. Other Considerations: Identification	Direction From Landing Area	Distance From Landing Area

D. Landing Area Data

1. Airport, Seaplane Base, or Flightpark	Existing (if any) Rwy #1	Rwy #2	Rwy #3	Proposed Rwy	Rwy	Rwy
Magnetic Bearing of Runway (s) or Sealane						
Length of Runway (s) or Sealane (s) in Feet						
Width of Runway (s) or Sealane (s) in Feet						
Type of Runway Surface (Concrete, Asphalt, Turf, Etc.)						

2. Heliport	Existing	Proposed
Dimensions of Final Approach and Take off Area (FATO) in Feet		
Dimensions of Touchdown and Lift-Off Area (TLOF) in Feet		
Magnetic Direction of Ingress/Egress Routes		
Type of Surface (Turf, concrete, rooftop, etc.)		

3. All Landing Areas	Description of Lighting (If any)	Direction of Prevailing Wind

F. Operational Data

1. Estimated or Actual Number Based Aircraft

Airport, Flightpark, Seaplane base	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence	Heliport	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence
Multi-engine			Under 3500 lbs. MGW		
Single-engine			Over 3500 lbs. MGW		
Glider					

2. Average Number Monthly Landings

	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence		Present (If est. indicate by letter "E")	Anticipated 5 Years Hence
Jet			Helicopter		
Turboprop			Ultralight		
Prop			Glider		

3. Are IFR Procedures For The Airport Anticipated
☐ No ☐ Yes Within ______ Years Type Navaid:

H. Application for Airport Licensing

☐ Has Been Made ☐ Will Be Made ☐ Not Required ☐ State ☐ County ☐ Municipal Authority

I. CERTIFICATION: I hereby certify that all of the above statements made by me are true and complete to the best of my knowledge.

Name, title (and address if different than above) of person filing this notice -- type or print	Signature (in ink)	
	Date of Signature	Telephone No. (Precede with area code)

FAA Form 7480-1 (1-93) Supersedes Previous Edition Central Region Electronic Revision per ACE-625 (1-97)

Figure 1–1. Form 7480-1, Notice of Landing Area Proposal

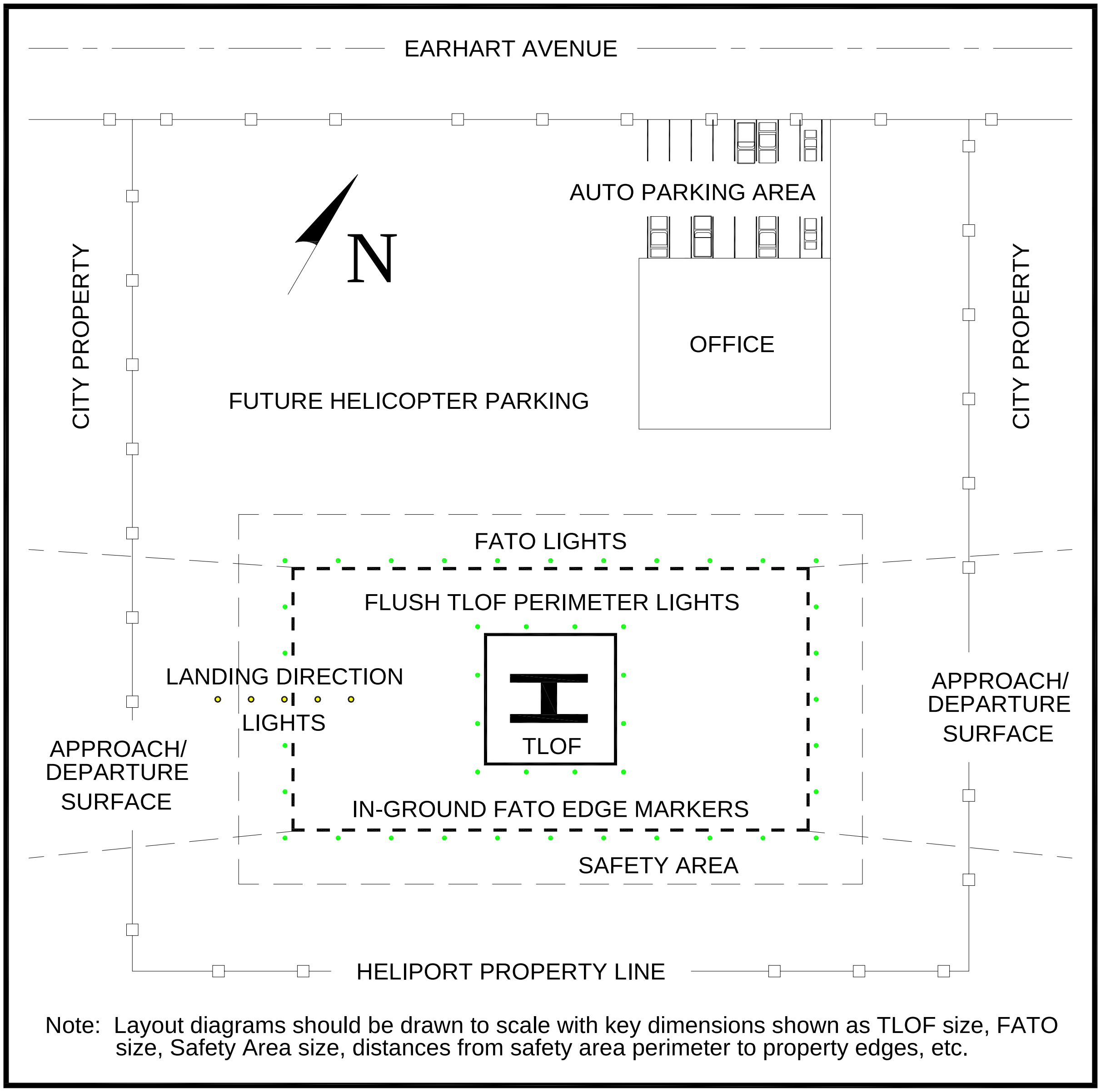


Figure 1–2. Example of a Heliport Layout Diagram

b. The preferred type of location map is the 7.5-minute U.S. Geological Survey Quadrangle Map, available from the US Geological Survey at nationalmap.gov. Web-based maps are also acceptable. The map should show the location of the heliport site and the approach/departure paths. Point out the heliport site on this map with an arrow. Indicate the latitude and longitude of the proposed heliport in North American Datum of 1983 (NAD-83) coordinates (see Figure 1–3 on page 11).

c. The FAA Role. The FAA will conduct an aeronautical study of the proposed heliport under part 157. Part 157 states: "The FAA will conduct an aeronautical study of an airport proposal and, after consultations with interested persons, as appropriate, issue a determination to the proponent and advise those concerned of the FAA determination. The FAA will consider matters such as the effects the proposed action would have on existing or contemplated traffic patterns of neighboring airports; the effects the proposed action would have on the existing airspace structure and projected programs of the FAA; and the effects that existing or proposed manmade objects (on file with the FAA) and natural objects within the affected area would have on the airport proposal. While determinations consider the effects of the proposed action on the safe and efficient use of airspace by aircraft and the safety of persons and property on the ground, the determinations are only advisory. Except for an objectionable determination, each determination will contain a determination-void date to facilitate efficient planning of the use of the navigable airspace. A determination does not relieve the proponent of responsibility for compliance with any local law, ordinance or regulation, or state or other Federal regulation. Aeronautical studies and determinations will not consider environmental or land use compatibility impacts".

d. Penalty for Failure to Provide Notice. Persons who fail to give notice are subject to civil penalty under 49 USC 46301, *Civil Penalties* of not more than $25,000 (or $1,100 if the person is an individual or small business concern).

e. Notice Exemptions. Paragraph 157.1, *Applicability*, of part 157 exempts sites meeting one of the conditions below from the requirement to submit notice. However, these exemptions do not negate a notice or formal approval requirement prescribed by state law or local ordinance. For the purposes of applying the part 157 exemption criteria cited in (2) and (3) below, a landing and associated takeoff is considered to be one operation.

(1) A heliport subject to conditions of a Federal agreement that requires an approved current heliport layout plan to be on file with the FAA.

(2) A heliport at which flight operations will be conducted under visual flight rules (VFR) and that is used or intended to be used for a period of less than 30 consecutive days with no more than 10 operations per day.

(3) The intermittent use of a site that is not an established airport, that is used or intended to be used for less than 1 year, and at which flight operations will be conducted only under VFR. For the purpose of this part, "intermittent use of a site" means:

(a) the site is used or is intended to be used for no more than 3 days in any one week and

(b) no more than 10 operations will be conducted in any one day at that site.

109. HAZARDS TO AIR NAVIGATION. Title 14 CFR part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, establishes requirements for notification to the FAA of objects that may affect navigable airspace. It sets standards for determining obstructions to navigable airspace and provides for aeronautical studies of such obstructions to determine their effect on the safe and efficient use of airspace. Part 77 applies only to public airports and heliports, and private airports and heliports with at least one FAA-approved instrument approach procedure (See Figure 1–4 on page 13).

a. FAA Studies.

(1) Part 77. Objects that are obstructions to surfaces defined in part 77 are presumed to be hazards unless an FAA study determines otherwise. The FAA conducts aeronautical studies to determine the physical and electromagnetic effect on the use of navigable airspace, air navigational facilities, public airports and heliports, and private airports and heliports with at least one FAA-approved instrument approach procedure. Public agencies are encouraged to enact zoning ordinances to prevent man-made features from becoming hazards to navigation.

(2) Part 157. While the FAA performs aeronautical studies under part 157 (see paragraph 108.c above), such studies do not identify hazards to private facilities that do not have an FAA-approved instrument approach.

b. Mitigation of Hazards. The adverse effect of an object presumed or determined to be a hazard to air navigation may be mitigated by:

(1) Removing the object

(2) Altering the object, e.g. reducing its height

(3) Marking and/or lighting the object, provided an FAA aeronautical study has determined that the object would not be a hazard to air navigation if it were marked and lighted. Guidance on marking and lighting objects is contained in AC 70/7460-1, *Obstruction Marking and Lighting.*

c. Notification Requirements. Part 77 requires persons proposing certain construction or alteration to give 45-days notice to the FAA of their intent. Notification of the proposal should be made on FAA Form 7460-1, Notice of Proposed Construction or Alteration. See https://oeaaa.faa.gov for more information and to download the form.

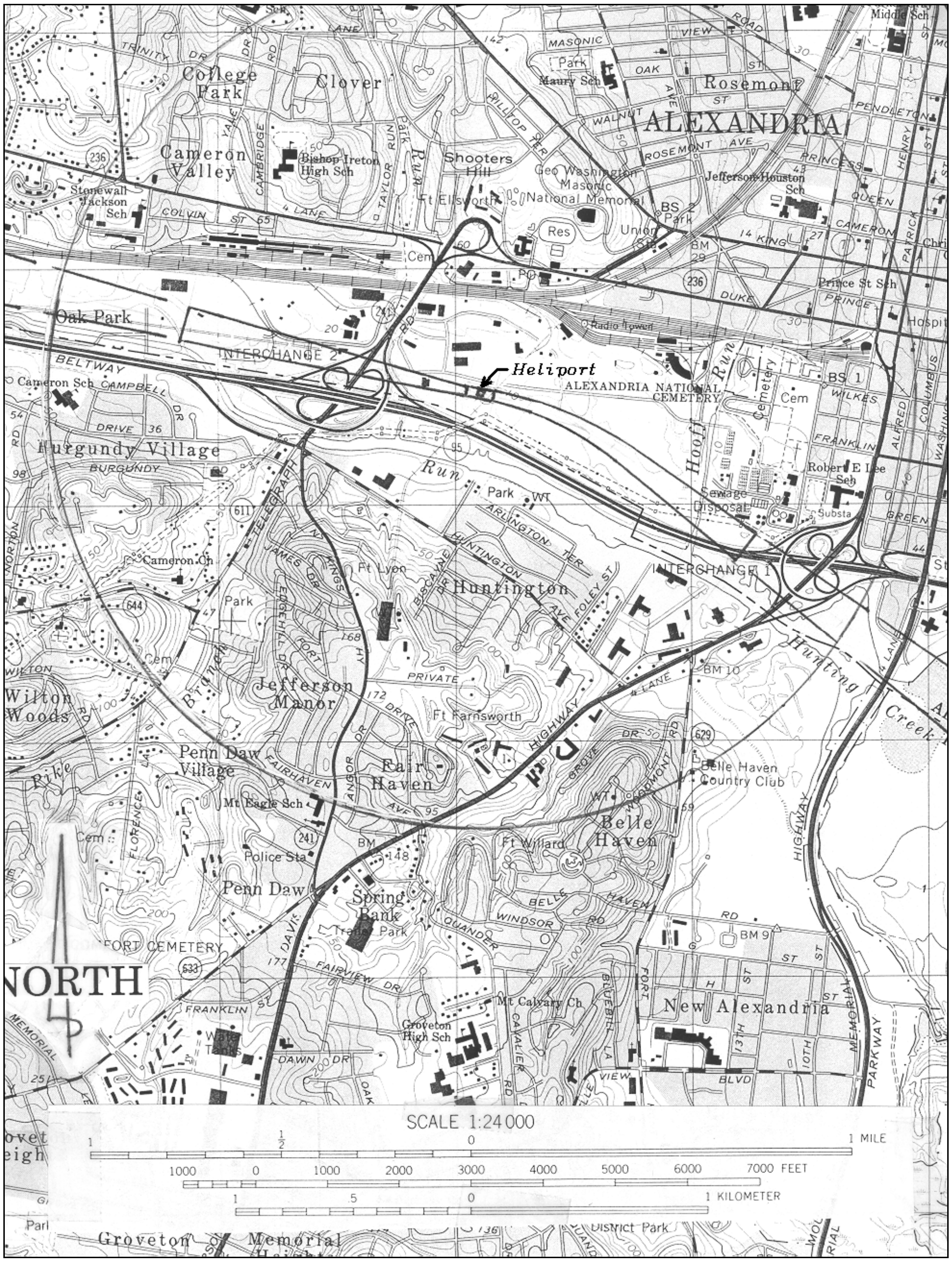


Figure 1–3. Example of a Heliport Location Map

d. Heliport Development Plans. Future public heliport development plans and feasibility studies on file with the FAA may influence the determinations resulting from part 77 studies. To assure full consideration of future public heliport development in part 77 studies, owners of public heliports and owners of private heliports with FAA-approved instrument approach procedures must file plans with the FAA. Heliport plan data should include planned FATO(s) coordinates and elevation(s), approach/departure paths including their azimuths, and type(s) of approach(es) for any new FATO or modification of existing FATO.

110. FEDERAL ASSISTANCE. The FAA administers a grant program that provides financial assistance to eligible sponsors to develop a public use heliport. Information on Federal aid program eligibility requirements is available from FAA Airports Regional and District Offices and on the FAA Airports web site, www.faa.gov/airports.

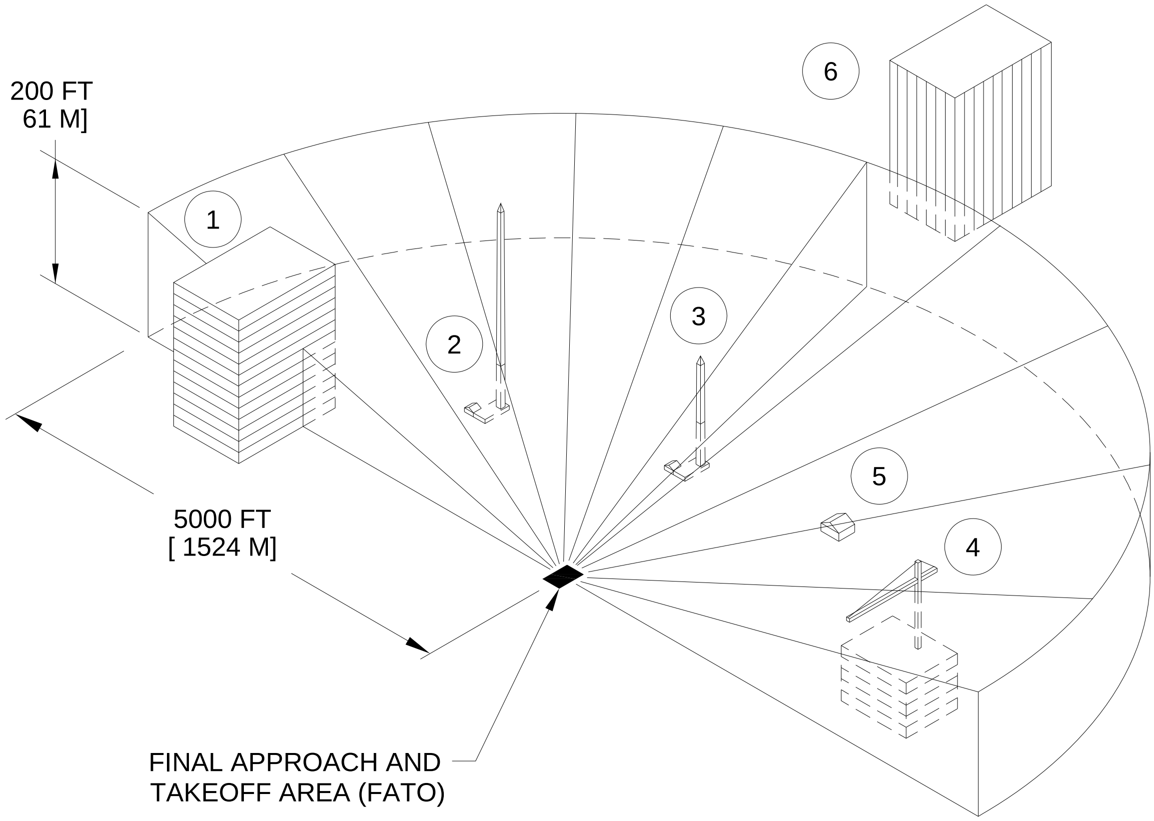
111. ENVIRONMENTAL IMPACT ANALYSES. The National Environmental Policy Act of 1969 requires consideration of potential environmental impacts prior to agency decision making, including, for example, the decision to fund or approve a project, plan, license, permit, certification, rulemaking, or operations specification, unless these actions are within an existing categorical exclusion and no extraordinary circumstances exist. Actions that may require an environmental assessment are normally associated with Federal grants or heliport layout plan approvals leading to the construction of a new heliport or significant expansion of an existing heliport.

a. Assessment Items. An environmental assessment should address noise, historic and cultural resources, wildlife, energy conservation, land usage, air quality, water quality, pollution prevention, light emissions and other visual effects, electromagnetic fields, other public health and safety issues, the “no action” alternative and a reasonable range of feasible alternatives, including mitigation not integrated into the alternative initially. It should also describe the action taken to ensure public involvement and citizen participation in the planning process. An opportunity for a public hearing may be required for the federally funded development of, or significant improvement to, an existing heliport.

b. Guidance. FAA Order 5050.4, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects*, and FAA Order 1050.1, *Polices and Procedures for Considering Environmental Impacts*, and other supplemental guidance from FAA Air Traffic and Flight Standards provide guidance on environmental impact analysis. State and local governments, including metropolitan planning organizations and local transit agencies, should be contacted directly as they may also require an environmental report. The procedures in AC 150/5020-1, *Noise Control and Compatibility Planning for Airports*, describe a means of assessing the noise impact. Contact the appropriate FAA Airports Regional or District for current information related to assessing noise impact of heliports. Proponents of non-Federally assisted heliports should work with local governmental authorities concerning environmental issues.

112. ACCESS TO HELIPORTS BY INDIVIDUALS WITH DISABILITIES. Congress has passed various laws concerning access to airports. Since heliports are a type of airport, these laws are similarly applicable. Guidance is contained in AC 150/5360-14, *Access to Airports by Individuals with Disabilities.*

113. STATE ROLE. Many state departments of transportation, aeronautical commissions, or similar authorities require prior approval and, in some instances, a license for the establishment and operation of a heliport. Several states administer a financial assistance program similar to the Federal program and are staffed to provide technical advice. Heliport proponents should contact their respective state aeronautics commissions or departments for particulars on licensing and assistance programs.



Notes:

1. Building is less 200 ft [61 M] in height, but top will penetrate the 25:1 surface (Notice is required by 14 CFR part 77.9.).
2. Antenna is over 200 ft [61 M] in height (Notice is required by 14 CFR part 77.9 (a)).
3. Antenna less than 200 ft [61 M] in height, but penetrates the 25:1 surface (Notice is required by 14 CFR part 77.9 (b) (3).).
4. Construction crane penetrates 25:1 surface (Notice is required by 14 CFR part 77.9 (b)(3).).
5. Building is less than 200 ft [61] in height and does not penetrate the 25:1 surface (Notice is not required.).
6. Building is more than 5,000 ft [1,525 m] from heliport (Notice is required if building will be 200 ft [61 M] or more in height.).

Note: Notice under 14 CFR part 77 required for all public-use heliports or a private use heliport with at least one FAA-approved instrument approach procedure.

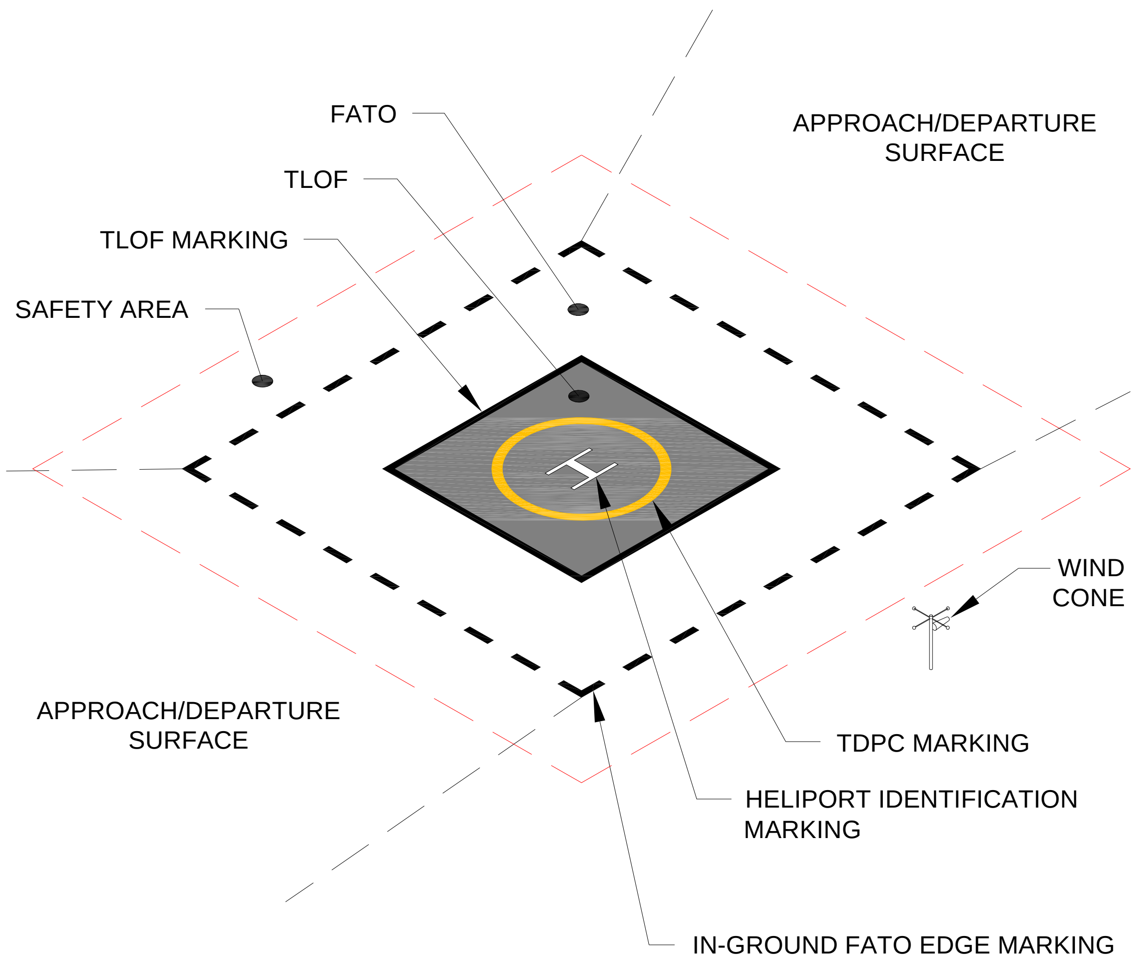
Figure 1–4. Offsite Development Requiring Notice to the FAA

114. LOCAL ROLE. Some communities have enacted zoning laws, building codes, fire regulations, etc. that can affect heliport establishment and operation. Some have or are in the process of developing codes or ordinances regulating environmental issues such as noise and air pollution. A few localities have enacted specific rules governing the establishment of a heliport. Therefore, heliport proponents should make early contact with officials or agencies representing the local zoning board, the fire, police, or sheriff's department, and the elected person(s) who represent the area where the heliport is to be located.

115. RELATED/REFERENCED MATERIAL. The list of related/referenced publications is provided in Appendix A on page 177.

CHAPTER 2. GENERAL AVIATION HELIPORTS

201. GENERAL. A General Aviation (GA) heliport accommodates helicopters used by individuals, corporations, and helicopter air taxi services. While GA heliports may be publicly owned, this is not required. Most GA heliports are privately owned. This chapter contains standards and recommendations for designing all GA heliports. The design recommendations given in this chapter are based on the assumption that there will never be more than one helicopter within the final approach and takeoff area (FATO) and the associated safety area. If there is a need for more than one touchdown and liftoff area (TLOF) at a heliport, each TLOF must be located within its own FATO and within its own safety area. Figure 2-1 below illustrates the essential features of a GA heliport.



Notes:

1. The wind cone must be located so that it will not interfere with the Approach/Departure Path or Transitional Surface.
2. TLOF size and weight limitation box omitted for clarity.

Figure 2-1. Essential Features of a GA Heliport: General Aviation

202. PRIOR PERMISSION REQUIRED (PPR) FACILITIES. The standards in this AC are recommended for all heliports. At heliports where the operator requires prior authorization for use, ensure that pilots are thoroughly familiar with the heliport its procedures, and any facility limitations.

203. ACCESS BY INDIVIDUALS WITH DISABILITIES. Heliports operated by public entities and those receiving Federal financial assistance must meet accessibility requirements. See paragraph 112 above.

204. HELIPORT SITE SELECTION.

a. Long Term Planning. Public agencies and others planning to develop a GA heliport should consider the possible future need for instrument operations and expansion.

b. Property Requirements. The property needed for a GA heliport depends upon the volume and types of users and the scope of amenities provided. Property requirements for helicopter operators and for passenger amenities frequently exceed that required for “airside” purposes.

c. Turbulence. Air flowing around and over buildings, stands of trees, terrain irregularities, etc. can create turbulence on ground-level and roof-top heliports that may affect helicopter operations. Where the FATO is located near the edge and top of a building or structure, or within the influence of turbulent wakes from other buildings or structures, the turbulence and airflow characteristics in the vicinity of, and across the surface of the FATO should be assessed to determine if an air-gap between the roof, roof parapet or supporting structure, and/or some other turbulence mitigating design measure is necessary. FAA Technical Report FAA/RD-84/25, *Evaluating Wind Flow Around Buildings on Heliport Placement* addresses the wind’s effect on helicopter operations. The following actions may be taken in selecting a site to minimize the effects of turbulence.

(1) Ground-Level Heliports. Helicopter operations from sites immediately adjacent to buildings, trees, and other large objects are subjected to air turbulence effects caused by such features. Therefore, locate the landing and takeoff area away from such objects in order to minimize air turbulence in the vicinity of the FATO and the approach/departure paths.

(2) Elevated Heliports. Establishing a 6 foot (1.8 m) or more air gap above the level of the roof will generally minimize the turbulent effect of air flowing over the roof edge. If an air gap or some other turbulence mitigating design measure is warranted but not practical, operational limitations may need to be considered under certain wind conditions. If an air gap is included in the design it should be kept free at all times of significant objects that would obstruct the airflow.

205. BASIC LAYOUT. The heliport consists of a TLOF contained within a FATO. A safety area is provided around the FATO. Table 2-1 shows how the minimum recommended safety area width varies as a function of heliport markings. The relationship of the TLOF to the FATO and the safety area is shown in Figure 2-2 on page 18. A FATO may not contain more than one TLOF. Appropriate approach/departure airspace to allow safe approaches to and departures from landing sites is required. To the extent feasible, the preferred approach/departure path should be aligned with the predominant winds. See paragraph 209 below.

Table 2-1. Minimum VFR Safety Area Width as a Function of General Aviation and PPR Heliport Markings

GA heliports:	1/3 RD but not less than 20 ft (6 m)	1/3 RD but not less than 30 ft (9 m)	½ D but not less than 20 ft (6 m)	½ D but not less than 30 ft (9 m)
PPR heliports:	1/3 RD but not less than 10 ft (3 m) **	1/3 RD but not less than 20 ft (6 m)**	½ D but not less than 20 ft (6 m)	½ D but not less than 30 ft (9 m)
TLOF perimeter marked:	Yes	Yes	No	No
FATO perimeter marked:	Yes	Yes	Yes	Yes
Std. "H" marking:	Yes	No	Yes	No

D: Overall length of the design helicopter

RD: Rotor diameter of the design helicopter

** Also applies to PPR heliports when the FATO is not marked. The FATO should not be marked if (a) the FATO (or part of the FATO) is a non-load bearing surface and/or (b) the TLOF is elevated above the level of a surrounding load bearing area.

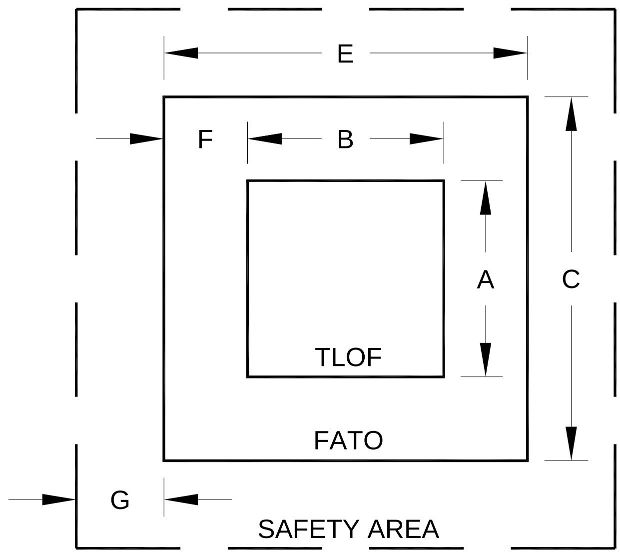
206. TOUCHDOWN AND LIFTOFF AREA (TLOF).

a. TLOF Location. The TLOF of a GA heliport may be at ground level, on an elevated structure, or at rooftop level. The TLOF is normally centered within the FATO. At a PPR rooftop or other PPR elevated facility, where the entire FATO is not load-bearing, there are operational advantages if the TLOF is located in a load-bearing area that is as large as possible. In this case, the TLOF should be located in the center of the load-bearing area.

(1) TLOF Size. The minimum TLOF dimension (length, width, or diameter) is equal to the RD of the design helicopter. TLOFs may be circular, however it is strongly recommended that new TLOFs should be square or rectangular, as a square or rectangular shape provides the pilot with better visual cues than a circular shape. Increasing the load-bearing area (LBA) centered on the TLOF may provide some safety and operational advantages. At PPR facilities, if only a portion of the TLOF is paved, the minimum length and width of this paved portion should be not less than two times the maximum dimension (length or width) of the undercarriage of the design helicopter. The center of this paved portion of the TLOF should be the center of the TLOF. To avoid the risk of catching a skid and the potential for a dynamic rollover, there should be no difference in elevation between the paved and unpaved portions of the TLOF.

(2) Elevated GA Heliport. If the FATO outside the TLOF is not load-bearing, the minimum width, length or diameter of the TLOF is increased to the overall length (D) of the design helicopter. See paragraph 207.b(3) on page 23.

(3) Elevated PPR Heliports. At PPR rooftop or elevated facilities, the TLOF may be a minimum of two times the maximum dimension (length or width) of the undercarriage of the design helicopter if the height of the TLOF surface above the surrounding area is no greater than 30 inches (76 cm), and there is a solid surrounding area equal to the rotor diameter (RD) able to support 20 lbs/ft^2 (98 kg/m^2) live load. The center of the load bearing area of the TLOF should be the center of the FATO.



DIM	ITEM	VALUE	NOTES
A	Minimum TLOF Length	1 RD	
B	Minimum TLOF Width	1 RD	
C	Minimum FATO Length	1.5 D	See Paragraph 207.a.(1) and Figure 2-5 for adjustments of elevations above 1000'
E	Minimum FATO Width	1.5 D	
F	Minimum Separation Between the Perimeters of the TLOF and FATO	.75 D - .5 RD	
G	Minimum Safety Area Width	Table 2-1.	

Note: For circular TLOFs and FATOs, dimensions A, B, C and E refer to diameters.

Figure 2-2. TLOF/FATO Safety Area Relationships and Minimum Dimensions: General Aviation

(4) Elongated TLOF. An elongated TLOF can provide an increased safety margin and greater operational flexibility. An elongated TLOF may contain a landing position located in the center and two takeoff positions located at either end. The landing position must have a minimum length equal to the RD of the design helicopter. If an elongated TLOF is provided, an elongated FATO is also required. Figure 2-3 on page 20 shows an elongated TLOF and an elongated FATO.

b. Ground-level TLOF Surface Characteristics.

(1) Design Loads. The TLOF and any supporting TLOF structure must be capable of supporting the dynamic loads of the design helicopter.

(2) Paving. The TLOF surface must be either paved or aggregate-turf (see AC 150/5370-10, *Standards for Specifying Construction of Airports* items P-217 and P-501). Portland cement concrete (PCC) is recommended for ground-level facilities. An asphalt surface is less desirable for heliports as it may rut under the wheels or skids of a parked helicopter. This has been a factor in some rollover accidents. Pavements should have a broomed or other roughened finish that provides a skid-resistant surface for helicopters and non-slippery footing for people. For PPR heliports where only a portion of the TLOF is paved, the paved portion should be dynamic load-bearing and the surrounding area of the TLOF must be designed for the static loads of the design helicopter.

c. Rooftop and Other Elevated TLOFs.

(1) Design Loads. Elevated TLOFs and any TLOF supporting structure must be capable of supporting the dynamic loads of the design helicopter described in paragraph 707.b on page 174. An elevated heliport is illustrated in Figure 2-4 on page 21.

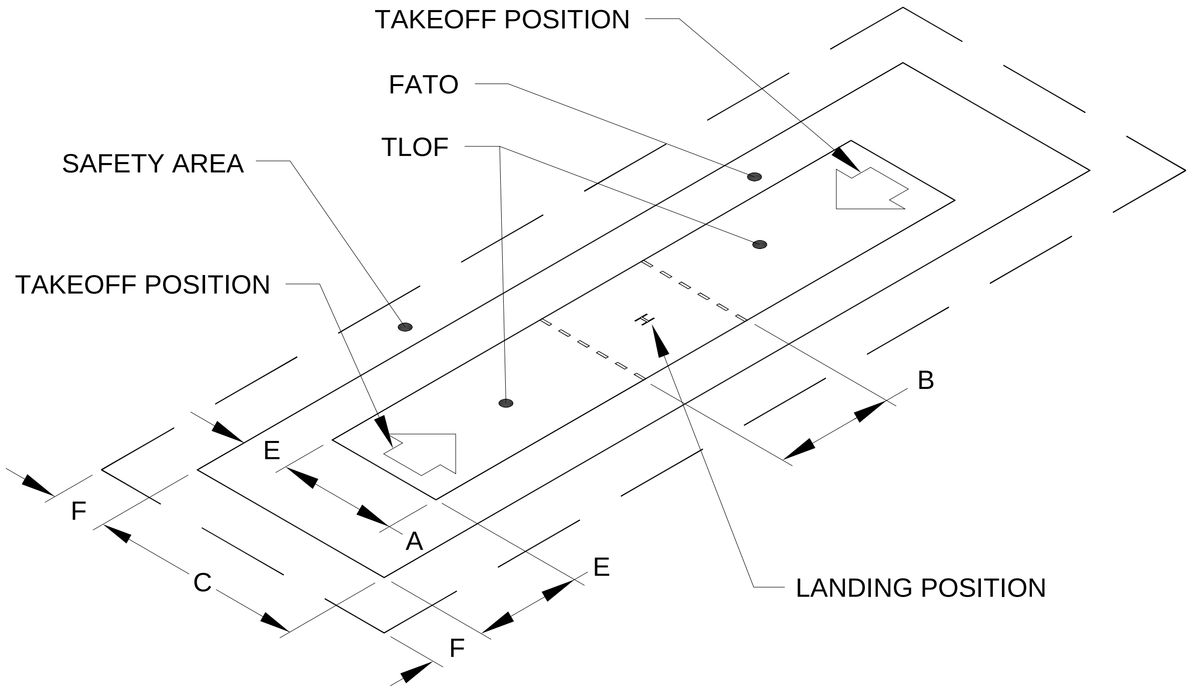
(2) Elevation. The TLOF must be elevated above the level of any obstacle in the FATO and safety area that cannot be removed, except for frangibly mounted objects that, due to their function, must be located within the safety area (see paragraph 208.c on page 24).

(3) Obstructions. Elevator penthouses, cooling towers, exhaust vents, fresh-air vents, and other raised features can affect heliport operations. Control mechanisms should be established to ensure that obstruction hazards are not installed after the heliport is operational.

(4) Air Quality. Helicopter exhaust can affect building air quality if the heliport is too close to fresh air vents. When designing a building intended to support a helipad, locate fresh air vents accordingly. When adding a heliport to an existing building, fresh air vents may have to be relocated.

(5) TLOF Surface Characteristics. Rooftop and other elevated heliport TLOFs should be constructed of metal or concrete (or other materials subject to local building codes). TLOF surfaces must have a finish that provides a skid-resistant surface for helicopters and non-slippery footing for people.

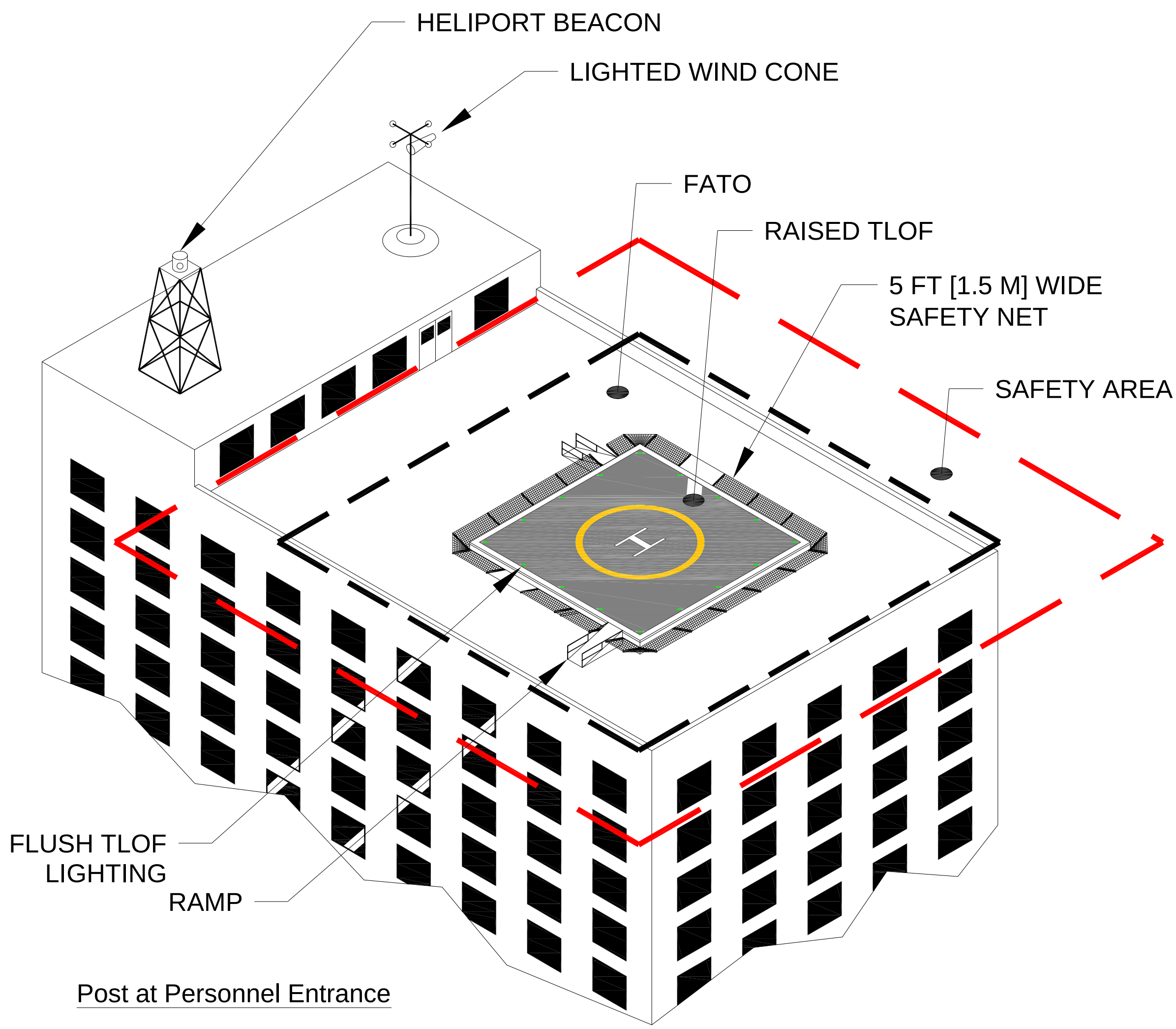
(6) Safety Net. If the platform is elevated 4 feet (1.2 m) or more above its surroundings, title 29 CFR part 1910.23, *Guarding Floor and Wall Openings and Holes*, requires the provision of fall protection. The FAA recommends that such protection be provided for all platforms elevated 30 inches (76 cm) or more. However, permanent railings or fences must not be used since they would be safety hazards during helicopter operations. An alternate method of installing a safety net, meeting state and local regulations but not less than 5 feet (1.5 m) wide, is suggested. The safety net should have a load carrying capability of 25 lbs/ft^2 (122 kg/m^2). The net, as illustrated in Figure 2-27 on page 55, must not project above the level of the TLOF. Both the inside and outside edges of the safety net should be fastened to a solid structure. Nets should be constructed of material that is resistant to environmental effects.

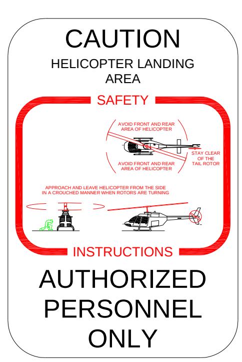


DIM	ITEM	VALUE	NOTES
A	Minimum TLOF Width	1 RD	
B	Minimum TLOF/Landing Position Length	1 RD	
C	Minimum FATO Width	1.5 D	
E	Minimum Separation Between the Perimeters of the TLOF and FATO	0.75 D - 0.5 RD	
F	Minimum Safety Area Width	Table 2-1.	

Note: For circular TLOFs, dimensions A and B refer to diameters.

Figure 2-3. An Elongated FATO with Two Takeoff Positions: General Aviation





Notes:

1. See Figure 2-26 for detailed views of the safety net and lighting.

2. TLOF size and weight limitation box is not shown for clarity.

Figure 2-4. Elevated Heliport: General Aviation

(7) Access to Elevated TLOFs. Title 29 CFR part 1936, *Means of Egress*, requires two separate access points for an elevated structure such as one supporting an elevated TLOF. If stairs are used, they must be built in compliance with title 29 CFR part 1910.24, *Fixed Industrial Stairs*. Handrails required by this standard must fold down or be removable to below the level of the TLOF so that they will not be hazards during helicopter operations.

d. TLOF Gradients. Recommended TLOF gradients are defined in paragraph 702 on page 173.

207. FINAL APPROACH AND TAKEOFF AREA (FATO). A general aviation heliport must have at least one FATO. The FATO must contain a TLOF within its borders at which arriving helicopters terminate their approach and from which departing helicopters take off.

a. FATO Size.

(1) The minimum width, length or diameter of a FATO is 1.5 times the overall length (D) of the design helicopter. A circular FATO is only used when the TLOF is circular. At elevations well above sea level, a longer FATO is needed to provide an increased safety margin and greater operational flexibility. The additional FATO length is depicted in Figure 2-5 on page 23. Where the operator of a PPR heliport chooses not to provide additional FATO length, the operator should ensure that all pilots using the facility are thoroughly knowledgeable with this and any other facility limitations.

(2) The minimum distance between the TLOF perimeter and the FATO perimeter must be not less than the distance (0.75D - 0.5RD) where D is the overall length and RD is the rotor diameter of the design helicopter. The relationship of the TLOF to the FATO and the safety area is shown in Figure 2-2 on page 18.

b. FATO Surface Characteristics.

(1) Ground Level GA Heliports. If the TLOF is marked, the FATO outside the TLOF must be capable of supporting the static loads of the design helicopter as described in paragraph 707.a. If the TLOF is not marked (see paragraph 214.b below) and/or it is intended that the helicopter can land anywhere within the FATO, the FATO outside the TLOF and any FATO supporting structure must, like the TLOF, be capable of supporting the dynamic loads of the design helicopter as described in paragraph 707.b.

(2) Ground Level PPR Heliports. For ground level PPR heliports, if the TLOF is marked, the FATO outside the TLOF need not be load-bearing providing it is a solid area able to support a 20lbs/ft^2 (98 kg/m^2) live load. If the TLOF is not marked and/or it is intended that the helicopter can land anywhere within the FATO, the FATO outside the TLOF should, like the TLOF, be capable of supporting the dynamic loads of the design helicopter.

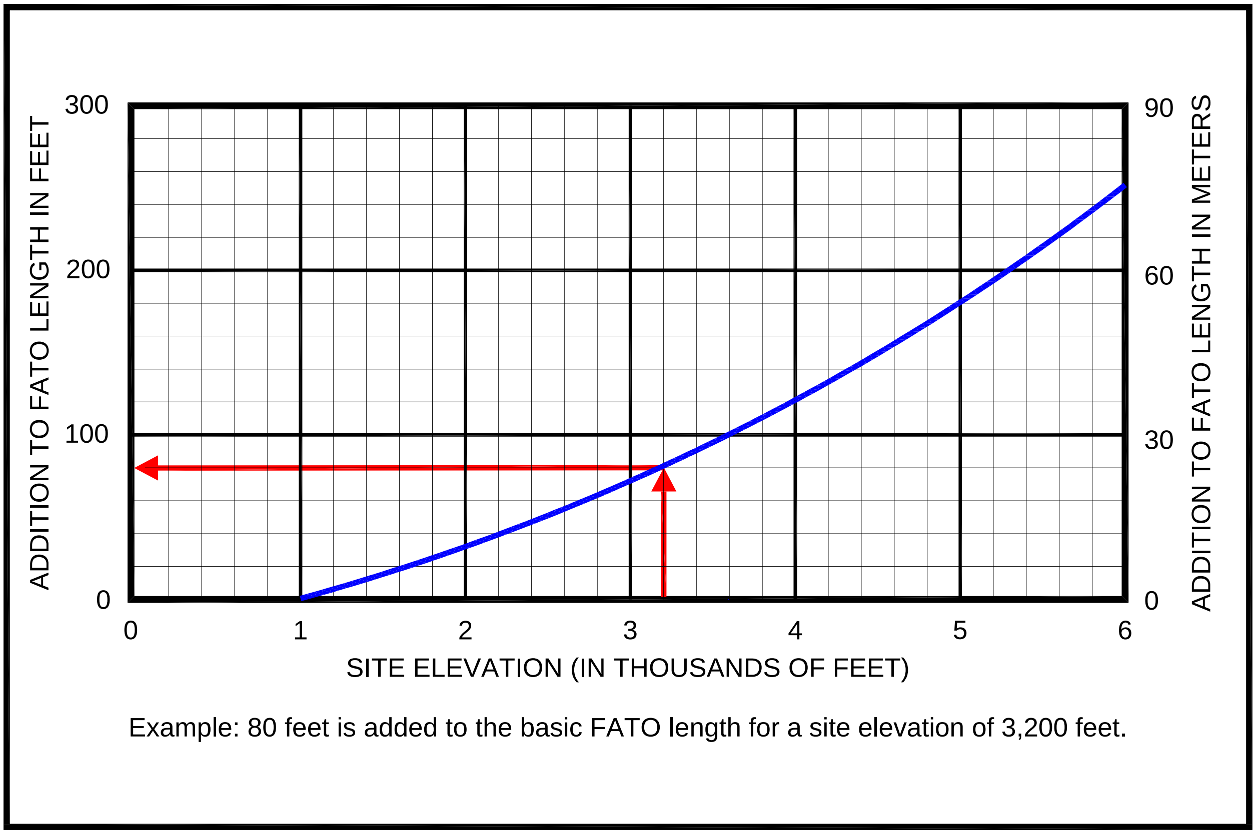


Figure 2-5. Additional FATO Length for Heliports at Higher Elevations: General Aviation

(3) Elevated Heliports. The FATO outside the TLOF may extend into clear airspace. However, there are some helicopter performance benefits and increased operational flexibility if the FATO outside the TLOF is load bearing. The FATO outside of the TLOF must be load bearing unless the minimum width and length or diameter of TLOF is increased to the overall length of the design helicopter.

(4) Elevated PPR Heliports. For elevated PPR heliports only the TLOF needs to be load bearing. If the TLOF is marked, the FATO outside the TLOF and the safety area may extend into the clear airspace. (See Figure 2-4 on page 21.). If the TLOF is not marked and/or it is intended that the helicopter can land anywhere within the FATO, the FATO outside the TLOF should, like the TLOF, be capable of supporting the dynamic loads of the design helicopter. The length and width or diameter of the load bearing area may be increased without a corresponding increase in the size of the FATO.

(5) If the FATO is load bearing, the portion abutting the TLOF must be contiguous with the TLOF and the adjoining edges must be at the same elevation.

(6) If the FATO is unpaved, the FATO must be treated to prevent loose stones and any other flying debris caused by rotor downwash.

(7) When the FATO or the load-bearing area in which it is located is elevated 4 feet or more above its surroundings, title 29 CFR part 1910.23 *Guarding floor and wall openings and holes*, requires the provision of fall protection. However, permanent railings or fences must not be used since they would be safety hazards during helicopter operations. An alternate method of installing a safety net, meeting state and local regulations but not less than 5 feet (1.5 m) wide, is suggested. The safety net should have a load carrying capability of 25 lbs/ft^2 (122 kg/m^2). The net, as illustrated in Figure 2-27 on page 55, must not project above the level of the TLOF. Both the inside and outside edges of the safety net should be fastened to a solid structure. Nets should be constructed of material that is resistant to environmental effects.

c. Mobile Objects within the FATO. The FATO design recommendations of this AC are based on the assumption that the TLOF and FATO are closed to other aircraft if a helicopter or other mobile object is within the FATO or the safety area.

d. Fixed Objects within the FATO. No fixed objects are permitted within a FATO except for frangibly mounted objects that, due to their function, must be located there. Those objects whose functions require them to be located within the FATO must not exceed a height of 2 inches (5 cm) above the elevation of the TLOF perimeter.

e. FATO/FATO Separation. If a heliport has more than one FATO, the separation between the perimeters of the two FATOs must be such that the respective safety areas do not overlap. This separation is based on the assumption that simultaneous approach/departure operations will not take place. If simultaneous operations are planned, a minimum 200 foot (61 m) separation is required.

f. FATO Gradients. Recommended FATO gradients are defined in paragraph 703 on page 173.

208. SAFETY AREA. A safety area surrounds a FATO.

a. Safety Area Width. The required width of the safety area is shown in Table 2-1 on page 17, and is the same on all sides. The width is affected by the provision or absence of standard heliport markings. The safety area may extend into clear airspace.

b. Mobile Objects within the Safety Area. The safety area design recommendations of this AC are based on the assumption that the TLOF and FATO are closed to other aircraft if a helicopter or other mobile object is within the FATO or the safety area.

c. Fixed Objects Within a Safety Area. No fixed objects are permitted within a safety area except for frangibly mounted objects that, due to their function, must be located there. Those objects whose functions require them to be located within the safety area must not exceed a height of 8 inches (20 cm) above the elevation of the FATO perimeter nor penetrate the approach/departure surfaces or transitional surfaces.

d. Safety Area Surface. The safety area need not be load bearing. Figure 2-6 on page 25 depicts a safety area extending over water. If possible, the portion of the safety area abutting the FATO should be contiguous with the FATO with the adjoining edges at the same elevation. This is needed to avoid the risk of catching a helicopter skid or wheel. The safety area should be treated to prevent loose stones and any other flying debris caused by rotor wash.

e. Safety Area Gradients. Recommended safety area gradients are defined in Chapter 7 on page 173.

209. VFR APPROACH/DEPARTURE PATHS. The purpose of approach/departure airspace, shown in Figure 2-7 on page 27, is to provide sufficient airspace clear of hazards to allow safe approaches to and departures from the TLOF.

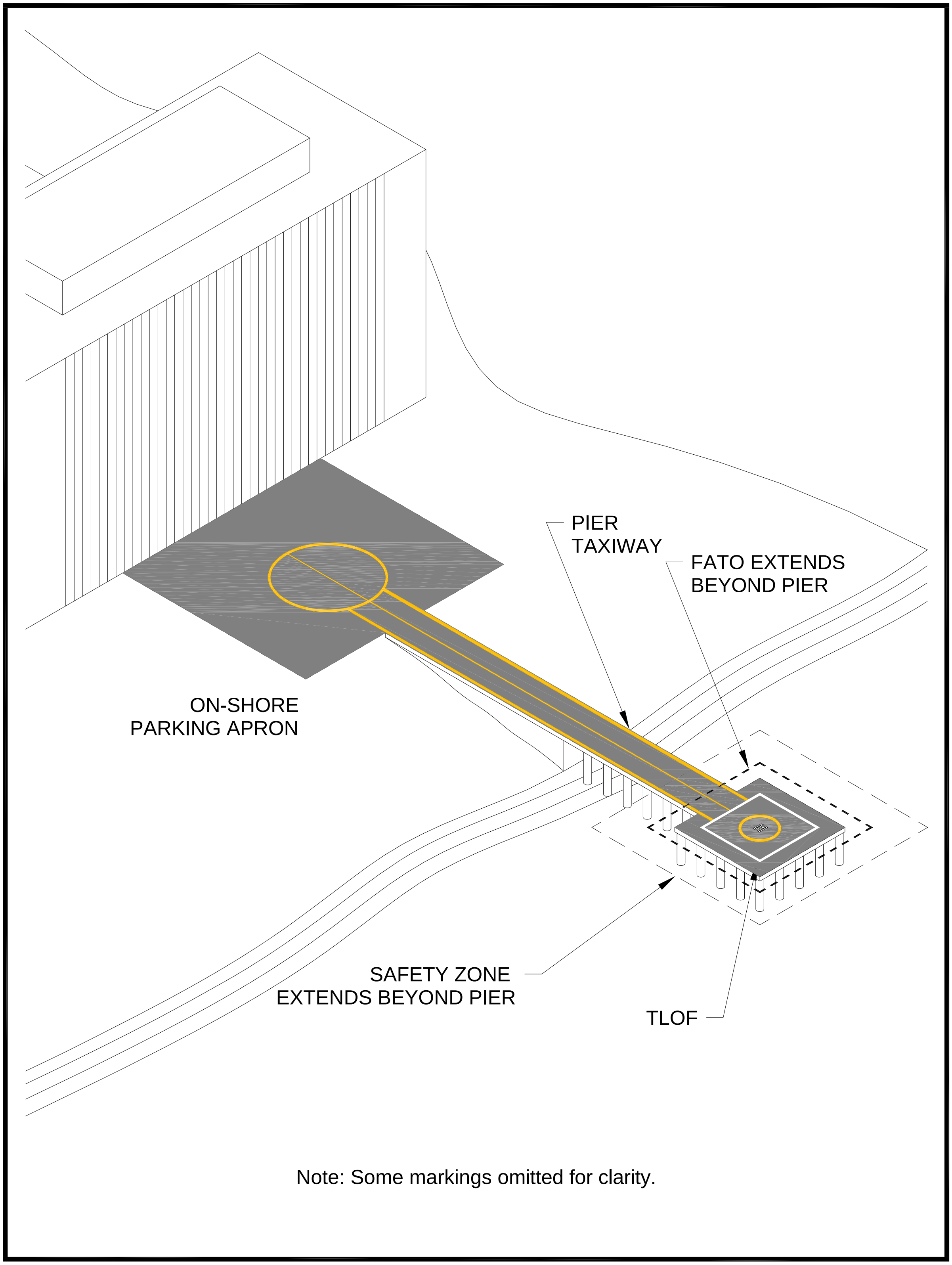


Figure 2-6. Non-load-bearing FATO and Safety Area: General Aviation

a. Number of Approach/Departure Paths. Preferred approach/departure paths should be aligned with the predominant wind direction so that downwind operations are avoided and crosswind operations are kept to a minimum. To accomplish this, a heliport should have more than one approach/departure path. Other approach/departure paths should be based on the assessment of the prevailing winds or, when this information is not available, the separation between such flight paths and the preferred flight path should be at least 135 degrees. See Figure 2-7 on page 27, Figure 2-8 on page 28, and Figure 2-9 on page 29. At a PPR heliport that has only one approach/departure path, the operator should ensure that all pilots using the facility are thoroughly knowledgeable with this and any other facility limitations. A second flight path provides additional safety margin and operational flexibility.

b. VFR Approach/Departure and Transitional Surfaces. Figure 2-7 on page 27 illustrates the approach/departure and transitional surfaces.

(1) An approach/departure surface is centered on each approach/departure path. The approach/departure path starts at the edge of the FATO and slopes upward at 8:1 (8 units horizontal in 1 unit vertical) for a distance of 4000 feet (1219 m) where the width is 500 feet (152 m) at a height of 500 feet (152 m) above the heliport elevation.

(2) The transitional surfaces start from the edges of the FATO parallel to the flight path center line, and from the outer edges of the 8:1 approach/departure surface, and extend outwards at a slope of 2:1 (2 units horizontal in 1 unit vertical) for a distance of 250 feet (76 m) from the centerline. The transitional surface is not applied on the FATO edge opposite the approach/departure surface.

(3) The approach/departure and transitional surfaces must be free of penetrations unless an FAA aeronautical study determines such penetrations not to be hazards. Such aeronautical studies are conducted only at public heliports and private airports with FAA-approved approach procedures. Paragraph 109 on page 9 provides additional information on hazards to air navigation.

(4) At PPR facilities, the size of the 8:1 approach/departure surface may be increased for a distance of 2,000 feet (610 m) as shown in Figure 2-9 on page 29 and Figure 2-11 on page 32 in lieu of considering transitional surfaces. The lateral extensions on each side of the 8:1 approach/departure surface start at the width of the FATO and are increased so that at a distance of 2,000 feet (610 m) from the FATO they are 100 feet (30 m) wide. Penetrations of obstacles into area A or area B, but not both, may be allowed providing the penetrations are marked or lighted and not considered a hazard.

c. Curved VFR Approach/Departure Paths. VFR approach/departure paths may include one curve. Such paths may use the airspace above public lands, such as freeways or rivers. However, the design of curved approach/departure paths must consider the performance capabilities of the helicopters intended to be served by the heliport. Where a curved portion of the approach/departure path is provided, the sum of the radius of arc defining the center line and the length of the straight portion originating at the FATO must not be less than 1886 feet (575 m). The minimum radius for curved approach/departure paths is 886 feet (270m) following a 1000 feet (305m) straight section. The combined length of the center line of the curved portion and the straight portion must be 4000 feet (1219 m). See Figure 2-8 on page 28. Figure 2-10 on page 30 shows a curved approach/departure path for an 8:1 approach/departure surface.

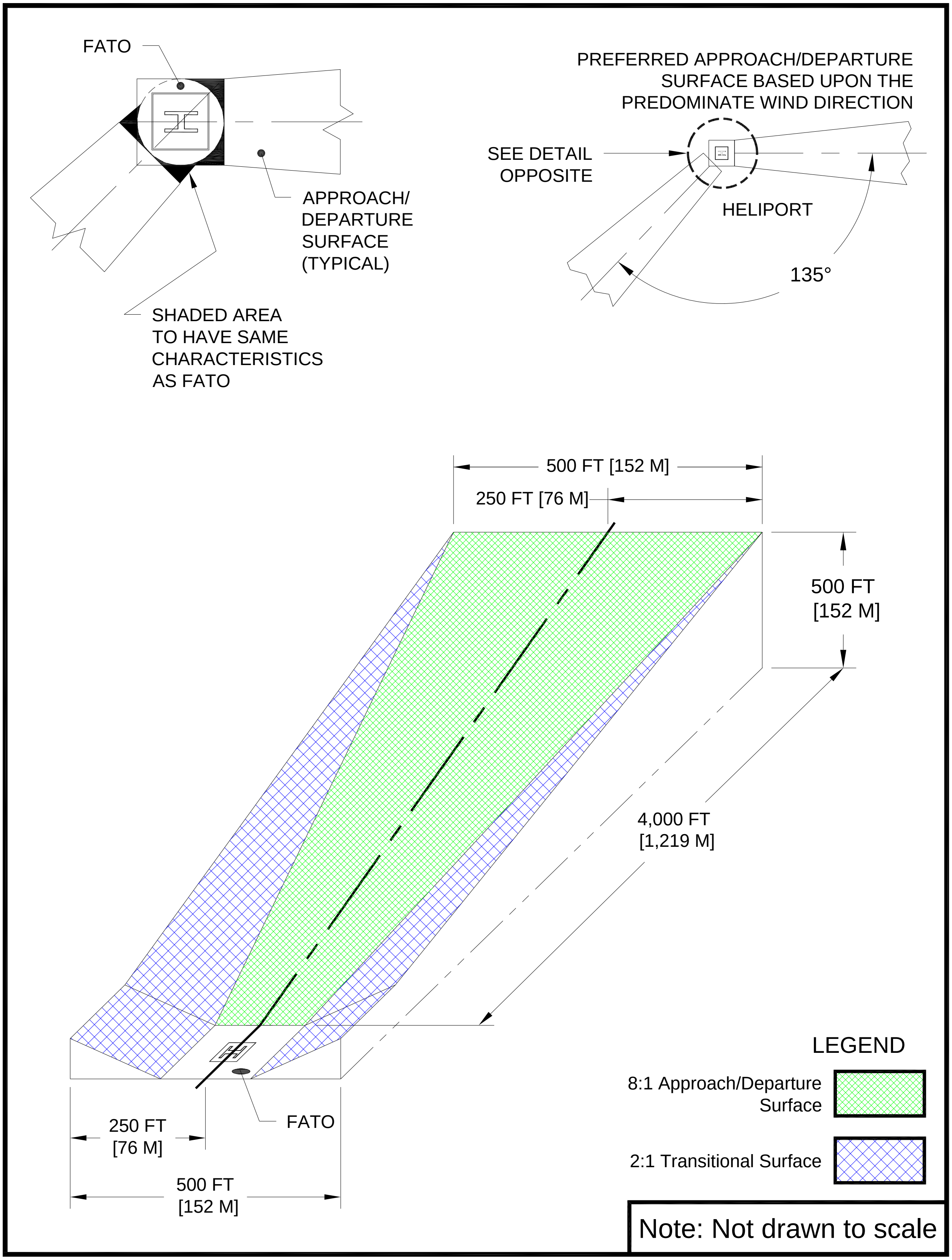
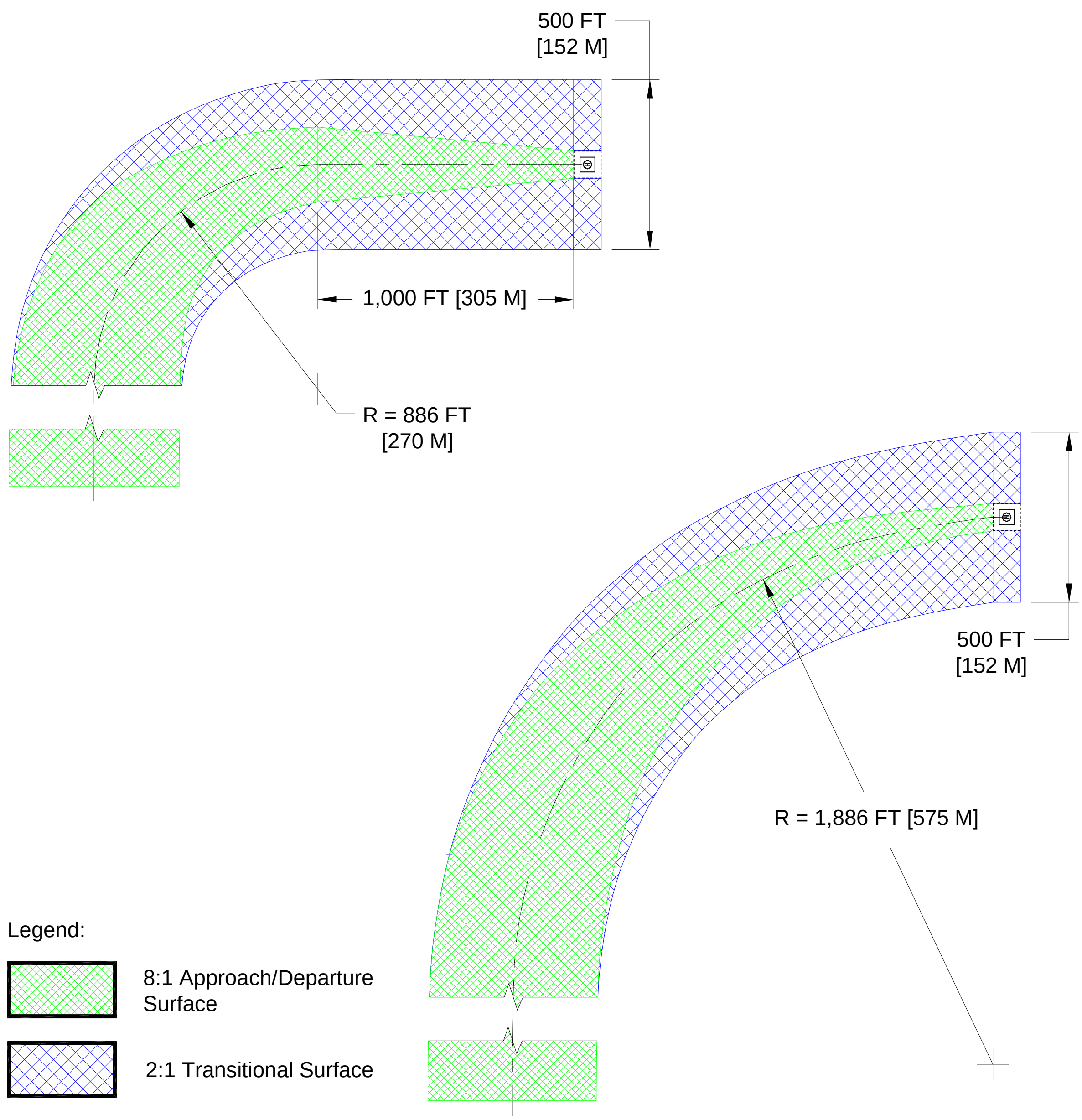


Figure 2-7. VFR Heliport Approach/Departure and Transitional Surfaces: General Aviation



Notes:

1. Any combination of straight portions and one curved portion may be established using the following formula: S + R ≥1,886 ft [575 m] and R ≥ 886 ft [270 m], where S is the length of the straight portion(s) and R is the radius of the turn. Note that any combination ≥1,886 ft [575 m] will work.
2. The minimum total length of the centerline of the straight and curved portion is 4,000 ft [1,219 m].
3. Helicopter take-off performance is reduced in a curve. Consider a straight portion along the take-off climb surface prior to the start of the curve to allow for acceleration.

Figure 2-8. Curved Approach/Departure: General Aviation

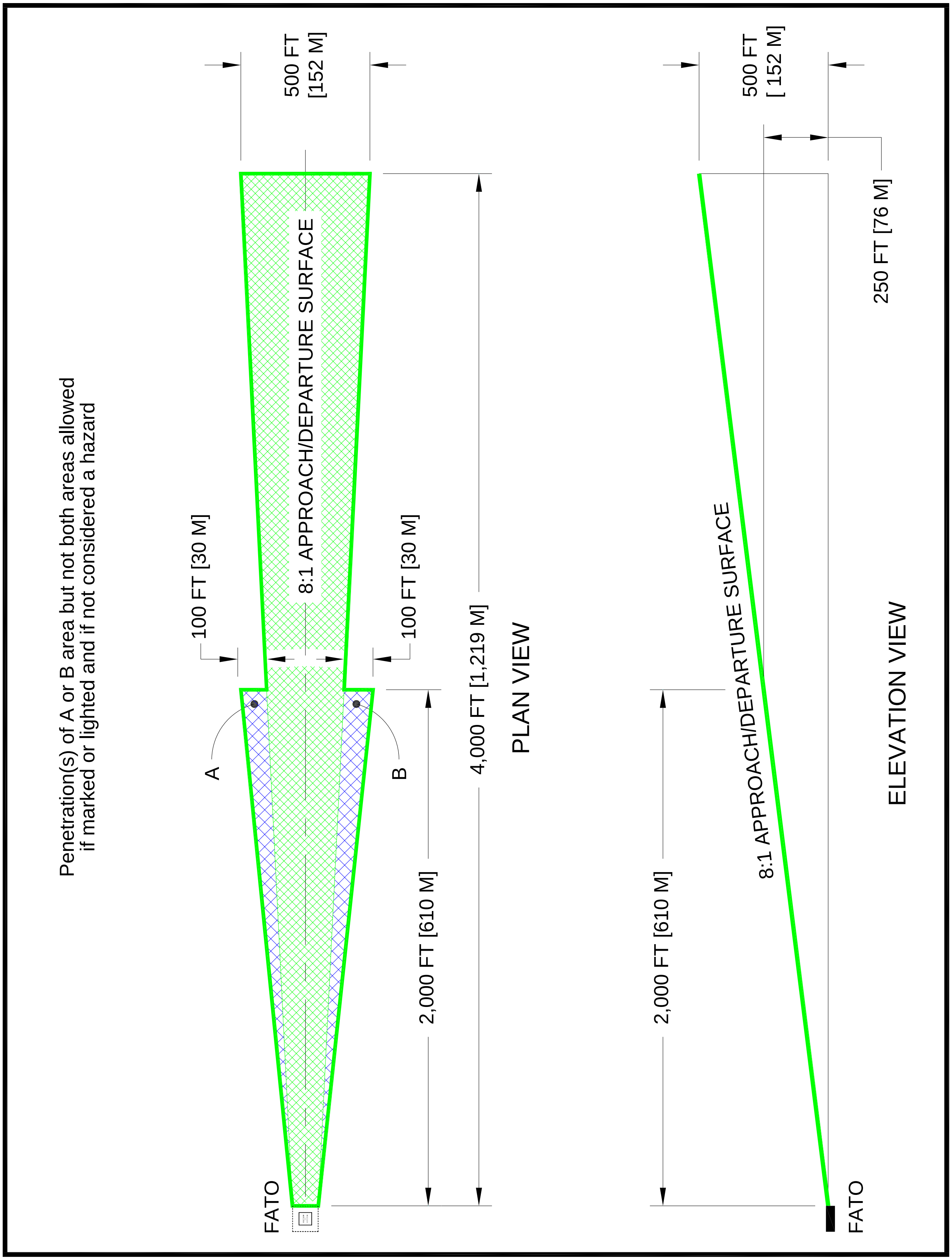
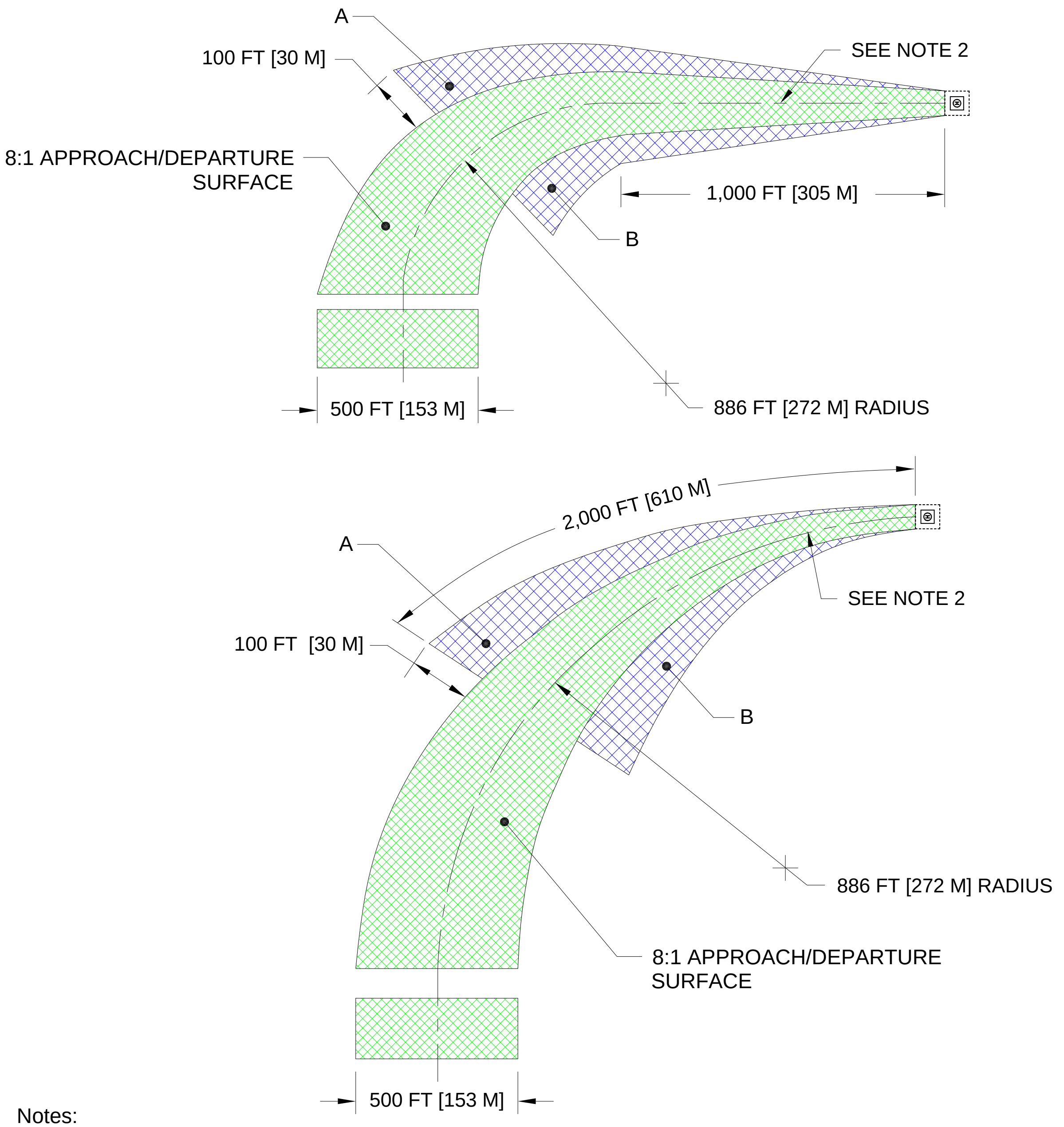


Figure 2-9. VFR PPR Heliport Lateral Extension of the 8:1 Approach/Departure Surface: General Aviation



Notes:

1. Any combination of straight portions and one curved portion may be established using the following formula: S + R ≥1,886 ft [575 m] and R ≥886 ft [270 m], where S is the length of the straight portion(s) and R is the radius of the turn. Note that any combination ≥1,886 ft [575 m] will work.
2. The minimum total length of the centerline of the straight and curved portion is 4,000 ft [1,219 m].
3. Helicopter take-off performance is reduced in a curve. Consider a straight portion along the take-off climb surface prior to the start of the curve to allow for acceleration.
4. Penetration(s) of A or B area but not both areas allowed if marked or lighted and if not considered a hazard.

Figure 2-10. VFR PPR Heliport Lateral Extension of the Curved 8:1 Approach/Departure Surface: General Aviation

d. Flight Path Alignment Guidance. Optional flight path alignment markings and/or flight path alignment lights (see paragraph 214.e below) may be used where it is desirable and practicable to indicate available approach and/or departure flight path direction(s). See Figure 2-11 on page 32.

e. Periodic Review of Obstructions. Heliport operators should reexamine obstacles in the vicinity of 8:1 approach/departure paths on at least an annual basis. This reexamination should include an appraisal of the growth of trees near approach and departure paths. Paragraph 109 on page 9 provides additional information on hazards to air navigation.

210. HELIPORT PROTECTION ZONE (HPZ). It is recommended that a Heliport Protection Zone be established for each approach/departure surface. The HPZ is the area under the 8:1 approach/departure surface starting at the FATO perimeter and extending out for a distance of 280 feet (85.3 m), as illustrated in Figure 2-12 on page 33. The HPZ is intended to enhance the protection of people and property on the ground. This is achieved through heliport owner control over the HPZ. Such control includes clearing HPZ areas (and maintaining them clear) of incompatible objects and activities. Land uses discouraged in the HPZ are residences and places of public assembly. (Churches, schools, hospitals, office buildings, shopping centers, and other uses with similar concentrations of persons typify places of public assembly.) Fuel storage facilities should not be located in the HPZ.

211. WIND CONE.

a. Specification. A wind cone conforming to AC 150/5345-27, *Specification for Wind Cone Assemblies*, must be used to show the direction and magnitude of the wind. The wind cone should provide the best possible color contrast to its background.

b. Wind Cone Location. The wind cone must be located so it provides the pilot with valid wind direction and speed information in the vicinity of the heliport under all wind conditions.

(1) At many landing sites, there may be no single, ideal location for the wind cone. At other sites, it may not be possible to site a wind cone at the ideal location. Consequently, more than one wind cone may be required in order to provide the pilot with all the wind information needed for safe operations.

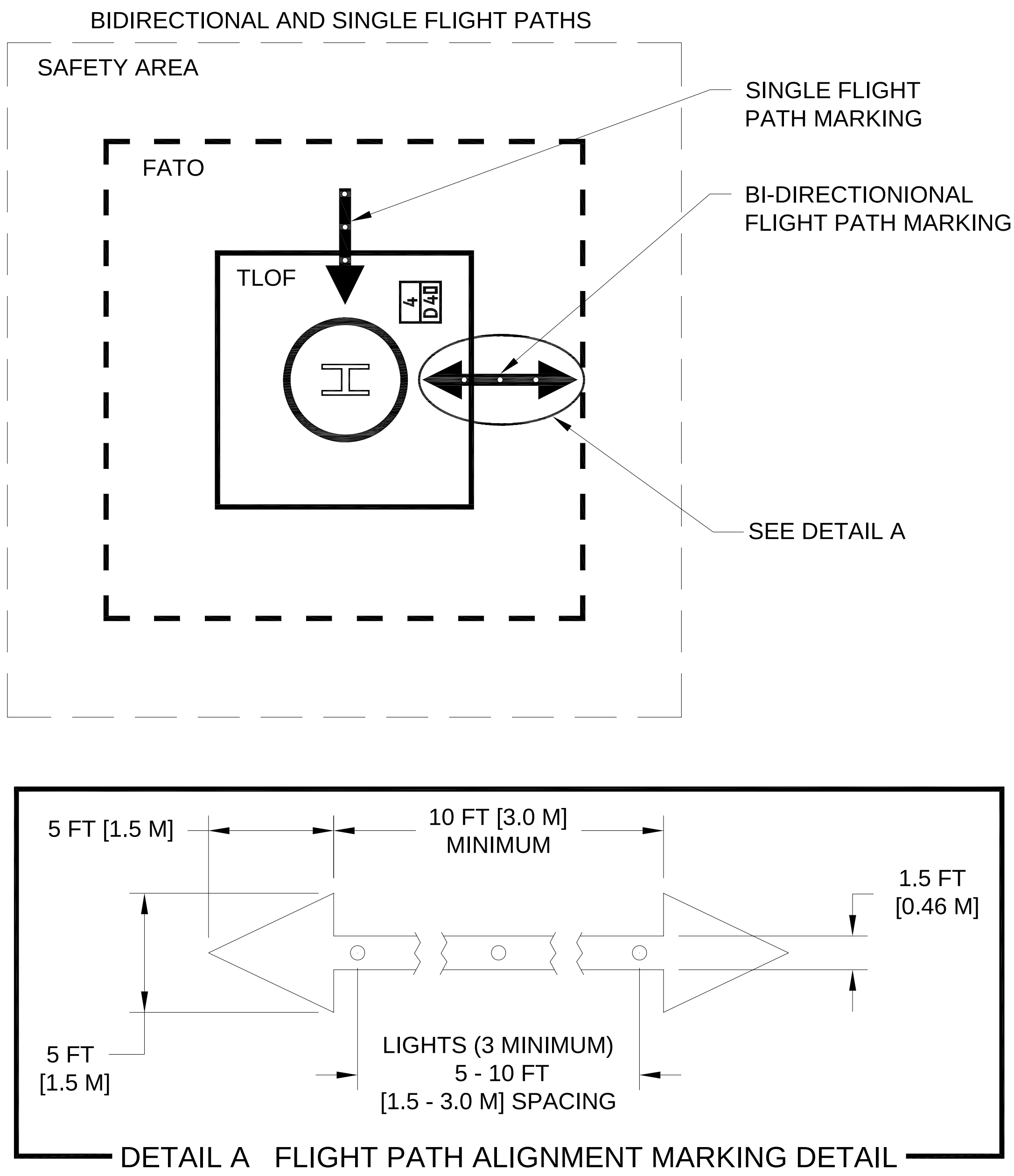
(2) A pilot on the approach path must be able to see a wind cone clearly when the helicopter is at a distance of 500 feet (152 m) from the TLOF.

(3) Pilots must also be able to see a wind cone from the TLOF.

(4) To avoid presenting an obstruction hazard, the wind cone(s) must be located outside the safety area, and it must not penetrate the approach/departure or transitional surfaces.

c. Wind Cone Lighting. For night operations, the wind cone must be illuminated, either internally or externally, to ensure that it is clearly visible.

212. TAXIWAYS AND TAXI ROUTES. Taxiways and taxi routes are provided for the movement of helicopters from one part of a landing facility to another. They provide a connecting path between the FATO and a parking area. They also provide a maneuvering aisle within the parking area. A taxi route includes the taxiway plus the appropriate clearances needed on both sides. The relationship between a taxiway and a taxi route is illustrated in Figure 2-13 on page 34, Figure 2-14 on page 35, and Figure 2-15 on page 36. At heliports with no parking or refueling area outside the TLOF(s), no taxi route or taxiway is required.



Notes (arrow):

1. Arrowheads must have constant dimensions
2. Stroke length may be adjusted to match length available (Minimum length: 10 ft [3 m])

Notes (lights):

1. Light type: omni-directional inset white lights
2. Lights may be outside arrow

Figure 2-11. Flight Path Alignment Marking and Lights: General Aviation

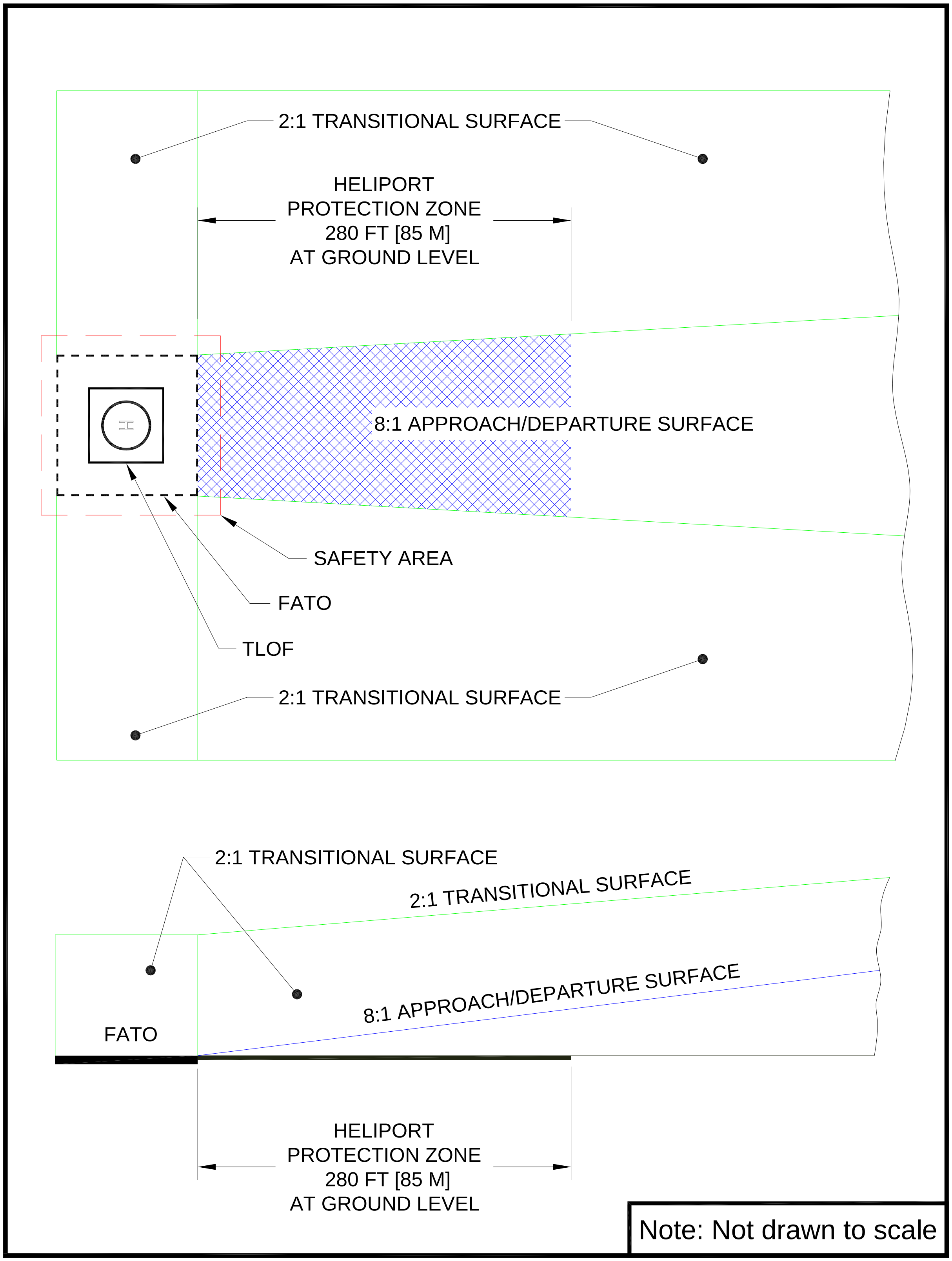


Figure 2-12. Heliport Protection Zone: General Aviation

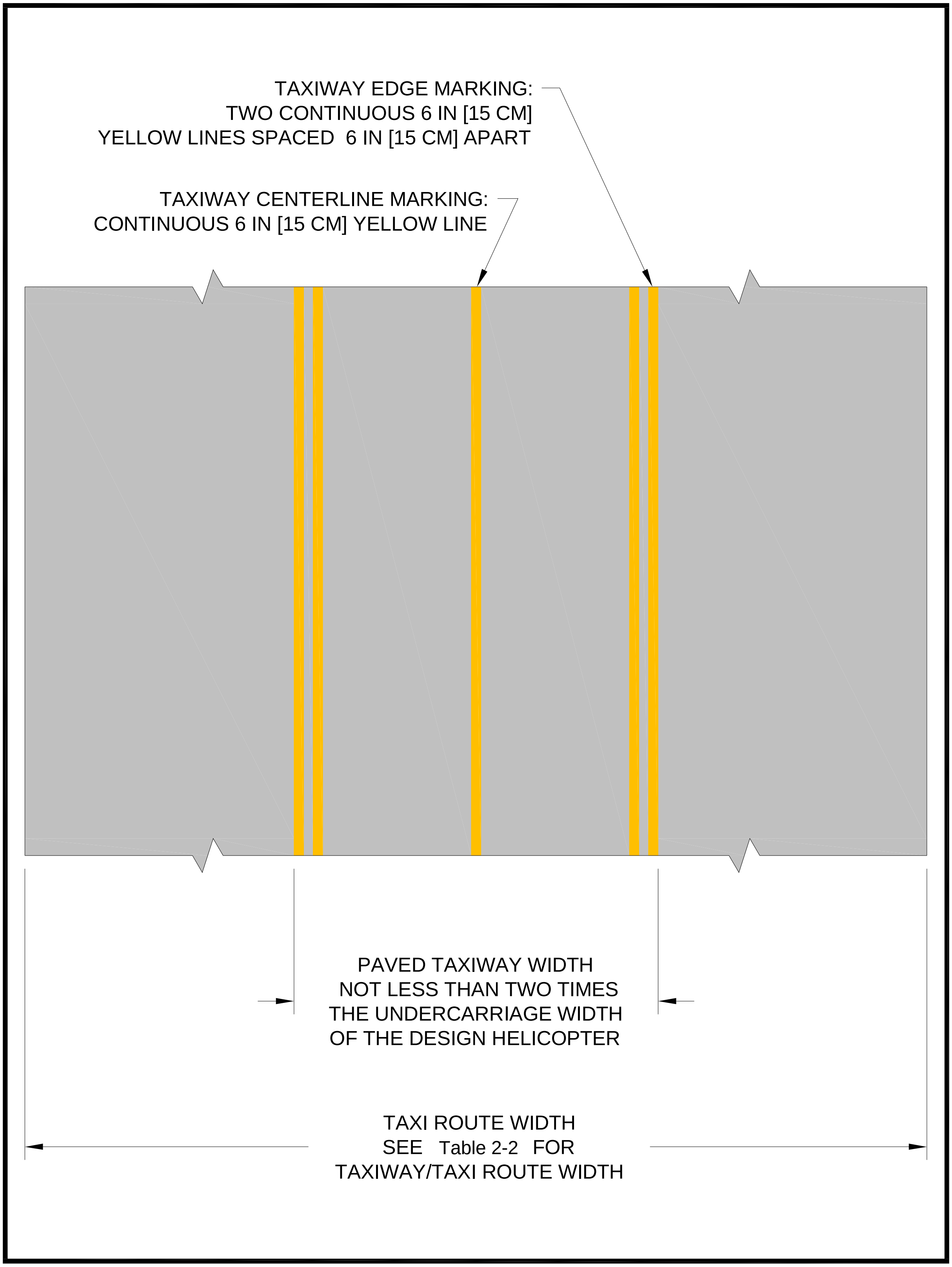


Figure 2-13. Taxiway/Taxi Route Relationship – Paved Taxiway: General Aviation

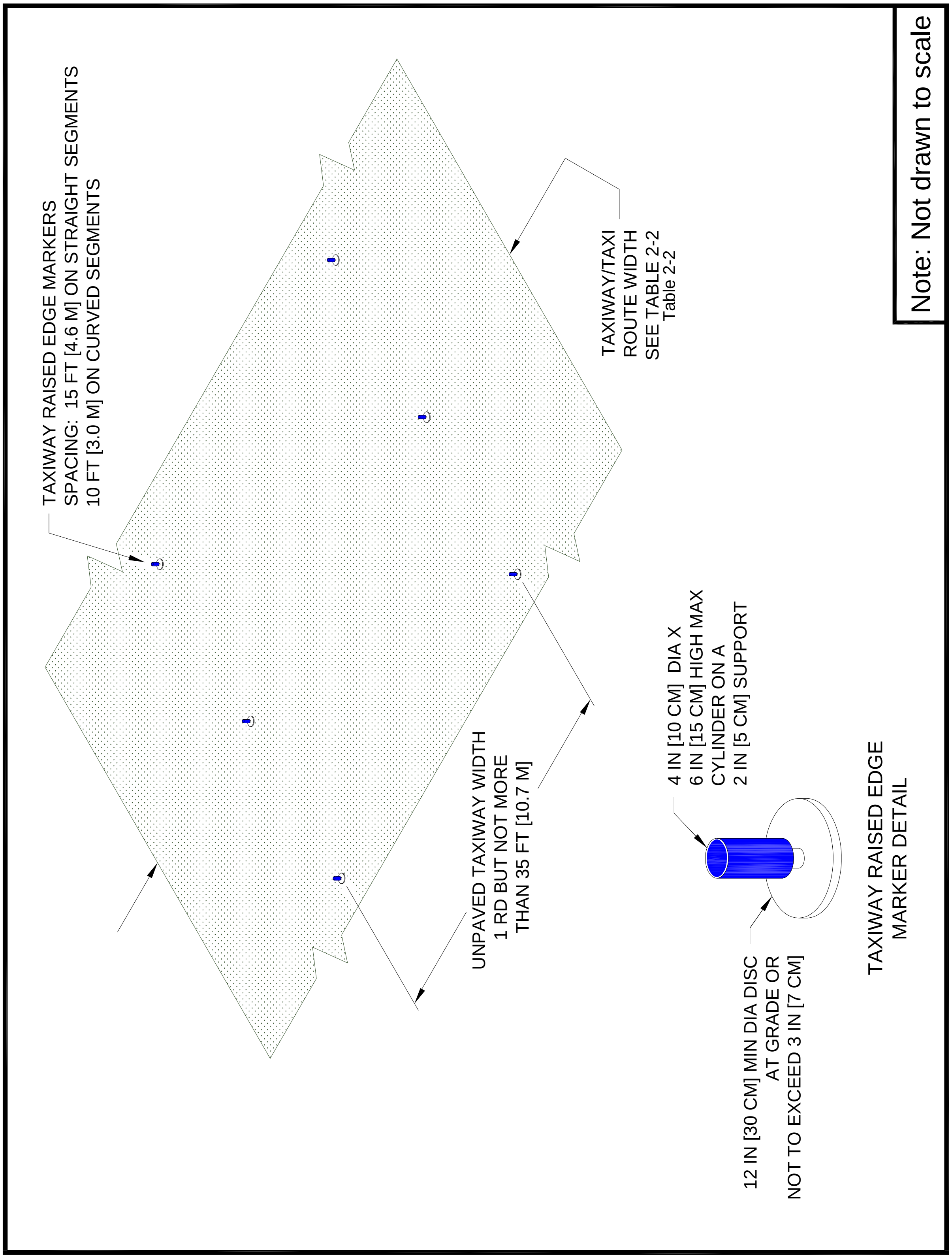


Figure 2-14. Taxiway/Taxi Route Relationship – Unpaved Taxiway with Raised Edge Markers: General Aviation

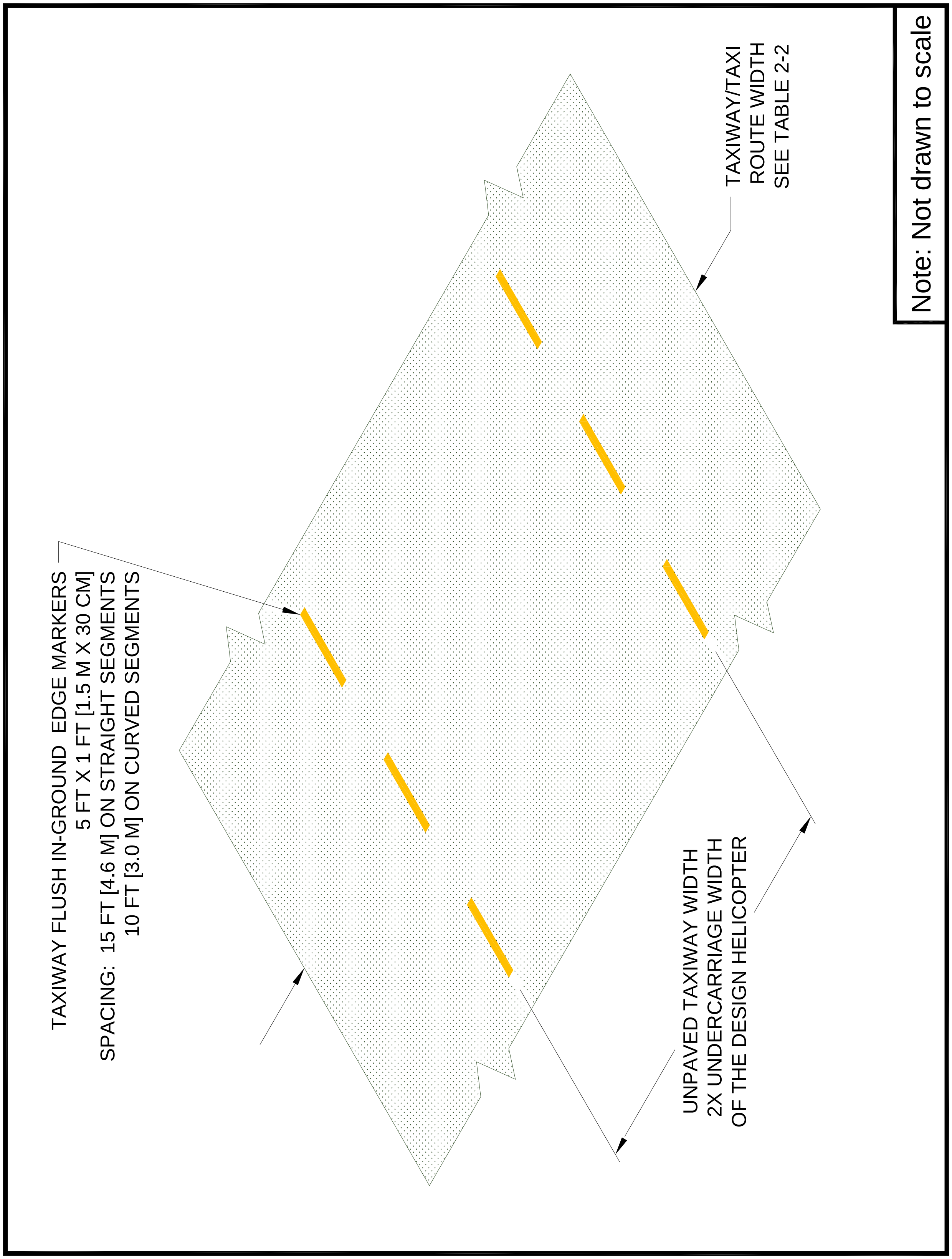


Figure 2-15. Taxiway/Taxi Route Relationship – Unpaved Taxiway with Flush Edge Markers: General Aviation

a. Taxiway/Taxi Route Widths. The dimensions of taxiways and taxi routes are a function of helicopter size, taxiway/taxi route marking, and type of taxi operations (ground taxi versus hover taxi). These dimensions are defined in Table 2-2 on page 38. Normally, the requirement for hover taxi dictates the taxiway/taxi route widths. However, when the fleet comprises a combination of large ground taxiing helicopters and smaller air taxiing helicopters, the larger aircraft may dictate the taxiway/taxi route widths. If wheel-equipped helicopters taxi with wheels not touching the surface, the facility should be designed with hover taxiway widths rather than ground taxiway widths. Where the visibility of the centerline marking cannot be guaranteed at all times, such as locations where snow or dust commonly obscure the centerline marking and it is not practical to remove it, the minimum taxiway/taxi route dimensions should be determined as if there was no centerline marking.

b. Surfaces. Ground taxiways must have a surface that is portland cement concrete, asphalt or a surface, such as turf, stabilized in accordance with the recommendations of items P-217 of AC 150/5370-10. Unpaved portions of taxiways and taxi routes must have a turf cover or be treated in some way to prevent dirt and debris from being raised by a taxiing helicopter's rotor wash.

c. Gradients. Recommended taxiway and taxi route gradients are defined in Chapter 7 on page 173.

213. HELICOPTER PARKING. If more than one helicopter at a time is expected at a heliport, the facility should have an area designated for parking helicopters. The size of this area depends on the number and size of specific helicopters to be accommodated. It is not necessary that every parking position accommodate the design helicopter. Individual parking positions should be designed to accommodate the helicopter size and weights expected to use the parking position at the facility. However, separation requirements between parking positions and taxi routes are based on the design helicopter. Separation requirements between parking positions intended for helicopters of different sizes are based on the larger helicopter. Parking positions must support the static loads of the helicopter intended to use the parking area. Parking areas may be designed as one large, paved apron or as individual, paved parking positions. Ground taxi turns of wheeled helicopters are significantly larger than a hover turn. Design of taxi intersections and parking positions for wheeled helicopters should consider the turn radius of the helicopters. Heliport parking areas must be designed so that helicopters will be parked in an orientation that keeps the "avoid areas" around the tail rotors (see Figure 2-16 on page 39, Figure 2-17 on page 40, and Figure 2-19 on page 42) clear of passenger walkways.

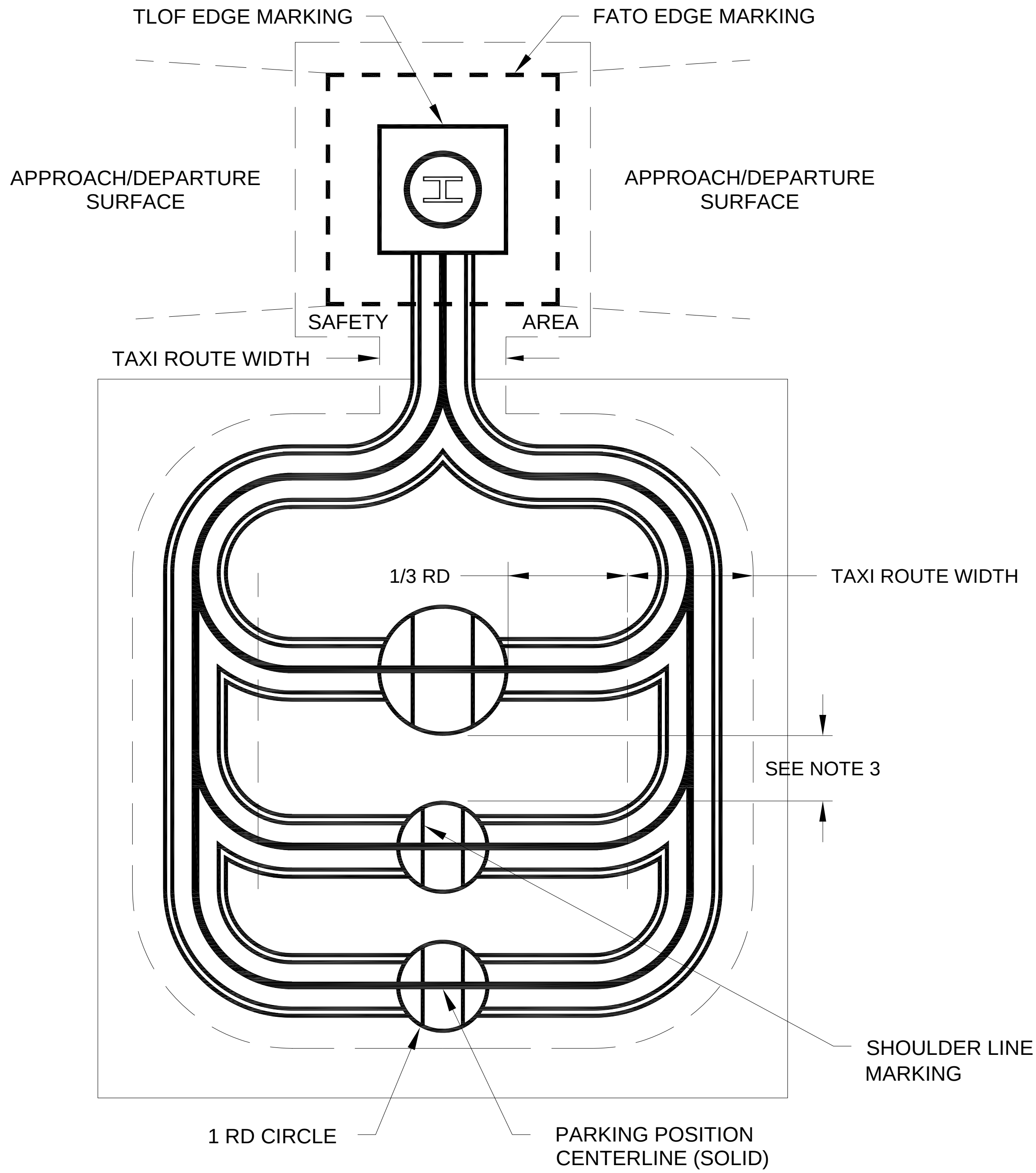
a. Location. Aircraft parking areas must not lie under an approach/departure surface. However, aircraft parking areas may lie under the transitional surfaces.

(1) The parking position must be located to provide a minimum distance between the tail rotor arc and any object, building, safety area, or other parking position. The minimum distance is 10 feet (3 m) for ground taxi operations and the greater of 10 feet (3 m) or 1/3 RD for hover taxi operations. See Figure 2-19 on page 42.

(2) The parking position must be located to provide a minimum distance between the main rotor arc and the edge of any taxi route. Parking positions may be designed such that the helicopter taxis through, turns around, or backs out to depart. The minimum distance is 1/3 RD for "turn around" and "taxi through" parking areas, and 1/2 RD for "back-out" parking areas. See Figure 2-16 on page 39, Figure 2-17 on page 40, and Figure 2-19 on page 42.

Table 2-2. Taxiway / Taxi Route Dimensions – General Aviation Heliports

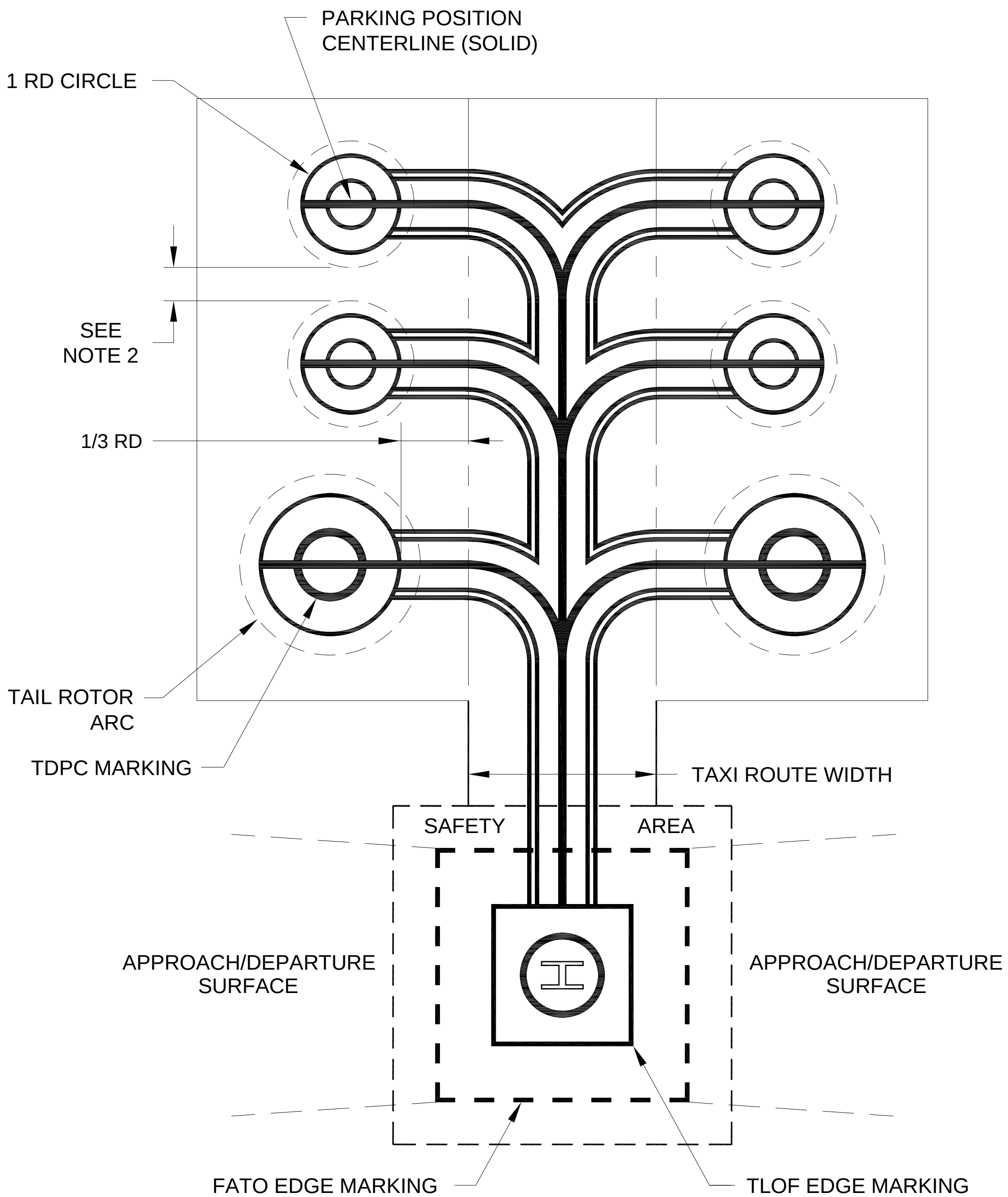
<table>
<tr><th>Taxiway (TW) Type</th><th>Minimum Width of Paved Area</th><th>Centerline Marking Type</th><th>TW Edge Marking Type</th><th>Lateral Separation Between TW Edge Markings</th><th>Total Taxi Route Width</th></tr>
<tr><td rowspan="4">Ground Taxiway</td><td rowspan="2">2 x UC</td><td rowspan="2">Painted</td><td>Painted</td><td>2 x UC</td><td rowspan="4">1.5 RD</td></tr>
<tr><td>Elevated</td><td>1 RD but not greater than 35 ft (10.7 m)</td></tr>
<tr><td rowspan="2">Unpaved but stabilized for ground taxi</td><td rowspan="2">None</td><td>Flush</td><td>2 x UC</td></tr>
<tr><td>Elevated</td><td>1 RD but not greater than 35 ft (10.7 m)</td></tr>
<tr><td rowspan="2">Hover Taxiway</td><td>2 x UC</td><td>Painted</td><td>Painted</td><td>2 x UC</td><td rowspan="2">2RD</td></tr>
<tr><td>Unpaved</td><td>None</td><td>Elevated or Flush</td><td>1 RD but not greater than 35 ft (10.7 m)</td></tr>
<tr><td colspan="6">RD: rotor diameter of the design helicopter
TW: taxiway
UC: undercarriage length or width (whichever is greater) of the design helicopter</td></tr>
</table>



Notes:

1. Several markings (such as Parking Position Identifier and passenger walkways) have been omitted for clarity.
2. The parking positions are designed so that the helicopters exit taxiing forward.
3. Minimum recommended clearance between the arcs generated by the main rotor:
   - Hover taxi operations: 1/3 RD of the larger helicopter
   - Ground taxi operations: 10 ft [3 m]

Figure 2-16. Parking Area Design – "Taxi-through" Parking Positions: General Aviation

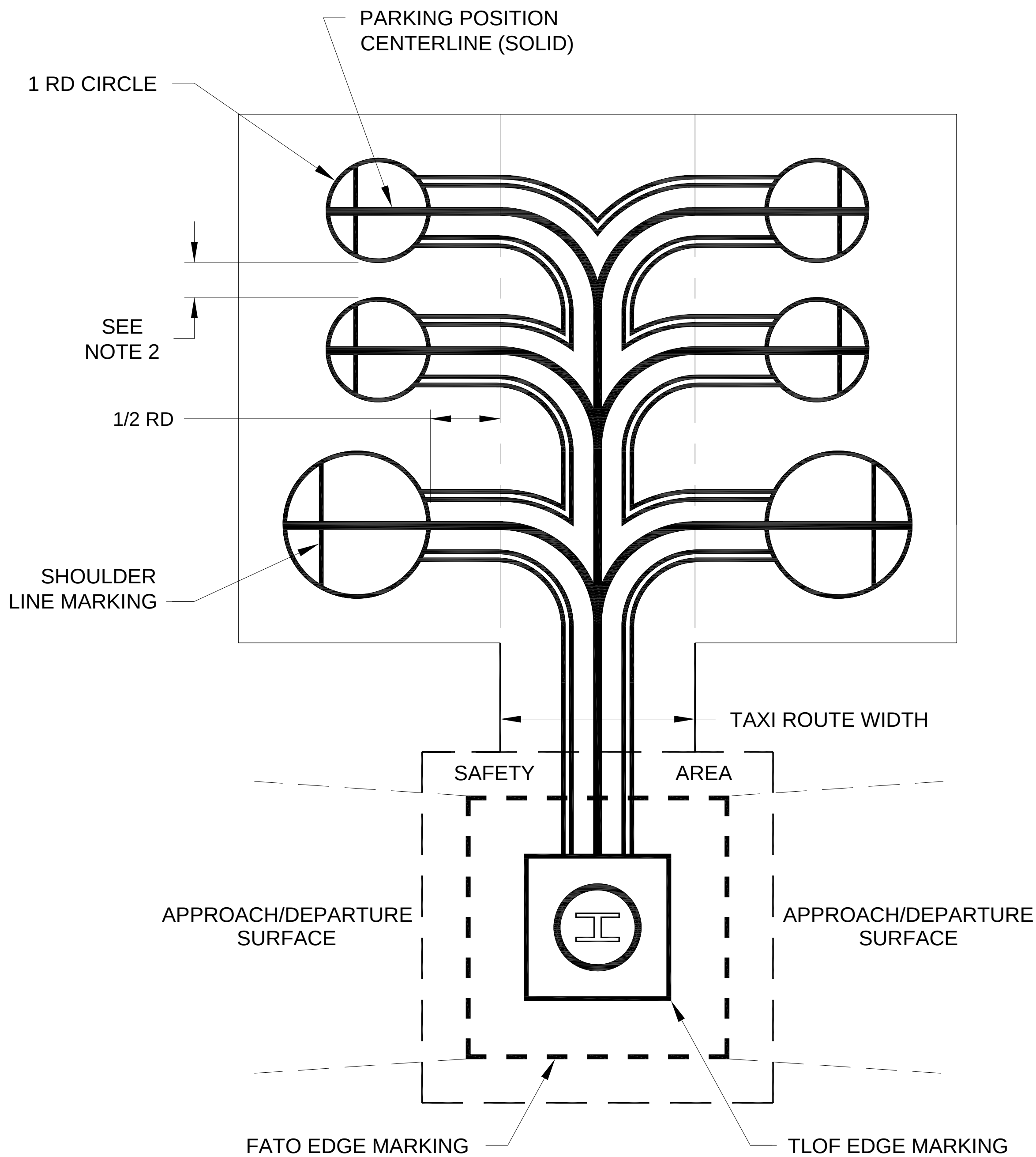


Notes:

1. Several markings (such as Parking Position Identifier and passenger walkways) have been omitted for clarity.

2. Minimum recommended clearance between the tail rotor arcs :
   - Hover taxi operations: 1/3 RD of the larger helicopter, but not less than 10 ft [3 m].
   - Ground taxi operations: 10 ft [3 m]

Figure 2-17. Parking Area Design – "Turn-around" Parking Positions: General Aviation

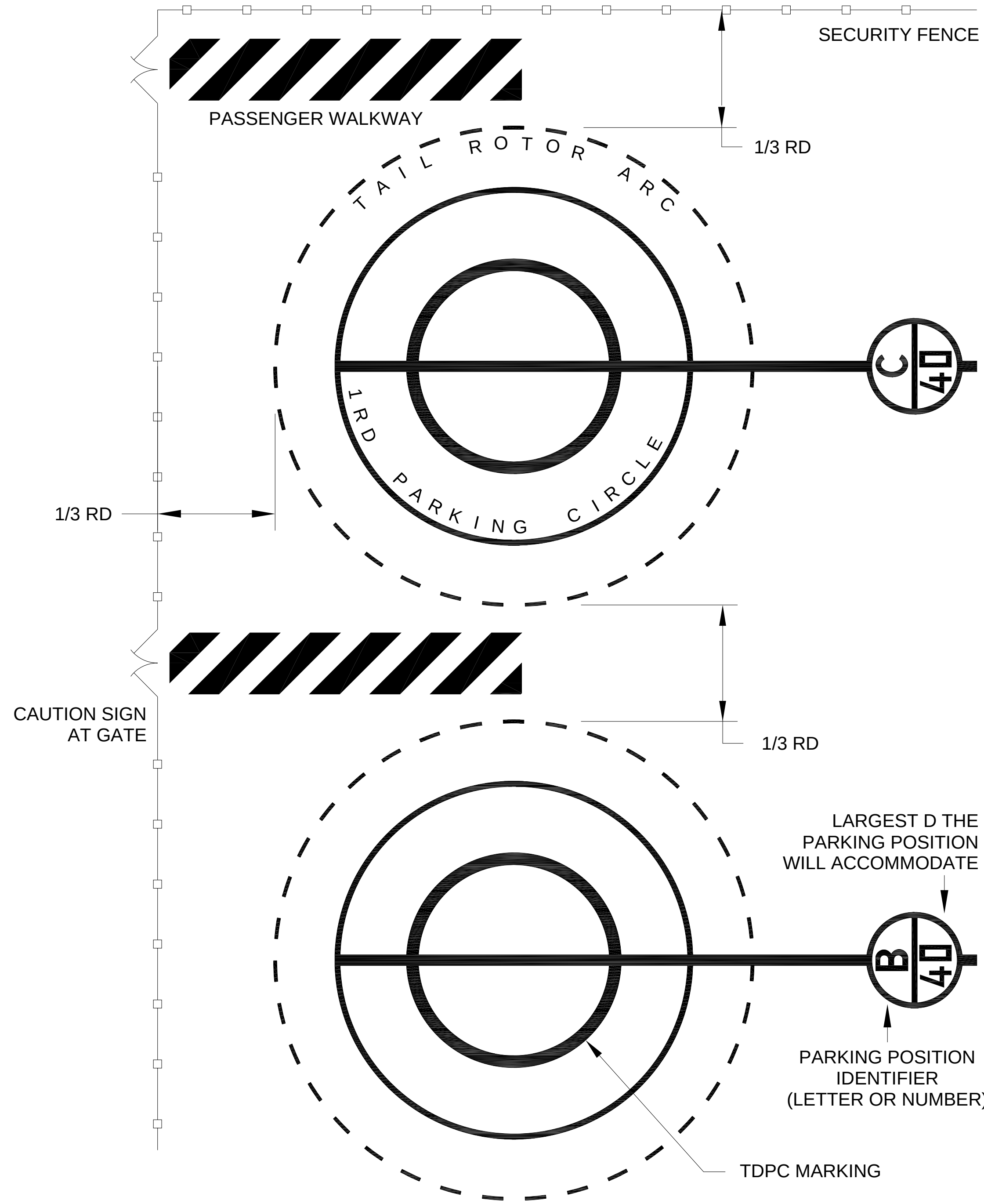


Notes:

1. Several markings (such as Parking Position Identifier and passenger walkways) have been omitted for clarity.

2. Minimum recommended clearance between the main rotor arcs :
   - Hover taxi operations: 1/3 RD of the larger helicopter, but not less than 10 ft [3 m].
   - Ground taxi operations: 10 ft [3 m]

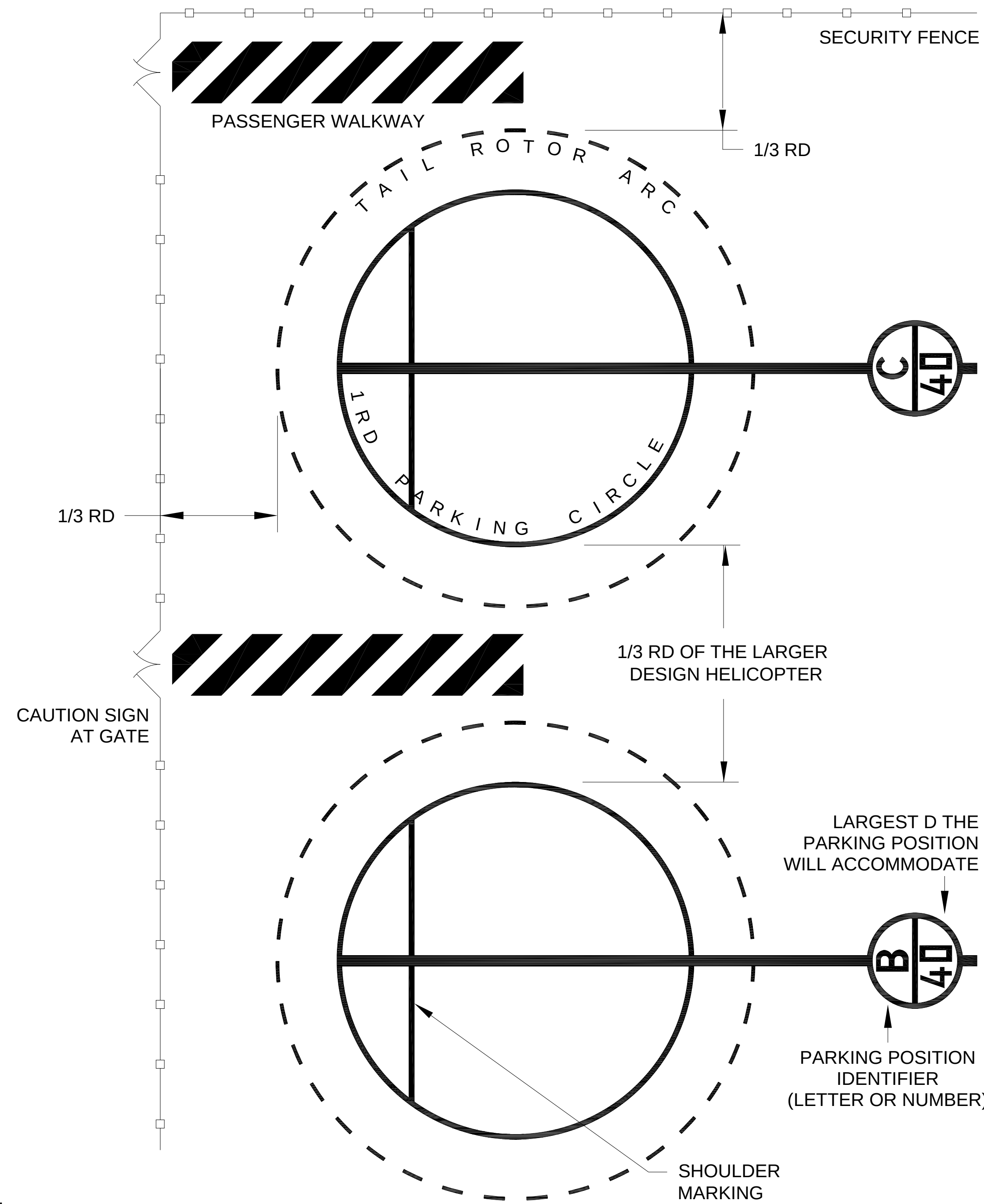
Figure 2-18. Parking Area Design – "Back-out" Parking Positions: General Aviation



Notes:

1. The design of these parking positions is based on the understanding that the helicopter may pivot about the mast prior to exiting the parking position.
2. This marking scheme is for paved areas only. For unpaved parking areas, all that is required is the RD marking.
3. Minimum clearance between the tail rotor arc and fixed objects:
   - Hover taxi operations: 1/3 RD of the larger helicopter but not less than 10 ft [3 m]
   - Ground taxi operations: 10 ft [3 m]

Figure 2-19. "Turn-around" Parking Position Marking: General Aviation



Notes:

1. The design of these parking positions is based on the understanding that the helicopter may pivot about the mast prior to exiting the parking position.

2. This marking scheme is for paved areas only. For unpaved parking areas, all that is required is the RD marking.

3. Minimum clearance between the tail rotor arc and fixed objects:
   - Hover taxi operations: 1/3 RD of the larger helicopter but not less than 10 ft [3 m]
   - Ground taxi operations: 10 ft [3 m]

Figure 2-20. "Taxi-through" and "Back-out" Parking Position Marking: General Aviation

b. Size. Parking position sizes are dependent upon the helicopter size. The clearance between parking positions are dependent upon the type of taxi operations (ground taxi or hover taxi) and the intended paths for maneuvering in and out of the parking position. The more demanding requirement will dictate what is required at a particular site. Usually, the parking area requirements for skid-equipped helicopters will be the most demanding. However, when the largest helicopter is a very large, wheeled aircraft (e.g., the S-61), and the skid-equipped helicopters are all much smaller, the parking requirements for wheeled helicopters may be the most demanding. If wheel-equipped helicopters taxi with wheels not touching the surface, parking areas should be designed based on hover taxi operations rather than ground taxi operations.

(1) If all parking positions are the same size, they must be large enough to accommodate the largest helicopter that will park at the heliport.

(2) When there is more than one parking position, the facility may be designed with parking positions of various sizes with at least one position that will accommodate the largest helicopter that will park at the heliport. Other parking positions may be smaller, designed for the size of the individual or range of individual helicopters planned to be parked at that position. Figure 2-21 on page 45 provides guidance on parking position identification, size, and weight limitations.

(3) "Taxi-through" parking positions are illustrated in Figure 2-16 on page 39. When this design is used for parking positions, the heliport owner and operator should take steps to ensure that all pilots are informed that "turn-around" or "back-up" departures from the parking position are not permitted.

(4) "Turn-around" parking positions are illustrated in Figure 2-17.

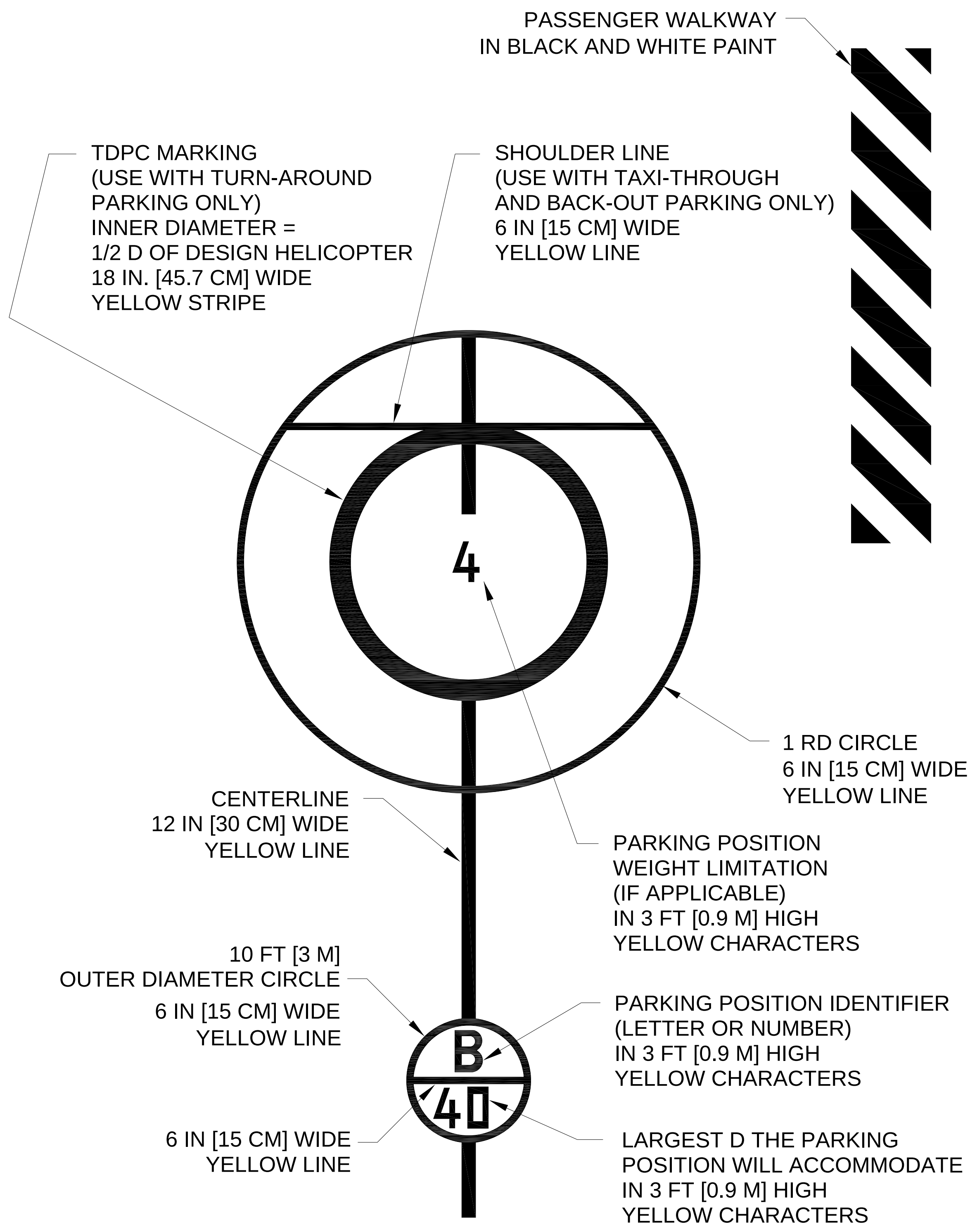
(5) "Back-out" parking positions are illustrated in Figure 2-18 on page 41. When this design is used for parking positions, the adjacent taxiway should be designed to accommodate hover taxi operations so that the width of the taxiway will be adequate to support "back-out" operations.

c. Parking Pads. If the entire area of the parking position is not paved, the smallest dimension of a paved parking pad must be a minimum of two times the maximum dimension (length or width, whichever is greater) of the undercarriage or the RD, whichever is less, of the largest helicopter that will use this parking position. The parking pad should be placed in the center of the parking position circle**.**

d. Walkways. At parking positions, marked walkways should be provided where practicable. The pavement should be designed to drain away from walkways.

e. Fueling. Helicopter fueling is typically accomplished with the use of a fuel truck or the use of a specific fueling area with stationary fuel tanks.

(1) Systems for storing and dispensing fuel must conform to Federal, state, and local requirements for petroleum handling facilities. Guidance is found in AC 150/5230-4, *Aircraft Fuel Storage, Handling, and Dispensing on Airports*, and National Fire Protection Association (NFPA) 403, *Standard for Aircraft Rescue and Fire Fighting Services at Airports*, and NFPA 418, *Standards for Heliports*.



Note: This marking scheme is for paved areas only. For an unpaved parking area, all that is required is the RD marking.

Figure 2-21. Parking Position Identification, Size, and Weight Limitations: General Aviation

(2) Fueling locations must be designed and marked to minimize the potential for helicopters to collide with the dispensing equipment. Fueling areas must be designed so there is no object tall enough to be hit by the main or tail rotor blades within a distance of RD from the center point of the position where the helicopter would be fueled (providing 0.5 rotor diameter tip clearance from the rotor tips). If this is not practical at an existing facility, long fuel hoses should be installed.

(3) Lighting. The fueling area should be lighted if night fueling operations are contemplated. Care should be taken to ensure that any light poles do not constitute an obstruction hazard.

f. Tiedowns. Recessed tiedowns may be installed to accommodate extended or overnight parking of based or transient helicopters. If tiedowns are provided, they must be recessed so as not to be a hazard to helicopters. Caution should be exercised to ensure that any depression associated with the tiedowns is of a diameter not greater than 1/2 the width of the smallest helicopter landing wheel or landing skid anticipated to be operated on the heliport surface. In addition, tiedown chocks, chains, cables and ropes should be stored off the heliport surface to avoid fouling landing gear. Guidance on recessed tiedowns can be found in AC 20-35, *Tiedown Sense.*

214. HELIPORT MARKERS AND MARKINGS. Markers and/or surface markings identify the facility as a heliport. Surface markings may be paint, reflective paint, reflective markers, or preformed material. Lines/markings may be outlined with a 6-inch-wide (15 cm) line of a contrasting color to enhance conspicuity. Markings that define the edges of a TLOF, FATO, taxiway or apron are placed within the limits of those areas. The following markers and markings are used.

a. Heliport Identification Marking. The identification marking identifies the location as a heliport, marks the TLOF and provides visual cues to the pilot.

(1) Standard Heliport Identification Symbol. The TLOF is marked with a white “H” marking. The height of the “H” is the lesser of 0.3D or 10 feet (3m). The “H” is located in the center of the TLOF and oriented on the axis of the preferred approach/departure path. A bar may be placed under the “H” when it is necessary to distinguish the preferred approach/departure direction. The proportions and layout of the letter “H” are illustrated in Figure 2-22 on page 48.

(2) Nonstandard Heliport Identification Marking. A distinctive marking, such as a company logo, may serve to identify the facility as a PPR heliport. However, nonstandard marking does not necessarily provide the pilot with the same degree of visual cueing as the standard heliport identification symbol. To compensate, the size of the safety area should be increased when the standard heliport identification symbol “H” is not used (see Table 2-1 on page 17).

b. TLOF Markings.

(1) TLOF Perimeter Marking. It is recommended that the TLOF perimeter be defined with markers and/or lines. See paragraph 208.a above and Table 2-1 on page 17 for guidance on increasing the size of the safety area if the TLOF perimeter is not marked.

(a) Paved TLOFs. The perimeter of a paved or hard surfaced TLOF is defined with a continuous, 12-inch-wide (30 cm), white line (see Figure 2-24 on page 49).

(b) Unpaved TLOFs. The perimeter of an unpaved TLOF is defined with a series of 12-inch-wide (30 cm), flush, in-ground markers, each approximately 5 feet (1.5 m) in length with end-to-end spacing of not more than 6 inches (15 cm). (See Figure 2-25 on page 51).

(2) Touchdown/Positioning Circle (TDPC) Marking. A touchdown/positioning circle marking is used to provide guidance to allow a pilot to touch down in a specific position on paved surfaces. When the pilot's seat is over the marking, the undercarriage will be inside the load-bearing area, and all parts of the helicopter will be clear of any obstacle by a safe margin. A TDPC marking is a yellow circle with an inner diameter of 0.5 D and a line width of 18 in (0.5 m). A TDPC marking is located in the center of a TLOF. See Figure 2-22 on page 48. At PPR heliports where the TLOF width is less than 16 feet, the TDPC marking may be omitted.

(3) TLOF Size and Weight Limitations. The TLOF is marked to indicate the length and weight of the largest helicopter for which it is designed, as shown in Figure 2-22 on page 48. These markings are contained in a box that is located in the lower right-hand corner of a rectangular TLOF, or on the right-hand side of the "H" of a circular TLOF, when viewed from the preferred approach direction. The box is 9 feet square (2.7m), or for TLOFs less than 24 feet (7.3m), no less than 5 feet (1.5m) square. The numbers are 3 feet (0.9 m) high or, for smaller heliports, no less than 20 inches (51 cm). If necessary, this marking may interrupt the Touchdown/Positioning Circle marking but may not extend to within the circle, except for circular TLOFs. (See Figure C–1 on page 187.) The numbers are black with a white background. This marking is optional at a TLOF with a turf surface. At PPR heliports this marking is optional, since the operator should ensure that all pilots using the facility are thoroughly knowledgeable with this and any other facility limitations.

(a) TLOF Size Limitation. This number is the length (D) of the largest helicopter for which it is designed, as shown in Figure 2-22 on page 48. The marking consists of the letter "D" followed by the dimension in feet. Metric equivalents are not used for this purpose. This marking is centered in the lower section of the TLOF size/weight limitation box.

(b) TLOF Weight Limitations. If a TLOF has limited weight-carrying capability, it is marked with the maximum takeoff weight of the design helicopter, in units of thousands of pounds, as shown in Figure 2-22 on page 48. Metric equivalents are not used for this purpose. This marking is centered in the upper section of a TLOF size/weight limitation box. If the TLOF does not have a weight limit, a diagonal line, extending from the lower left hand corner to the upper right hand corner, should be added to the upper section of the TLOF size/weight limitation box (see Figure 2-22 on page 48).

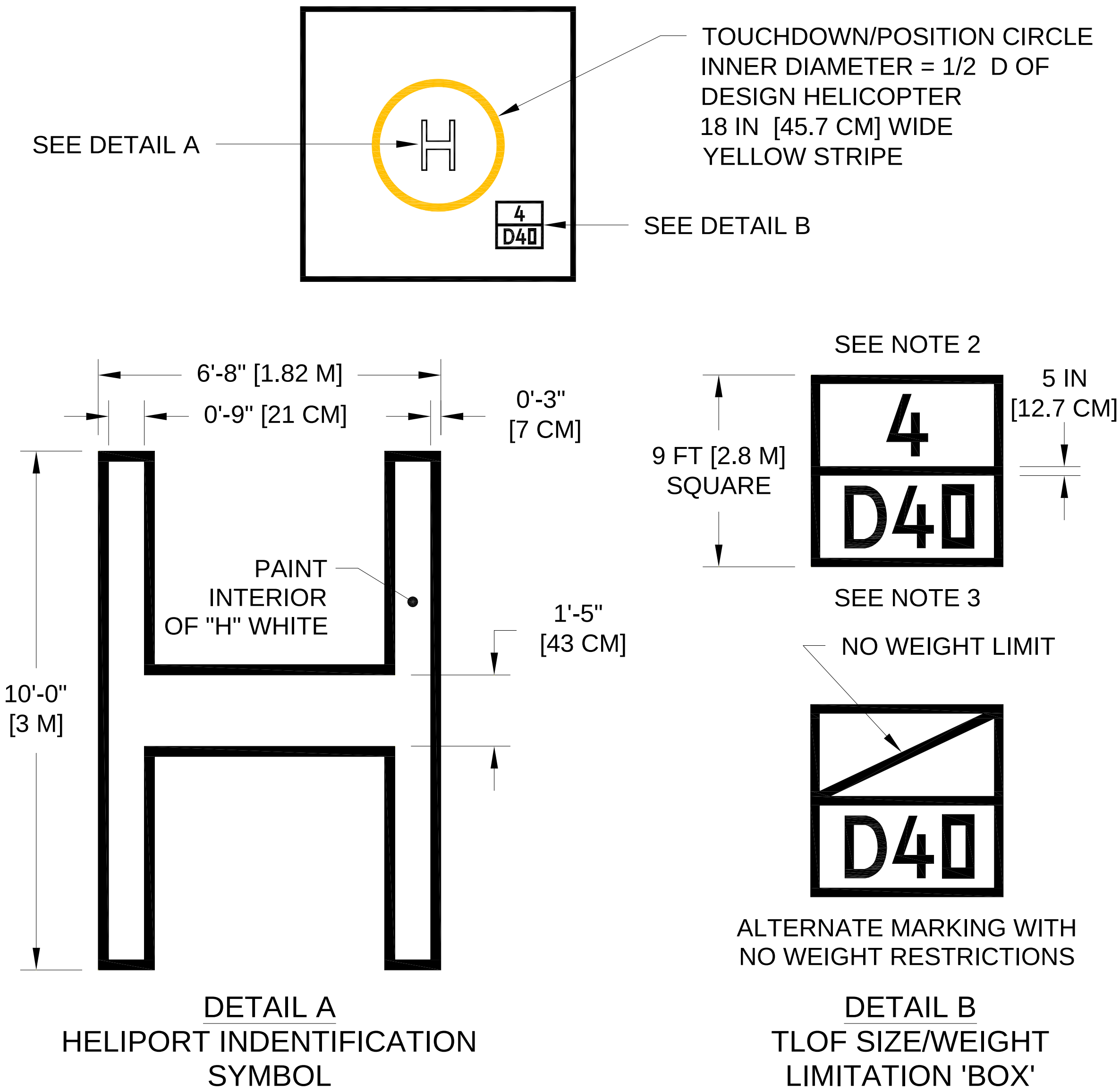
c. LBA Markings. At PPR heliports, the load bearing area may be increased without a corresponding increase in the length and width or diameter of the FATO. The LBA outside the TLOF is marked with 12-inch-wide (30 cm) diagonal black and white stripes. See Figure 2-23 for marking details.

d. FATO Markings.

(1) FATO Perimeter Marking. The perimeter of a load-bearing FATO is defined with markers and/or lines. The FATO perimeter is not marked if any portion of the FATO is not a load-bearing surface. In such cases, the perimeter of the load-bearing area should be marked (see paragraph (b) below).

(a) Paved FATOs. The perimeter of a paved load-bearing FATO is defined with a 12-inch-wide (30 cm) dashed white line. The corners of the FATO are defined, and the perimeter marking segments are 12 inches in width, approximately 5 feet (1.5 m) in length, and with end-to-end spacing of approximately 5 feet (1.5 m). (See Figure 2-24 on page 49).

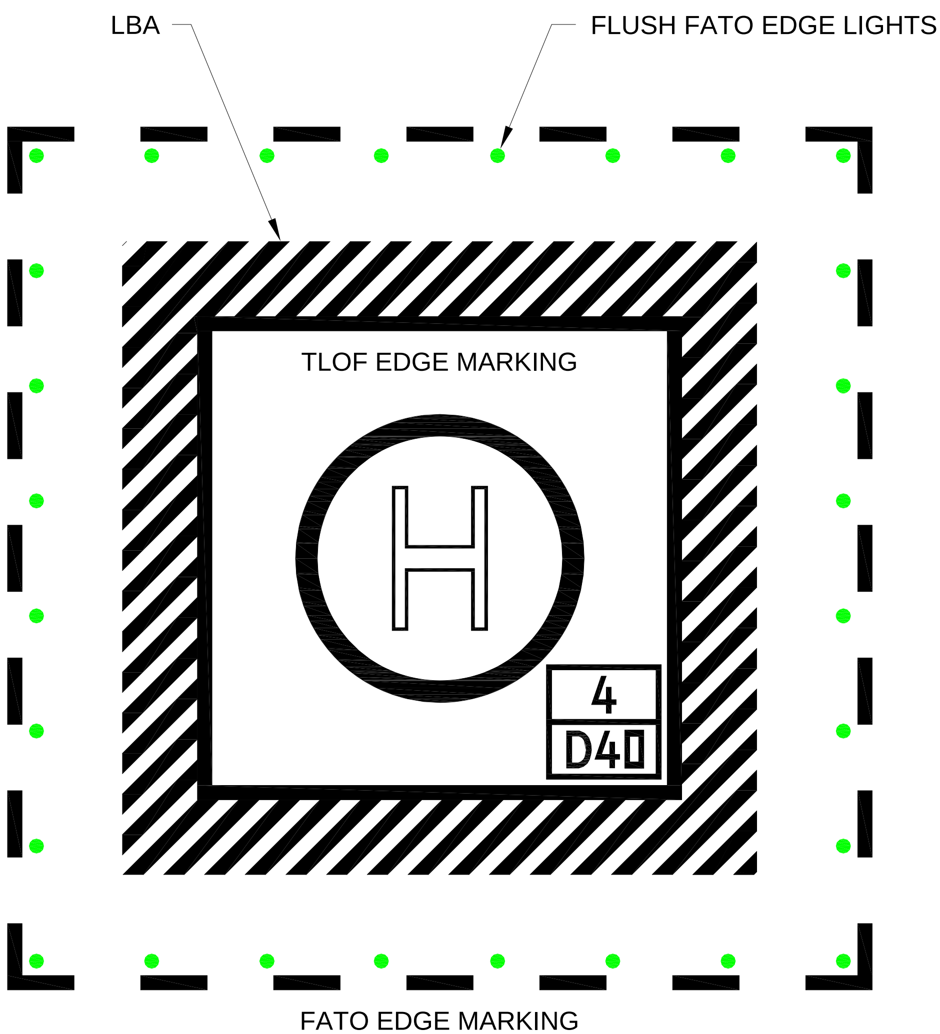
(b) Unpaved FATOs. The perimeter of an unpaved load-bearing FATO is defined with 12-inch-wide (30 cm), flush, in-ground markers. The corners of the FATO are defined, and the rest of the perimeter markers are approximately 5 feet (1.5 m) in length, and have end-to-end spacing of approximately 5 feet (1.5 m). (See Figure 2-25 on page 51.)



Notes:

1. See Appendix C for the form and proportion of the numbers used in the TLOF Size and Limitation Box.
2. "4" indicates the maximum takeoff weight (4,000 lbs) of the TLOF design helicopter, in units of thousands of pounds.
3. "D40" indicates the overall length of the largest helicopter (40 ft) for which the TLOF is designed.

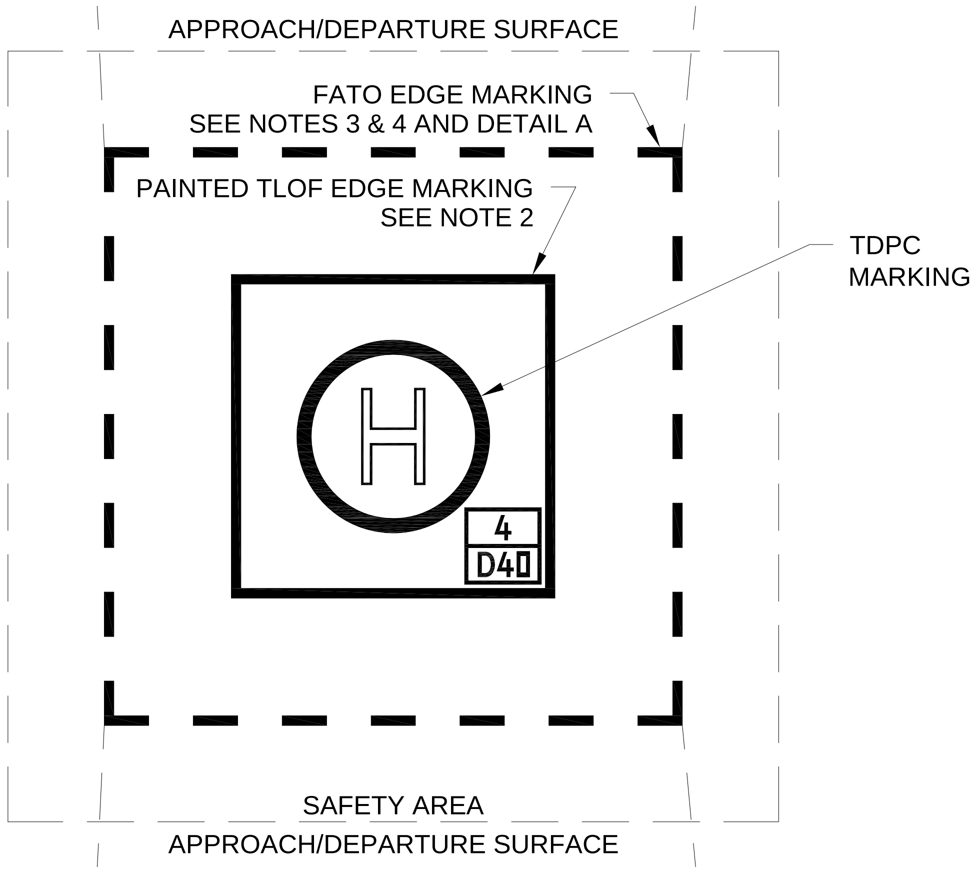
Figure 2-22. Standard Heliport Identification Symbol, TLOF Size and Weight Limitations: General Aviation



Notes:

1. Expanded load bearing markings begin flush with TLOF edge markings and end at the edge of the LBA.
2. Expanded Load bearing markings are defined with 12 in [30 cm] wide black and white stripes on a 45° angle.

Figure 2-23. LBA Marking: General Aviation

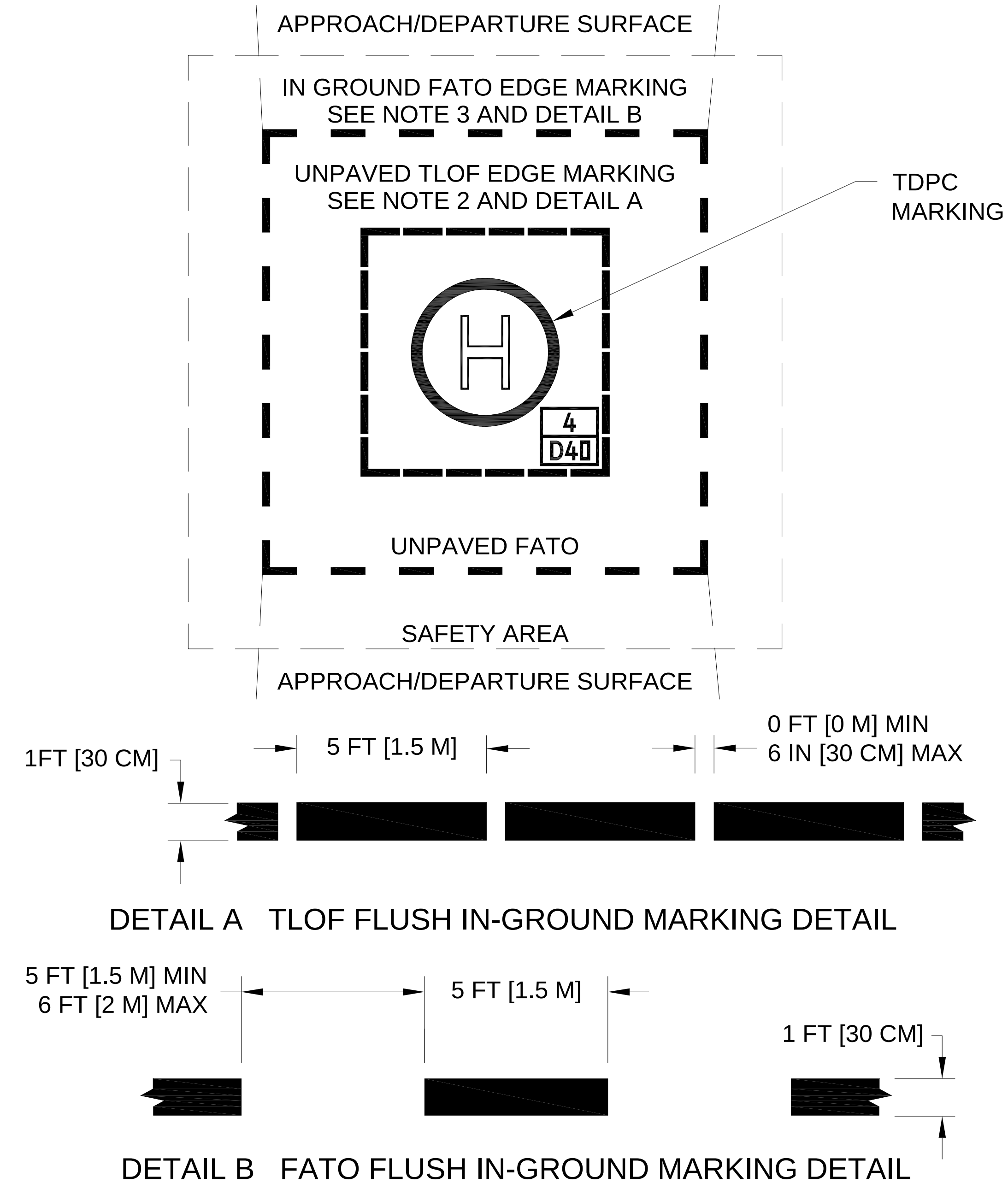


DETAIL A FATO MARKING DETAIL

Notes:

1. The perimeter of the TLOF and FATO are marked.
2. The perimeter of a paved or hard surfaced TLOF is defined with a continuous 12 in [30 cm] white line.
3. Paved FATO perimeters are defined with a 12 in [30 cm] wide dashed line per Detail A.
4. Unpaved FATO perimeters are defined with a flush in-ground marker per Detail A.
5. See Figure 2-22 for " H", Touchdown/Position, Overall Length and Weight Limitation box dimensions.

Figure 2-24. Paved TLOF/Paved FATO – Paved TLOF/ Unpaved FATO – Marking: General Aviation



Notes:

1. The perimeter of the TLOF and FATO are marked.
2. An unpaved TLOF perimeter is defined with flush in-ground markers per Detail A.
3. An unpaved FATO perimeter is defined with flush in-ground markers per Detail B.
4. See Figure 2-22 for "H", Touchdown/Position, Overall Length and Weight Limitation box dimensions.

Figure 2-25. Unpaved TLOF/Unpaved FATO – Marking: General Aviation

e. Flight Path Alignment Guidance Marking. An optional flight path alignment guidance marking consists of one or more arrows to indicate the preferred approach/departure direction(s). It is marked on the TLOF, FATO and/or safety area surface as shown in Figure 2-11 on page 32. The shaft of the arrow(s) is 18 in. (50 cm) in width and at least 10 feet (3 m) in length. The markings must be in a color which provides good contrast against the background color of the surface on which they are marked. In the case of a flight path limited to a single approach direction or a single departure path, the arrow marking is unidirectional. In the case of a heliport with only a bidirectional approach /takeoff flight path available, the arrow marking is bidirectional.

f. Taxiway and Taxi Route Markings.

(1) Paved Taxiway Markings. The centerline of a paved taxiway is marked with a continuous 6-inch (15 cm) yellow line. Both edges of the paved portion of the taxiway are marked with two continuous 6- inch wide (15 cm) yellow lines spaced 6 inches (15 cm) apart. Figure 2-13 on page 34 illustrates taxiway centerline and edge markings.

(2) Unpaved Taxiway Markings. Edge markers are used to provide strong visual cues to pilots. Edge markers may be either raised or in-ground flush markers. They are longitudinally spaced at approximately 15-foot (5 m) intervals on straight segments and at approximately 10-foot (3 m) intervals on curved segments. Figure 2-14 on page 35 and Figure 2-15 on page 36 illustrate taxiway edge markings.

(a) Raised-edge markers are blue, 4 inches (10 cm) in diameter, and 8 inches (20 cm) high, as illustrated in Figure 2-14 on page 35.

(b) In-ground, flush edge markers are yellow, 12 inches (30 cm) wide, and approximately 5 feet (1.5 m) long.

(3) Raised Edge Markers in Grassy Areas. Raised edge markers are sometimes obscured by tall grass. The heliport operator should address this problem with a 12-inch diameter (30 cm) diameter solid material disk around the pole supporting the raised marker.

(4) Taxiway to Parking Position Transition Requirements. For paved taxiways and parking areas, taxiway centerline markings continue into parking positions and become the parking position centerlines.

g. Helicopter Parking Position Markings. Helicopter parking positions have the following markings:

(1) Paved Parking Position Identifications. Parking position identifications (numbers or letters) are marked if there is more than one parking position. These markings are yellow characters 3 feet (0.9 m) high. (See Figure 2-21 on page 45 and Figure C–1 on page 187).

(2) Rotor Diameter Circle. A 6-inch-wide (15 cm), solid yellow line defines a circle of the rotor diameter of the largest helicopter that will park at that position. The RD is defined by the outside diameter of the circle. In paved areas, this is a painted line (see Figure 2-21 on page 45). In unpaved areas, this line is defined by a series of flush markers, 6 inches (15 cm) in width, a maximum of 5 feet (1.5 m) in length, and with end-to-end spacing of approximately 5 feet (1.5 m).

(3) Touchdown/Positioning Circle (TDPC) Marking. An optional touchdown/positioning circle marking provides guidance to allow a pilot to touch down in a specific position on paved surfaces.

When the pilot's seat is over the marking, the undercarriage will be inside the load-bearing area, and all parts of the helicopter will be clear of any obstacle by a safe margin. A TDPC marking is a yellow circle with an inner diameter of 0.5 D and a line width of 18 in (0.5 m). A TDPC marking is located in the center of a parking area. See Figure 2-21 on page 45 and Figure 2-24 on page 50. A TDPC marking is recommended for "turn-around" parking areas.

(4) Maximum Length Marking. This marking on paved surfaces indicates the D of the largest helicopter that the position is designed to accommodate (e.g., 49). This marking is in yellow characters at least 3 feet (0.9 m) high. (See Figure 2-21 on page 45 and Figure C–1 on page 187.)

(5) Parking Position Weight Limit. If a paved parking position has a weight limitation, it is stated in units of 1,000 pounds as illustrated in Figure 2-21 on page 45. (A 4 indicates a weight-carrying capability of up to 4,000 pounds. Metric equivalents are not be used for this purpose.) This marking consists of yellow characters 3 feet (0.9 m) high. A bar may be placed under the number to minimize the possibility of being misread. (See Figure 2-21 on page 45, Figure 2-24 on page 49, and Figure C–1 on page 187.

(6) Shoulder Line Markings. Optional shoulder line markings are used for paved parking areas (Figure 2-21 on page 45) to ensure safe rotor clearance. A 6-inch-wide (15 cm) solid yellow shoulder line, perpendicular to the centerline and extending to the RD marking, is located so it is under the pilot's shoulder such that the main rotor of the largest helicopter for which the position is designed will be entirely within the rotor diameter parking circle (see Figure 2-21 on page 45). Use 0.25D from the center of parking area to define the location of shoulder line. A shoulder line marking is recommended for "taxi-through" and "back-out" parking areas.

h. Walkways. Figure 2-21 on page 45 illustrates one marking scheme.

i. Closed Heliport. All markings of a permanently closed heliport, FATO, or TLOF should be obliterated. If it is impractical to obliterate markings, a yellow "X" should be placed over the "H" as illustrated in Figure 2-26 on page 54. The yellow "X" should be large enough to ensure early pilot recognition that the heliport is closed. The wind cone(s) and other visual indications of an active heliport should also be removed.

j. Marking Sizes. See Appendix C on page 187 for guidance on the proportions of painted numbers.

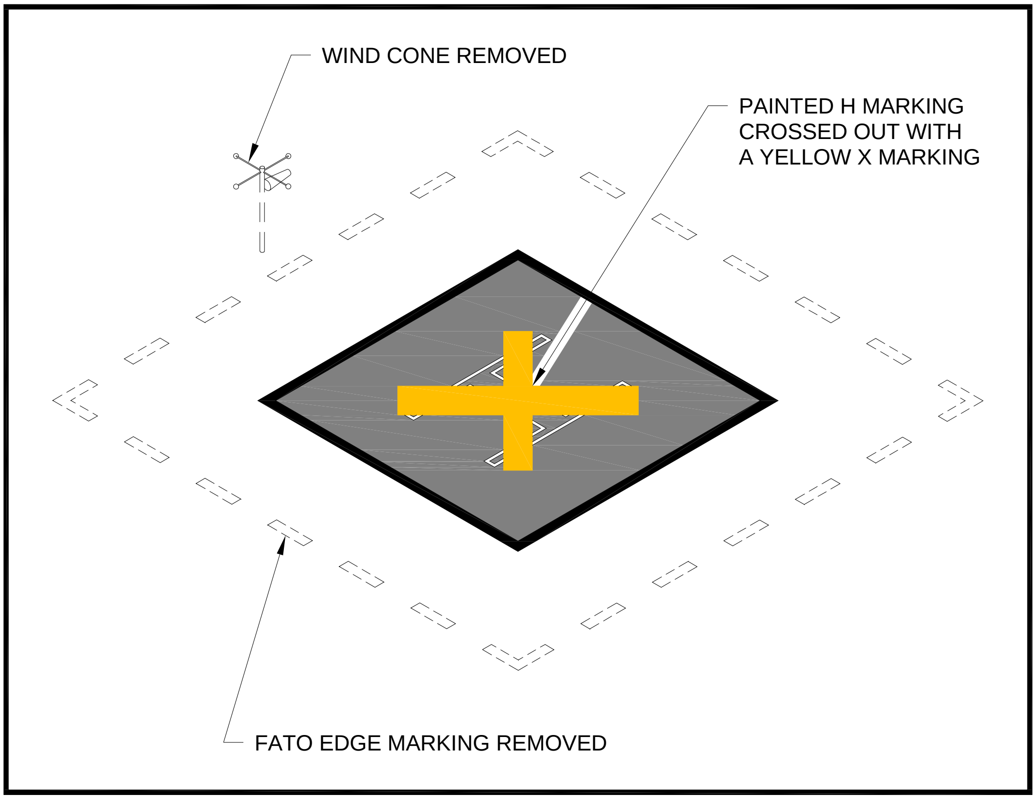


Figure 2-26. Marking a Closed Heliport: General Aviation

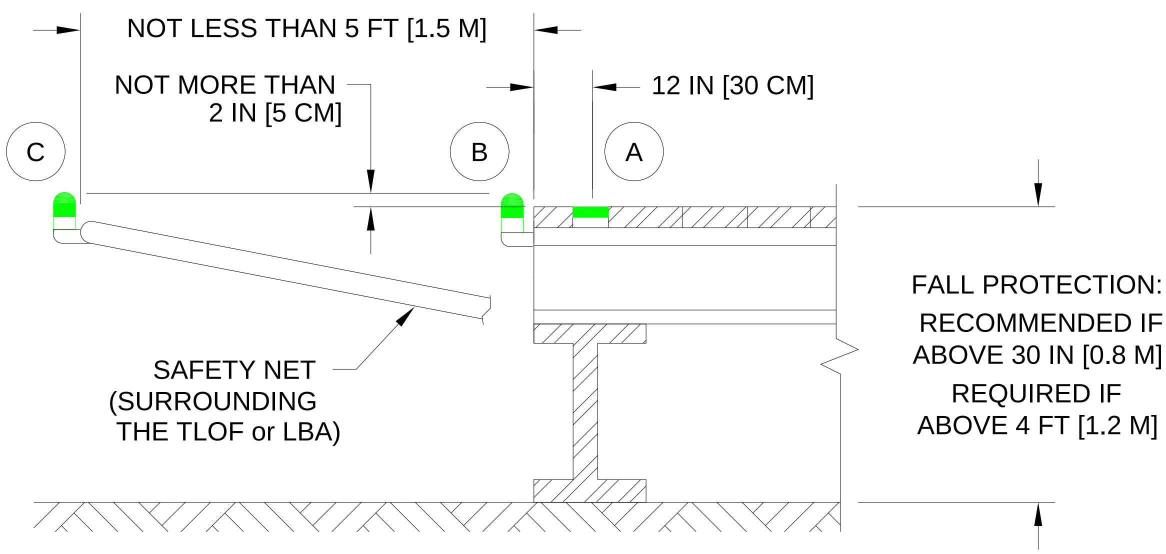
215. HELIPORT LIGHTING. For night operations, the heliport must be lighted with FATO and/or TLOF perimeter lights as described below. Where flush lights are specified, the fixtures and installation method must be designed to support point loads of the design helicopter transmitted through a skid or wheel.

a. TLOF Perimeter Lights. Flush green lights meeting the requirements of FAA Airports Engineering Brief 87, *Heliport Lighting*[1], are used to define the TLOF perimeter. A minimum of four light fixtures is required per side of a square or rectangular TLOF, except at PPR facilities, for which the minimum recommended number is three. A light is located at each corner, with additional lights uniformly spaced between the corner lights. It is recommended each side comprise an odd number of lights, thereby including lights along the centerline of the approach. To define a circular TLOF, an even number of lights, with a minimum of eight, are uniformly spaced. The maximum spacing of lights is 25 feet (7.6 m). Flush lights are located within 1 foot (30 cm) (inside or outside) of the TLOF perimeter. In areas where it snows, the outside edge is the preferred location, as lights on the inside edge of the TLOF are prone to breakage during snow removal.

(1) Elevated TLOF Perimeter Lights. Raised, omnidirectional lights meeting the requirements of EB 87 may be used, located on the outside edge of the TLOF or the outer edge of the safety net, as shown in Figure 2-27 on page 55. In areas where it snows, the outer edge of the safety net is the preferred location, as lights on the outside edge of the TLOF are prone to breakage during snow removal. Lighting

[1] As of the date of this draft, EB 87 has not been completed. Guidance on heliport lighting will be published as soon as possible.

on the outer edge of the safety net also provides better visual cues to pilots at a distance from the heliport since it outlines a larger area. The raised lights must not penetrate a horizontal plane at the TLOF elevation by more than 2 inches (5 cm).



Three possible locations for TLOF/LBA edge lighting:

- (A) Flush edge fixtures
- (B) Omni-directional light, mounted off TLOF/LBA edge
- (C) Omni-directional light, mounted off outer edge of safety net (preferred location in snow areas)

Figure 2-27. Elevated TLOF/LBA – Perimeter Lighting: General Aviation

(2) PPR facilities. Flush lights are recommended for PPR heliports, but raised omnidirectional lights may be used if only the TLOF is load bearing. The raised lights should be located outside and within 10 feet (3m) of the edge of the TLOF and should not penetrate a horizontal plane at the TLOF elevation by more than 2 inches (5 cm). When the load-bearing area (LBA) is larger than the TLOF, perimeter lights may be mounted on the outer edge of the LBA or the inner or outer edge of the safety net.

b. Load-bearing FATO Perimeter Lights. Green lights meeting the requirements of EB 87 define the perimeter of a load bearing FATO. The FATO perimeter is not lighted if any portion of the FATO is not a load-bearing surface. A minimum of four flush or raised light fixtures is required per side of a square or rectangular FATO, except at PPR facilities, for which the minimum recommended number is three. A light is located at each corner, with additional lights uniformly spaced between the corner lights. It is recommended each side comprise an odd number of lights, thereby including lights along the centerline of the approach. To define a circular FATO, an even number of lights, with a minimum of eight, are uniformly spaced. The maximum spacing of lights is 25 feet (7.6 m). Flush lights are located within 1 foot (30 cm) (inside or outside) of the FATO perimeter (See Figure 2-28 on page 57). In areas where it snows, the outside edge is the preferred location, as lights on the inside edge of the FATO are prone to breakage during snow removal. A square or rectangular pattern of FATO perimeter lights are recommended even if the TLOF is circular. At a distance during nighttime operations, a square or rectangular pattern of FATO perimeter lights provides the pilot with better visual cues than a circular pattern. In the case of an elevated FATO with a safety net, the perimeter lights are mounted in a similar manner as discussed in paragraph 215.a(1) above. If raised FATO perimeter lights are used, they should be no more than 8 inches (20 cm) high, and located 10 feet (3 m) from the FATO perimeter. (See Figure 2-29 on page 58.) When a heliport on an airport is sited near a taxiway, there may be a concern that the green taxiway centerline lights could be confused with the FATO perimeter lights. In such cases, yellow lights may be used as an alternative color for marking the FATO.

c. Floodlights. If ambient light does not adequately illuminate markings for night operations, floodlights should be used to illuminate the TLOF, the FATO, and/or the parking area. To eliminate the need for tall poles, these floodlights may be mounted on adjacent buildings. Care should be taken, however, to place floodlights clear of the TLOF, the FATO, the safety area, and the approach/departure surfaces, and transitional surfaces. Care should be taken to ensure that floodlights and their associated hardware do not constitute an obstruction hazard. Floodlights should be aimed down and provide adequate illumination on the surface. Floodlights that might interfere with pilot vision during takeoff and landings should be capable of being turned off by pilot control or at pilot request.

d. Landing Direction Lights. Landing direction lights are an optional feature to be installed when it is necessary to provide directional guidance. Landing direction lights are a configuration of five white, omnidirectional lights meeting the standards of EB 87, on the centerline of the preferred approach/departure path. These lights are spaced at 15-foot (5 m) intervals beginning at a point not less than 20 feet (6 m) and not more than 60 feet (18 m) from the TLOF perimeter and extending outward in the direction of the preferred approach/departure path, as illustrated in Figure 2-30 on page 59.

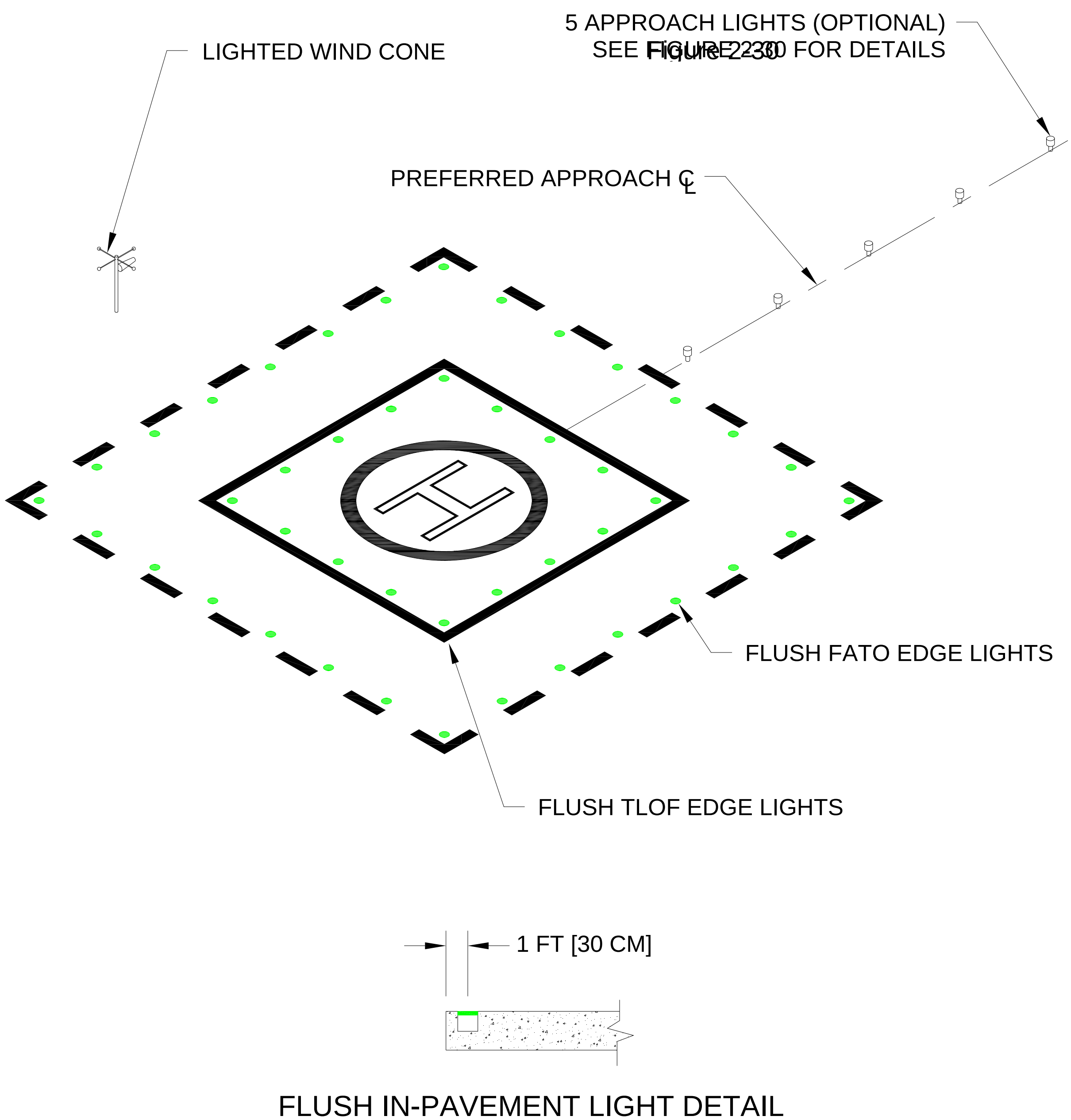
e. Flight Path Alignment Lights. Flight path alignment lights meeting the requirements of FAA Engineering Brief 87 are optional. They are placed in a straight line along the direction of approach and/or departure flight paths. The lights may extend across the TLOF, FATO, safety area or any suitable surface in the immediate vicinity of the FATO or safety area. Three or more white lights are spaced at 5 feet (1.5 m) to 10 feet (3.0 m). (See Figure 2-11 on page 32.)

f. Taxiway and Taxi Route Lighting.

(1) Taxiway Centerline Lights. Taxiway centerlines are defined with flush bidirectional green lights meeting the standards of AC 150/5345-46 for type L-852A (straight segments) or L-852B (curved segments). These lights are spaced at maximum 50-foot (15 m) longitudinal intervals on straight segments and at maximum 25-foot (7.5 m) intervals on curved segments, with a minimum of four lights needed to define the curve. Taxiway centerline lights may be uniformly offset no more than two feet to ease painting the taxiway centerline. Green retroreflective markers meeting requirements for type II markers in AC 150/5345-39, *Specification for L-853, Runway and Taxiway Retroreflective Markers*, may be used in lieu of the L-852A or L-852B lighting fixtures.

(2) Taxiway Edge Lights. Omnidirectional blue lights are used to light the edges of a taxiway. Blue retroreflective markers may be used to identify the edges of the taxiway in lieu of lights. When retroreflective markers are used, they must be no more than 8 inches (20 cm) tall.

(a) Straight Segments. Lights are spaced at 50 feet (15.2 m) longitudinal intervals on straight segments.

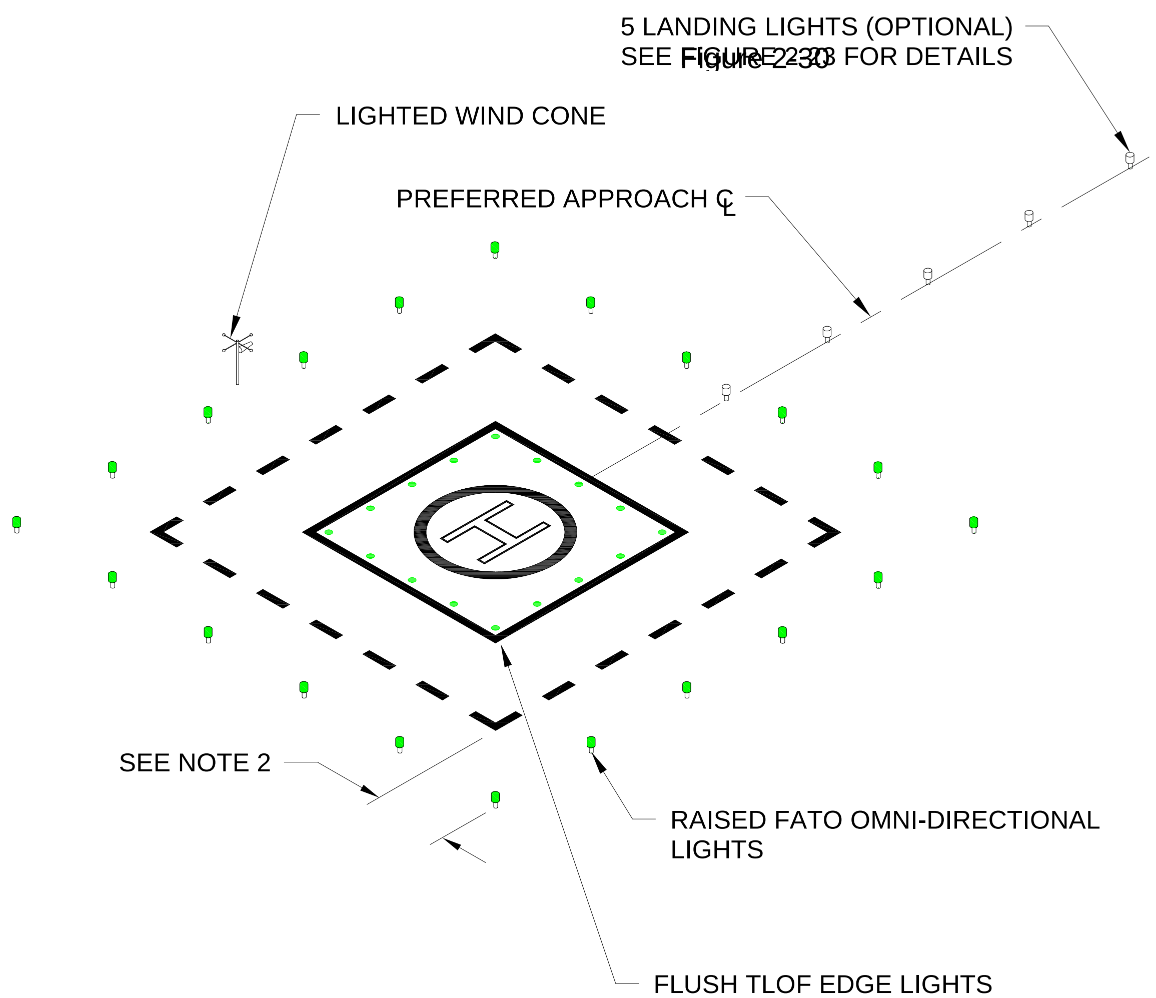


Notes:

1. Flush FATO and TLOF perimeter lights may be installed inside or outside within 1 ft [30 cm] of the FATO and TLOF respective perimeters.

2. Overall length and weight limitation box is omitted for clarity.

Figure 2-28. TLOF/FATO Flush Perimeter Lighting: General Aviation



Notes:

1. Flush FATO and TLOF perimeter lights may be installed inside or outside within 1 ft [30 cm] of the FATO and TLOF respective perimeters.
2. Raised FATO lights may be installed 10 ft [3 m] outside the FATO perimeter.
3. Overall length and weight limitation box is omitted for clarity.

Figure 2-29. TLOF Flush and FATO Raised Perimeter Lighting: General Aviation

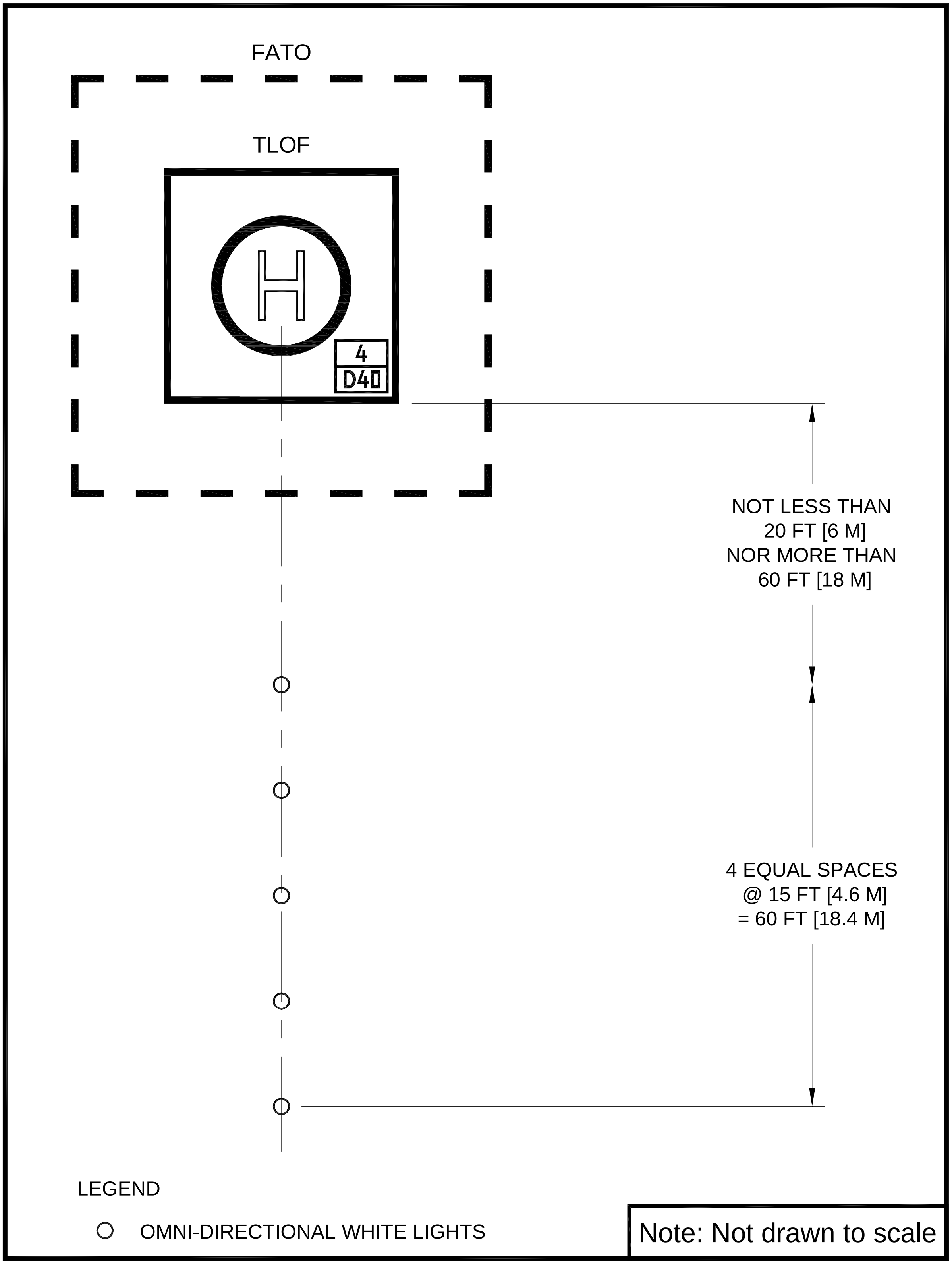


Figure 2-30. Landing Direction Lights: General Aviation

(b) Curved Segments. Curved taxiway edges require shorter spacing of edge lights. The spacing is determined based on the radius of the curve. The applicable spacing for curves is shown in Figure 17 of AC 150/5340-30, *Design and Installation Detail for Airport Visual Aids*. The taxiway edge lights are uniformly spaced. Curved edges of more than 30 degrees from point of tangency (PT) of the taxiway section to PT of the intersecting surface must have at least three edge lights. For radii not listed in Figure 17 determine spacing by linear interpolation.

(c) Paved Taxiways. Flush lights must meet the standards of AC 150/5345-46 for type L-852T .

(d) Unpaved Taxiways. Raised lights must meet the standards of AC 150/5345-46 for type L-861T. The lateral spacing for the lights or reflectors is equal to the RD of the design helicopter, but not more than 35 feet.

g. Heliport Identification Beacon. A heliport identification beacon is optional equipment. It should be installed when it is needed to aid the pilot in visually locating the heliport. When installed, the beacon, flashing white/green/yellow at the rate of 30 to 45 flashes per minute, is located on or close to the heliport. Guidance on heliport beacons is found in AC 150/5345-12, *Specification for Airport and Heliport Beacon*. It is permissible for the beacon to be pilot controllable such that it is “on” only when required.

216. MARKING AND LIGHTING OF DIFFICULT-TO-SEE OBJECTS. Unmarked wires, antennas, poles, cell towers, and similar objects are often difficult to see, even in the best daylight weather, in time for a pilot to successfully take evasive action. While pilots can avoid such objects during en route operations by flying well above them, approaches and departures require operations near the ground where obstacles may be a factor. This paragraph discusses the marking and lighting of objects near, but outside and below the approach/departure surface. Guidance on marking and lighting objects is contained in AC 70/7460-1, *Obstruction Marking and Lighting*.

a. Airspace. If difficult-to-see objects penetrate the object identification surfaces illustrated in Figure 2-31 on page 61, these objects must be marked to make them more conspicuous. If operations are conducted at a heliport between dusk and dawn, these difficult-to-see objects must be lighted. The object identification surfaces in Figure 2-31 on page 61 are described as follows:

(1) In all directions from the safety area except under the approach/departure paths, the object identification surface starts at the safety area perimeter and extends out horizontally for a distance of 100 feet (30.5 m).

(2) Under the approach/departure surface, the object identification surface starts from the outside edge of the FATO and extends horizontally out for a distance of 800 feet (244 m). From this point, the object identification surface extends out for an additional distance of 3,200 feet (975 m) while rising on an 8:1 slope (8 units horizontal in 1 unit vertical). From the point 800 feet (244 m) from the FATO perimeter, the object identification surface is 100 feet (30.5 m) beneath the approach/departure surface.

(3) The width of this object identification surface under the approach/departure surface increases as a function of distance from the safety area. From the safety area perimeter, the object identification surface extends laterally to a point 100 feet (30.5 m) outside the safety area perimeter. At the upper end of the surface, the object identification surface extends laterally 200 feet (61 m) on either side of the approach/departure path.

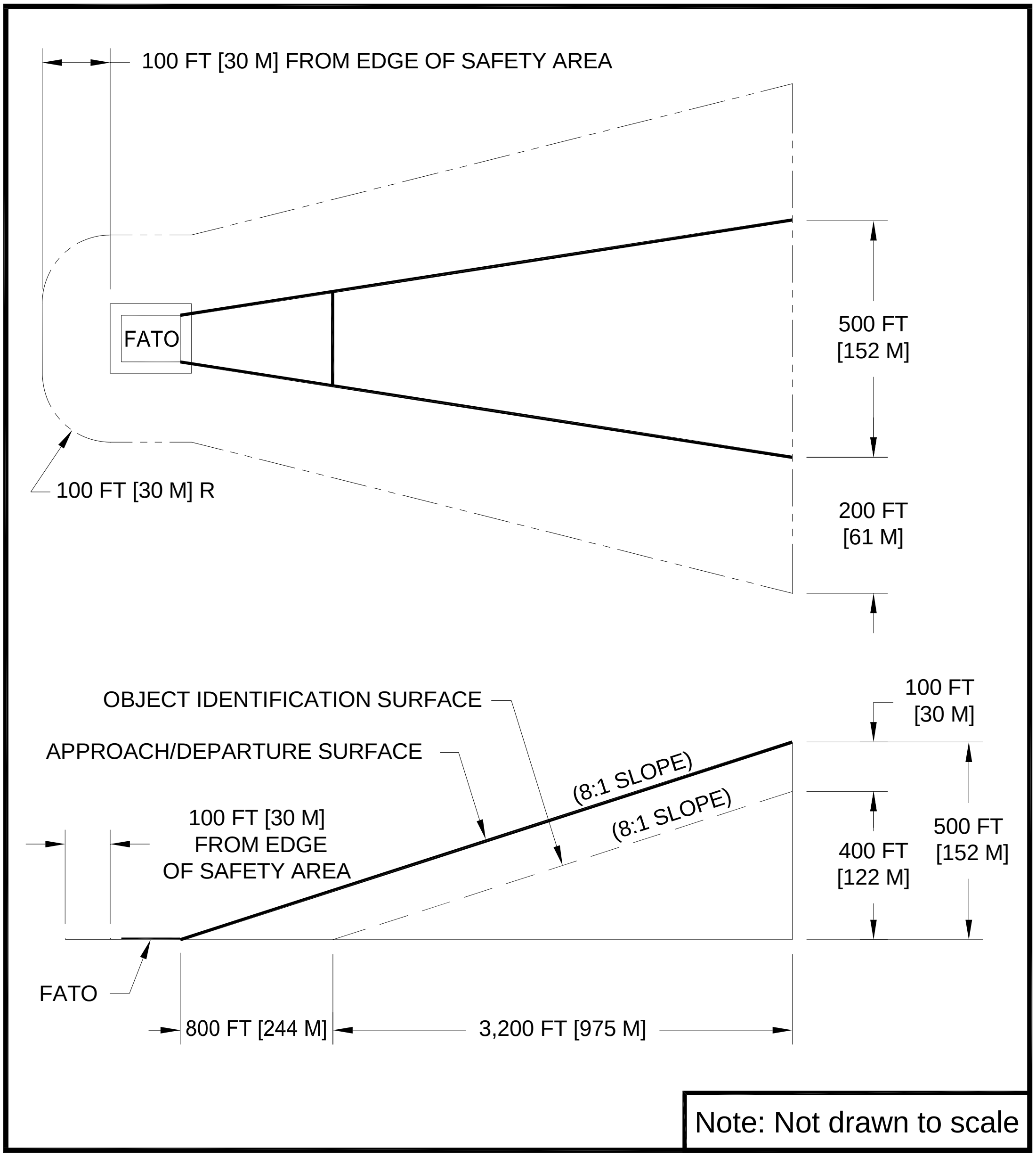


Figure 2-31. Airspace Where Marking and Lighting are Recommended: General Aviation

b. Shielding of Objects. If there are a number of objects close together, it may not be necessary to mark all of them if they are shielded. To meet the shielding guidelines an object must be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and must be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation. Additional guidance on this topic may be found in 14 CFR part 77.9, *Construction or alteration requiring notice*.

c. Equipment/Object Marking. Heliport maintenance and servicing equipment, as well as other objects used in the airside operational areas, should be made conspicuous with paint, reflective paint, reflective tape, or other reflective markings. Reference AC 150/5210-5, *Painting, Marking, and Lighting of Vehicles Used on an Airport*.

217. SAFETY CONSIDERATIONS. Some safety enhancements to be considered in the design of a heliport are discussed below. Other areas such as the effects of rotor downwash may need to be addressed based on site conditions and the design helicopter.

a. Security. The operational areas of a heliport must be kept clear of people, animals, and vehicles. The method used to control access depends upon the helicopter location and types of potential intruders.

(1) Safety Barrier. At ground-level general aviation heliports, one control method is to erect a safety barrier around the helicopter operational areas. This barrier may take the form of a fence, wall, or hedge. It must be no closer to the operating areas than the outer perimeter of the safety area. Barriers must not penetrate any approach /departure (primary or transitional) surface. Thus, in the vicinity of the approach/departure paths, the barrier may need to be well outside the outer perimeter of the safety area.

(2) Any barrier must be high enough to present a positive deterrent to persons inadvertently entering an operational area and yet low enough to be non-hazardous to helicopter operations.

(3) Access to airside areas must be controlled in a manner commensurate with the barrier (e.g. a fence should contain a locked gate). Access points should display a cautionary sign similar to that illustrated in Figure 2-32 on page 63.

b. Rescue and Fire-Fighting Services. Heliports must meet State and local rescue and fire-fighting regulations. A fire hose cabinet or extinguisher must be provided at each access gate/door and each fueling location. At elevated TLOFs, fire hose cabinets, fire extinguishers, and other fire-fighting equipment must be located adjacent to, but below the level of, the TLOF. Information is available in NFPA 418, *Standards for Heliports*, and NFPA 403, *Standard for Aircraft Rescue and Fire-Fighting Services at Airports*. NFPA standards are available at National Fire Protection Association web site at http://www.nfpa.org.

c. Communications. A Common Traffic Advisory Frequency (CTAF) radio may be used to provide arriving helicopters with heliport and traffic advisory information but may not be used to control air traffic. The Federal Communications Commission (FCC) should be contacted for information on CTAF licensing.

d. Weather Information. An automated weather observing system (AWOS) measures and automatically broadcasts current weather conditions at the heliport site. When an AWOS is installed, it must be located at least 100 feet (30 m) and not more than 700 feet (213 m) from the TLOF. Locate the AWOS so its instruments will not be affected by rotor wash from helicopter operations. Guidance on AWOS systems is found in AC 150/5220-16, *Automated Weather Observing Systems (AWOS) for Non-Federal Applications*, and FAA Order 6560.20, *Siting Criteria for Automated Weather Observing Systems (AWOS)*.

e. Winter Operations. Swirling snow raised by a helicopter's rotor wash can cause the pilot to lose sight of the intended landing point and/or hide objects that need to be avoided. The TLOF, the FATO, and as much of the safety area as practical should be kept free of snow. Heliport design should take into account the methods and equipment to be used for snow removal. The heliport design should allow the snow to be removed sufficiently so the snow will not present an obstruction hazard to either the tail rotor or the main rotor. Guidance on winter operations is found in AC 150/5200-30, *Airport Winter Safety and Operations*.

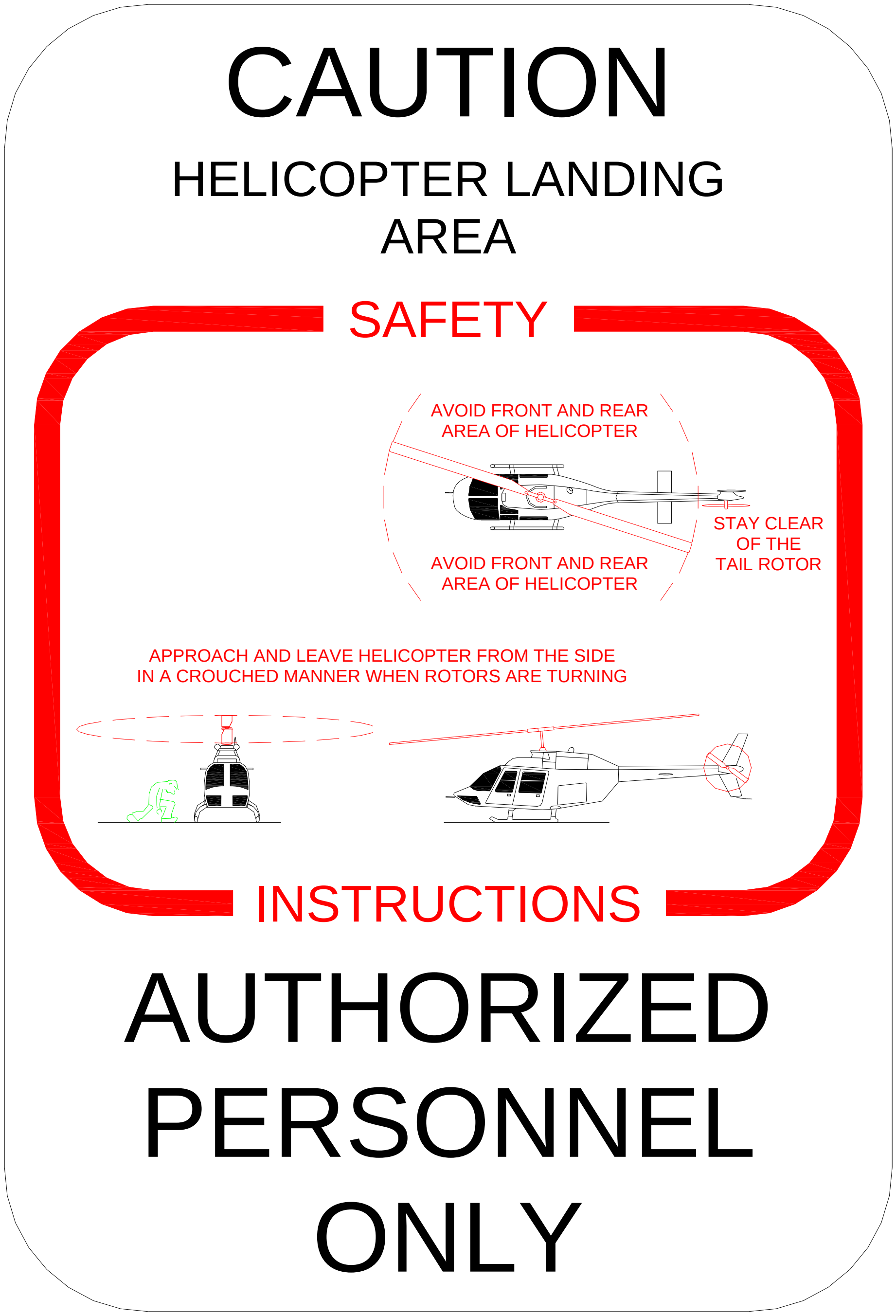


Figure 2-32. Caution Sign: General Aviation

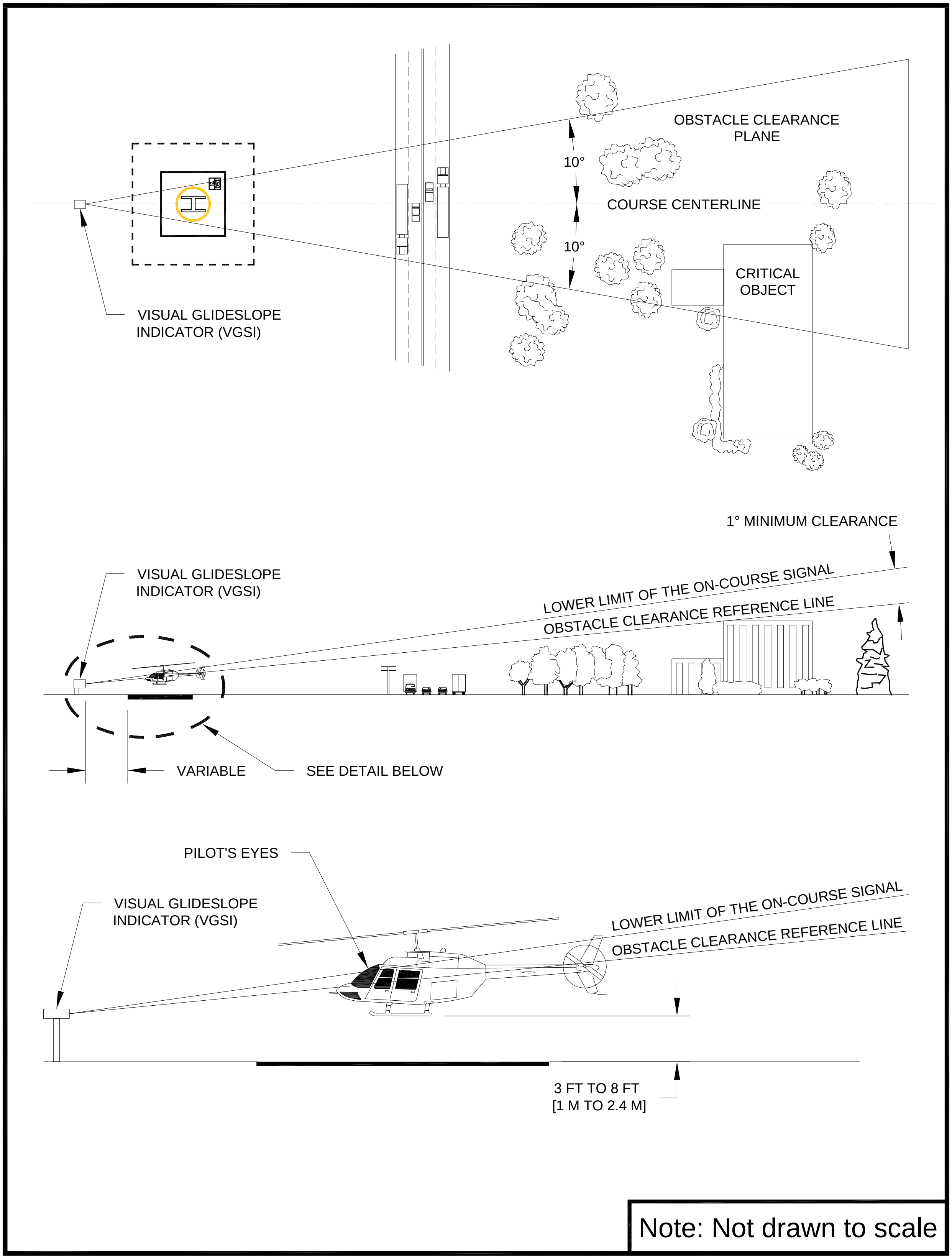


Figure 2-33. Visual Glideslope Indicator Siting and Clearance Criteria: General Aviation

218. VISUAL GLIDESLOPE INDICATORS (VGSI). A visual glideslope indicator (VGSI) provides pilots with visual vertical course and descent cues. The lowest on-course visual signal must provide a minimum of 1 degree of clearance over any object that lies within 10 degrees of the approach course centerline.

a. Siting. The optimum location of a VGSI is on the extended centerline of the approach path at a distance that brings the helicopter to a hover with the undercarriage between 3 and 8 feet (0.9 to 2.5 m) above the TLOF. Figure 2-33 on above illustrates VGSI clearance criteria. This will require estimating the vertical distance from the undercarriage to the pilot's eye.

b. Control of the VGSI. It is permissible for the VGSI to be pilot controllable such that it is "on" only when required.

c. VGSI Needed. A VGSI is an optional feature. However, a VGSI should be provided if one or more of the following conditions exist, especially at night:

(1) Obstacle clearance, noise abatement, or traffic control procedures require a particular slope to be flown.

(2) The environment of the heliport provides few visual surface cues.

d. Additional Guidance. AC 150/5345-52, *Generic Visual Glideslope Indicators (GVGI)*, and AC 150/5345-28, *Precision Approach Path Indicator (PAPI) Systems*, provide additional guidance.

219. TERMINAL FACILITIES. The heliport terminal requires curbside access for passengers using private autos, taxicabs, and public transit vehicles. Public waiting areas need the usual amenities, and a counter for rental car services may be desirable. Passenger auto parking areas should accommodate current requirements and have the capability of being expanded to meet future requirements. Readily available public transportation may reduce the requirement for employee and service personnel auto parking spaces. The heliport terminal building or sheltered waiting area should be attractive and functional. AC 150/5360-9, *Planning and Design of Airport Terminal Facilities at Non-Hub Locations*, contains guidance on designing terminal facilities. At PPR heliports, the number of people using the facility may be so small that there is no need for a terminal building. In addition, the other facilities and amenities needed may be minimal.

220. ZONING AND COMPATIBLE LAND USE. Where state and local statutes permit, the GA heliport operator is encouraged to promote the adoption of the following zoning measures to ensure that the heliport will continue to be available and to protect the investment in the facility.

a. Zoning to Limit Building/Object Heights. General guidance on drafting an ordinance that would limit building and object heights is contained in AC 150/5190-4, *A Model Zoning Ordinance to Limit Height of Objects Around Airports*. The ordinance should substitute the heliport surfaces for the airport surfaces in the model ordinance.

b. Zoning for Compatible Land Use. A zoning ordinance may be enacted, or an existing ordinance modified, to control the use of property within the Heliport Protection Zone. The ordinance should restrict activities to those that are compatible with helicopter operations. See paragraph 210 on page 31.

c. Air Rights and Property Easements are options that may be used to prevent the encroachment of obstacles in the vicinity of a heliport.

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CHAPTER 3. TRANSPORT HELIPORTS

301. GENERAL. A transport heliport is intended to accommodate air carrier operators providing scheduled or unscheduled service with large helicopters. This chapter contains standards and recommendations for designing a transport heliport. The design recommendations given in this chapter are based on the assumption that there will never be more than one helicopter within the final approach and takeoff area (FATO) and the associated safety area. If there is a need for more than one touchdown and lift-off area (TLOF) at a heliport, each TLOF must be located within its own FATO and within its own safety area. Figure 3-1 on page 68 illustrates a typical transport heliport.

302. ACCESS BY INDIVIDUALS WITH DISABILITIES. Heliports operated by public entities and those receiving Federal financial assistance must meet accessibility requirements. See paragraph 112 on page 12.

303. HELIPORT SITE SELECTION.

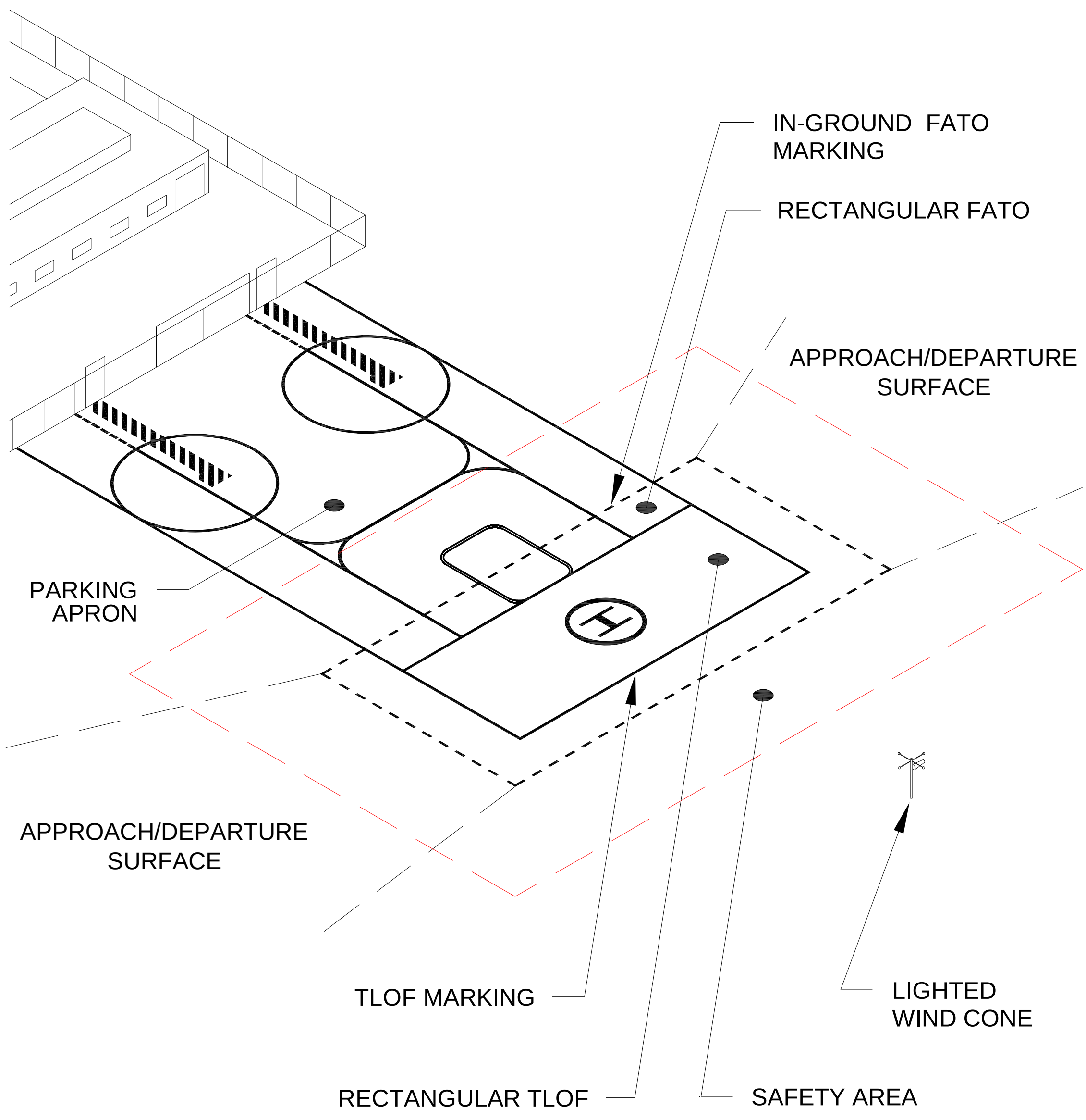
a. Long Term Planning. Public agencies and others planning to develop a transport heliport should consider the possible future need for instrument operations and future expansion.

b. Property Requirements. The property needed for a transport heliport depends upon the volume and types of users and the scope of amenities provided. Property requirements for helicopter operators and for passenger amenities frequently exceed that required for "airside" purposes.

c. Turbulence. Air flowing around and over buildings, stands of trees, terrain irregularities, etc. can create turbulence on ground-level and roof-top heliports that may affect helicopter operations. Where the FATO is located near the edge and top of a building or structure, or within the influence of turbulent wakes from other buildings or structures, the turbulence and airflow characteristics in the vicinity of, and across the surface of the FATO should be assessed to determine if an air-gap between the roof, roof parapet or supporting structure, and/or some other turbulence mitigating design measure is necessary. See FAA Technical Report FAA/RD-84/25, *Evaluating Wind Flow Around Buildings on Heliport Placement* addresses the wind's effect on helicopter operations. The following actions may be taken in selecting a site to minimize the effects of turbulence.

(1) Ground-Level Heliports. Helicopter operations from sites immediately adjacent to buildings, trees, and other large objects are subjected to air turbulence effects caused by such features. Therefore, locate the landing and takeoff area away from such objects in order to minimize air turbulence in the vicinity of the FATO and the approach/departure paths.

(2) Elevated Heliports. Establishing a 6 foot (1.8 m) or more air gap above the level of the roof will generally minimize the turbulent effect of air flowing over the roof edge. If an air gap or some other turbulence mitigating design measure is warranted but not practical, operational limitations may need to be considered under certain wind conditions. If an air gap is included in the design it should be kept free at all times of significant objects that would obstruct the airflow



Notes:

1. The wind cone should be located so that it will not interfere with the approach/departure path or transitional surface.

2. TLOF size and weight limitation box omitted for clarity.

Figure 3-1. A Typical Transport Heliport: Transport

304. BASIC LAYOUT. The heliport consists of a TLOF contained within a FATO. A safety area is provided around the FATO. The relationship of the TLOF to the FATO and the safety area is shown in Figure 3-2 on page 70. A FATO may not contain more than one TLOF. Appropriate approach/departure airspace, to allow safe approaches to and departures from landing sites, is required. To the extent feasible, the preferred approach/departure path should be aligned with the predominant winds (see paragraph 308 on page 75). Where helicopter flight manuals specify the minimum size required for operations, the size should be taken into account in the design of the facility.

305. TOUCHDOWN AND LIFTOFF AREA (TLOF).

a. TLOF Location. The TLOF of a transport heliport is normally at ground level but may be developed with the TLOF located on a pier or, when carefully planned, on the roof of a building. The TLOF is centered in the load-bearing area (LBA), and on the major axis of the FATO.

b. TLOF Size. The TLOF is a square or rectangular surface whose minimum length and width is the rotor diameter (RD) of the design helicopter but not less than 50 feet (15.2 m). Increasing the LBA centered on the TLOF may provide some safety and operational advantages

c. Elongated TLOF: An elongated TLOF can provide an increased safety margin and greater operational flexibility. An elongated TLOF may contain a landing position located in the center and two takeoff positions located at either end as illustrated in Figure 3-3 on page 71. The landing position must have a minimum length of the RD of the design helicopter, but not less than 50 feet (15.2 m). If an elongated TLOF is provided an elongated FATO is also required.

d. Ground-level TLOF Surface Characteristics.

(1) Design loads. The TLOF must be capable of supporting the dynamic loads of the design helicopter.

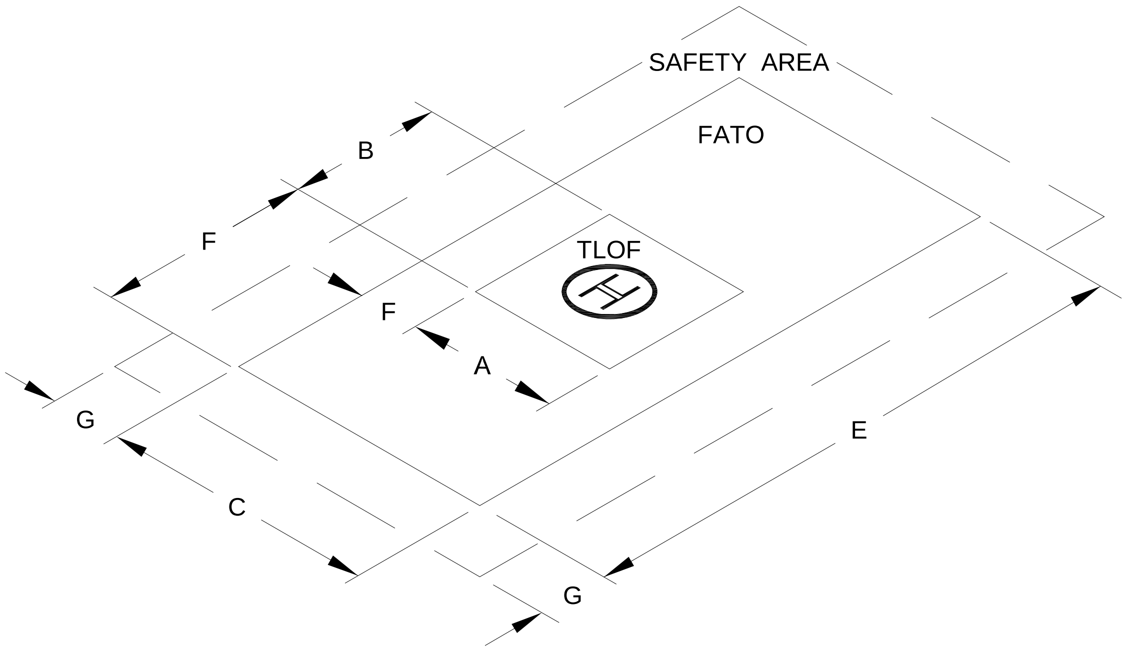
(2) Paving. The TLOF must be constructed of portland cement concrete (PCC). An asphalt surface is less desirable for heliports as it may rut under the wheels or skids of a parked helicopter. This has been a factor in some rollover accidents. Pavements must have a broomed or other roughened finish that provides a skid-resistant surface for helicopters and non-slippery footing for people.

e. Rooftop and Other Elevated TLOFs.

(1) Design Loads. Elevated TLOFs and any TLOF supporting structure must be capable of supporting the dynamic loads of the design helicopter. An elevated heliport is illustrated in Figure 3-4 on page 72.

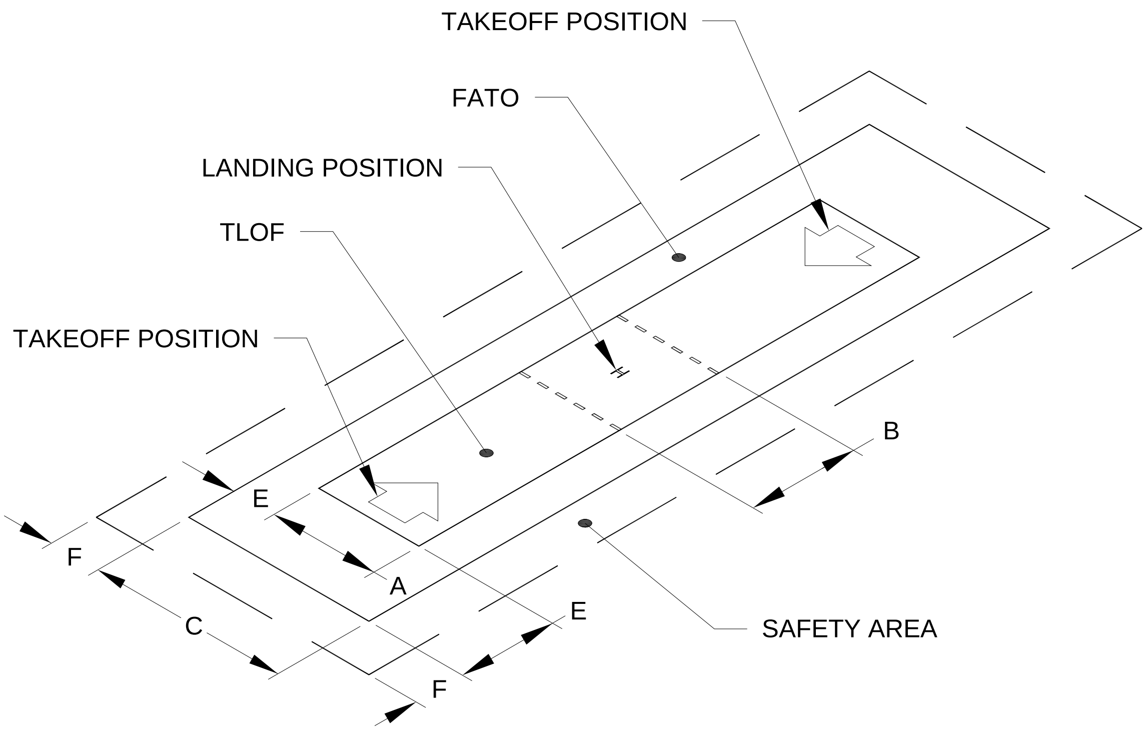
(2) TLOF Surface Characteristics. Rooftop and other elevated heliport TLOFs should be constructed of metal, concrete, or other materials subject to local building codes. TLOF surfaces should have a finish that provides a skid-resistant surface for helicopters and non-slippery footing for people.

f. TLOF Gradients. Recommended TLOF gradients are defined in Chapter 7 on page 173.



DIM	ITEM	VALUE	NOTES
A	Minimum TLOF Width	1RD but not less than 50 ft [15 m]	
B	Minimum TLOF Length	1RD but not less than 50 ft [15 m]	
C	Minimum FATO Width	2RD but not less than 100 ft [30 m]	
E	Minimum FATO Length	2RD but not less than 200 ft [60 m]	See paragraph 306.a.(2) and Figure 3-4 for adjustments for elevations above 1,000 ft [304 m]
F	Minimum Separation Between the Perimeters of the TLOF and FATO	0.75D - 0.5RD	
G	Minimum Safety Area Width	0.5RD but not less than 30 ft [9 m]	

Figure 3-2. TLOF/FATO Safety Area Relationships and Minimum Dimensions Transport



DIM	ITEM	VALUE	NOTES
A	Minimum TLOF Width	1RD but not less than 50 ft [15 m]	
B	Minimum TLOF/Landing Position Length	1RD but not less than 50 ft [15 m]	
C	Minimum FATO Width	2 RD but not less than 100 ft [30 m]	
E	Minimum Separation Between the Perimeters of the TLOF and FATO	0.75D - 0.5RD	
F	Minimum Safety Area Width	30 ft [9 m]	

Figure 3-3. An Elongated FATO with Two Takeoff Positions: Transport

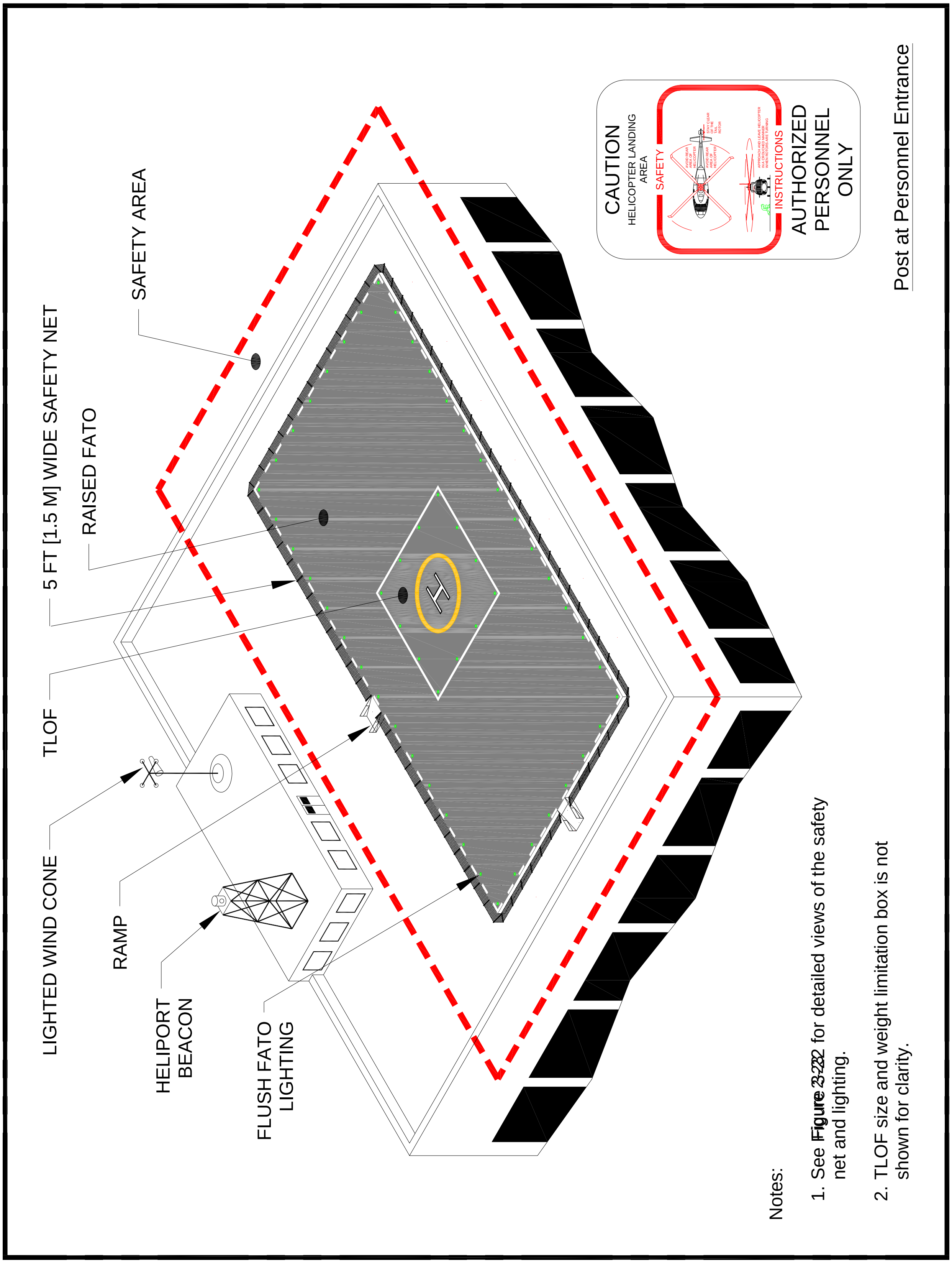


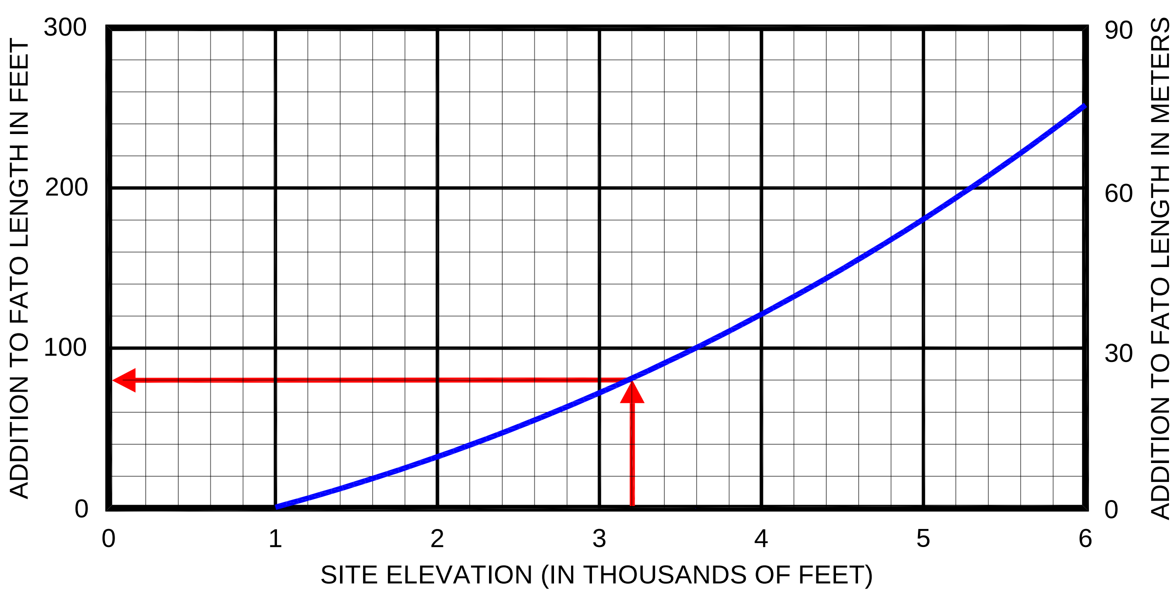
Figure 3-4. Elevated Heliport: Transport

306. FINAL APPROACH AND TAKEOFF AREA (FATO). A transport heliport must have at least one FATO. The FATO must contain a TLOF within its borders at which arriving helicopters terminate their approach, and from which departing helicopters take off.

a. FATO Size. FATOs are rectangular surfaces with the long axis aligned with the preferred flight path. See Figure 3-2 on page 70.

(1) FATO Width. The minimum width of a FATO is at least 2.0 times the RD of the design helicopter but not less than 100 feet (30.5 m).

(2) FATO Length. The minimum length of the FATO is 2.0 times the RD of the design helicopter but not less than 200 feet (61 m). At elevations well above sea level, a longer FATO is required to provide an increased safety margin and greater operational flexibility. The additional FATO length that must be used is depicted in Figure 3-5 below.



Example: 80 feet is added to the basic FATO length for a site elevation of 3,200 feet.

Figure 3-5. Additional FATO Length for Heliports at Higher Elevations: Transport

(3) The minimum distance between the TLOF perimeter and the FATO perimeter is the distance 0.75D - 0.5RD, where D and RD are of the design helicopter.

b. FATO Surface Characteristics.

(1) The entire FATO must be capable of supporting the dynamic loads of the design helicopter.

(2) If it is unpaved, the FATO surface must be treated to prevent loose stones and any other flying debris caused by rotor wash.

(3) The portion of the FATO abutting the TLOF must be contiguous with the TLOF and the adjoining edges must be at the same elevation.

c. Rooftop and Other Elevated FATOs.

(1) Design Loads. Elevated FATOs and any FATO supporting structure must be capable of supporting the dynamic loads of the design helicopter

(2) Elevation. The FATO must be elevated above the level of any object in the safety area that cannot be removed, except for frangibly mounted objects that, due to their function, must be located within the safety area.

(3) Obstructions. Elevator penthouses, cooling towers, exhaust vents, fresh air vents, and other raised features can affect heliport operations. Control mechanisms should be established to ensure that obstruction hazards are not installed after the heliport is operational.

(4) Air Quality. Helicopter exhaust can affect building air quality if the heliport is too close to fresh air vents. When designing a building intended to support a helipad, locate fresh air vents accordingly. When adding a helipad to an existing building, fresh air vents may have to be relocated.

(5) FATO Surface Characteristics. Rooftop and other elevated heliport FATOs should be constructed of metal, concrete, or other materials subject to local building codes. FATO surfaces should have a non-slippery footing for people.

(6) Safety Net. If the platform is elevated 4 feet (1.2 m) or more above its surroundings, title 29 CFR part 1910.23, *Guarding Floor and Wall Openings and Holes*, requires the provision of fall protection. The FAA recommends that such protection be provided for all platforms elevated 30 inches (76 cm) or more. However, permanent railings or fences must not be used since they would be safety hazards during helicopter operations. An alternate method of installing a safety net, meeting state and local regulations but not less than 5 feet (1.5 m) wide, is suggested. The safety net should have a load-carrying capability of 50 lb/ft^2 (244 kg/m^2). The net, as illustrated in Figure 3-23 on page 101, must not project above the level of the FATO. Both the inside and outside edges of the safety net should be fastened to a solid structure. Nets should be constructed of material that is resistant to environmental effects.

(7) Access to Elevated FATOs. Title 29 CFR part 1936, *Means of Egress*, requires two separate access points for an elevated structure such as one supporting an elevated FATO. If stairs are used, they must be built in compliance with title 29 CFR part 1910.24, *Fixed Industrial Stairs*. Handrails required by this standard must fold down or be removable to below the level of the FATO so that they will not be hazards during helicopter operations.

d. Mobile Objects within the FATO. The FATO design standards in this AC are based on the assumption that the TLOF and FATO are closed to other aircraft if a helicopter or other mobile object is within the FATO or the safety area.

e. Fixed Objects within the FATO. No fixed objects are permitted within a FATO except for frangibly mounted objects that, due to their function, must be located there. Those objects whose functions require them to be located within the FATO must not exceed a height of 2 inches (5 cm) above the elevation of the TLOF perimeter.

f. FATO/FATO Separation. If a heliport has more than one FATO, the separation between the perimeters of two FATOs must be such that the respective safety areas do not overlap. This separation is based on the assumption that simultaneous approach/departure operations will not take place. If simultaneous operations are planned, a minimum 200 foot (61 m) separation is required.

g. FATO Gradients. Recommended FATO gradients are defined in Chapter 7 on page 173.

307. SAFETY AREA. The safety area surrounds the FATO.

a. Safety Area Width. The safety area extends outward on all sides of the FATO for a distance not less than 30 feet (9 m).

b. Mobile Objects within the Safety Area. The safety area design recommendations of this AC are based on the assumption that the TLOF and FATO are closed to other aircraft if a helicopter or other mobile object is within the FATO or the safety area.

c. Fixed Objects Within a Safety Area. The safety area must be cleared of all objects except small, frangible objects that, because of their function, must be located there. Those objects whose functions require them to be located within the safety area must not exceed a height of 8 inches (20 cm) above the elevation of the FATO perimeter, nor penetrate the approach/departure surfaces or transitional surfaces.

d. Safety Area Surface. The safety area need not be load bearing. Figure 3-6 on page 76 depicts a safety area extending over water. If possible, the portion of the safety area abutting the FATO should be contiguous with the FATO with the adjoining edges at the same elevation. This is needed to avoid the risk of catching a helicopter skid or wheel. The safety area must be treated to prevent loose stones and any other flying debris caused by rotor wash.

e. Safety Area Gradients. Safety area gradients are detailed in Chapter 7 on page 173.

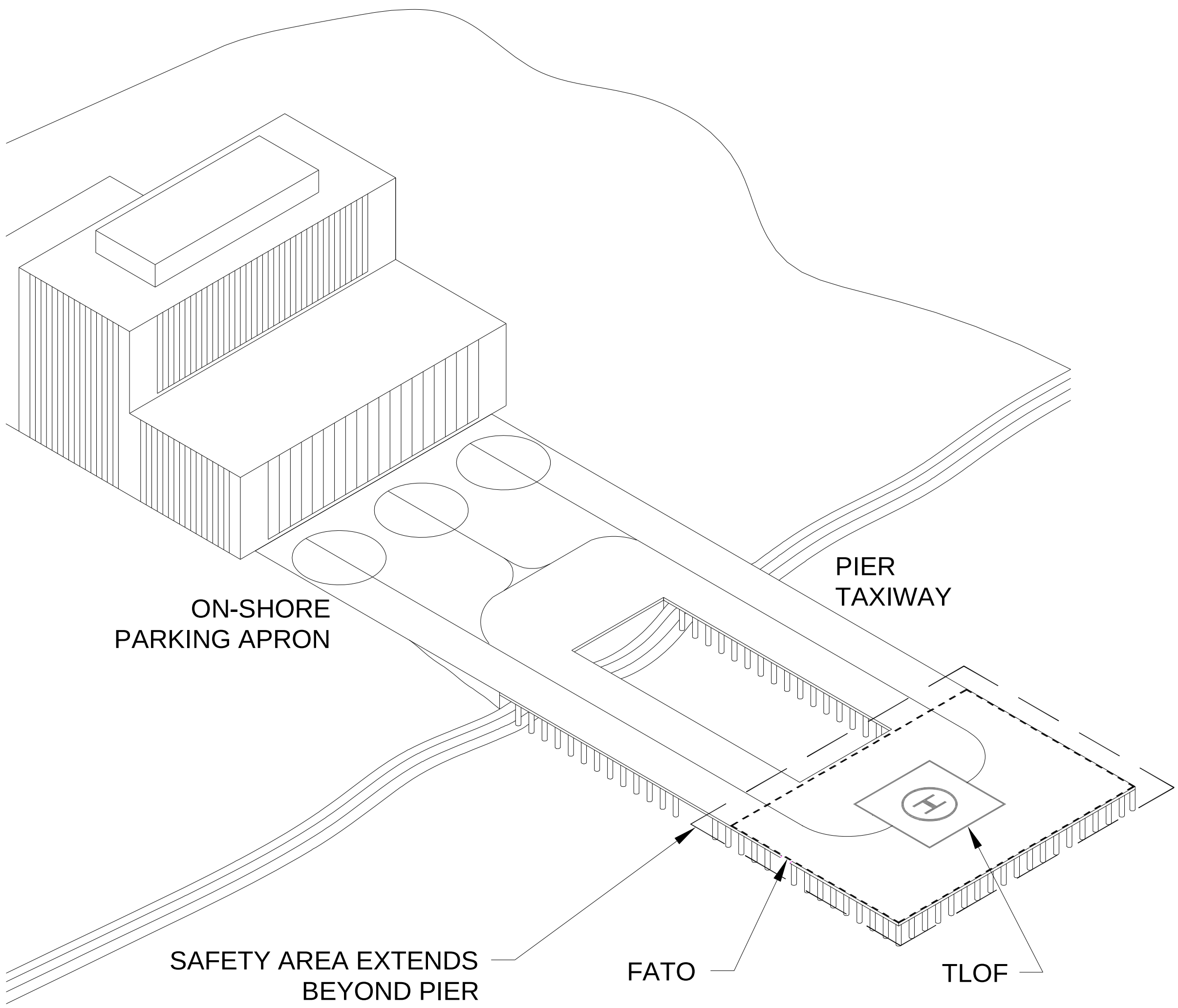
308. VFR APPROACH/DEPARTURE PATHS. The purpose of approach/departure airspace, shown in Figure 3-7 on page 77 and Figure 3-8 on page 80, is to provide sufficient airspace clear of hazards to allow safe approaches to and departures from the TLOF.

a. Number of Approach/Departure Paths. Preferred approach/departure paths should be aligned with the predominant wind direction so that downwind operations are avoided and crosswind operations are kept to a minimum. To accomplish this, a heliport must have more than one approach/departure path. Other approach/departure paths should be based on the assessment of the prevailing winds or, when this information is not available, the separation between such flight paths and the preferred flight path should be at least 135 degrees. See Figure 3-7 on page 77.

b. VFR Approach/Departure and Transitional Surfaces. Figure 3-7 on page 77 illustrates the approach/departure and transitional surfaces.

(1) An approach/departure surface is centered on each approach/departure path. The approach /departure path starts at the edge of the FATO and slopes upward at 8:1 (8 units horizontal in 1 unit vertical) for a distance of 4000 feet (1219 m) where the width is 500 feet (152 m) at a height of 500 feet (152 m) above the heliport elevation.

(2) The transitional surfaces start from the edges of the FATO parallel to the flight path center line, and from the outer edges of approach/departure surface, and extend outwards at a slope of 2:1 (2 units horizontal in 1 units vertical) for a distance of 250 feet (76 m) from the centerline. The transitional surfaces start at the edge of the FATO parallel to the approach/departure surfaces and extend to the end of the approach/departure surface. The transitional surface is not applied on the FATO edge opposite the approach/departure surface.



Note: Markings not shown omitted for clarity.

Figure 3-6. Non-load-bearing Safety Area: Transport

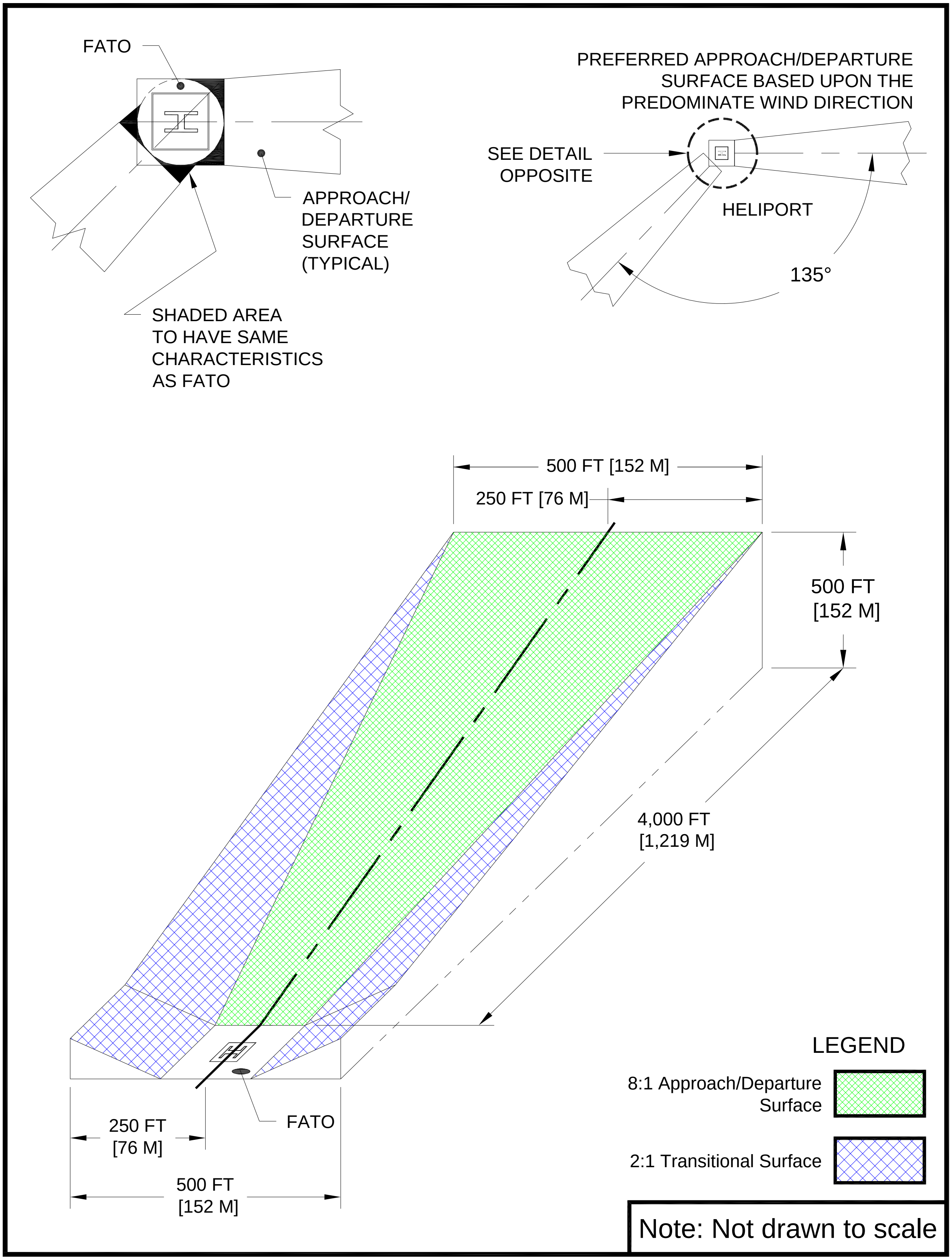


Figure 3-7. VFR Heliport Approach/Departure and Transitional Surfaces: Transport

(3) The approach/departure and transitional surfaces must be free of penetrations unless an FAA aeronautical study determines such penetrations not to be hazards. Such aeronautical studies are conducted only at public heliports and private airports with FAA-approved approach procedures. Paragraph 109 on page 9 provides additional information on hazards to air navigation.

c. Curved VFR Approach/Departure Paths. VFR approach/departure paths may include one curve. Such paths may use the airspace above public lands, such as freeways or rivers. However, the design of curved approach/departure paths must consider the performance capabilities of the helicopters intended to be served by the heliport. Where a curved portion of the approach/departure path is provided, the sum of the radius of arc defining the center line and the length of the straight portion originating at the FATO must not be less than 1886 feet (575 m). The minimum radius for curved approach/departure paths is 886 feet (270m) following a 1000 feet (305 m) straight section. The combined length of the center line of the curved portion and the straight portion must be 4000 feet (1219 m).). See Figure 3-8 on page 80.

d. Flight Path Alignment Guidance. Optional flight path alignment markings and/or flight path alignment lights (see paragraph 313.d on page 94) may be used where it is desirable and practicable to indicate available approach and/or departure flight path direction(s). See Figure 3-9 on page 81.

e. Periodic Review of Obstructions. Heliport operators should maintain a list of the GPS coordinates and the peak elevation of obstacles in the vicinity of the heliport and its approach and departure paths. Particular attention should be given to any obstacles that need to be marked or lighted. Heliport operators should reexamine obstacles in the vicinity of approach/departure paths on at least an annual basis. This reexamination should include an appraisal of the growth of trees near approach and departure paths. Paragraph 109 on page 9 provides additional information on hazards to air navigation.

309. HELIPORT PROTECTION ZONE (HPZ). It is recommended that a Heliport Protection Zone be established for each approach/departure surface. The HPZ is the area under the approach/departure surface starting at the FATO perimeter and extending out for a distance of 400 feet (122 m), as illustrated in Figure 3-10 on page 82. The HPZ is intended to enhance the protection of people and property on the ground. This is achieved through heliport owner control over the HPZ. Such control includes clearing HPZ areas (and maintaining them clear) of incompatible objects and activities. Land uses discouraged in the HPZ are residences and places of public assembly. (Churches, schools, hospitals, office buildings, shopping centers, and other uses with similar concentrations of persons typify places of public assembly.) Fuel storage facilities should not be located in the HPZ.**WIND CONE.**

a. Specification. A wind cone conforming to AC 150/5345-27, *Specification for Wind Cone Assemblies*, must be used to show the direction and magnitude of the wind. The wind cone should provide the best possible color contrast to its background.

b. Wind Cone Location. The wind cone must be located so it provides the pilot with valid wind direction and speed information in the vicinity of the heliport under all wind conditions.

(1) At many landing sites, there may be no single, ideal location for the wind cone. At other sites, it may not be possible to site a wind cone at the ideal location. Consequently, more than one wind cone may be required in order to provide the pilot with all the wind information needed for safe operations.

(2) A pilot on the approach path must be able to see a wind cone clearly when the helicopter is at a distance of 500 feet (152 m) from the TLOF.

(3) Pilots must also be able to see a wind cone from the TLOF.

(4) To avoid presenting an obstruction hazard, the wind cone(s) must be located outside the safety area, and it must not penetrate the approach/departure or transitional surfaces.

c. Wind Cone Lighting. For night operations, the wind cone must be illuminated, either internally or externally, to ensure that it is clearly visible.

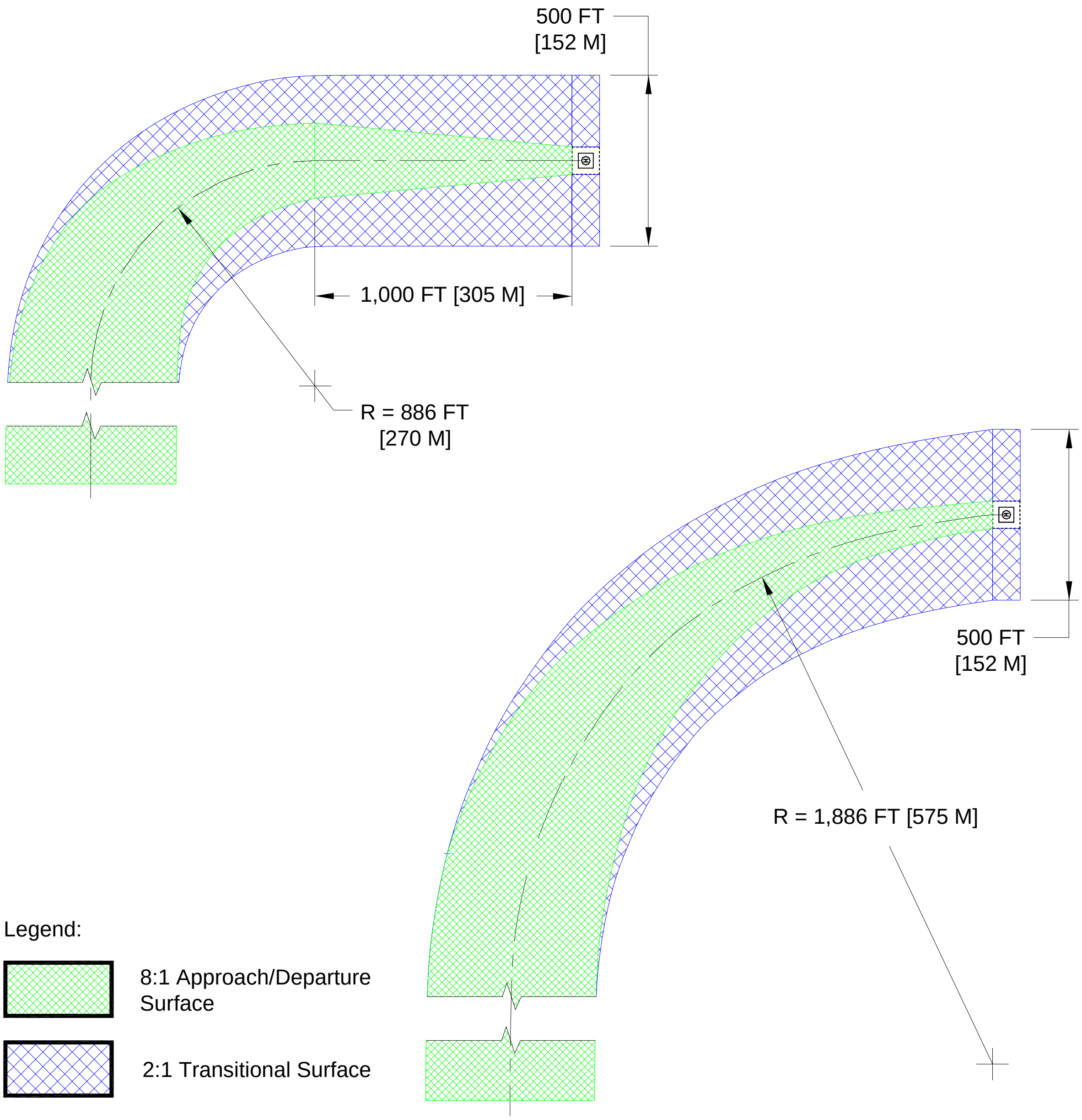
311. TAXIWAYS AND TAXI ROUTES. Taxiways and taxi routes are provided for the movement of helicopters from one part of a landing facility to another. They provide a connecting path between the FATO and a parking area. They also provide a maneuvering aisle within the parking area. A taxi route includes the taxiway plus the appropriate clearances needed on both sides. The relationship between a taxiway and a taxi route is illustrated in Figure 3-11 on page 83.

a. Taxiway/Taxi Route Widths. The dimensions of taxiways and taxi routes are a function of helicopter size and type of taxi operations (ground taxi or hover taxi). These dimensions are defined in Table 3-1. Normally, the requirement for hover taxi dictates the taxiway/taxi route widths. However, when the fleet comprises a combination of large ground taxiing helicopters and smaller air taxiing helicopters, the larger aircraft may dictate the taxiway/taxi route widths. If wheel-equipped helicopters taxi with wheels not touching the surface, the facility should be designed with hover taxiway widths rather than ground taxiway widths. Where the visibility of the centerline marking cannot be guaranteed at all times, such as locations where snow or dust commonly obscure the centerline marking and it is not practical to remove it, the minimum taxiway/taxi route dimensions should be determined as if there was no centerline marking.

b. Surfaces. Ground taxiways must have a surface that is portland cement concrete or asphalt. Unpaved portions of taxi routes must have a turf cover or be treated in some way to prevent dirt and debris from being raised by a taxiing helicopter's rotor wash.

c. Gradients. Recommended taxiway and taxi route gradients are detailed in Chapter 7 on page 173.

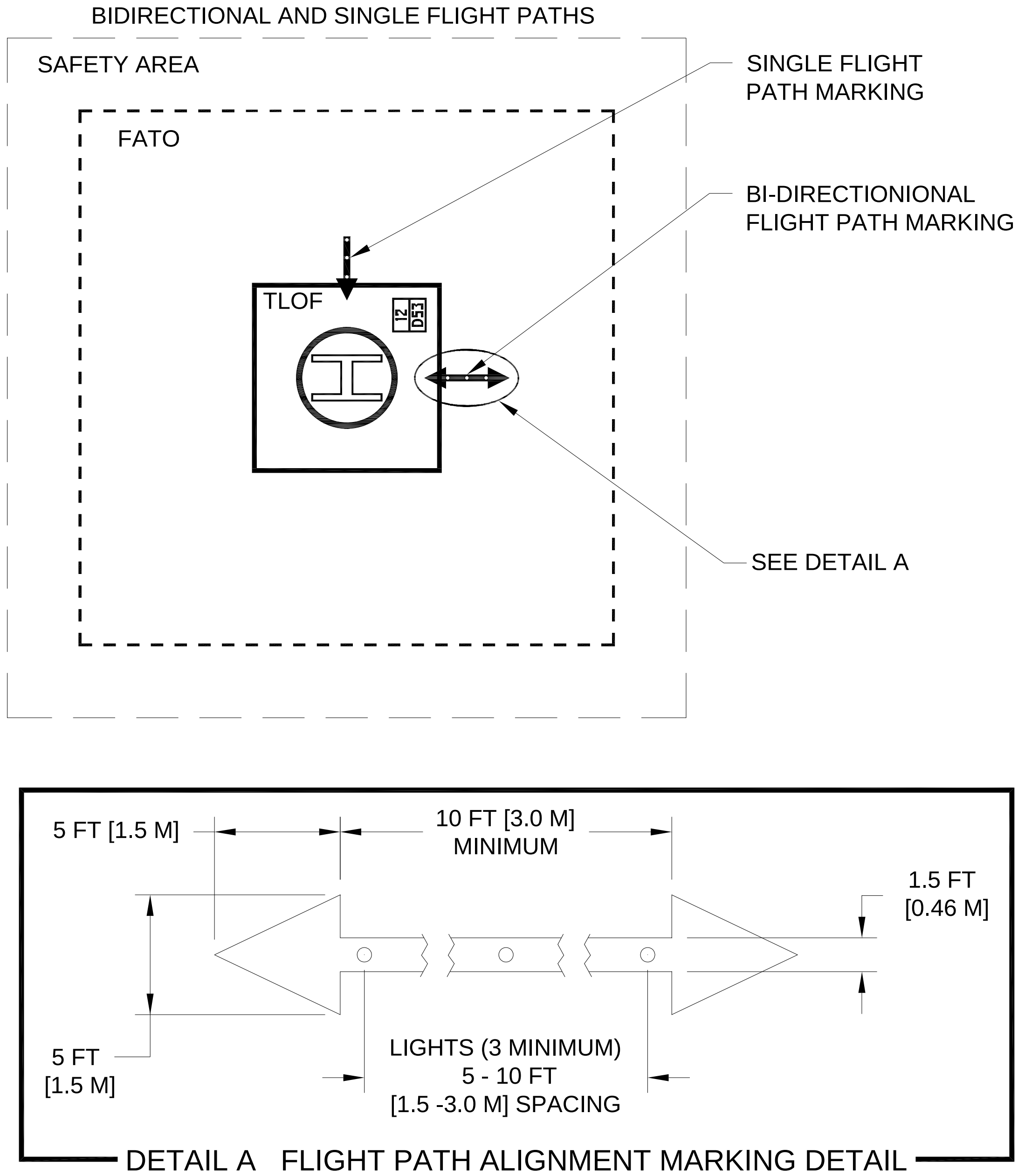
312. HELICOPTER PARKING. A transport heliport must have a paved apron for parking helicopters. The size of the apron depends on the number and size of specific helicopters to be accommodated. It is not necessary that every parking position accommodate the design helicopter. Individual parking positions should be designed to accommodate the helicopter size and weights expected to use the parking position at the facility. However, separation requirements between parking positions and taxi routes are based on the design helicopter. Separation requirements between parking positions intended for helicopters of different sizes are based on the larger helicopter. Parking positions must support the static loads of the helicopter intended to use the parking area. Ground taxi turns of wheeled helicopters are significantly larger than a hover turn. Design of taxi intersections and parking positions for wheeled helicopters should consider the turn radius of the helicopters. Heliport parking areas must be designed so that helicopters will be parked in an orientation that keeps the "avoid areas" around the tail rotors (see Figure 3-12 on page 85) clear of passenger walkways. Separate aprons may be established for specific functions such as passenger boarding, maintenance, and parking of based and transient helicopters.



Notes:

1. Any combination of straight portions and one curved portion may be established using the following formula: S + R ≥1,886 ft [575 m] and R ≥ 886 ft [270 m], where S is the length of the straight portion(s) and R is the radius of the turn. Note that any combination ≥1,886 ft [575 m] will work.
2. The minimum total length of the centerline of the straight and curved portion is 4,000 ft [1,219 m].
3. Helicopter take-off performance is reduced in a curve. Consider a straight portion along the take-off climb surface prior to the start of the curve to allow for acceleration.

Figure 3-8. Curved Approach/Departure: Transport



Notes (arrow):

1. Arrowheads must have constant dimensions
2. Stroke length may be adjusted to match length available (Minimum length: 10 ft [3 m])

Notes (lights):

1. Light type: omni-directional inset white lights
2. Lights may be outside arrows

Figure 3-9. Flight Path Alignment Marking and Lights: Transport

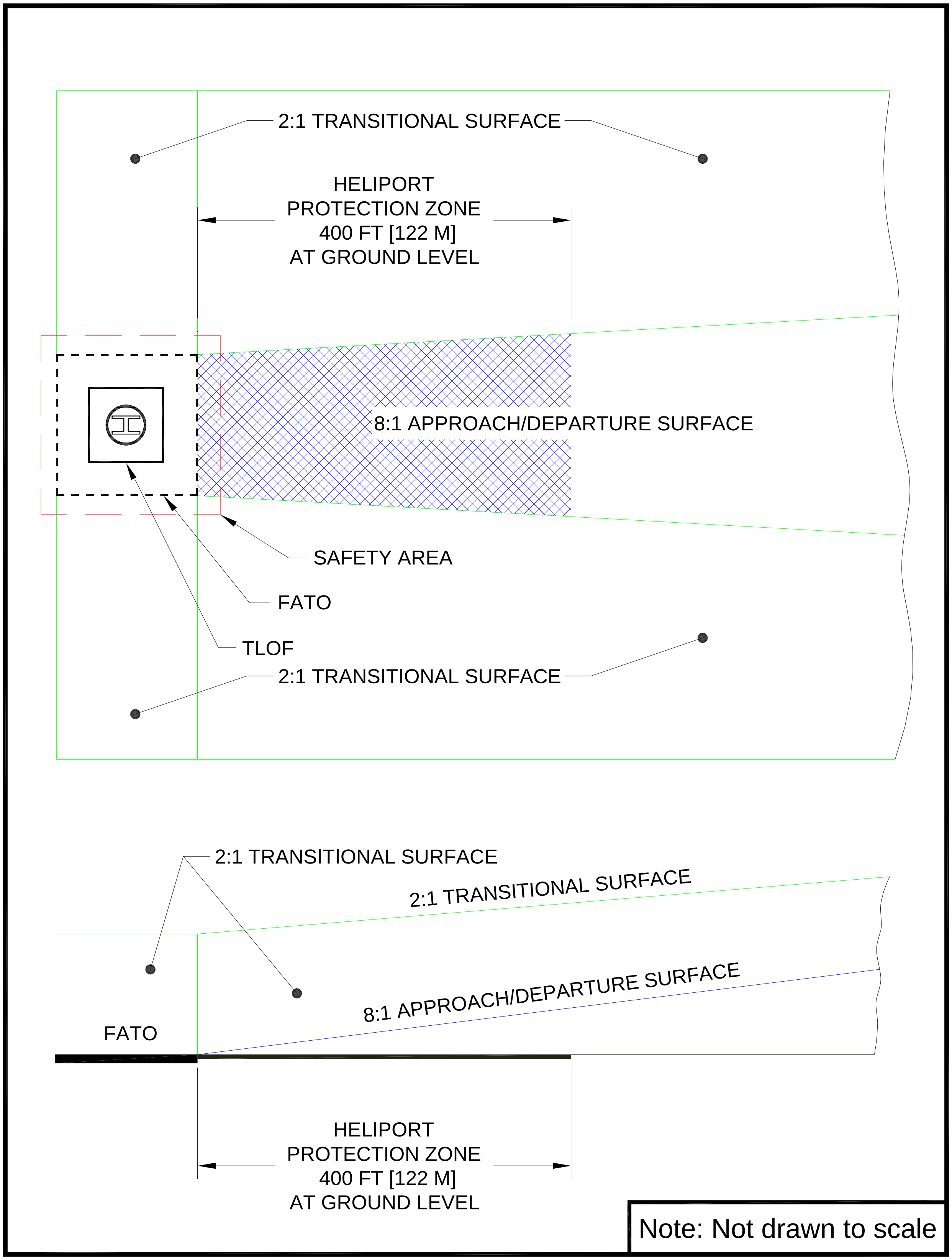


Figure 3-10. Heliport Protection Zone: Transport

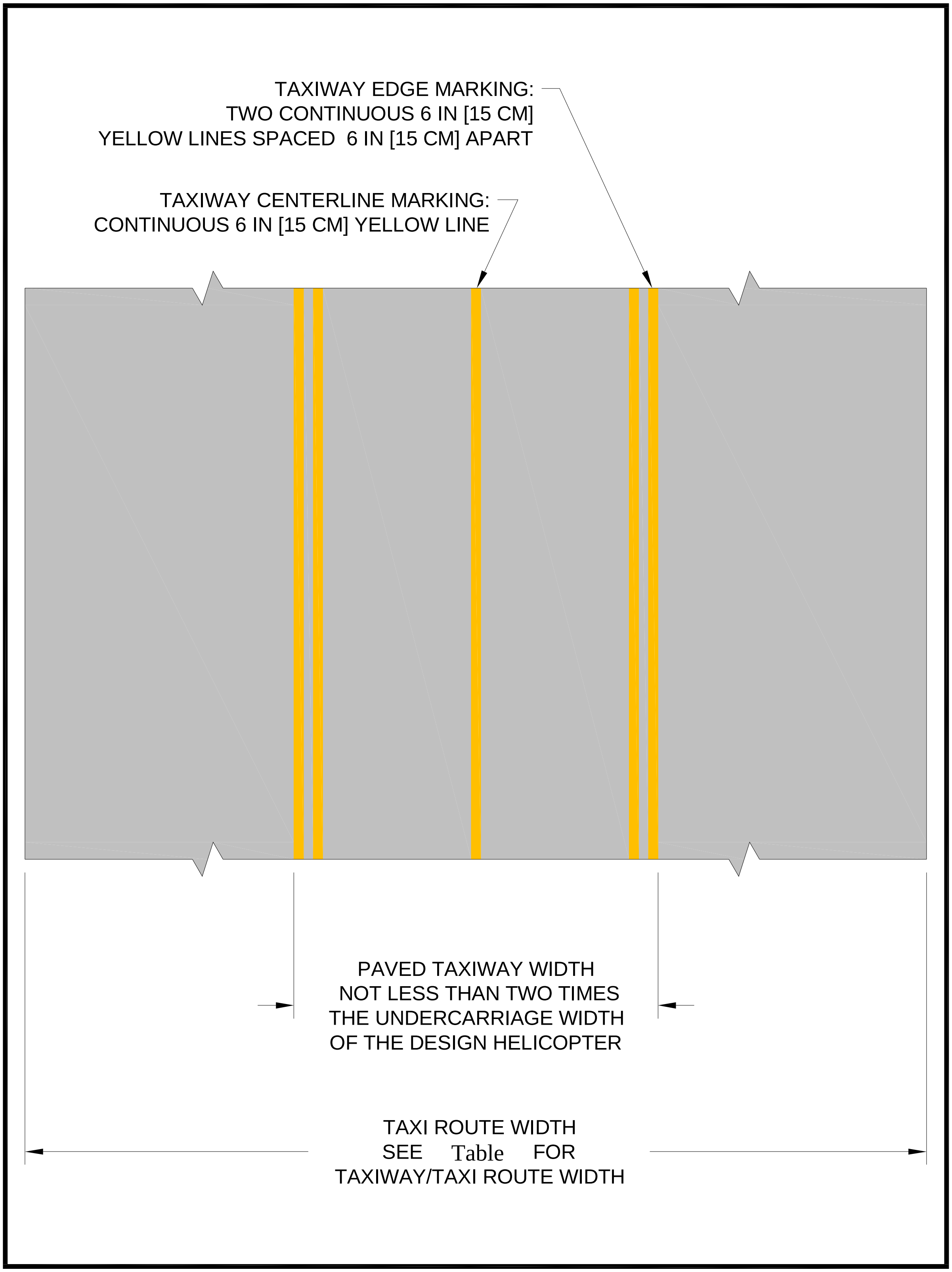
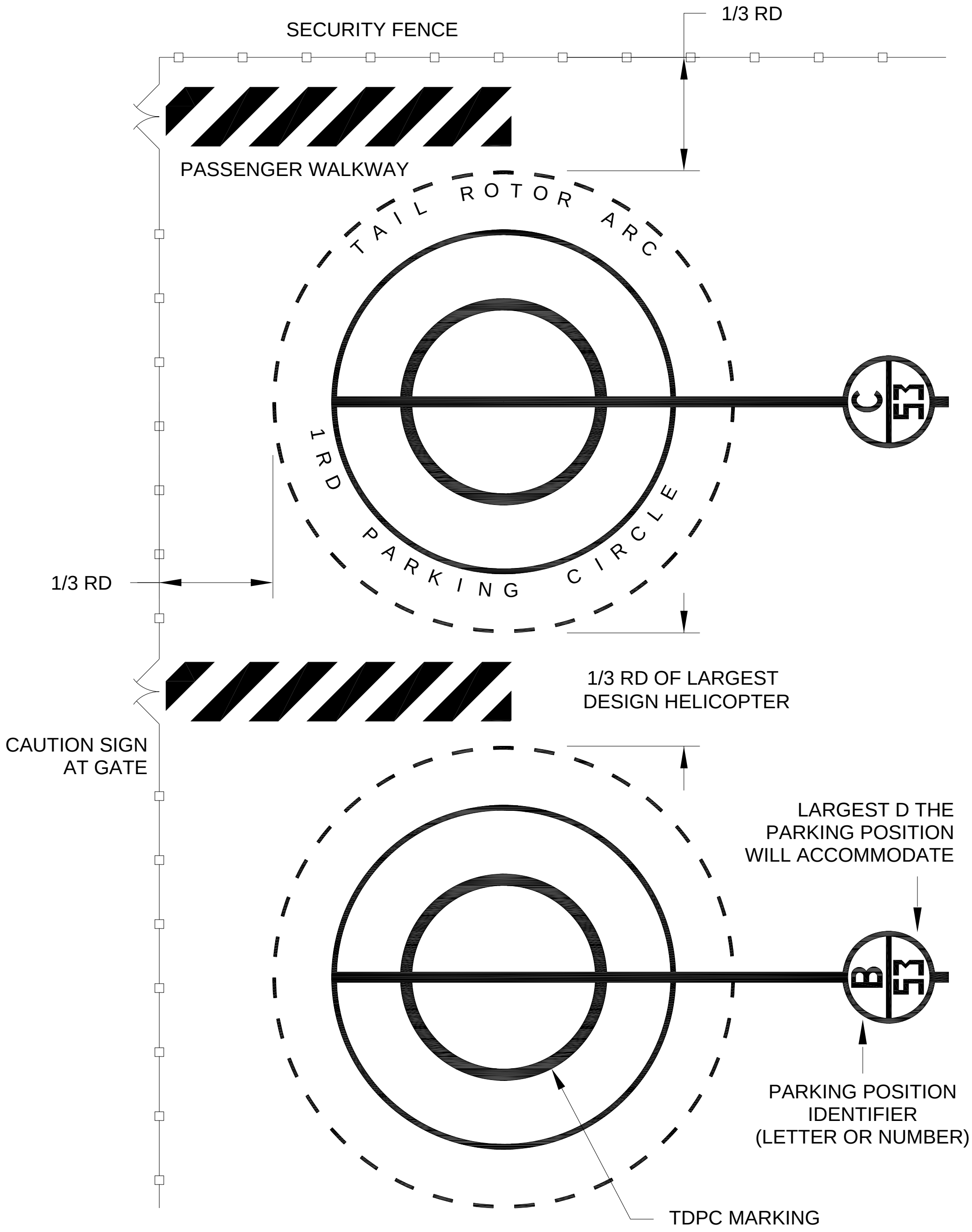


Figure 3-11. Taxiway/Taxi Route Relationship, Centerline and Edge Marking: Transport

Table 3-1. Taxiway and Taxi Route Dimensions – Transport Heliports

Taxiway (TW)	Centerline Marking Type	TW Edge Marking Type	Minimum Width of Paved Area	Lateral Separation Between TW Edge Markings	Total Taxi Route Width
Ground Taxiway	Painted	Painted	2 x UC	2 x UC	1.5RD
Hover Taxi	Painted	Painted	2 x UC	2 x UC	2.0RD

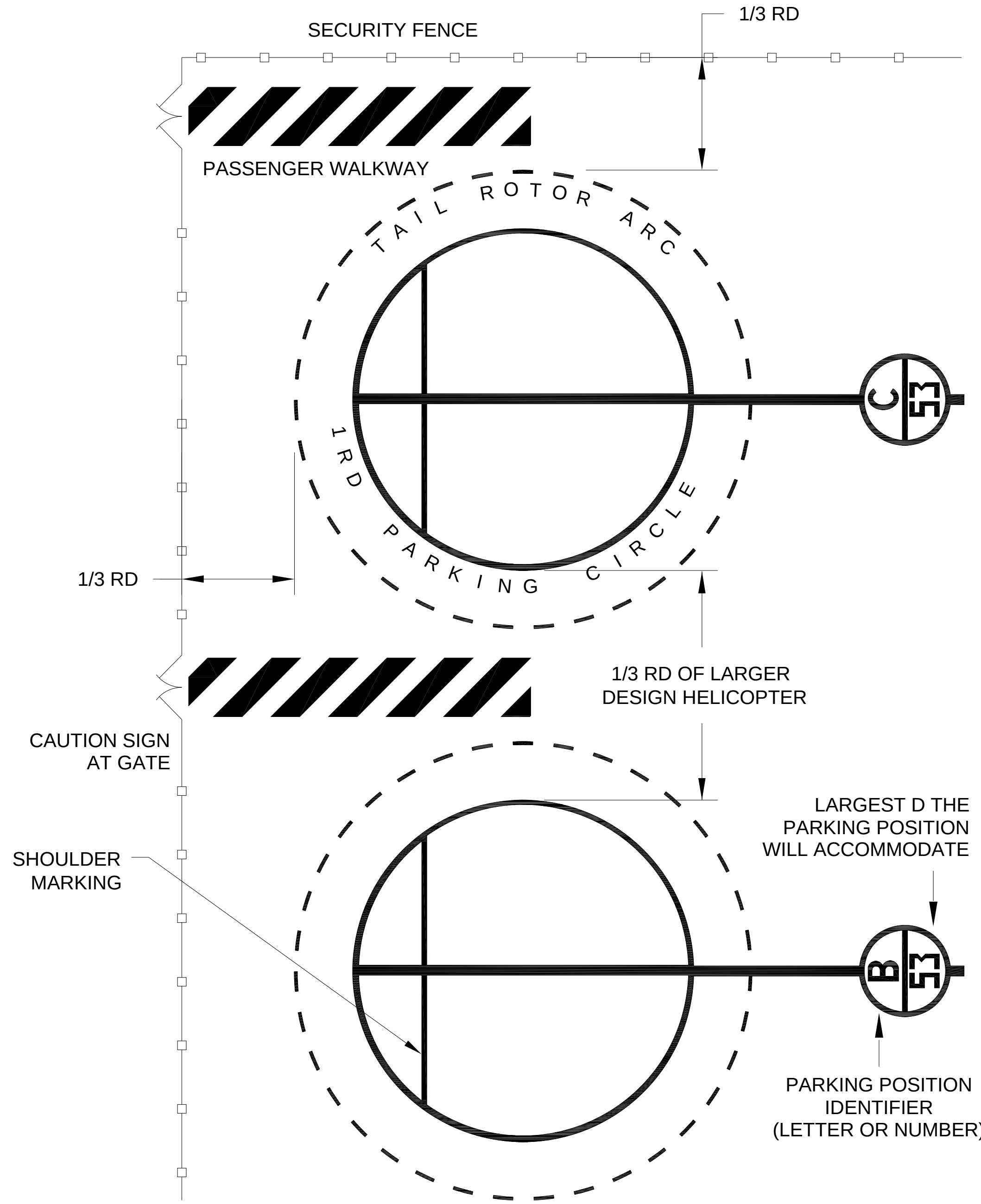
RD: rotor diameter of the design helicopter
TW: taxiway
UC: undercarriage length or width (whichever is larger) of the design helicopter



Notes:

1. The design of these parking positions is based on the understanding that the helicopter may pivot about the mast prior to exiting the parking position.
2. Minimum clearance between the tail rotor arc and fixed objects:
   - Hover taxi operations: 1/3 RD of the larger helicopter but not less than 10 ft [3 m]
   - Ground taxi operations: 10 ft [3 m]

Figure 3-12. "Turn-around" Helicopter Parking Position Marking: Transport



Notes:

1. The design of these parking positions is based on the understanding that the helicopter may pivot about the mast prior to exiting the parking position.
2. Minimum clearance between the tail rotor arc and fixed objects:
   - Hover taxi operations: 1/3 RD of the larger helicopter but not less than 10 ft [3 m]
   - Ground taxi operations: 10 ft [3 m]

Figure 3-13. "Taxi-through" Helicopter Parking Position Marking: Transport

a. Location. Aircraft parking areas must not lie under an approach/departure surface. However, aircraft parking areas may lie under the transitional surfaces.

(1) The parking position must be located to provide a minimum distance between the tail rotor arc and any object, building, or safety area. The minimum distance is 10 feet (3 m) for ground taxi operations and the greater of 10 feet (3 m) or 1/3 RD for hover taxi operations. See Figure 3-12 on page 85 and Figure 3-14 on page 88.

(2) The parking position must be located to provide a minimum distance of 1/2 RD, but not less than 30 feet (9.1m), between the tail rotor arc and the edge of any taxi route.

b. Size. Parking position sizes are dependent upon the helicopter size. The clearances between parking positions are dependent upon the type of taxi operations (ground-taxi or hover/ taxi) and the intended paths for maneuvering in and out of the parking position. The more demanding requirement will dictate what is required at a particular site. Usually, the parking area requirements for skid-equipped helicopters will be the most demanding. However, when the largest helicopter is a very large, wheeled aircraft (e.g., the S-61), and the skid-equipped helicopters are all much smaller, the parking size requirements for wheeled helicopters may be the most demanding. If wheel-equipped helicopters taxi with wheels not touching the surface, parking areas should be designed based on hover taxi operations rather than ground taxi operations.

(1) If all parking positions are the same size, they must be large enough to accommodate the largest helicopter that will operate at the heliport.

(2) When there is more than one parking position, the facility may be designed with parking positions of various sizes with at least one position that will accommodate the largest helicopter that will park at the heliport. Other parking positions may be smaller, designed for the size of the individual or range of individual helicopters planned to be parked at that position.

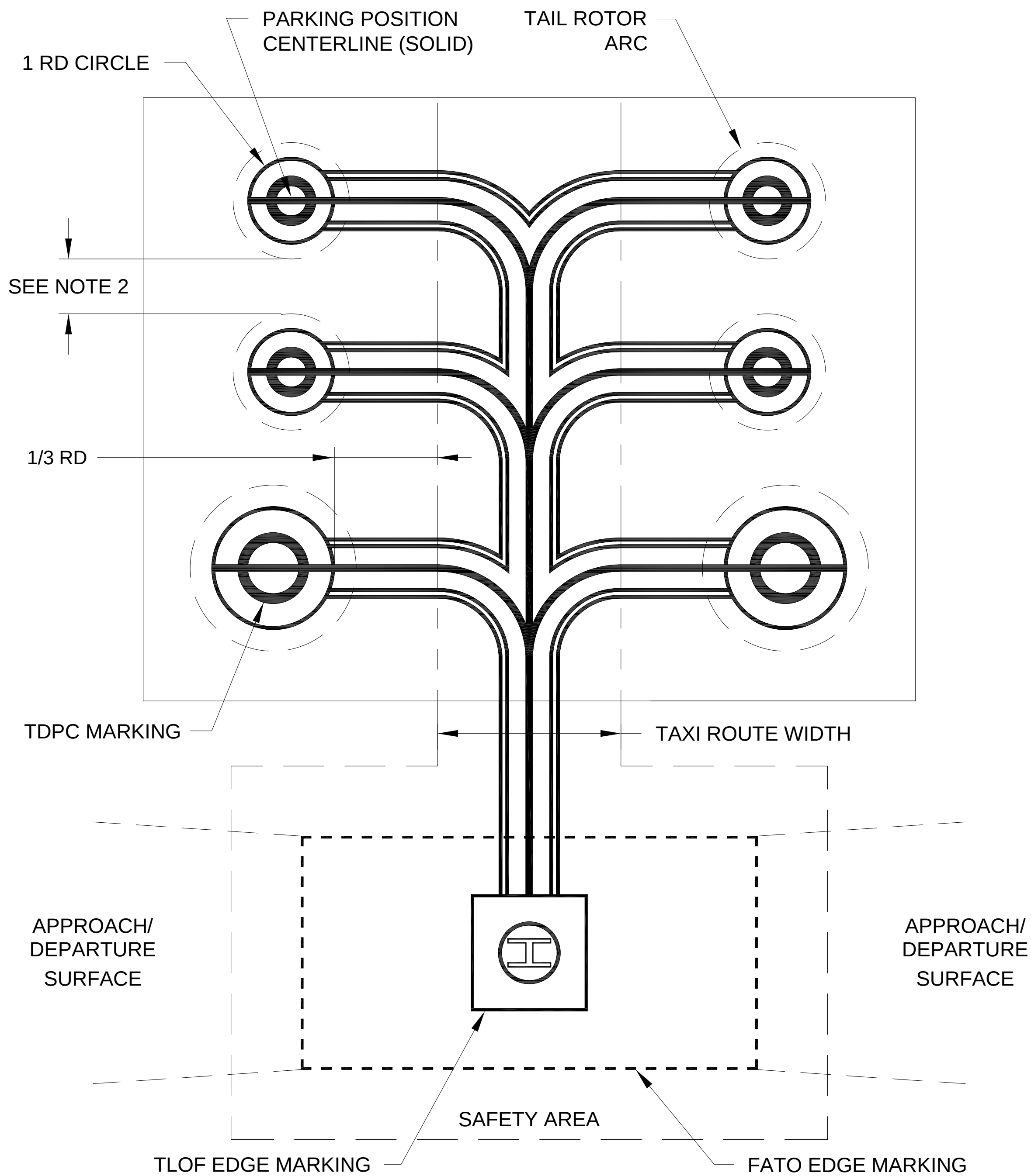
(3) “Turn-around” parking positions are illustrated in Figure 3-14 on page 88.

(4) “Taxi-through” parking positions are illustrated in Figure 3-15 on page 89. When this design is used for parking positions, the heliport owner and operator should take steps to ensure that all pilots are informed that “turn-around” departures from the parking position are not permitted.

(5) “Back-out” parking positions are not used at transport heliports.

c. Passenger Walkways. At parking positions, marked walkways must be provided. Layout of passenger walkways should minimize the passenger exposure to various risks during passenger loading and unloading. The pavement must be designed so spilled fuel does not drain onto passenger walkways or toward parked helicopters.

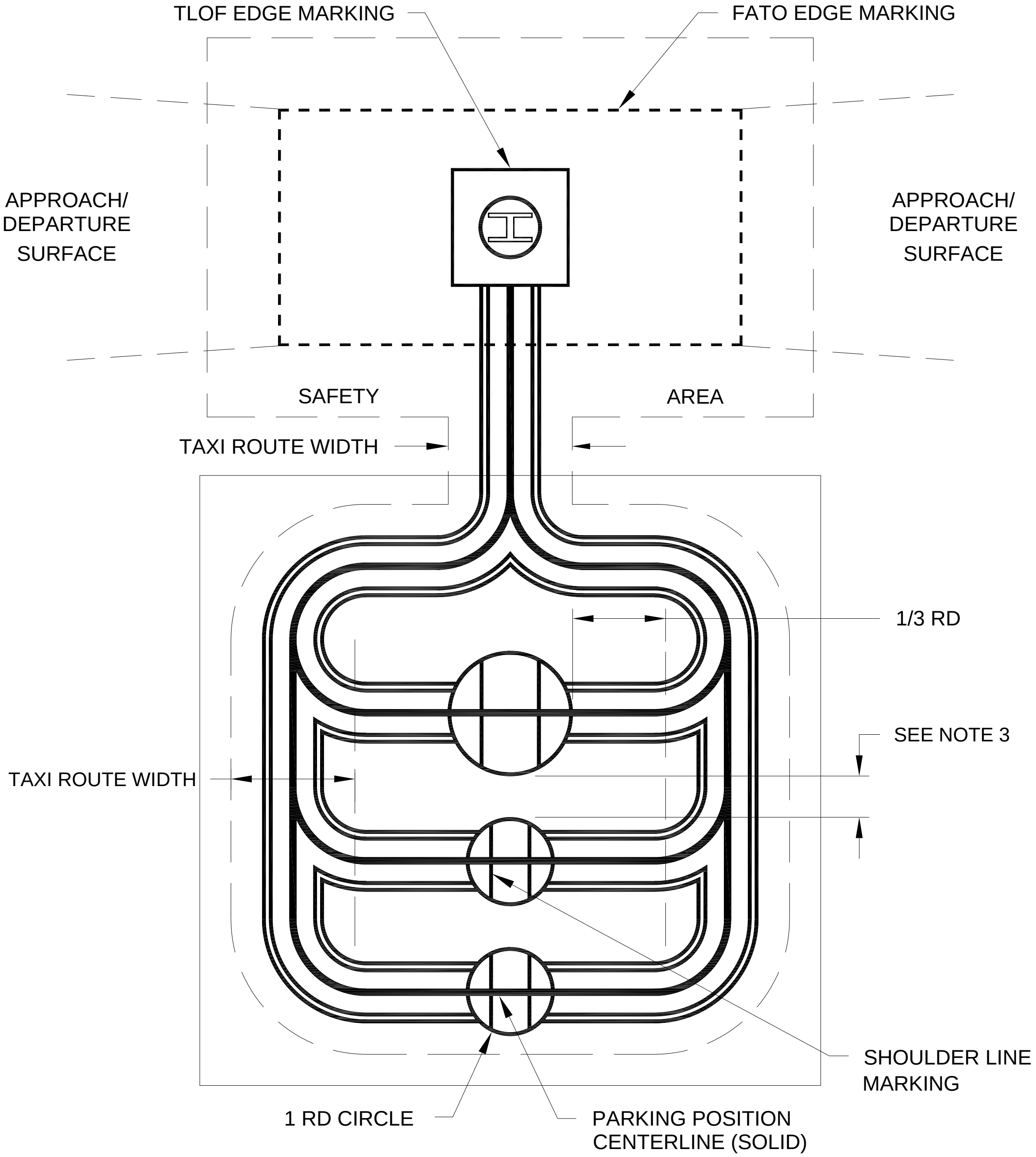
d. Fueling. Helicopter fueling is typically accomplished with the use of a fuel truck or a specific fueling area with stationary fuel tanks.



Notes:

1. Several markings (such as Parking Position Identifier and passenger walkways) have been omitted for clarity.
2. Minimum recommended clearance between the tail rotor arcs :
   - Hover taxi operations: 1/3 RD of the larger helicopter, but not less than 10 ft [3 m].
   - Ground taxi operations: 10 ft [3 m]

Figure 3-14. Parking Area Design – "Turn-around" Parking Positions: Transport



Notes:

1. Several markings (such as Parking Position Identifier and passenger walkways) have been omitted for clarity.
2. The parking positions are designed so that the helicopters exit taxiing forward.
3. Minimum recommended clearance between the arcs generated by the main rotor:
   - Hover taxi operations: 1/3 RD of the larger helicopter
   - Ground taxi operations: 10 ft [3 m]

Figure 3-15. Parking Area Design – “Taxi-through” Parking Position

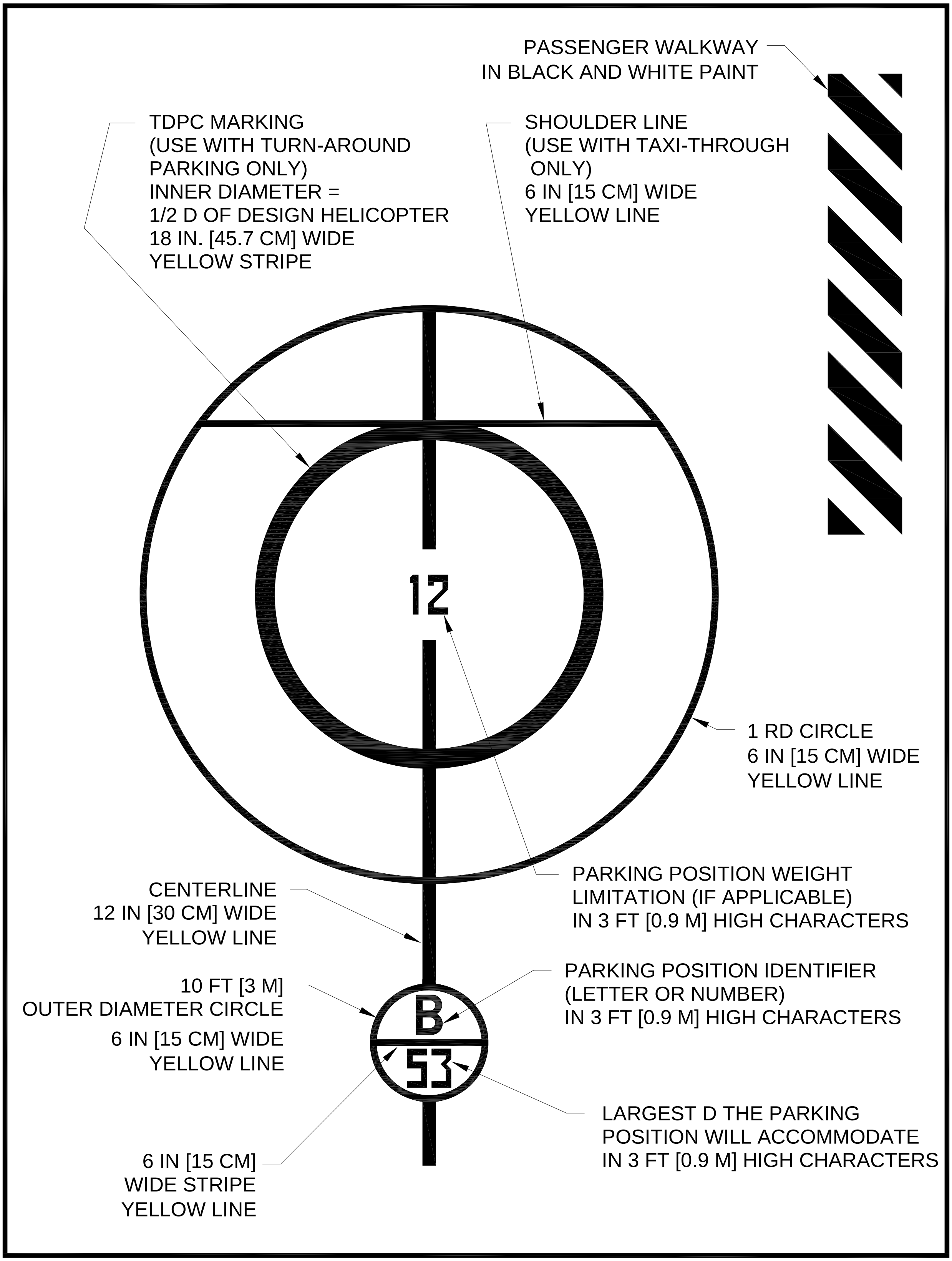


Figure 3-16. Parking Position Identification, Size and Weight Limitations: Transport

(1) Systems for storing and dispensing fuel must conform to Federal, state, and local requirements for petroleum handling facilities. Guidance is found in AC 150/5230-4, *Aircraft Fuel Storage, Handling, and Dispensing on Airports*, and in appropriate National Fire Protection Association (NFPA) 403, *Standard for Aircraft Rescue and Fire Fighting Services at Airp*orts, and NFPA 418, *Standards for Heliports*.

(2) Fueling locations must be designed and marked to minimize the potential for helicopters to collide with the dispensing equipment. Fueling areas should be designed so there is no object tall enough to be hit by the main or tail rotor blades within a distance of RD of the design helicopter from the center point of the position where the helicopter would be fueled. If this is not practical at an existing facility, long fuel hoses should be installed.

(3) Lighting. The fueling area should be lighted if night fueling operations are contemplated. Care should be taken to ensure that any light poles do not constitute an obstruction hazard.

e. Tiedowns. Recessed tiedowns should be installed to accommodate extended or overnight parking of based or transient helicopters. Caution should be exercised to ensure that any depression associated with the tiedowns is of a diameter not greater than one-half the width of the smallest helicopter landing wheel or landing skid anticipated to be operated on the heliport surface. In addition, tiedown chocks, chains, cables, and ropes should be stored off the heliport surface to avoid fouling landing gear. Guidance on tiedowns can be found in AC 20-35, *Tiedown Sense*.

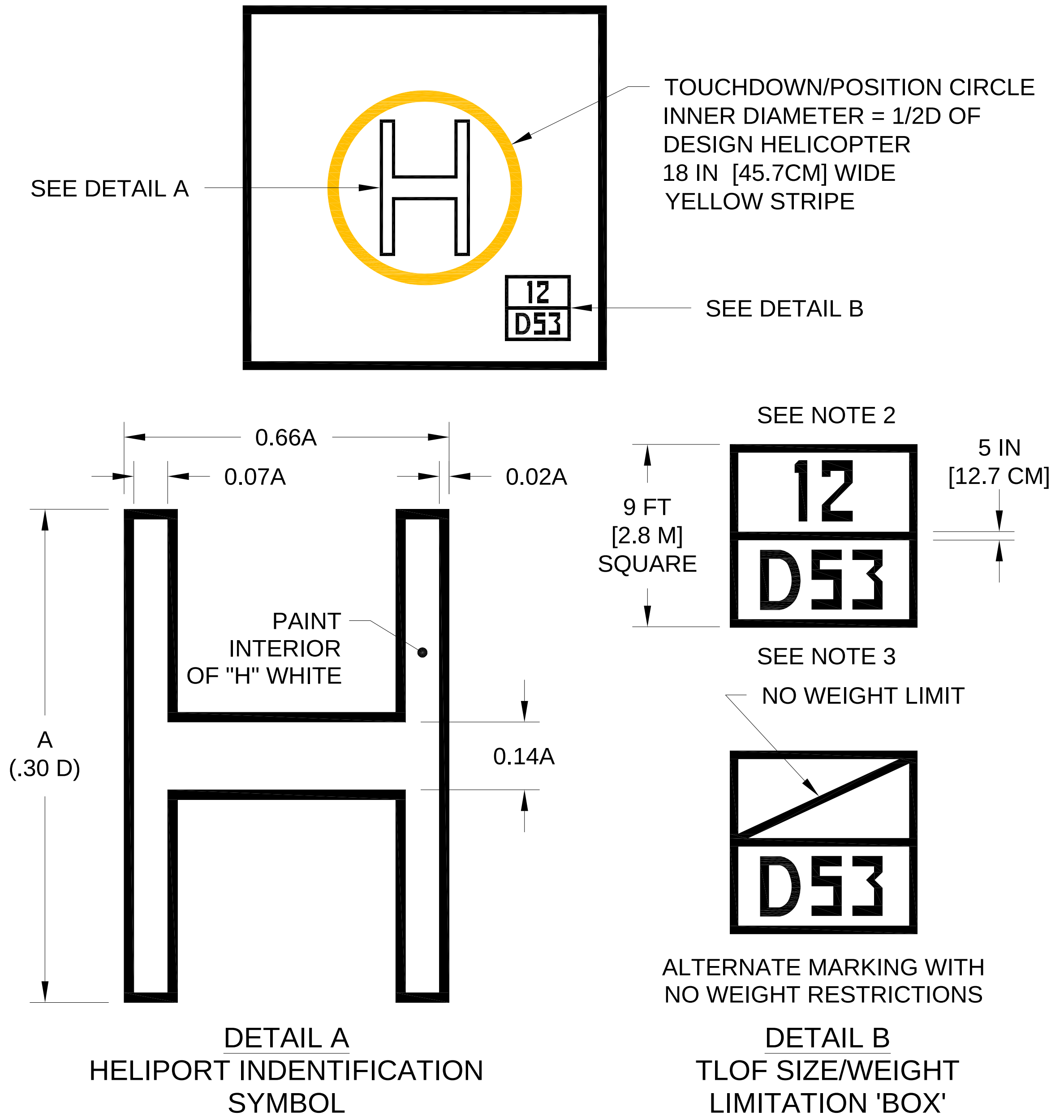
313. HELIPORT MARKERS AND MARKINGS. Markers and/or surface markings identify the facility as a heliport. Surface markings may be paint, reflective paint, reflective markers, or preformed material. Lines/markings may be outlined with a 6-inch-wide (15 cm) line of a contrasting color to enhance conspicuity. Markings that define the edges of a TLOF, FATO, taxiway or apron are placed within the limits of those areas. The following markers and markings are used.

a. Heliport Identification Marking. The identification marking identifies the location as a heliport, marks the TLOF and provides visual cues to the pilot. The marking consists of a white "H." The height of the "H" is 0.3D. The "H" is located in the center of the TLOF and oriented on the axis of the preferred approach/departure path. A bar may be placed under the "H" when it is necessary to distinguish the preferred approach/departure direction. The proportions and layout of the letter "H" are illustrated in Figure 3-17 on page 92.

b. TLOF Markings.

(1) TLOF Perimeter Marking. The perimeter of a TLOF is defined with a continuous 12-inch wide (30 cm), white line, as shown in Figure 3-18 on page 93.

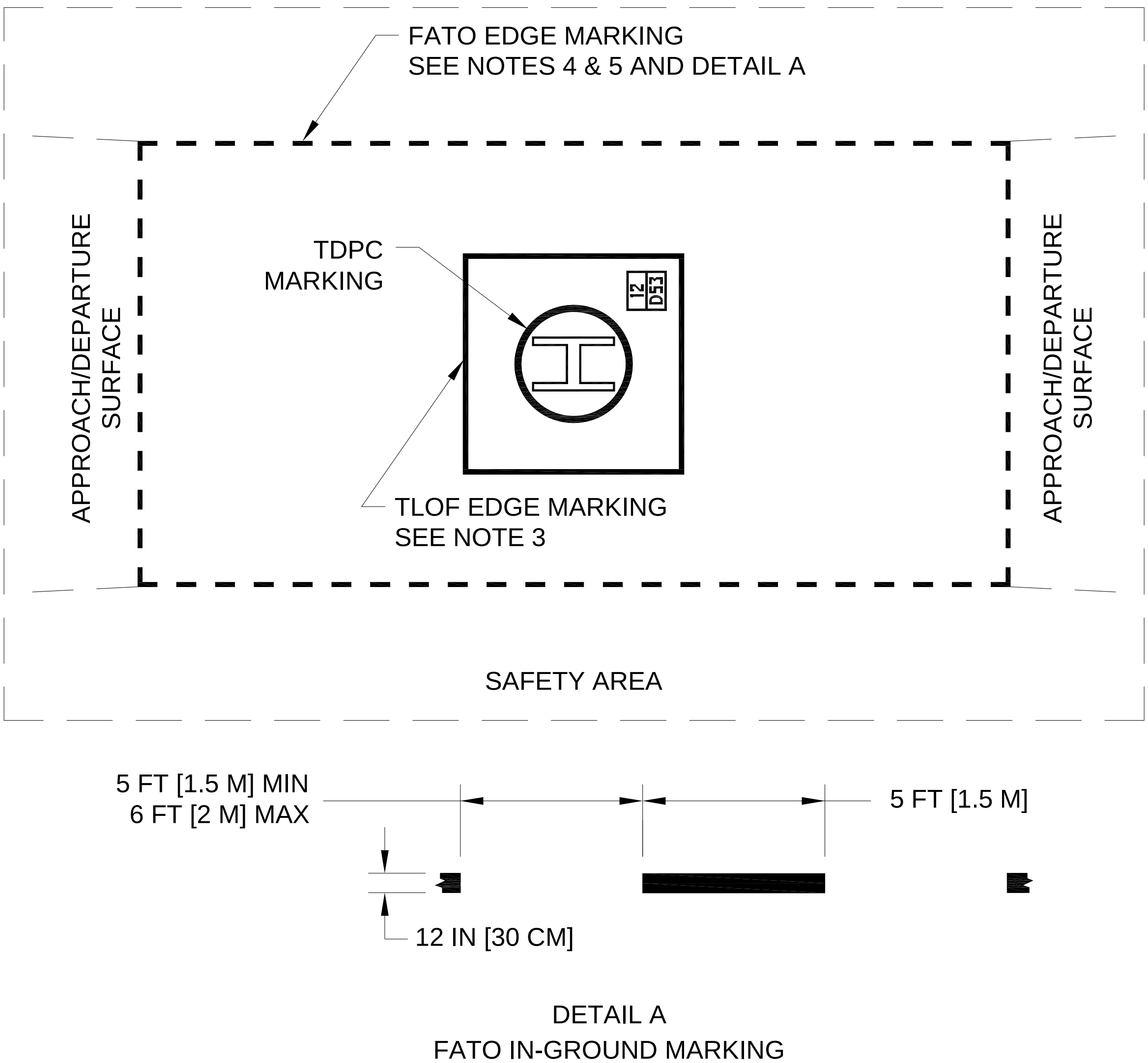
(2) Touchdown/Positioning Circle (TDPC) Marking. A touchdown/positioning circle marking is provided for guidance to allow a pilot to touch down in a specific position on paved surfaces. When the pilot's seat is over the marking, the undercarriage will be inside the load-bearing area, and all parts of the helicopter will be clear of any obstacle by a safe margin. A TDPC marking is a yellow circle with an inner diameter of 0.5 D and a line width of 18 in (0.5 m). A TDPC marking is located in the center of a TLOF. See Figure 3-17 on page 92.



Notes:

1. See Appendix C for the form and proportion of the numbers used in the TLOF Size and Limitation Box.
2. "12" indicates the maximum takeoff weight (12,000 lbs) of the TLOF design helicopter, in units of thousands of pounds.
3. "D53" indicates the overall length of the largest helicopter (53 ft) for which the TLOF is designed.

Figure 3-17. Standard Heliport Identification Symbol, TLOF Size and Weight Limitations: Transport



Notes:

1. The "H" is orientated on the axis of the preferred approach/departure surface.
2. The perimeter of the TLOF and FATO are marked.
3. The perimeter of a paved or hard surfaced TLOF is defined with a continuous 12 in [30 cm] white line.
4. Paved FATO perimeters are defined with a 12 in [30 cm] wide dashed line per Detail A.
5. Unpaved FATO perimeters are defined with a flush in-ground marker per Detail A.
6. See Figure 3-17 for " H", Touchdown/Position, Overall Length and Weight Limitation box dimensions.

Figure 3-18. Paved TLOF/Paved FATO – Paved TLOF/Unpaved FATO – Marking: Transport

(3) TLOF Size and Weight Limitations. The TLOF is marked to indicate the length and weight of the largest helicopter for which it is designed, as shown in Figure 3-17 on page 92. These markings are contained in a box that is located in the lower right-hand corner of the TLOF, or the on right-hand side of the "H" of a circular TLOF, when viewed from the preferred approach direction. The numbers are 5 feet (1.5 m) high (see Figure C–2 on page 188). The numbers are black with a white background.

(4) TLOF Size Limitation. This number is the length (D) of the largest helicopter for which it is designed, as shown in Figure 3-17 on page 92. The marking consists of the letter "D" followed by the dimension in feet. Metric equivalents are not used for this purpose. This marking is centered in the lower section of the TLOF size/weight limitation box.

(5) TLOF Weight Limitations. If a TLOF has limited weight-carrying capability, it is marked with the maximum takeoff weight of the design helicopter, in units of thousands of pounds, as shown in Figure 3-17 on page 92. Metric equivalents are not be used for this purpose. This marking is centered in the upper section of a TLOF size/weight limitation box. If the TLOF does not have a weight limit, a diagonal line, extending from the lower left hand corner to the upper right hand corner, should be added to the upper section of the TLOF size/weight limitation box.

c. FATO Markings.

(1) FATO Perimeter Marking.

(a) Paved FATOs. The perimeter of a paved FATO is defined with a 12-inch wide (30 cm) dashed white line. The corners of the FATO are defined and the perimeter marking segments are 12 inches in width, approximately 5 feet (1.5 m) in length, and with end-to-end spacing of approximately 5 feet (1.5 m). See Figure 3-18 on page 93.

(b) Unpaved FATOs. The perimeter of an unpaved FATO is marked with 12-inch wide (30 cm), flush in-ground markers. The corners of the FATO are defined and the perimeter markers are 12 inches in width, approximately 5 feet (1.5 m) in length, and with end-to-end spacing of approximately 5 feet (1 5 m). Figure 3-18 on page 93.

d. Flight Path Alignment Guidance Marking. An optional flight path alignment guidance marking consists of one or more arrows to indicate the preferred approach/departure direction(s). It is marked on the TLOF, FATO and/or safety area surface as shown in Figure 3-9 on page 81. The shaft of the arrow is 18 in. (50 cm) in width and at least 10 feet (3 m) in length. When combined with a flight path alignment guidance lighting system described in paragraph 314.g on page 99, it takes the form shown in Figure 3-9 on page 81, which includes scheme for marking the arrowheads. The markings must be in a color that provides good contrast against the background color of the surface on which they are marked. In the case of a flight path limited to a single departure path, the arrow marking is unidirectional. In the case of a heliport with only a bidirectional approach /takeoff flight path available, the arrow marking is bidirectional.

e. Taxiway and Taxi Route Markings.

(1) Taxiway Markings. The centerline of a taxiway is marked with a continuous 6-inch (15 cm) yellow line. Both edges of the taxiway are marked with two continuous 6- inch wide (15 cm) yellow lines spaced 6 inches (15 cm) apart. Figure 3-11 on page 83 illustrates taxiway centerline and edge markings.

(2) Taxiway to Parking Position Transition Requirements. For paved taxiways and parking areas, taxiway centerline markings continue into parking positions and become the parking position centerlines.

f. Helicopter Parking Position Markings. Helicopter parking positions have the following markings.

(1) Paved Parking Position Identifications. Parking position identifications (numbers or letters) are marked if there is more than one parking position. These markings are yellow characters 3 feet (0.9 m) high. (See Figure 3-16 on page 90, and Figure C–1 on page 187).

(2) Rotor Diameter Circle. A 6-inch-wide (15 cm), solid yellow line defines a circle of the RD of the largest helicopter that will park at that position. The RD is measured at the outside edge of the circle. See Figure 3-12 on page 85.

(3) Touchdown/Positioning Circle (TDPC) Marking. An optional touchdown/positioning circle marking provides guidance to allow a pilot to touch down in a specific position on paved surfaces. When the pilot's seat is over the marking, the undercarriage will be inside the load-bearing area, and all parts of the helicopter will be clear of any obstacle by a safe margin. A TDPC marking is a yellow circle with an inner diameter of 0.5 D and a line width of 18 in (0.5 m). A TDPC marking is located in the center of a parking area. See Figure 3-16 on page 90. A TDPC marking is recommended for "turn-around" parking areas.

(4) Maximum Length Marking. A marking on paved surfaces indicates the D of the largest helicopter that the position is designed to accommodate (e.g., 49). This marking is in yellow characters at least 3 feet (0.9 m) high. (See Figure 3-17 on page 92 and Figure C–1 on page 187.)

(5) Parking Position Weight Limit. If a paved parking position has a weight limitation, it is stated in units of 1,000 pounds as illustrated in Figure 3-16 on page 90. (A 12 indicates a weight-carrying capability of up to 9,000 pounds. Metric equivalents are not be used for this purpose.) This marking consists of yellow characters 3 feet (0.9 m) high. A bar may be placed under the number to minimize the possibility of being misread. (See Figure 3-17 on page 92 and Figure C–1 on page 187).

(6) Shoulder Line Markings. Optional shoulder line markings are used for paved parking areas (Figure 3-12 on page 85) to ensure safe rotor clearance. A 6-inch-wide (15 cm) solid yellow shoulder line, perpendicular to the centerline and extending to the RD marking, is located so it is under the pilot's shoulder such that the main rotor of the largest helicopter for which the position is designed will be entirely within the rotor diameter parking circle. See Figure 3-16 on page 90. A shoulder line marking is recommended for "taxi through" parking areas.

(7) Walkways. Figure 3-12 on page 85 illustrates one marking scheme.

g. Closed Heliport. All markings of a permanently closed heliport, FATO, or TLOF should be obliterated. If it is impractical to obliterate markings, a yellow "X" should be placed over the "H", as illustrated in Figure 3-19 below. The yellow "X" must be large enough to ensure early pilot recognition that the heliport is closed. The wind cone(s) and other visual indications of an active heliport must also be removed.

h. Marking Sizes. See Appendix C on page 187 for guidance on the proportions of painted numbers.

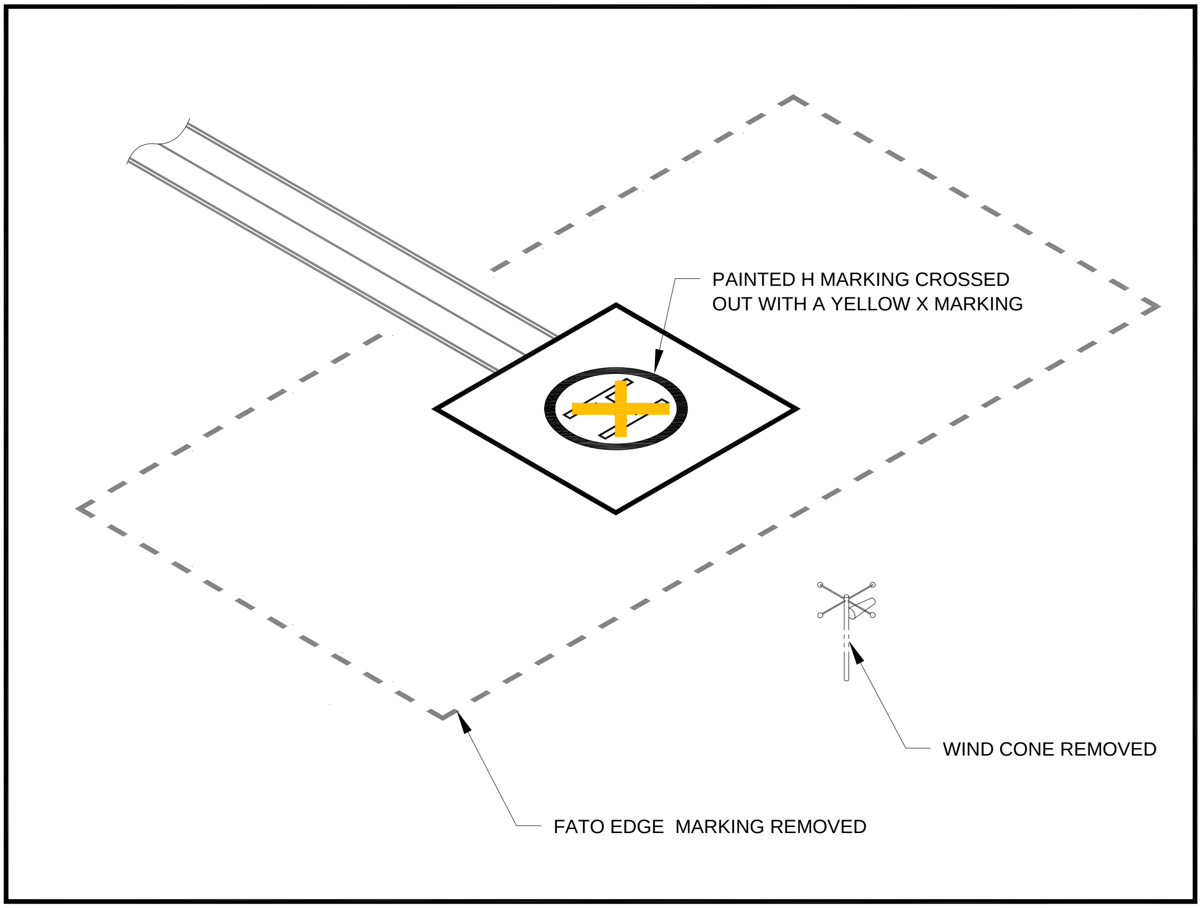


Figure 3-19. Marking a Closed Heliport: Transport

314. HELIPORT LIGHTING. For night operations, the heliport must be lighted with FATO and/or TLOF perimeter lights as described below. Where flush lights are specified, the fixtures and installation method must be designed to support point loads of the design helicopter transmitted through a skid or wheel.

a. TLOF–Perimeter Lights. Flush green lights meeting the requirements of FAA Airports Engineering Brief 87, *Heliport Lighting*[2] are used to define the TLOF perimeter. A minimum of four light fixtures is required per side of the TLOF. A light is located at each corner, with additional lights uniformly spaced between the corner lights. It is recommended each side comprise an odd number of lights, thereby including lights along the centerline of the approach. The maximum spacing of lights is 25 feet (7.6 m). Flush lights are located within 1 foot (30 cm) (inside or outside) of the TLOF perimeter. Figure 3-20 on page 97 and Figure 3-21 on page 98 illustrate this lighting.

[2] As of the date of this draft, EB 87 has not been completed. Guidance on heliport lighting will be published as soon as possible.

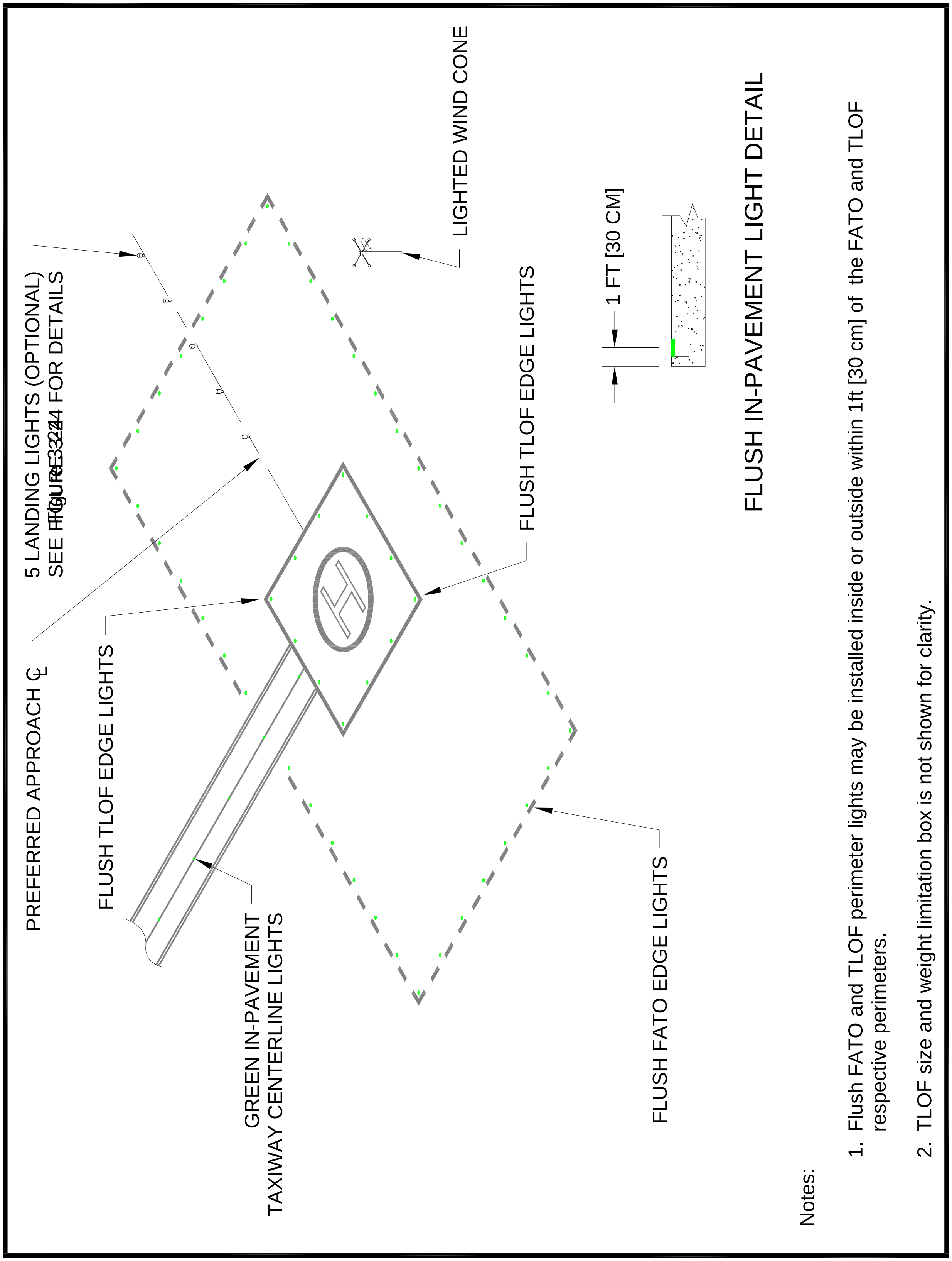


Figure 3-20. TLOF and FATO Flush Perimeter Lighting: Transport

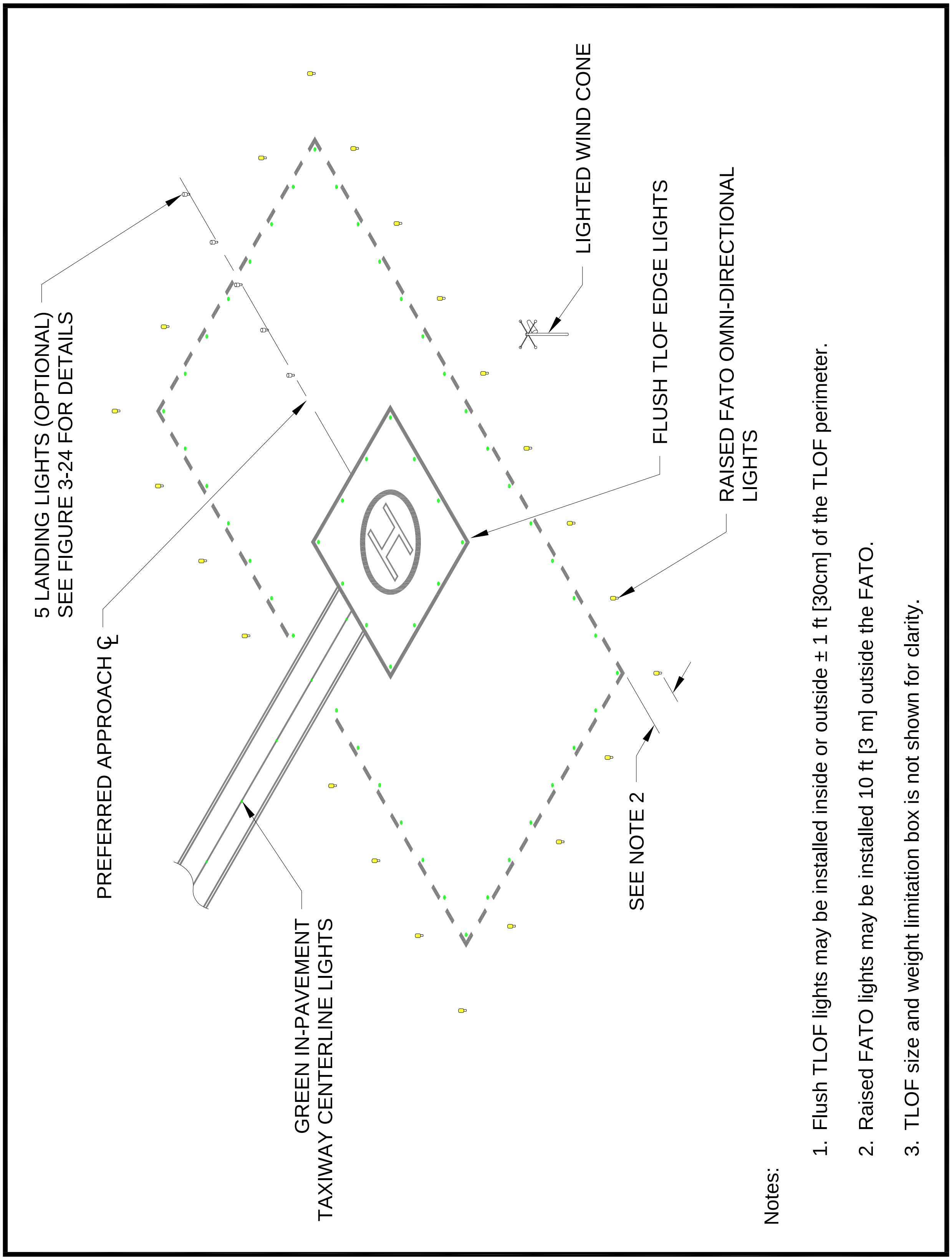


Figure 3-21. FATO Raised and TLOF Flush Perimeter Lighting: Transport

b. Optional TLOF Lights. An optional feature is a line of 7 green, flush lights meeting the standards of EB 87 spaced at 5-foot (1.5 m) intervals installed in the TLOF pavement. These lights are aligned on the centerline of the approach course to provide close-in directional guidance and improve TLOF surface definition. These lights are illustrated in Figure 3-22 on page 100.

c. Ground Level FATO Perimeter Lights. Green lights meeting the requirements of EB 87 are used to define the limits of the FATO. A light is located at each corner with additional lights uniformly spaced between the corner lights with a maximum interval of 25 feet (8 m) between lights. It is recommended each side comprise an odd number of lights, thereby including lights along the centerline of the approach. If flush lights are used, they are located within 1 foot (30 cm) inside or outside of the FATO perimeter. If raised light fixtures are used, they must be no more than 8 inches (20 cm) high, located 10 feet (3 m) out from the FATO perimeter, and must not penetrate a horizontal plane at the FATO elevation by more than 2 inches (5 cm). See Figure 3-21 on page 98.

d. Elevated FATO–Perimeter Lights. Lighting for an elevated FATO is the same as for a ground level FATO except that lights may be located at the outside edge of the safety net, as shown in Figure 3-23 on page 101. The raised lights must not penetrate a horizontal plane at the FATO elevation by more than 2 inches (5 cm). In areas where it snows in the winter, the outside edge of the safety net is the preferred location.

e. Floodlights. If ambient light does not adequately illuminate markings for night operations, floodlights should be used to illuminate the TLOF, the FATO, and /or the parking apron. To eliminate the need for tall poles, these floodlights may be mounted on adjacent buildings. Care should be taken, however, to place floodlights clear of the TLOF, the FATO, the safety area, and the approach/departure surfaces and transitional surfaces. Care should be taken to ensure that floodlights and their associated hardware do not constitute an obstruction hazard. Floodlights should be aimed down and provide illumination on the apron surface. Floodlights that might interfere with pilot vision during takeoff and landings should be capable of being turned off by pilot control or at pilot request.

f. Landing Direction Lights. Landing direction lights are an optional feature to be installed when it is necessary to provide directional guidance. Landing direction lights are a configuration of five white omnidirectional lights meeting the standards of EB 87 on the centerline of the preferred approach/departure path. These lights are spaced at 15-foot (4.6 m) intervals beginning at a point not less than 30 feet (9 m) and not more than 60 feet (18 m) from the TLOF perimeter and extending outward in the direction of the preferred approach/departure path, as illustrated in Figure 2-26 on page 102.

g. Flight Path Alignment Lights. Flight path alignment lights meeting the requirements of EB 87 are optional. They are placed in a straight line along the direction of approach and/or departure flight paths. The lights may extend across the TLOF, FATO, safety area or any suitable surface in the immediate vicinity of the FATO or safety area. Lights in the TLOF or FATO must be flush lights. Three or more white lights are spaced at 5 feet (1.5 m) to 10 feet (3.0 m). (See Figure 3-9 on page 81.)

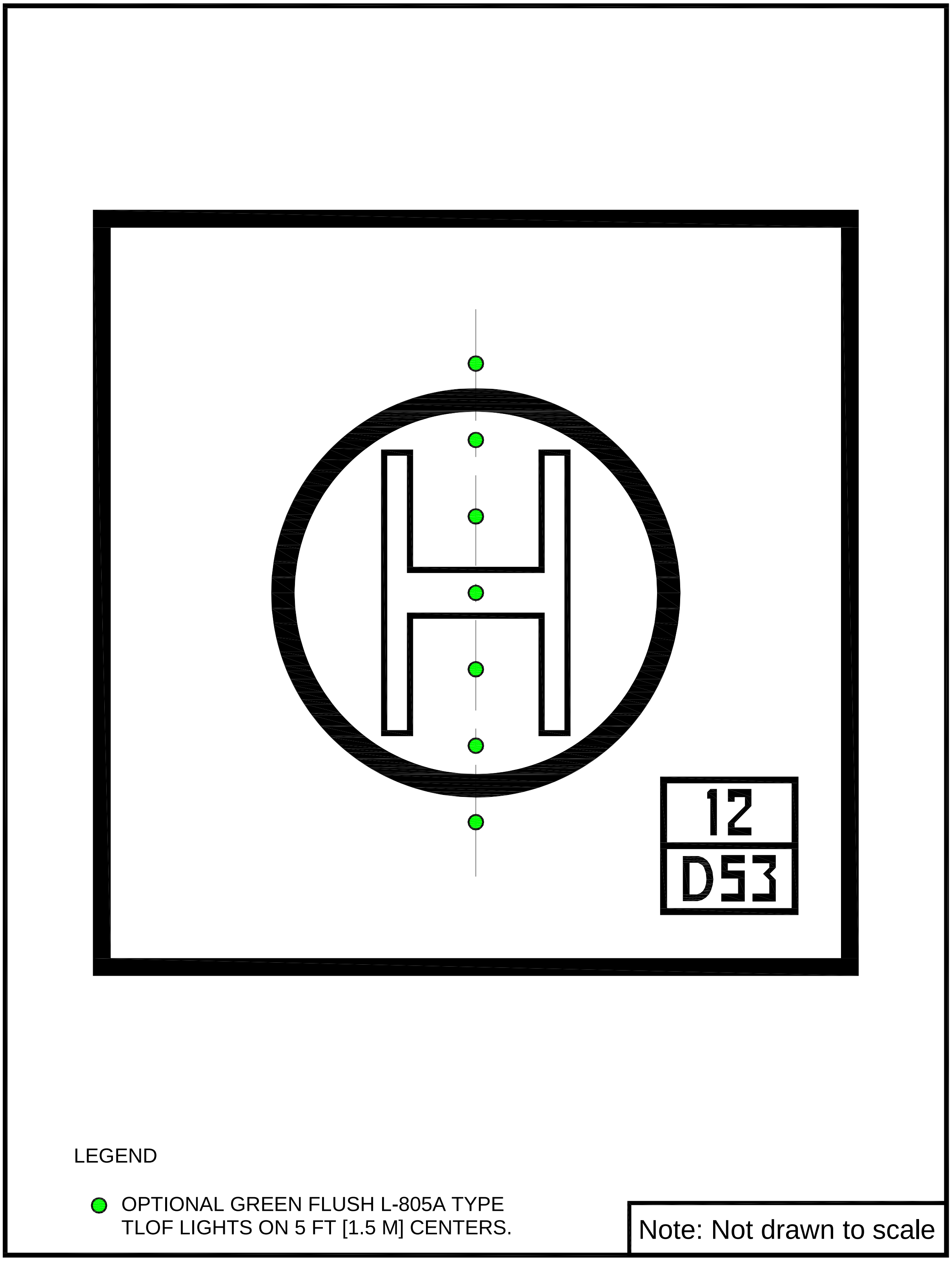
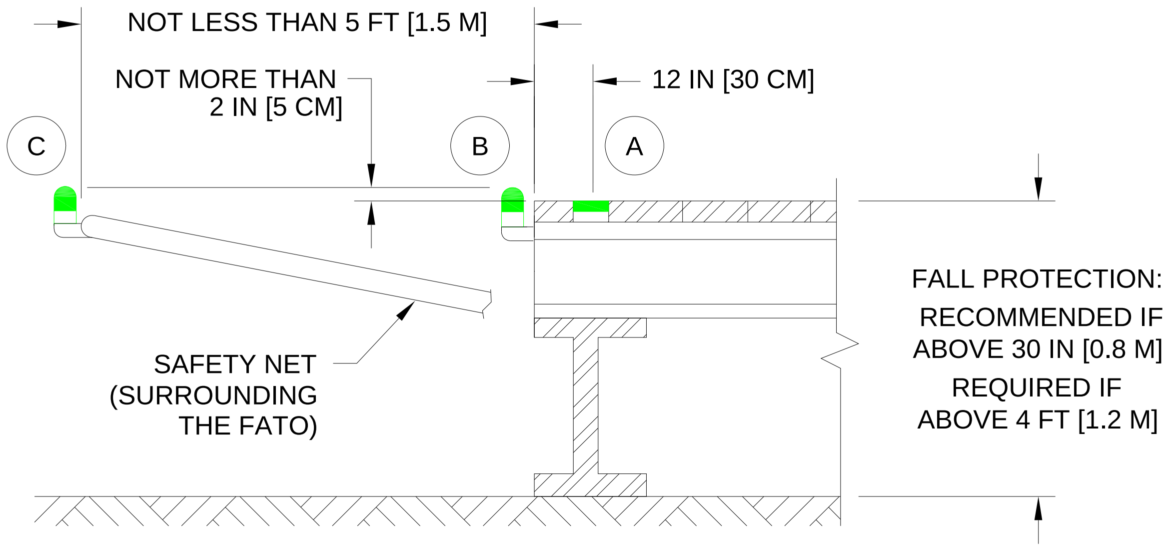


Figure 3-22. Optional TLOF Lights: Transport



Three possible locations for FATO edge lighting:

- (A) Flush edge fixtures
- (B) Omni-directional light, mounted off FATO edge
- (C) Omni-directional light, mounted off outer edge of safety net (preferred location in snow areas)

Figure 3-23. Elevated FATO – Perimeter Lighting: Transport

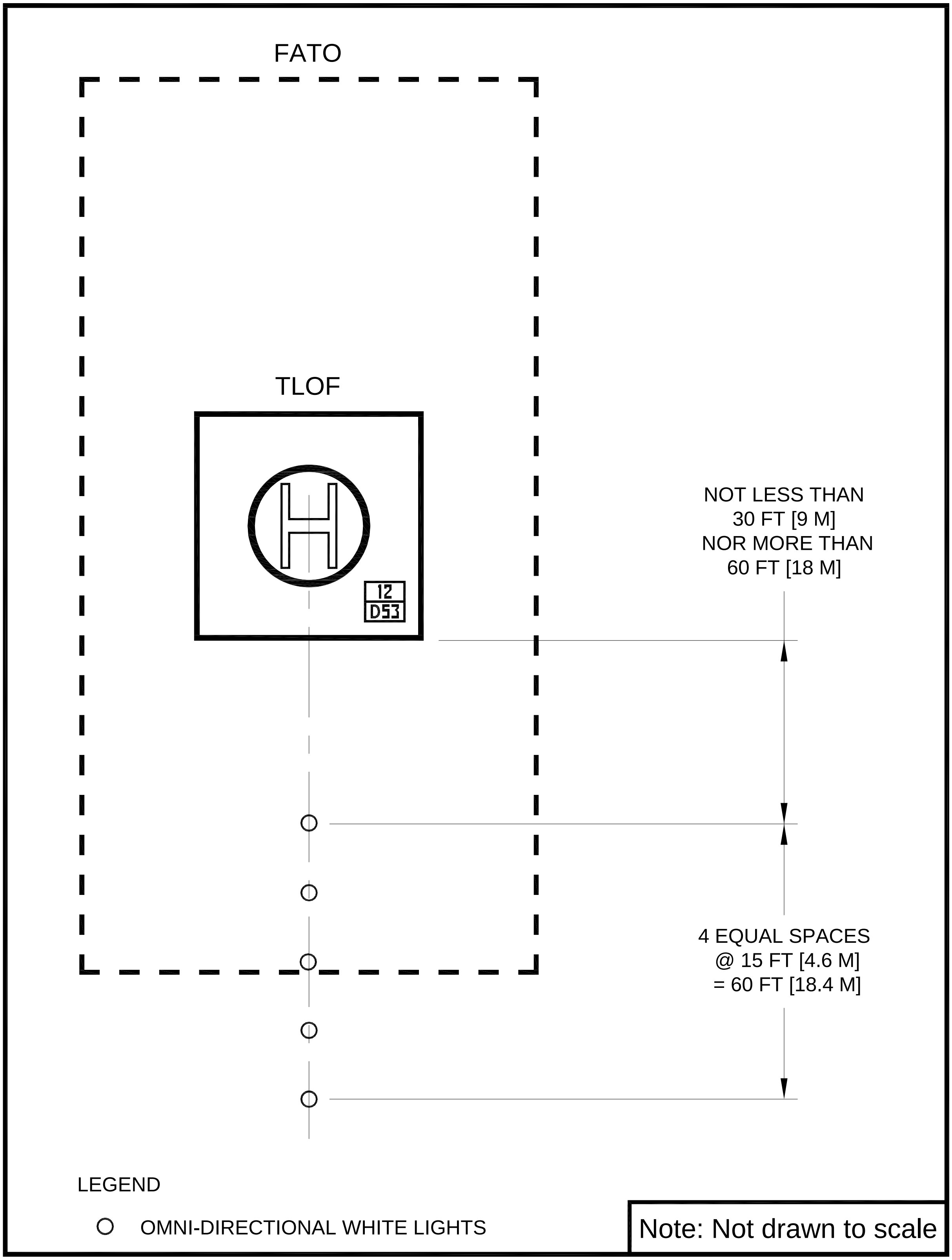


Figure 3-24. Landing Direction Lights: Transport

h. Taxiway and Taxi Route Lighting.

(1) Taxiway Centerline Lights. Taxiway centerlines are defined with flush bidirectional green lights meeting the standards of AC 150/5345-46 for type L-852A (straight segments) or L-852B (curved segments). These lights are spaced at maximum 50-foot (15 m) longitudinal intervals on straight segments and at maximum 25-foot (7.5 m) intervals on curved segments, with a minimum of four lights needed to define the curve. Taxiway centerline lights may be uniformly offset no more than two feet to ease painting the taxiway centerline. Retroreflective markers are not permitted.

(2) Taxiway Edge Lights. Flush omnidirectional blue lights meeting the standards of AC 150/5345-46 for type L-852T are used to mark the edges of a taxiway. Retroreflective markers are not permitted.

(a) Straight Segments. Lights are spaced at 50 feet (15.2 m) longitudinal intervals on straight segments.

(b) Curved Segments. Curved taxiway edges require shorter spacing of edge lights. The spacing is determined based on the radius of the curve. The applicable spacing for curves is the shown in Figure 17 of AC 150/5340-30, *Design and Installation Detail for Airport Visual Aids*. The taxiway edge lights are uniformly spaced. Curved edges of more than 30 degrees from point of tangency (PT) of the taxiway section to PT of the intersecting surface must have at least three edge lights. For radii not listed in Figure 17 determine spacing by linear interpolation.

i. Heliport Identification Beacon. A heliport identification beacon must be installed. The beacon, flashing white/green/yellow at the rate of 30 to 45 flashes per minute, must be located on or close to the heliport. Guidance on heliport beacons is found in AC 150/5345-12, *Specification for Airport and Heliport Beacon*.

315. MARKING AND LIGHTING OF DIFFICULT-TO-SEE OBJECTS. Unmarked wires, antennas, poles, cell towers, and similar objects are often difficult to see, even in the best daylight weather, in time for a pilot to successfully take evasive action. While pilots can avoid such objects during en route operations by flying well above them, approaches and departures require operations near the ground where obstacles may be a factor. This paragraph discusses the marking and lighting of objects near, but outside and below the approach/departure surface. Guidance on marking and lighting objects is contained in AC 70/7460-1, *Obstruction Marking and Lighting*.

a. Airspace. If difficult-to-see objects penetrate the object identification surfaces illustrated in Figure 3-25 on page 104, these objects must be marked to make them more conspicuous. If operations are conducted at a heliport between dusk and dawn, these difficult-to-see objects must be lighted. The object identification surfaces in Figure 3-25 on page 104 are described as follows:

(1) In all directions from the safety area except under the approach/departure paths, the object identification surface starts at the safety area perimeter and extends out horizontally for a distance of 100 feet (30.5 m).

(2) Under the approach/departure surface, the object identification surface starts from the outside edge of the FATO and extends horizontally out for a distance of 800 feet (244 m). From this point, the object identification surface extends out for an additional distance of 3,200 feet (975 m) while rising on an 8:1 slope (8 units horizontal in 1 unit vertical). From the point 800 feet (244 m) from the FATO perimeter, the object identification surface is 100 feet (30.5 m) beneath the approach/departure surface.

(3) The width of this object identification surface under the approach/departure surface increases as a function of distance from the safety area. From the safety area perimeter, the object identification surface extends laterally to a point 100 feet (30.5 m) outside the safety area perimeter. At the upper end of the surface, the object identification surface extends laterally 200 feet (61 m) on either side of the approach/departure path.

b. Shielding of Objects. If there are a number of objects close together, it may not be necessary to mark all of them if they are shielded. To meet the shielding guidelines an object must be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and must be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation. Additional guidance on this topic may be found in 14 CFR part 77.9, *Construction or alteration requiring notice*.

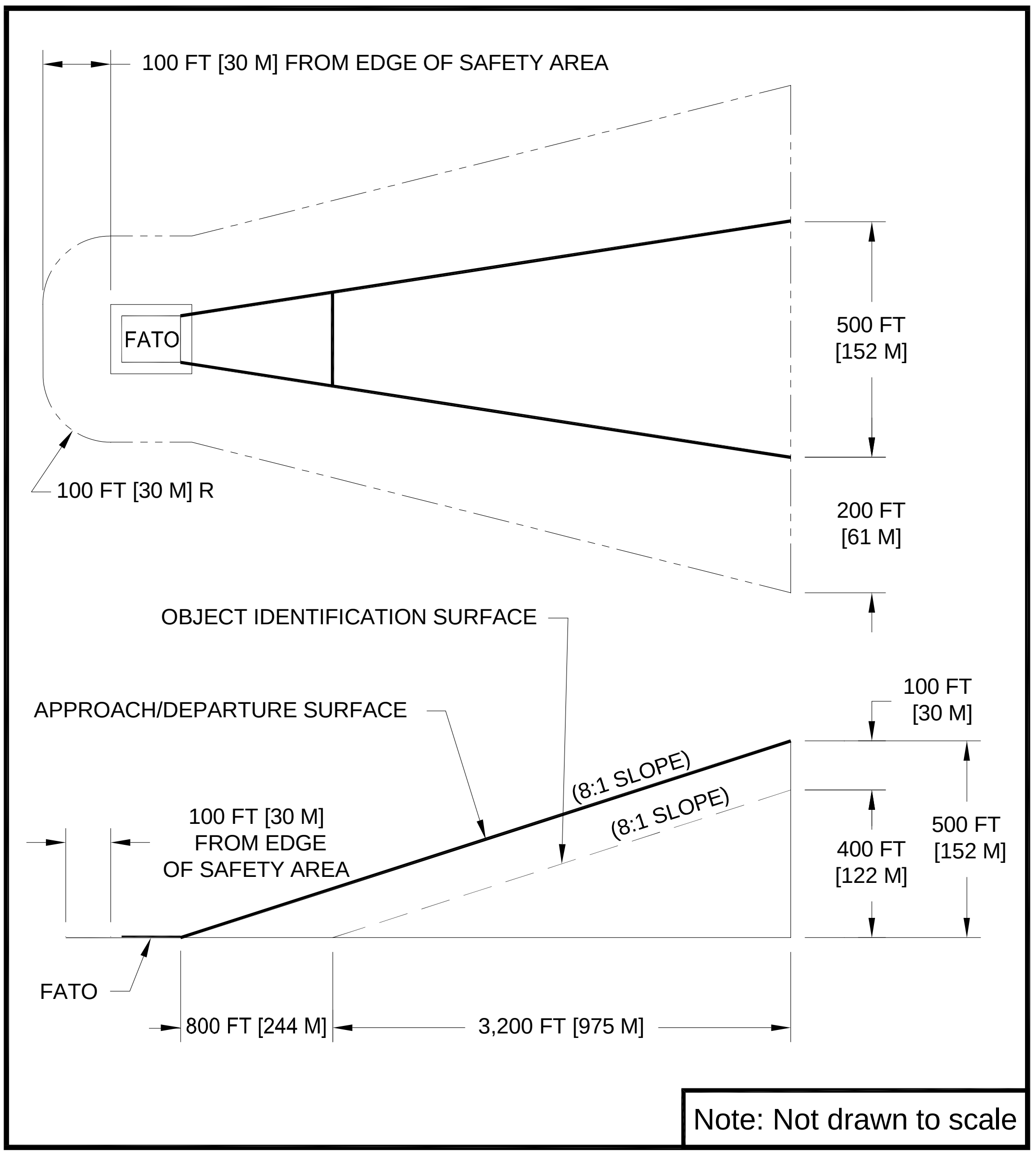


Figure 3-25. Airspace Where Marking and Lighting are Recommended: Transport

316. SAFETY CONSIDERATIONS. Some safety enhancements to be considered in the design of a heliport are discussed below. Other areas such as the effects of rotor downwash may need to be addressed based on site conditions and the design helicopter.

a. Security. The operational areas of a heliport need to be kept clear of people, animals, and vehicles.

(1) Safety Barrier. At ground-level transport heliports, the heliport owner or operator must erect a safety barrier around the helicopter operational areas. This barrier may take the form of a fence or a wall. It must be no closer to the operation areas than the outer perimeter of the safety area. Barriers should not penetrate any approach/departure (primary or transitional) surface. Thus, in the vicinity of the approach/departure paths, the barrier may need to be well outside the outer perimeter of the safety area.

(2) Any barrier must be high enough to present a positive barrier to persons inadvertently entering an operational area and yet low enough to be non-hazardous to helicopter operations.

(3) Access to airside areas must be through controlled and locked gates and doors. Gates and doors should display a cautionary sign similar to that illustrated in Figure 3-26 on page 106.

b. Rescue and Fire-Fighting Services. Heliports must meet State and local rescue and fire-fighting regulations. A fire hose cabinet or extinguisher must be provided at each access gate and each fueling location. At elevated TLOF/FATOs, fire hose cabinets, fire extinguishers, and other fire-fighting equipment must be located adjacent to, but below the level, of the TLOF/FATO. Information is available in NFPA 418, *Standards for Heliports*, and NFPA 403, *Standard for Aircraft Rescue and Fire-Fighting Services at Airports*. NFPA standards are available at the NFPA web site http://www.nfpa.org.

c. Communications. A Common Traffic Advisory Frequency (CTAF) radio may be used to provide arriving helicopters with heliport and traffic advisory information but may not be used to control air traffic. The Federal Communications Commission (FCC) should be contacted for information on CTAF licensing.

d. Weather Information. An automated weather observing system (AWOS) measures and automatically broadcasts current weather conditions at the heliport site. When an AWOS is installed, it must be located at least 100 feet (30 m) and not more than 700 feet (213 m) from the TLOF. Locate the AWOS so its instruments will not be affected by rotor wash from helicopter operations. Guidance on AWOS systems is found in AC 150/5220-16, *Automated Weather Observing Systems (AWOS) for Non-Federal Applications*, and FAA Order 6560.20, *Siting Criteria for Automated Weather Observing Systems (AWOS).*

e. Winter Operations. Swirling snow raised by a helicopter's rotor wash can cause the pilot to lose sight of the intended landing point and/or hide objects that need to be avoided. At least the TLOF, the FATO, and as much of the safety area as practical, should be kept free of snow. Heliport design should take into account the methods and equipment to be used for snow removal. The heliport design should allow the snow to be removed sufficiently so that the snow will not present an obstruction hazard to either the tail rotor or the main rotor. Guidance on winter operations is found in AC150/5200-30, *Airport Winter Safety and Operations*.

Figure 3-26. Caution Sign: Transport

317. VISUAL GLIDESLOPE INDICATORS (VGSI). A visual glideslope indicator (VGSI) provides pilots with visual vertical course and descent cues. The lowest on-course visual signal must provide a minimum of 1 degree of clearance over any object that lies within 10 degrees of the approach course centerline.

a. Siting. The optimum location of a VGSI is on the extended centerline of the approach path at a distance that brings the helicopter to a hover with the undercarriage between 3 and 8 feet (0.9 to 2.4 m) above the TLOF. Figure 3-27 below illustrates VGSI clearance criteria. This will require estimating the vertical distance from the undercarriage to the pilot's eye.

b. Control of the VGSI. It is permissible for the VGSI to be pilot controllable such that it is "on" only when required.

c. VGSI Needed. A VGSI is an optional feature. However, a VGSI should be provided if one or more of the following conditions exist, especially at night:

(1) Obstacle clearance, noise abatement, or traffic control procedures require a particular slope to be flown.

(2) The environment of the heliport provides few visual surface cues.

d. Additional Guidance. AC 150/5345-52, *Generic Visual Glideslope Indicators (GVGI)*, and AC 150/5345-28, *Precision Approach Path Indicator (PAPI) Systems*, provide additional guidance.

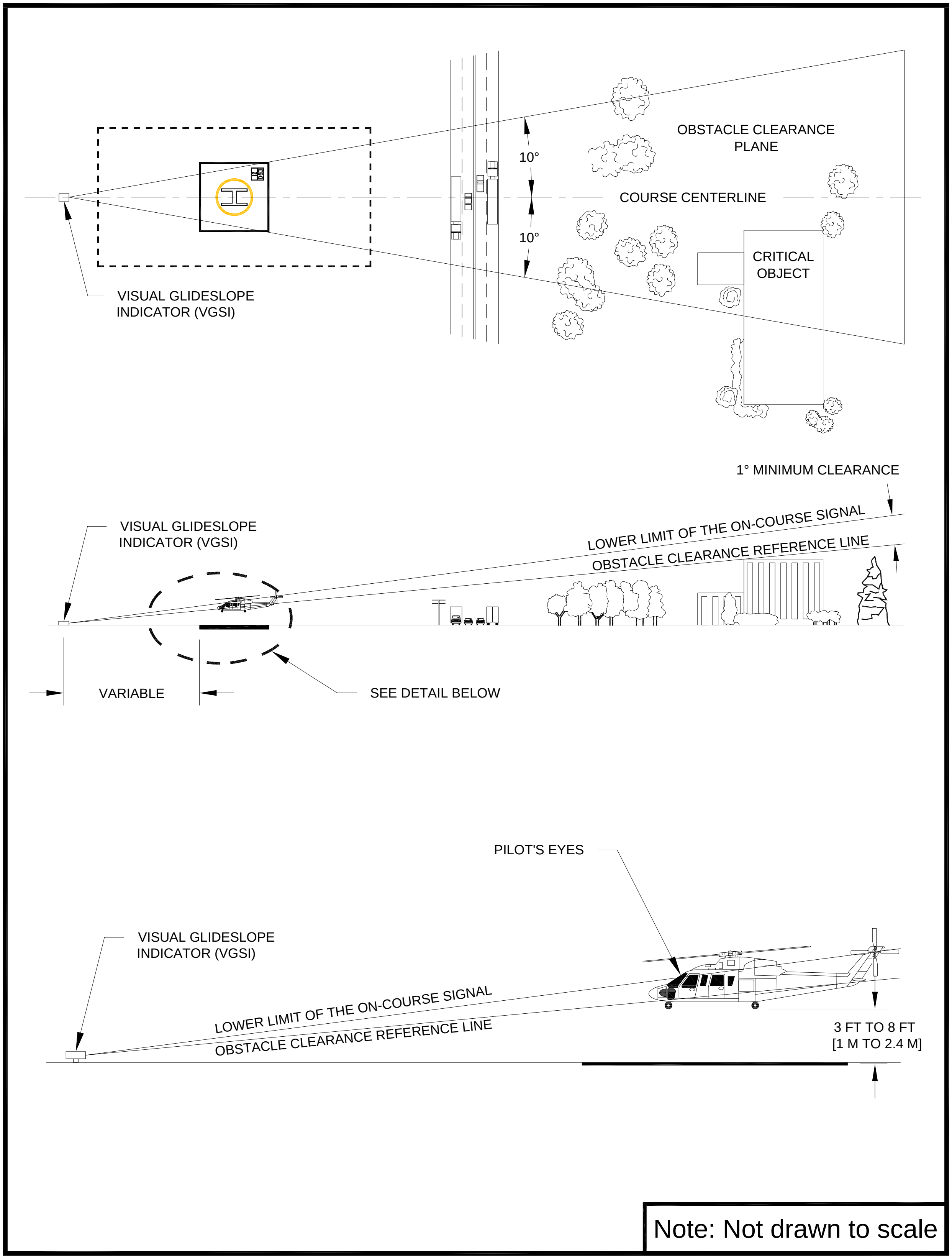


Figure 3-27. Visual Glideslope Indicator Siting and Clearance Criteria: Transport

318. TERMINAL FACILITIES.

a. Design Considerations. The heliport terminal requires curbside access for passengers using private autos, taxicabs, and public transit vehicles. Public waiting areas need the usual amenities, and a counter for rental car services may be desirable. Passenger auto parking areas should accommodate current requirements and have the capability of being expanded to meet future requirements. Readily available public transportation may reduce the requirement for employee and service personnel auto parking spaces. The heliport terminal building or sheltered waiting area should be attractive and functional. AC 150/5360-9, *Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations*, contains guidance on designing terminal facilities.

b. Security. Unless screening was carried out at the helicopter passengers' departure location, Transportation Security Administration regulations may require that a screening area and/or screening be provided before passengers enter the airport's secured areas. Multiple helicopter parking positions and/or locations may be needed in the terminal area to service helicopter passenger and/or cargo inter connecting needs. Information about passenger screening is available at Transportation Security Administration web site http://www.tsa.gov/public/.

319. ZONING AND COMPATIBLE LAND USE. Where state and local statutes permit, the transport heliport operator is encouraged to promote the adoption of the following zoning measures to ensure that the heliport will continue to be available for public use and to protect the community's investment in the facility.

a. Zoning to Limit Building/Object Heights. General guidance on drafting an ordinance that would limit building and object heights is contained in AC 150/5190-4, *A Model Zoning Ordinance to Limit Height of Objects Around Airports*. The locally developed ordinance should substitute the heliport surfaces for the airport surfaces described in the model ordinance.

b. Zoning for Compatible Land Use. A zoning ordinance may be enacted, or an existing ordinance modified, to control the use of property within the Heliport Protection Zone. The ordinance should restrict activities to those that are compatible with helicopter operations. See paragraph 309 on page 78.

c. Air rights and property easements are options that may be used to prevent the encroachment of obstacles in the vicinity of a heliport.

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CHAPTER 4. HOSPITAL HELIPORTS

401. GENERAL. Helicopters are often used to transport injured persons from the scene of an accident to a hospital and to transfer patients from one hospital to another. This chapter addresses issues that are unique to hospital heliports and issues for which the design recommendations are different than what is recommended for other categories of heliports. These recommendations address the design of a heliport that will accommodate air ambulance helicopter operations and emergency medical service (EMS) personnel and equipment. The design recommendations given in this chapter are based on the understanding that there will never be more than one helicopter within the final approach and takeoff area (FATO) and the associated safety area. If there is a need for more than one touchdown and lift-off area (TLOF) at a heliport, each TLOF should be located within its own FATO. Consider the feasibility of accommodating large military helicopters that might be used in an emergency.

402. ACCESS BY INDIVIDUALS WITH DISABILITIES. Hospital heliports by their nature must be accessible to individuals with disabilities. The legal requirement, however, is that heliports operated by public entities and those receiving Federal financial assistance must meet accessibility requirements. See paragraph 112 on page 12.

403. HELIPORT SITE SELECTION.

a. Planning. Public agencies and others planning to develop a hospital heliport are encouraged to select a site capable of supporting instrument operations, future expansion, and military helicopters that will be used in disaster relief efforts.

b. Property Requirements. A functional hospital heliport may be as simple as a cleared area on the ground, together with a wind cone and a clear approach/departure path. Figure 4-1 on page 112 illustrates the essential elements of a ground-level hospital heliport.

c. Turbulence. Air flowing around and over buildings, stands of trees, terrain irregularities, etc. can create turbulence on ground-level and roof-top heliports that may affect helicopter operations. Where the FATO is located near the edge and top of a building or structure, or within the influence of turbulent wakes from other buildings or structures, the turbulence and airflow characteristics in the vicinity of, and across the surface of the FATO should be assessed to determine if an air-gap between the roof, roof parapet or supporting structure, and/or some other turbulence mitigating design measure is necessary. FAA Technical Report FAA/RD-84/25, *Evaluating Wind Flow Around Buildings on Heliport Placement* (Reference 34 on page 190 addresses the wind's effect on helicopter operations). The following actions may be taken in selecting a site to minimize the effects of turbulence.

(1) Ground-Level Heliports. Helicopter operations from sites immediately adjacent to buildings, trees, and other large objects are subjected to air turbulence effects caused by such features. Therefore, locate the landing and takeoff area away from such objects in order to minimize air turbulence in the vicinity of the FATO and the approach/departure paths.

(2) Elevated Heliports. Establishing a 6 foot (1.8 m) or more air gap above the level of the roof will generally minimize the turbulent effect of air flowing over the roof edge. If an air gap or some other turbulence mitigating design measure is warranted but not practical, operational limitations may need to be considered under certain wind conditions. If an air gap is included in the design it should be kept free at all times of significant objects that would obstruct the airflow.

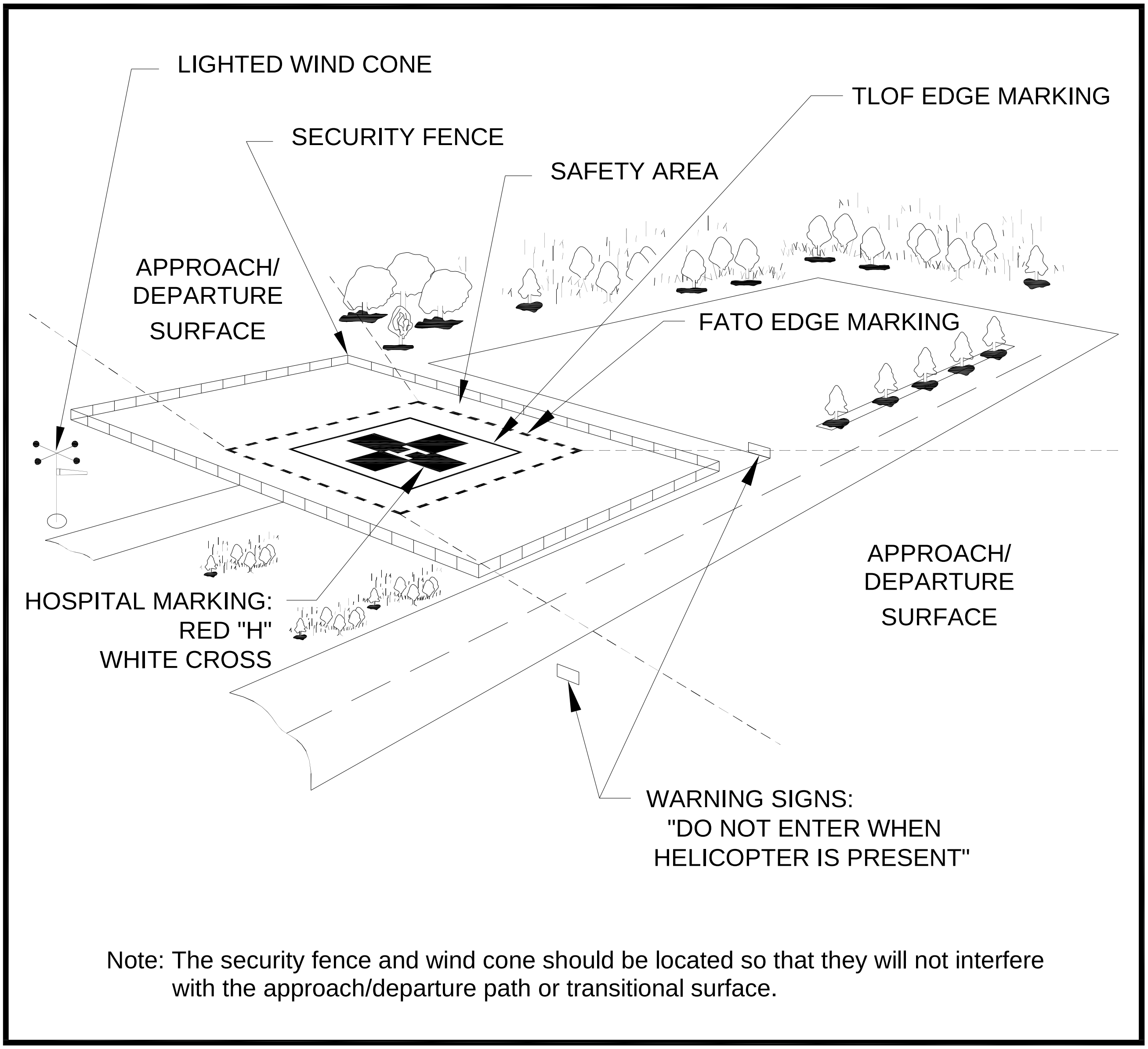
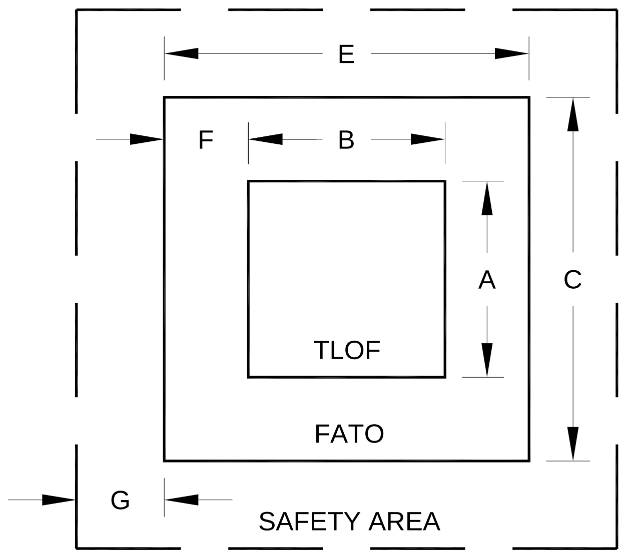


Figure 4-1. Essential Features of a Ground-level Hospital Heliport: Hospital

d. MAGNETIC RESONANCE IMAGERS (MRI). Hospital equipment, such as an MRI used in diagnostic work, can create a strong magnetic field that will cause temporary aberrations in the helicopter's magnetic compass and may interfere with other navigational systems. Heliport proponents should be alert to the location of any MRI with respect to the heliport location. A warning sign alerting pilots to the presence of an MRI is recommended. Steps should be taken to inform pilots of the locations of MRIs and other similar equipment. For additional information, see reference 35 on page 190.



DIM	ITEM	VALUE	NOTES
A	Minimum TLOF Length	1RD but not less than 40 ft [12 m]	
B	Minimum TLOF Width	1RD but not less than 40 ft [12 m]	
C	Minimum FATO Length	1.5D	See Paragraph 406.b.(1) for adjustments of elevations above 1,000 ft
E	Minimum FATO Width	1.5D	
F	Minimum Separation Between the Perimeters of the TLOF and FATO	.75D - .5RD	
G	Minimum Safety Area Width	see Table 4-1	

Note: For circular TLOFs and FATOs, dimensions A, B, C and E refer to diameters.

Figure 4-2. TLOF/FATO Safety Area Relationships and Minimum Dimension: Hospital

404. BASIC LAYOUT. The heliport consists of a TLOF contained within a FATO. A safety area is provided around the FATO. The relationship of the TLOF to the FATO and the safety area is shown in Figure 4-2 above. A FATO may not contain more than one TLOF. Appropriate approach/departure airspace, to allow safe approaches to and departures from landing sites is required. (See paragraph 408 on page 120.)

405. TOUCHDOWN AND LIFTOFF AREA (TLOF).

a. TLOF Location. The TLOF of a hospital heliport may be at ground level, on an elevated structure, or at rooftop level. The TLOF is normally centered within the FATO.

b. TLOF Size. The minimum TLOF dimension (length, width, or diameter) is equal to the rotor diameter (RD) of the design helicopter but not less than 40 feet (12 m). Increasing the load-bearing area (LBA) centered on the TLOF may provide some safety and operational advantages. TLOF dimensions may be increased to enhance safety factors and/or operational efficiency.

(1) Elevated Hospital Heliport. If the FATO outside the TLOF is non-load-bearing, the minimum width, length or diameter of the TLOF is increased to the overall length (D) of the design helicopter.

(2) Elongated TLOF. An elongated TLOF can provide an increased safety margin and greater operational flexibility. An elongated TLOF may contain a landing position located in the center and two takeoff positions located at either end as illustrated in Figure 4-3 on page 115. The landing position must have a minimum length of 1.0 times the RD of the design helicopter. If an elongated TLOF is provided an elongated FATO is also required.

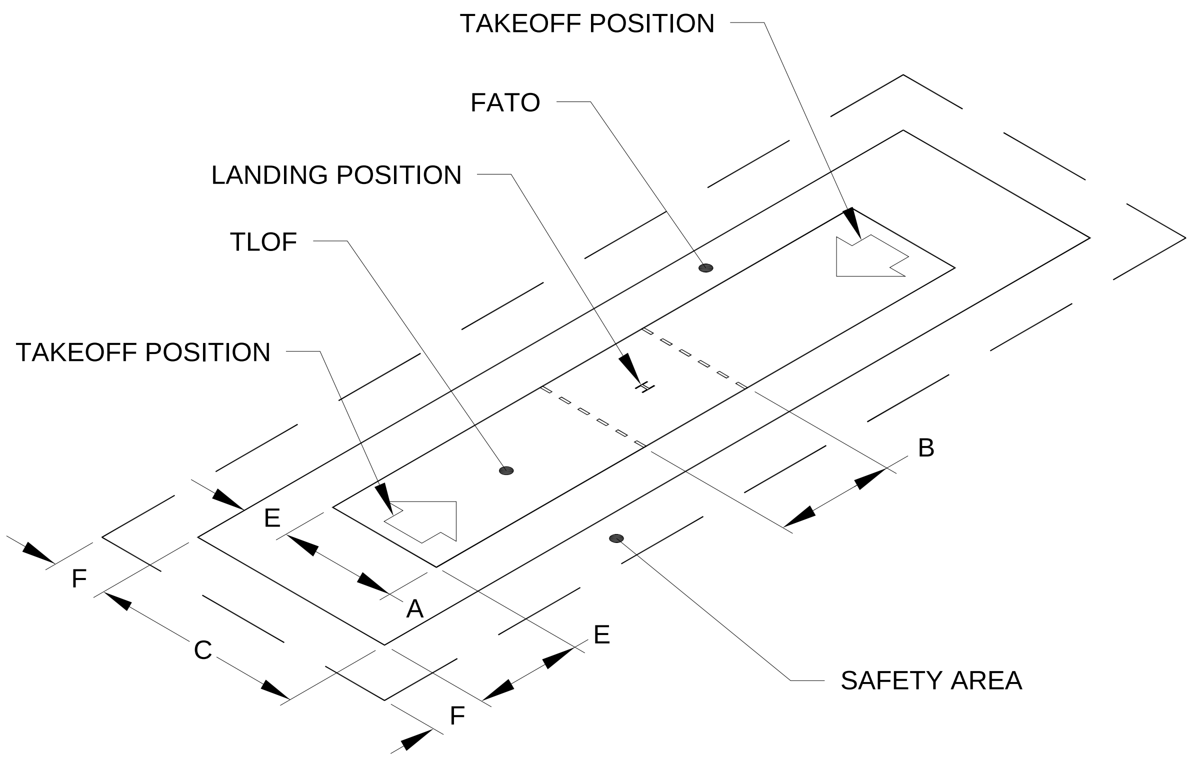
c. Ground-level TLOF Surface Characteristics. The entire TLOF must be dynamic load bearing.

(1) Design Loads. The TLOF and any supporting TLOF structure must be capable of supporting the dynamic loads of the design helicopter.

(2) Paving. The TLOF surface must be either paved or aggregate-turf (see AC 150/5370-10, Items P-217 and P-501). portland cement concrete (PCC) is recommended for ground-level facilities. An asphalt surface is less desirable for heliports as it may rut under the wheels or skids of a parked helicopter. This has been a factor in some rollover accidents. Pavements should have a broomed or other roughened finish that provides a skid-resistant surface for helicopters and non-slippery footing for people.

d. Rooftop and Other Elevated TLOFs.

(1) Design Loads. Elevated TLOFs and any TLOF supporting structure must be capable of supporting the dynamic loads of the design helicopter.



DIM	ITEM	VALUE	NOTES
A	Minimum TLOF Width	1RD	but not less then 40 ft [12 m]
B	Minimum TLOF/Landing Position Length	1RD	but not less then 40 ft [12 m]
C	Minimum FATO Width	1.5D	
E	Minimum Separation Between the Perimeters of the TLOF and FATO	.75D - .5RD	
F	Minimum Safety Area Width	See Table 4-1	

Note: For circular TLOFs, dimensions A and B refer to diameters.

Figure 4-3. An Elongated FATO with Two Takeoff Positions: Hospital

(2) Elevation. The TLOF must be elevated above the level of any obstacle in the FATO and safety area that cannot be removed, except for frangibly mounted objects that, due to their function, must be located within the safety area (see paragraph 407.d on page 118.

(3) Obstructions. Elevator penthouses, cooling towers, exhaust vents, fresh-air vents, and other raised features can affect heliport operations. Control mechanisms should be established to ensure that obstruction hazards are not installed after the heliport is operational.

(4) Air Quality. Helicopter exhaust can affect building air quality if the heliport is too close to fresh air vents. When designing a building intended to support a helipad, locate fresh air vents accordingly. When adding a helipad to an existing building, fresh air vents may have to be relocated.

(5) TLOF Surface Characteristics. Rooftop and other elevated heliport TLOFs must be constructed of metal, concrete, or other materials subject to local building codes. TLOF surfaces must have a finish that provides a skid-resistant surface for helicopters and non-slippery footing for people.

(6) Safety Net. If the platform is elevated 4 feet or more above its surroundings, title 29 CFR part 1910.23, *Guarding Floor and Wall Openings and Holes*, requires the provision of fall protection. The FAA recommends that such protection be provided for all platforms elevated 30 inches (76 cm) or more. However, permanent railings or fences must not be used since they would be safety hazards during helicopter operations. An alternate method of installing a safety net, meeting state and local regulation but not less than 5 feet (1.5 m) wide, is suggested. The safety net should have a load carrying capability of 25 lbs/ft^2 (122 kg/m^2). The net, as illustrated in Figure 4-29 on page 154 must not project above the level of the TLOF. Both the inside and outside edges of the safety net should be fastened to a solid structure. Nets should be constructed of material that is resistant to environmental effects.

(7) Access to Elevated TLOFs. Title 29 CFR part 1936, *Means of Egress* requires two separate access points for an elevated structure such as an elevated TLOF. Hospital heliports should provide access to and from the TLOF via a ramp in order to provide for quick and easy transportation of a patient on a gurney. Ramps should be built in accordance with state and local requirements. The width of the ramp, and any turns in the ramp, should be wide enough to accommodate a gurney with a person walking on each side. Straight segments of the ramp should be not less than 6 feet (1.8 m) wide. Additional width may be required in the turns. The ramp surface should provide a slip-resistant surface. The slope of the ramp should be no steeper than 12:1 (12 unit horizontal in 1 units vertical). While it is possible to move a gurney to and from the TLOF using a lift, this is not recommended since it invariably results in a delay in the movement of patients in time-critical conditions. If stairs are used, they must be built in compliance with title 29 CFR part 1910.24, *Fixed Industrial Stairs*. Handrails required by this standard must fold down or be removable to below the level of the TLOF so that they will not be hazards during helicopter operations.

e. TLOF Gradients. Recommended TLOF gradients are defined in Chapter 7 on page 173.

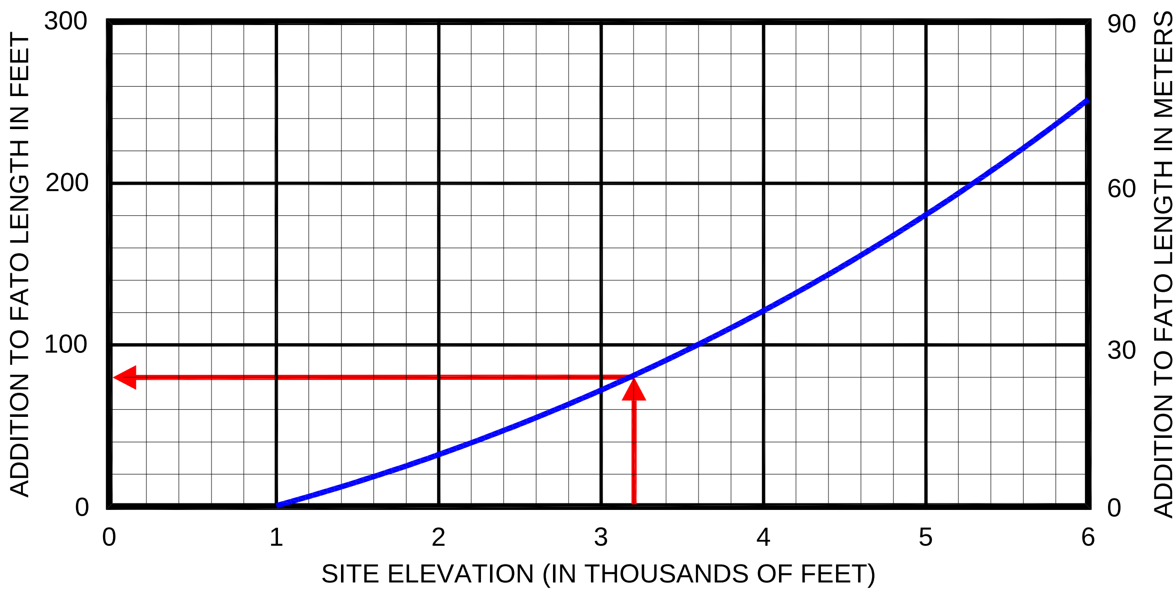
406. FINAL APPROACH AND TAKEOFF AREA (FATO). A hospital heliport must have at least one FATO. The FATO must contain a TLOF within its borders at which arriving helicopters terminate their approach and from which departing helicopters take off.

a. FATO Location. The FATO of a hospital heliport may be at ground level, on an elevated structure, or on a rooftop. To avoid or minimize the need for additional ground transport, the FATO location should provide ready access to the hospital's emergency room. However, the heliport should be located so buildings and other objects are outside the safety area and below obstacle clearance surfaces. The relationship of the FATO to the TLOF and the safety area is shown in Figure 4-2 on page 113.

b. FATO Size.

(1) The minimum width, length or diameter of a FATO is 1.5 times the overall length (D) of the design helicopter. At elevations well above sea level a longer FATO is needed to provide an increased safety margin and greater operational flexibility. The additional FATO length is depicted in Figure 4-4.

(2) The minimum distance between the TLOF perimeter and the FATO perimeter must be not less than the distance 0.75D – 0.5RD where D is the overall length and RD is the rotor diameter of the design helicopter. The relationship of the TLOF to the FATO and the safety area is shown in Figure 4-2 on page 113.



Example: 80 feet is added to the basic FATO length for a site elevation of 3,200 feet.

Figure 4-4. Additional FATO Length for Heliports at Higher Elevation: Hospital

c. FATO Surface Characteristics.

(1) Ground-level hospital heliports. If the TLOF is marked, the FATO outside the TLOF must be capable of supporting the static loads of the design helicopter. If the TLOF is not marked and/or it is intended that the helicopter can land anywhere within the FATO, the FATO outside the TLOF and any FATO supporting structure must, like the TLOF, be capable of supporting the dynamic loads of the design helicopter.

(2) Elevated hospital heliports. The FATO outside the TLOF may extend into clear airspace. However, there are some helicopter performance benefits and increased operational flexibility if the FATO outside the TLOF is load bearing. The FATO outside of the TLOF must be load-bearing unless the minimum width and length or diameter of TLOF is increased to the overall length of the design helicopter.

(3) If the FATO is load bearing, the portion abutting the TLOF must be contiguous with the TLOF and the adjoining edges should be at the same elevation.

(4) If the FATO is unpaved, the FATO must be treated to prevent loose stones and any other flying debris caused by rotor downwash.

(5) When the FATO or the load-bearing area in which it is located is elevated 4 feet or more above its surroundings, title 29 CFR part 1910.23 *Guarding Floor and Wall Openings and Holes,* requires the provision of fall protection. However, permanent railings or fences must not be used since they would be safety hazards during helicopter operations. An alternate method of installing a safety net, meeting state and local regulations but not less than 5 feet (1.5 m) wide, is suggested. The safety net should have a load carrying capability of 25 lbs/ft^2 (122 kg/m^2). The net, as illustrated in Figure 4-29 on page 154, must not project above the level of the TLOF. Both the inside and outside edges of the safety net should be fastened to a solid structure. Nets should be constructed of material that is resistant to environmental effects.

d. Mobile Objects within the FATO. The FATO design recommendations in this AC are based on the assumption that the FATO is closed to other aircraft if a helicopter or other mobile object is within the FATO or the associated safety area.

e. Fixed Objects within the FATO. No fixed objects are permitted within a FATO except for frangibly mounted objects that, due to their aeronautical function, must be located there. Those objects whose functions require them to be located within the FATO must not exceed a height of 2 inches (5 cm) above the elevation of the TLOF perimeter.

f. FATO/FATO Separation. If a heliport has more than one FATO, the separation between the perimeters of the two FATOs must be such that the respective safety areas do not overlap. This separation is based on the assumption that simultaneous approach/departure operations will not take place. If simultaneous operations are planned, a minimum 200 foot (61 m) separation is required.

g. FATO Gradients. Recommended FATO gradients are defined in Chapter 7.

407. SAFETY AREA. A safety area surrounds a FATO and should be clear of all obstacles except small, frangible objects that, because of their function, must be located there.

a. Safety Area Width. The required width of the safety area is shown in

b. below, and is the same on all sides. The width is affected by the provision or absence of standard heliport markings. The safety area may extend into clear airspace.

c. Mobile Objects within the Safety Area. The safety area design recommendations of this AC are based on the assumption that the TLOF and FATO are closed to other aircraft if a helicopter or other mobile object is within the FATO or the safety area.

d. Fixed Objects within a Safety Area. No fixed objects are permitted within a safety area except for frangibly mounted objects that, due to their function, must be located there. Those objects whose functions require them to be located within the safety area must not exceed a height of 8 inches (20 cm) above the elevation of the FATO perimeter nor penetrate the approach/departure surfaces or transitional surfaces.

e. Safety Area Surface. The safety area need not be load bearing. Figure 4-5 on page 120 depicts a non-load-bearing safety area. If possible, the portion of the safety area abutting the FATO should be contiguous with the FATO with the adjoining edges at the same elevation. This is needed in order to avoid the risk of catching a helicopter skid or wheel. The safety area should be treated to prevent loose stones and any other flying debris caused by rotor wash.

f. Safety Gradients. Recommended safety area gradients are defined in Chapter 7 on page 173.

Table 4-1. Minimum VFR Safety Area Width as a Function of Hospital Heliport Markings

TLOF perimeter marked: FATO perimeter marked: Standard Hospital marking symbol:	Yes Yes Yes	Yes Yes No	No Yes Yes	No Yes No
Hospital heliports:	1/3 RD but not less than 10 ft (3 m)**	1/3RD but not less than 20 ft (6 m)**	½ D but not less than 20 ft (6 m)	½ D but not less than 30 ft (9 m)

D: overall length of the design helicopter

RD: rotor diameter of the design helicopter

** Also applies when the FATO is not marked. The FATO should not be marked if (a) the FATO (or part of the FATO) is a non-load bearing surface and/or (b) the TLOF is elevated above the level of a surrounding load bearing area.

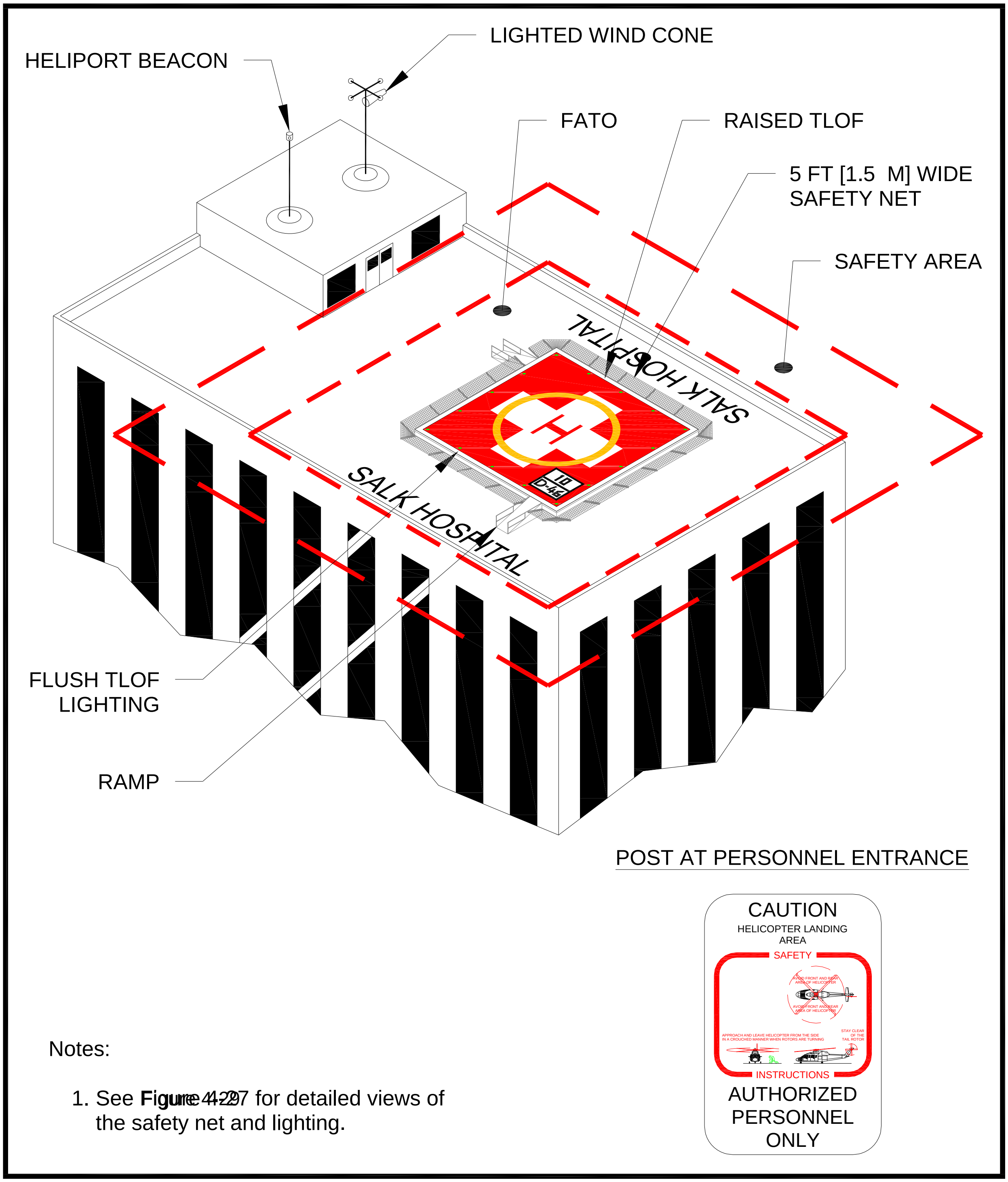


Figure 4-5. A Rooftop Hospital Heliport: Hospital

408. VFR APPROACH/DEPARTURE PATHS. The purpose of approach/departure airspace as shown in Figure 4-6 on page 122 is to provide sufficient airspace clear of hazards to allow safe approaches to and departures from the TLOF.

a. Number of Approach/Departure Paths. Preferred approach/departure paths should be aligned with the predominant wind direction so that downwind operations are avoided and crosswind operations are kept to a minimum. To accomplish this, a heliport should have more than one approach/departure path. Other approach/departure paths should be based on the assessment of the prevailing winds or, when this information is not available, the separation between such flight paths and the preferred flight path should be at least 135 degrees. (See Figure 4-6 on page 122). Hospital facilities may have only a single approach/departure path although a second flight path provides additional safety margin and operational flexibility.

b. VFR Approach/Departure and Transitional Surfaces. Figure 4-6 on page 122 illustrates the approach/departure and transitional surfaces.

(1) An approach/departure surface is centered on each approach/departure path. The approach/departure path starts at the edge of the FATO and slopes upward at 8:1 (8 units horizontal in 1 unit vertical) for a distance of 4,000 feet (1219 m) where the width is 500 feet (152 m) at a height of 500 feet (152 m) above the heliport elevation.

(2) The transitional surfaces start from the edges of the FATO parallel to the flight path center line, and from the outer edges of approach/departure surface, and extend outwards at a slope of 2:1 (2 units horizontal in 1 unit vertical) for a distance of 250 feet (76 m) from the centerline. The transitional surface is not applied on the FATO edge opposite the approach/departure surface. See Figure 4-8 on page 124.

(3) The approach/departure and transitional surfaces must be free of penetrations unless an FAA aeronautical study determines such penetrations not to be hazards. Such aeronautical studies are conducted only at public heliports and private airports with FAA-approved approach procedures. Paragraph 109 on page 9 provides additional information on hazards to air navigation.

(4) At hospital heliports, the size of the 8:1 approach/departure surface may be increased for a distance of 2,000 feet (610 m) as shown in Figure 4-8 on page 124 and Figure 4-9 on page 125 in lieu of considering transitional surfaces. The lateral extensions on each side of the 8:1 approach/departure surface start at the width of the FATO and are increased so that at a distance of 2,000 feet (610 m) from the FATO they are 100 feet (30 m) wide. Penetrations of obstacles into area A or area B, but not both, may be allowed providing the penetrations are marked or lighted and not considered a hazard.

c. Curved VFR Approach/Departure Paths. VFR approach/departure paths may include one curve. Such paths may use the airspace above public lands, such as freeways or rivers. However, the design of curved approach/departure paths must consider the performance capabilities of the helicopters intended to be served by the heliport. Where a curved portion of the approach/departure path is provided, the sum of the radius of arc defining the center line and the length of the straight portion originating at the FATO must not be less than 1,886 feet (575 m). The minimum radius for curved approach/departure paths is 886 feet (270m) following a 1,000 feet (305m) straight section. The combined length of the center line of the curved portion and the straight portion must be 4,000 feet (1219 m). See Figure 4-7 on page 123. Figure 4-9 on page 125 shows a curved approach/departure path for an 8:1 approach/departure surface.

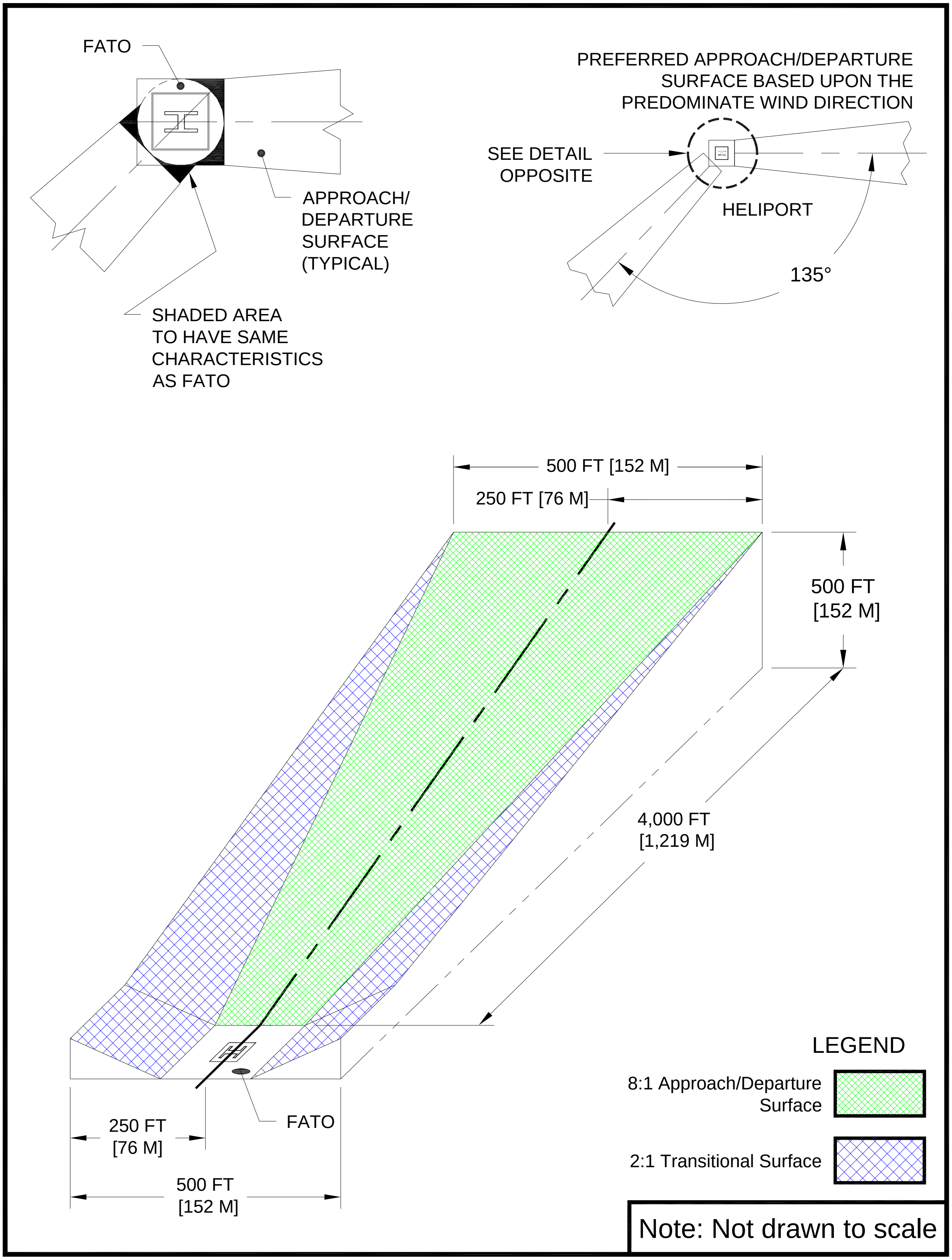
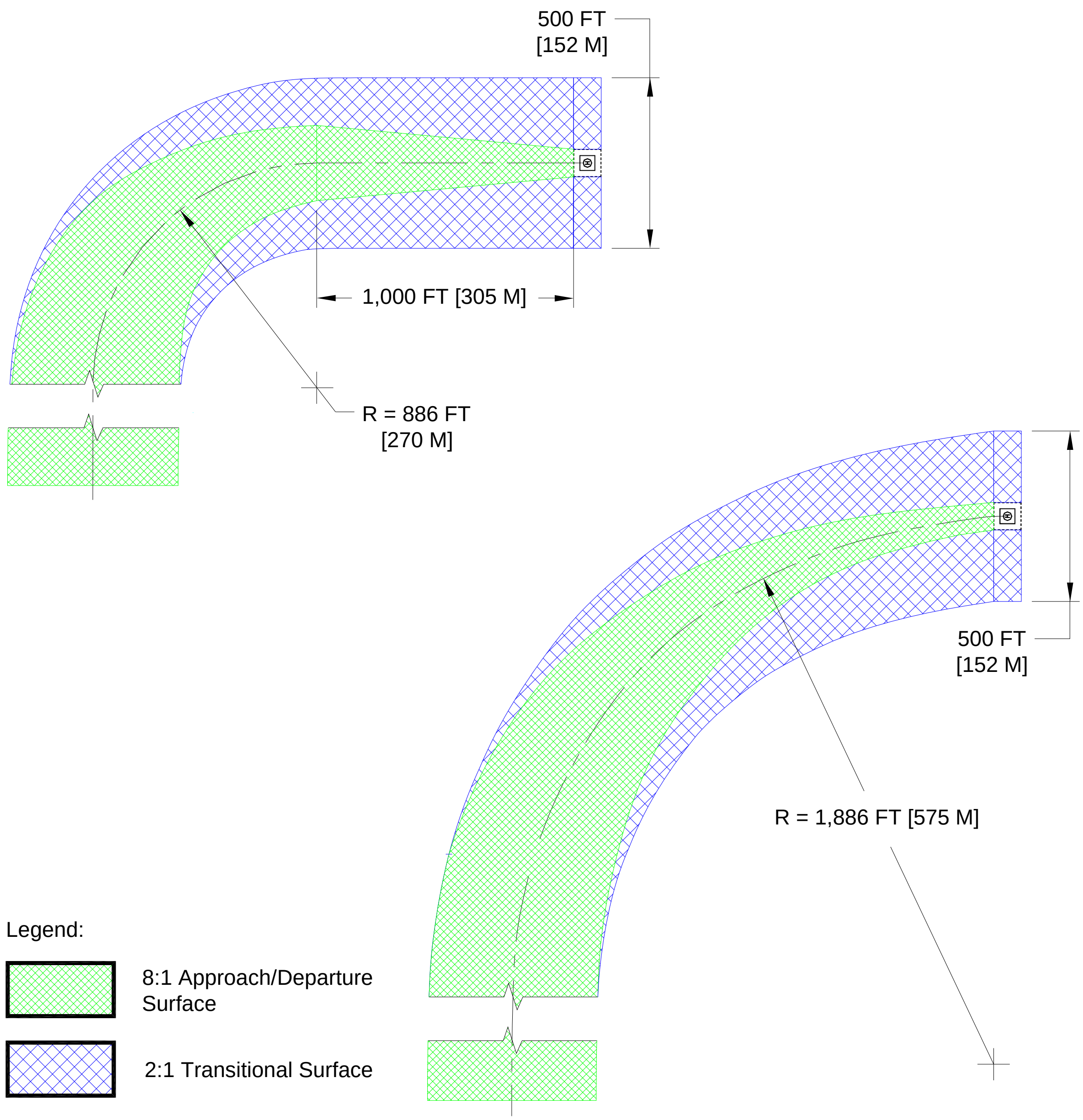


Figure 4-6. VFR Heliport Approach/Departure and Transitional Surfaces: Hospital



Notes:

1. Any combination of straight portions and one curved portion may be established using the following formula: S + R ≥1,886 ft [575 m] and R ≥ 886 ft [270 m], where S is the length of the straight portion(s) and R is the radius of the turn. Note that any combination ≥1,886 ft [575 m] will work.
2. The minimum total length of the centerline of the straight and curved portion is 4,000 ft [1,219 m].
3. Helicopter take-off performance is reduced in a curve. Consider a straight portion along the take-off climb surface prior to the start of the curve to allow for acceleration.

Figure 4-7. Curved Approach/Departure: Hospital

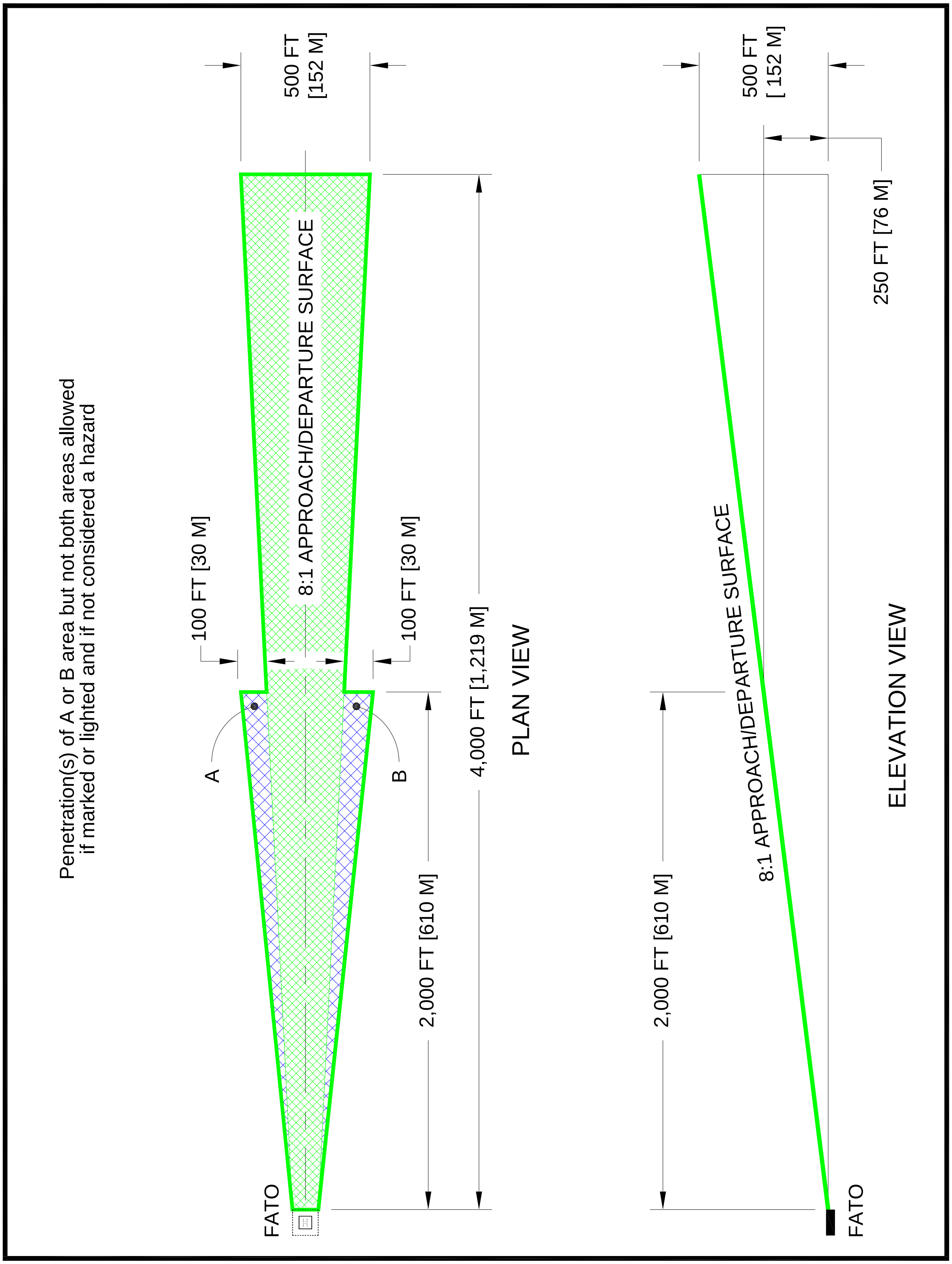
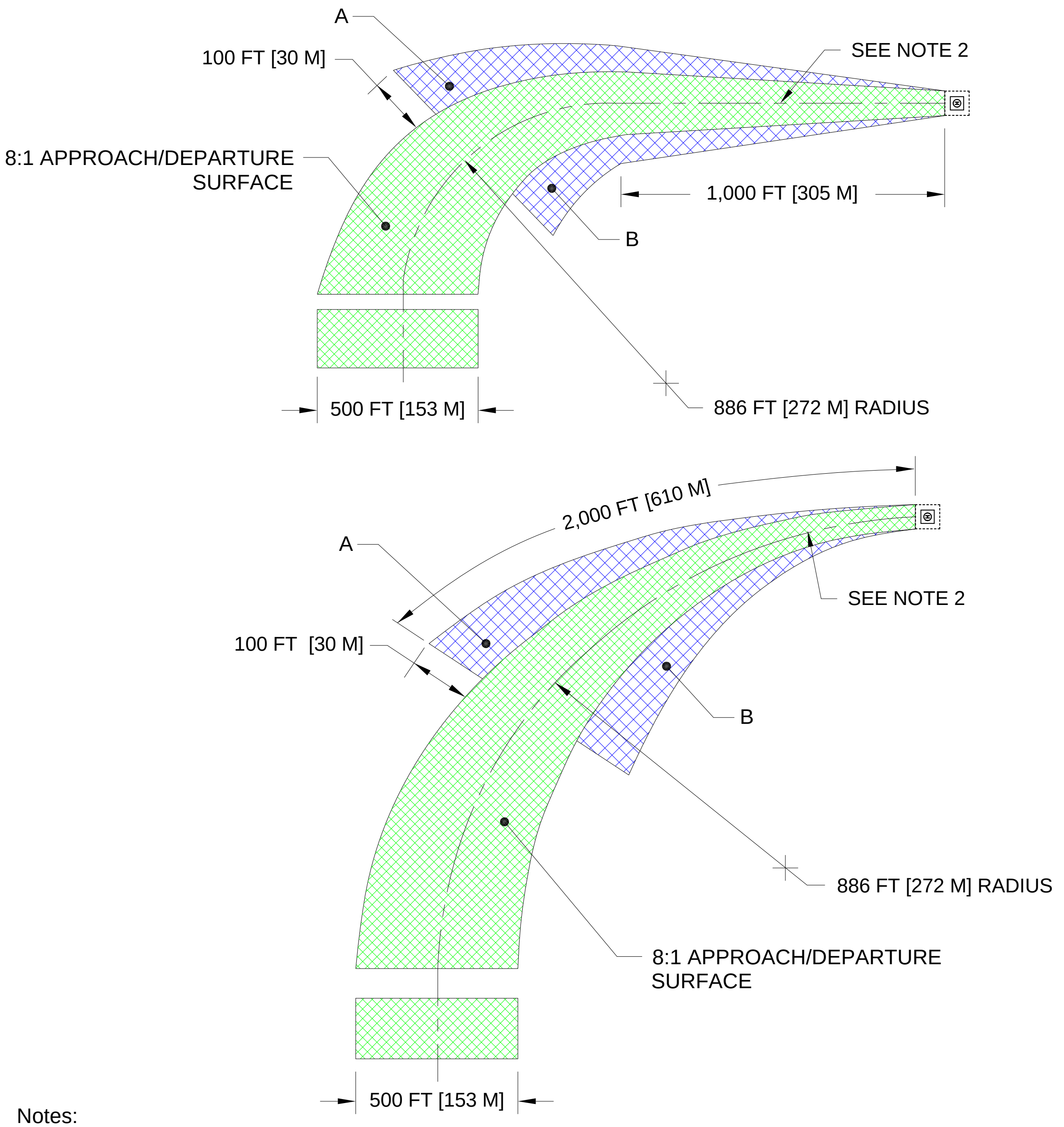


Figure 4-8. VFR Heliport Lateral Extension of the 8:1 Approach/Departure Surface: Hospital



Notes:

1. Any combination of straight portions and one curved portion may be established using the following formula: S + R ≥1,886 ft [575 m] and R ≥886 ft [270 m], where S is the length of the straight portion(s) and R is the radius of the turn. Note that any combination ≥1,886 ft [575 m] will work.
2. The minimum total length of the centerline of the straight and curved portion is 4,000 ft [1,219 m].
3. Helicopter take-off performance is reduced in a curve. Consider a straight portion along the take-off climb surface prior to the start of the curve to allow for acceleration.
4. Penetration(s) of A or B area but not both areas allowed if marked or lighted and if not considered a hazard.

Figure 4-9. VFR Heliport Lateral Extension of the Curved 8:1 Approach/Departure Surface: Hospital

d. Flight Path Alignment Guidance. Optional flight path alignment markings and/or flight path alignment lights (see paragraph 414.e below) may be used where it is desirable and practicable to indicate available approach and/or departure flight path direction(s). See Figure 4-10 on page 127.

e. Periodic Review of Obstructions. Heliport operators should reexamine obstacles in the vicinity of 8:1 approach/departure paths on at least an annual basis. This reexamination should include an appraisal of the growth of trees near approach and departure paths. Paragraph 109 on page 9 provides additional information on hazards to air navigation.

409. HELIPORT PROTECTION ZONE (HPZ) It is recommended that a Heliport Protection Zone be established for each approach/departure surface. The HPZ is the area under the 8:1 approach/departure surface starting at the FATO perimeter and extending out for a distance of 280 feet (85.3 m), as illustrated in Figure 4-11 on page 128. The HPZ is intended to enhance the protection of people and property on the ground. This is achieved through heliport owner control over the HPZ. Such control includes clearing HPZ areas (and maintaining them clear) of incompatible objects and activities. Land uses discouraged in the HPZ are residences and places of public assembly. (Churches, schools, hospitals, office buildings, shopping centers, and other uses with similar concentrations of persons typify places of public assembly.) Fuel storage facilities should not be located in the HPZ.

410. WIND CONE.

a. Specification. A wind cone conforming to AC 150/5345-27, *Specification for Wind Cone Assemblies*, must be used to show the direction and magnitude of the wind. The wind cone should provide the best possible color contrast to its background.

b. Wind Cone Location. The wind cone must be located so it provides the pilot with valid wind direction and speed information in the vicinity of the heliport under all wind conditions.

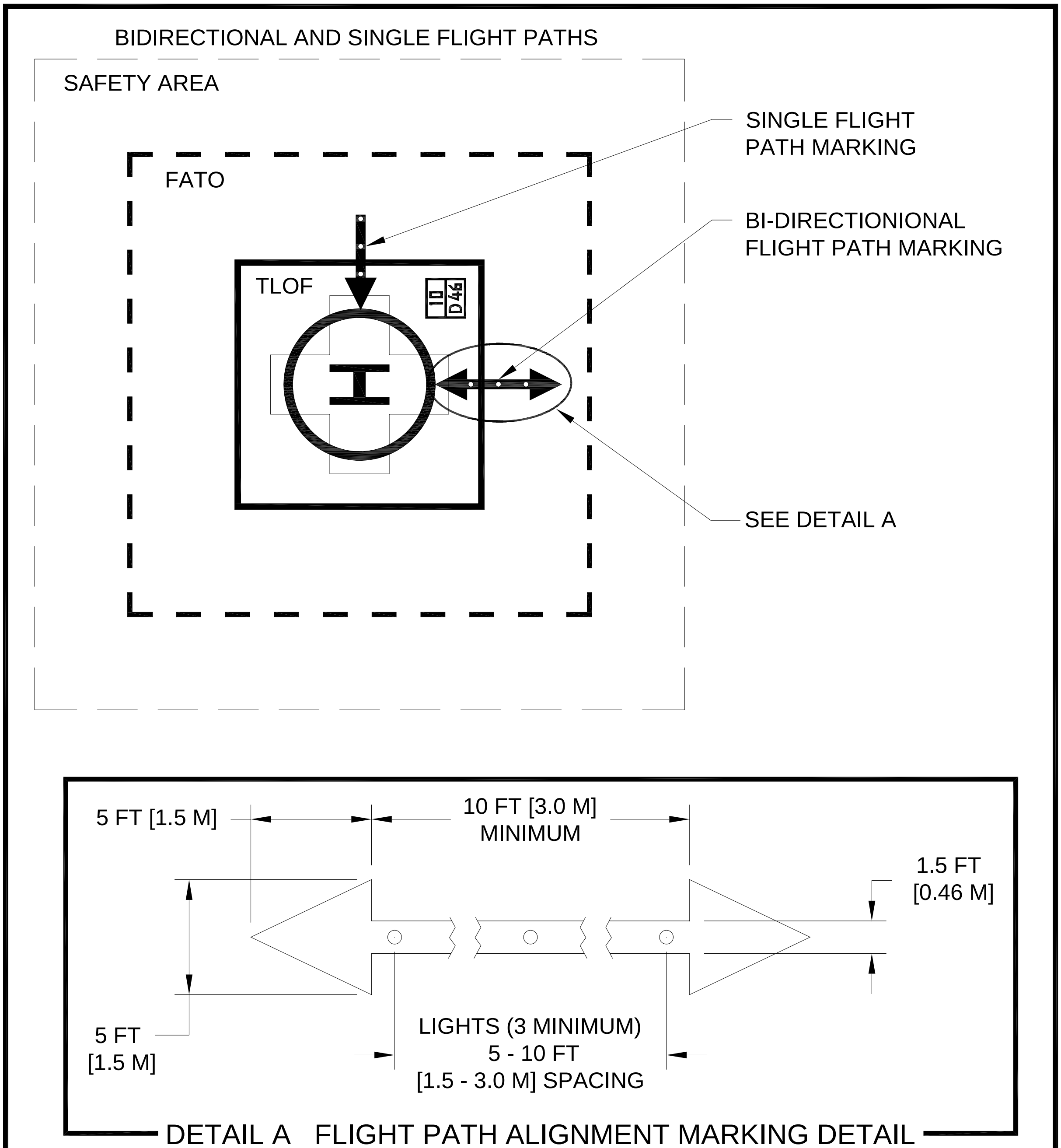
(1) At many landing sites, there may be no single, ideal location for the wind cone. At other sites, it may not be possible to site a wind cone at the ideal location. Consequently, more than one wind cone may be required in order to provide the pilot with all the wind information needed for safe operations.

(2) A pilot on the approach path must be able to see a wind cone clearly when the helicopter is at a distance of 500 feet (152 m) from the TLOF.

(3) Pilots must also be able to see a wind cone from the TLOF.

(4) To avoid presenting an obstruction hazard, the wind cone(s) must be located outside the safety area, and it must not penetrate the approach/departure or transitional surfaces.

c. Wind Cone Lighting. For night operations, the wind cone must be illuminated, either internally or externally, to ensure that it is clearly visible.



Notes (arrow):

1. Arrowheads must have constant dimensions
2. Stroke length may be adjusted to match length available (Minimum length: 10 ft [3 m])

Notes (lights):

1. Light type: omni-directional inset white lights
2. Lights may be outside arrow

Figure 4-10. Flight Path Alignment Marking and Lights: Hospital

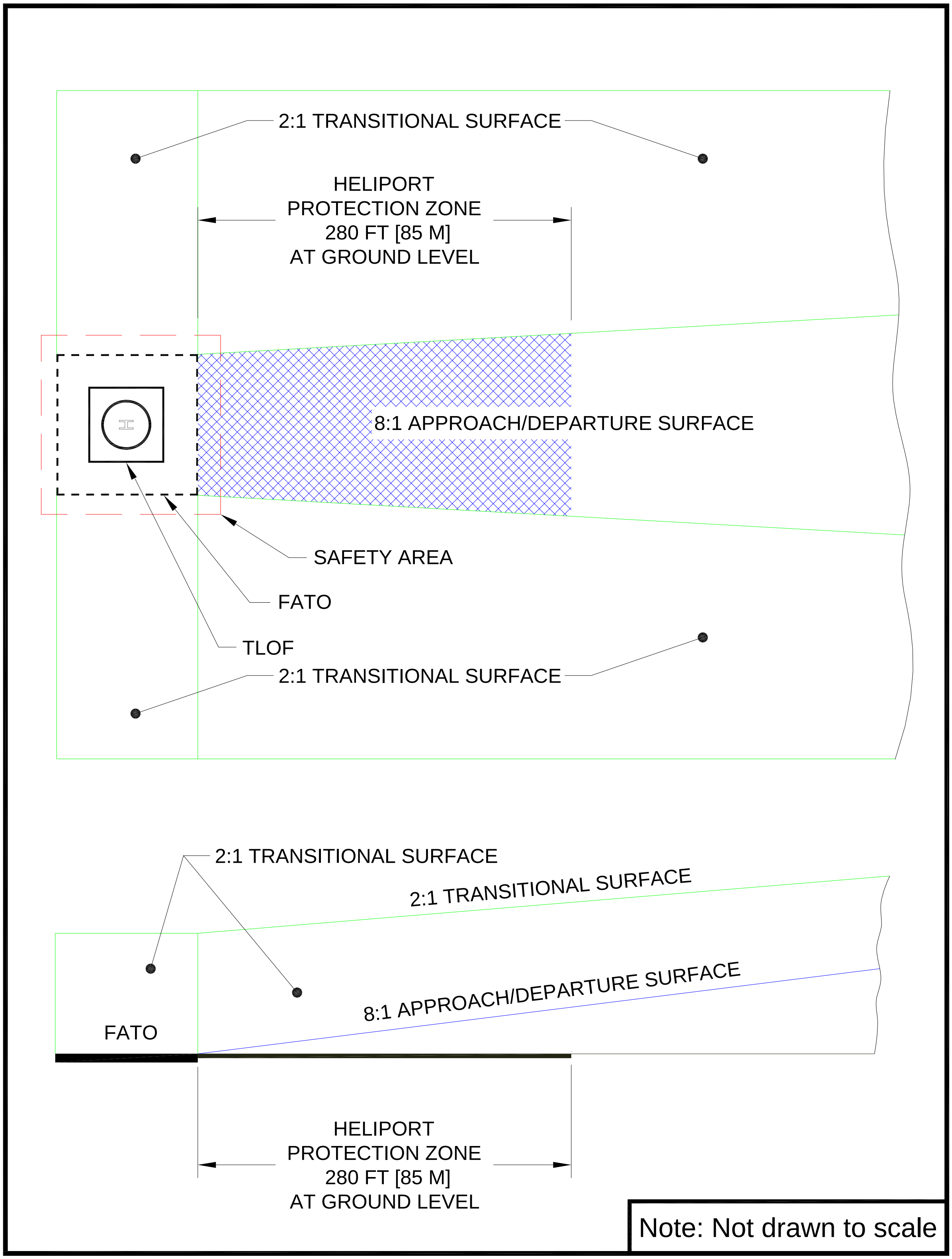


Figure 4-11. Heliport Protection Zone: Hospital

411. TAXIWAYS AND TAXI ROUTES. Taxiways and taxi routes are provided for the movement of helicopters from one part of a landing facility to another. They provide a connecting path between the FATO and a parking area. They also provide a maneuvering aisle within the parking area. A taxi route includes the taxiway plus the appropriate clearances needed on both sides. The relationship between a taxiway and a taxi route is illustrated in Figure 4-12 on page 130, Figure 4-13 on page 131, and Figure 4-14 on page 132. At hospital heliports with no parking or refueling area outside the TLOF(s), no taxi route or taxiway is required.

a. Taxiway/Taxi Route Widths. The dimensions of taxiways and taxi routes are a function of helicopter size, taxiway/taxi route marking, and type of taxi operations (ground taxi versus hover taxi). These dimensions are defined in Table 4-2 on page 133. Normally, the requirement for hover taxi dictates the taxiway/taxi route widths. However, when the fleet comprises a combination of large ground taxiing helicopters and smaller air taxiing helicopters, the larger aircraft may dictate the taxiway/taxi route widths. If wheel-equipped helicopters taxi with wheels not touching the surface, the facility should be designed with hover taxiway widths rather than ground taxiway widths. Where the visibility of the centerline marking cannot be guaranteed at all times, such as locations where snow or dust commonly obscure the centerline marking and it is not practical to remove it, the minimum taxiway/taxi route dimensions should be determined as if there was no centerline marking.

b. Surfaces. Ground taxiways must have a surface that is portland cement concrete, asphalt or a surface, such as turf, stabilized in accordance with the recommendations of Items P-217 of AC 150/5370-10. Unpaved portions of taxiways and taxi routes must have a turf cover or be treated in some way to prevent dirt and debris from being raised by a taxiing helicopter's rotor wash.

c. Gradients. Recommended taxiway and taxi route gradients are defined in Chapter 7 on page 173.

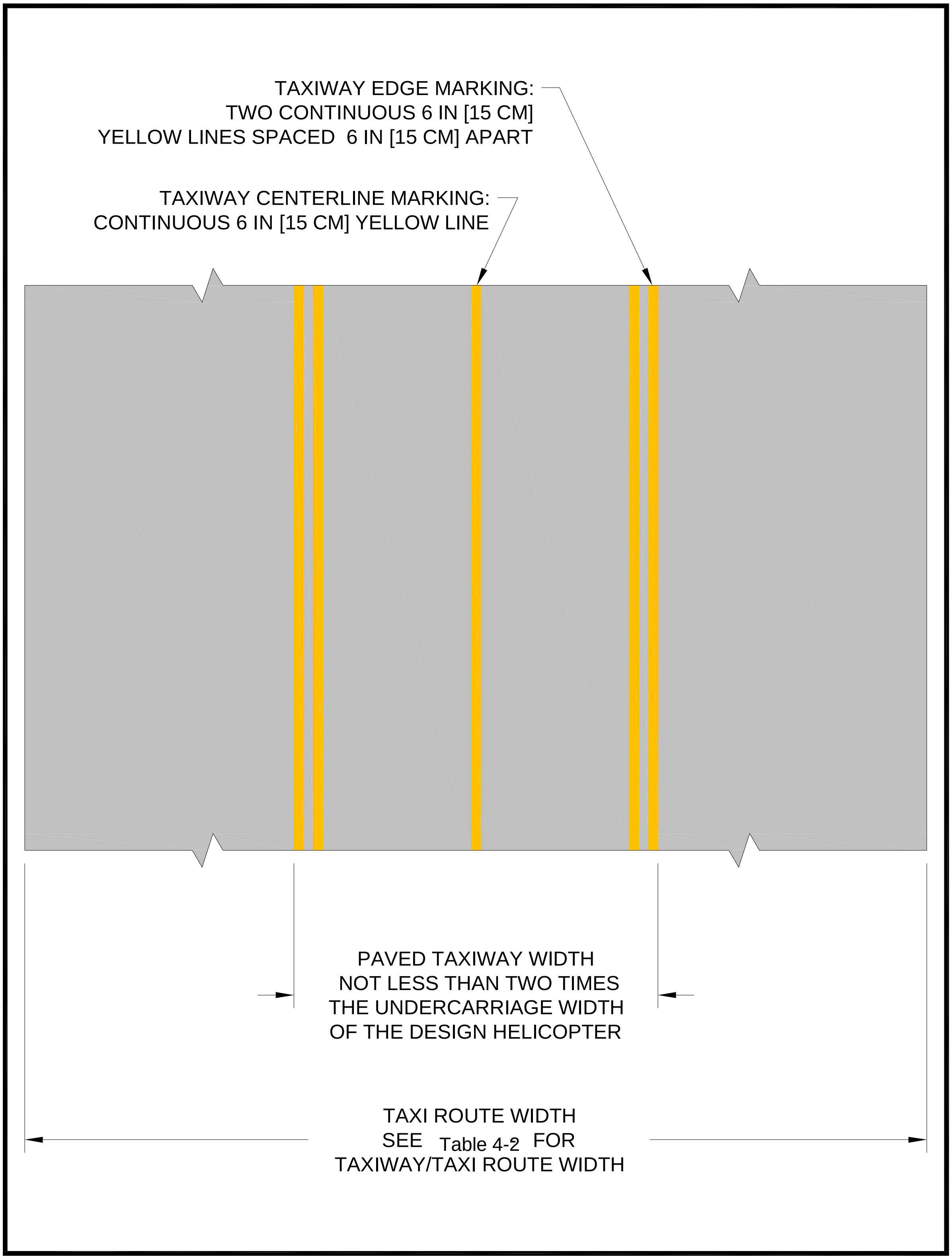


Figure 4-12. Taxiway/Taxi Route Relationship – Paved Taxiway: Hospital

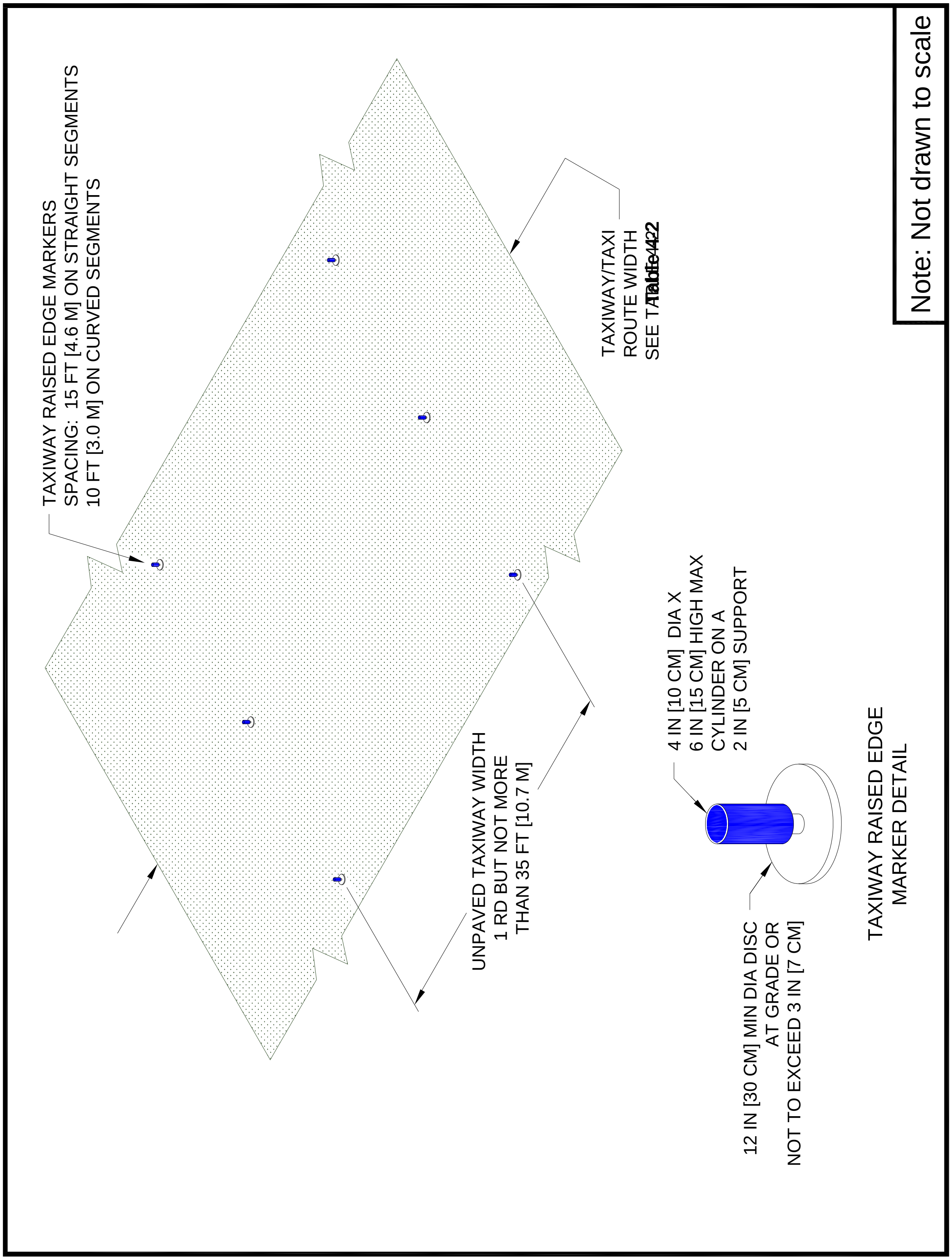


Figure 4-13. Taxiway/Taxi Route Relationship – Unpaved Taxiway with Raised Edge Markers: Hospital

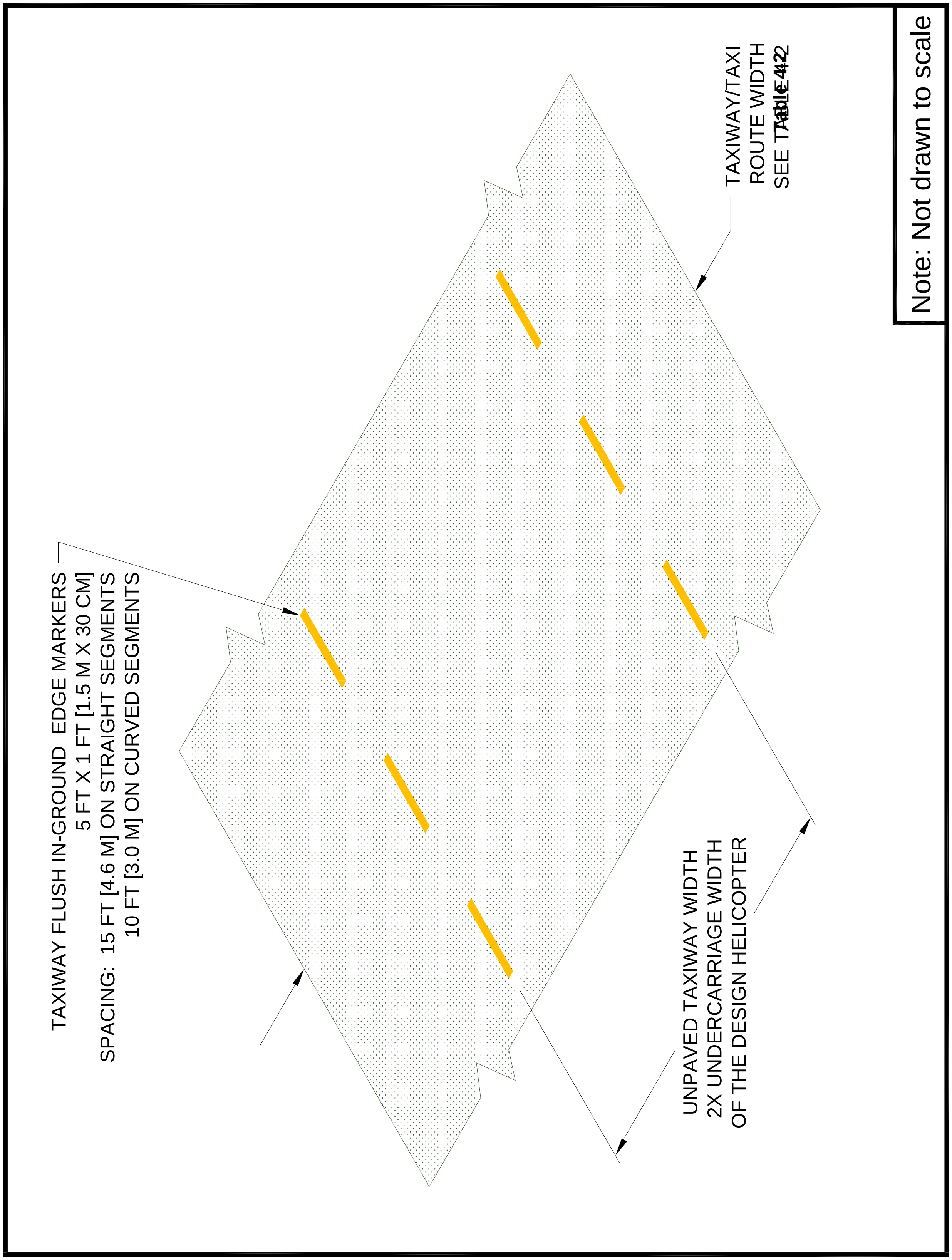


Figure 4-14. Taxiway/Route Relationship – Unpaved Taxiway with Flush Edge Markers: Hospital

Table 4-2. Taxiway / Taxi Route Dimensions – Hospital Heliports

Taxiway (TW) Type	Minimum Width of Paved Area	Centerline Marking Type	TW Edge Marking Type	Lateral Separation Between TW Edge Markings	Total Taxi Route Width
Ground Taxiway	2 x UC	Painted	Painted	2 x UC	1.5 RD
			Elevated	1 RD but not greater than 35 ft (10.7 m)	
	Unpaved but stabilized for ground taxi	None	Flush	2 x UC	
			Elevated	1 RD but not greater than 35 ft (10.7 m)	
Hover Taxiway	2 x UC	Painted	Painted	2 x UC	2RD
	Unpaved	None	Elevated or Flush	1 RD but not greater than 35 ft (10.7 m)	

RD: rotor diameter of the design helicopter

TW: taxiway

UC: undercarriage length or width (whichever is greater) of the design helicopter

412. HELICOPTER PARKING. A separate helicopter parking area is required at heliports that will accommodate more than one helicopter at a time. If more than one helicopter at a time is expected at a heliport, the facility should have an area designated for parking helicopters. The size of this area depends on the number and size of specific helicopters to be accommodated. It is not necessary that every parking position accommodate the design helicopter. Individual parking positions should be designed to accommodate the helicopter size and weights expected to use the parking position at the facility. However, separation requirements between parking positions and taxi routes are based on the design helicopter. Separation requirements between parking positions intended for helicopters of different sizes are based on the larger helicopter. Parking positions must support the static loads of the helicopter intended to use the parking area. Parking areas may be designed as one large, paved apron or as individual, paved parking positions. Ground taxi turns of wheeled helicopters are significantly larger than a hover turn. Design of taxi intersections and parking positions for wheeled helicopters should take into consideration the turn radius of the helicopters. Heliport parking areas must be designed so that helicopters will be parked in an orientation that keeps the "avoid areas" around the tail rotors (see Figure 4-15 on page 135, Figure 4-17on page 137, and Figure 4-18 on page 138) clear of passenger walkways

a. Location. Aircraft parking areas must not lie under an approach/departure surface. However, aircraft parking areas may lie under the transitional surfaces.

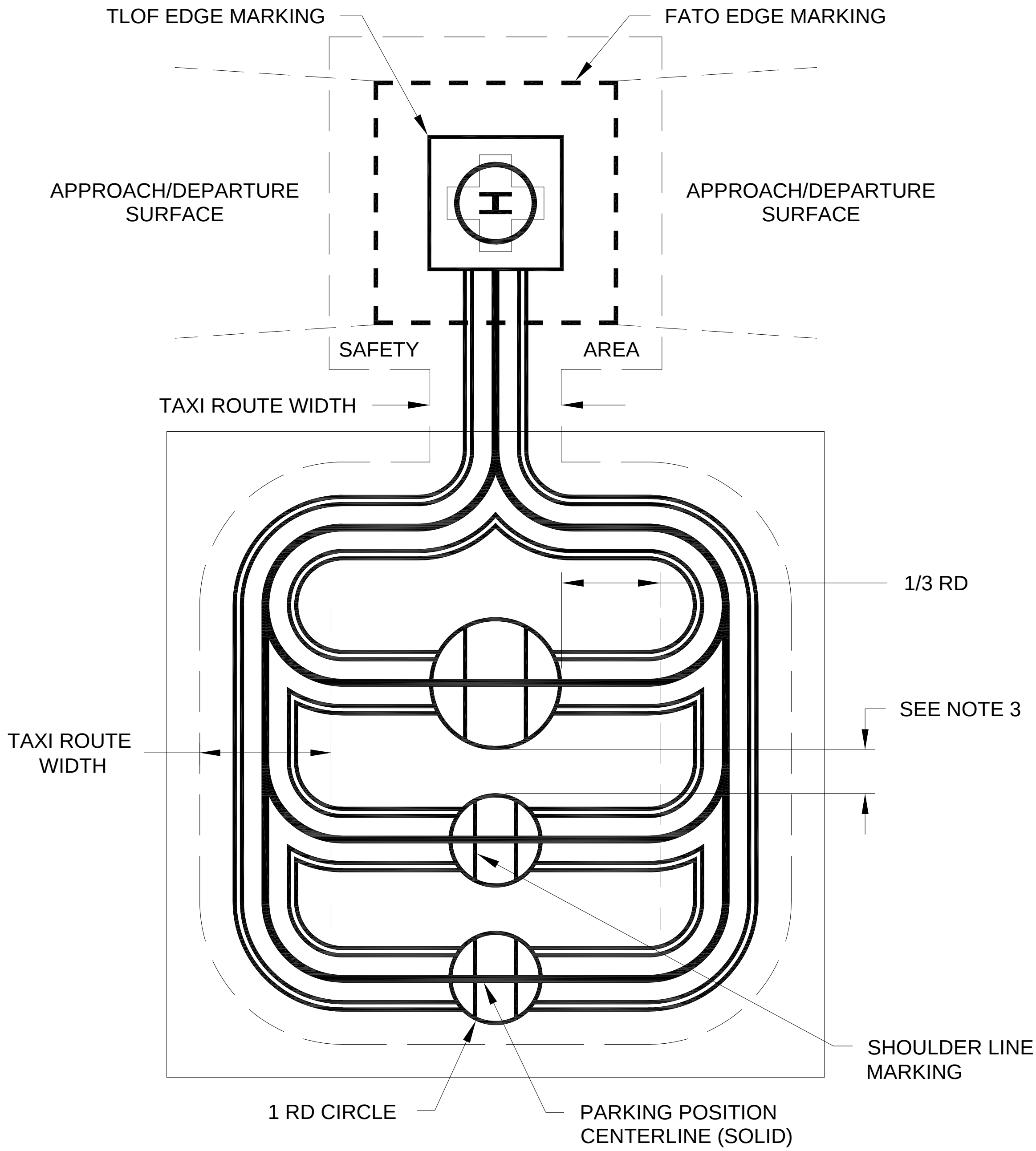
(1) The parking position must be located to provide a minimum distance between the main rotor arc and the edge of any taxi route. Parking positions may be designed such that the helicopter taxis through, turns around, or backs out to depart. The minimum distance is 1/3 RD for “turn around” and “taxi through” parking areas, and 1/2 RD for “back-out” parking areas. See Figure 4-15 on page 135.

(2) The parking position must be located to provide a minimum distance between the tail rotor arc and the edge of any taxi route. The minimum distance is 1/2 RD. See Figure 4-15 on page 135, and Figure 4-17on page 137.

b. Parking position sizes are dependent upon the helicopter size. The clearance between parking positions are dependent upon the type of taxi operations (ground taxi or hover taxi) and the intended paths for maneuvering in and out of the parking position. The more demanding requirement will dictate what is required at a particular site. Usually, the parking area requirements for skid-equipped helicopters will be the most demanding. However, when the largest helicopter is a very large, wheeled aircraft (e.g., the S-61), and the skid-equipped helicopters are all much smaller, the parking requirements for wheeled helicopters may be the most demanding. If wheel-equipped helicopters taxi with wheels not touching the surface, parking areas should be designed based on hover taxi operations rather than ground taxi operations.

(1) If all parking positions are the same size, they must be large enough to accommodate the largest helicopter that will park at the heliport.

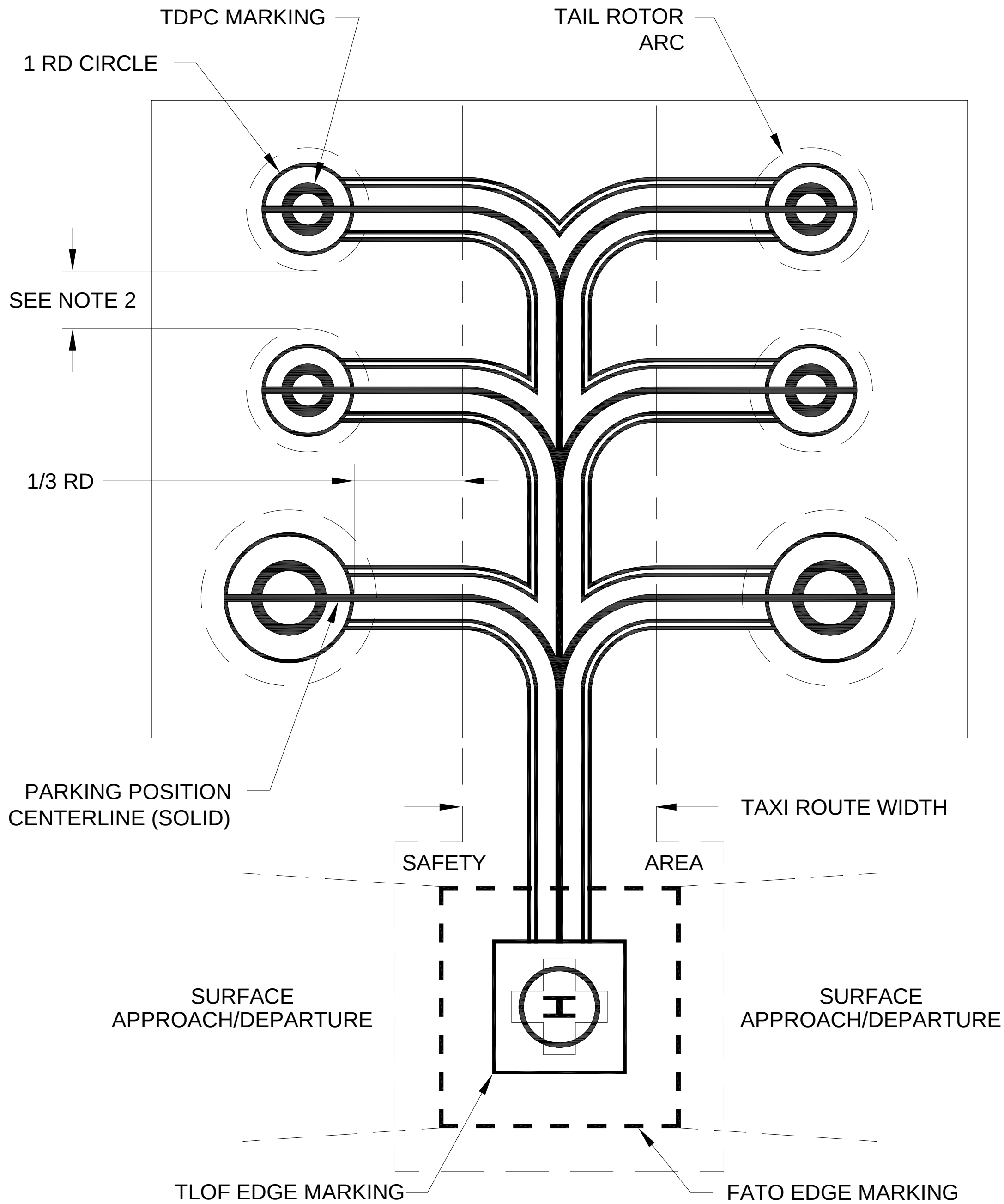
(2) When there is more than one parking position, the facility may be designed with parking positions of various sizes with at least one position that will accommodate the largest helicopter that will park at the heliport. Other parking positions may be smaller, designed for the size of the individual or range of individual helicopters planned to be parked at that position. Figure 4-20 on page 140 also provides guidance on parking position identification, size and weight limitations.



Notes:

1. Several markings (such as Parking Position Identifier and passenger walkways) have been omitted for clarity.
2. The parking positions are designed so that the helicopters exit taxiing forward.
3. Minimum recommended clearance between the arcs generated by the main rotor:
   - Hover taxi operations: 1/3 RD of the larger helicopter
   - Ground taxi operations: 10 ft [3 m]

Figure 4-15. Parking Area Design – "Taxi-through" Parking Positions: Hospital

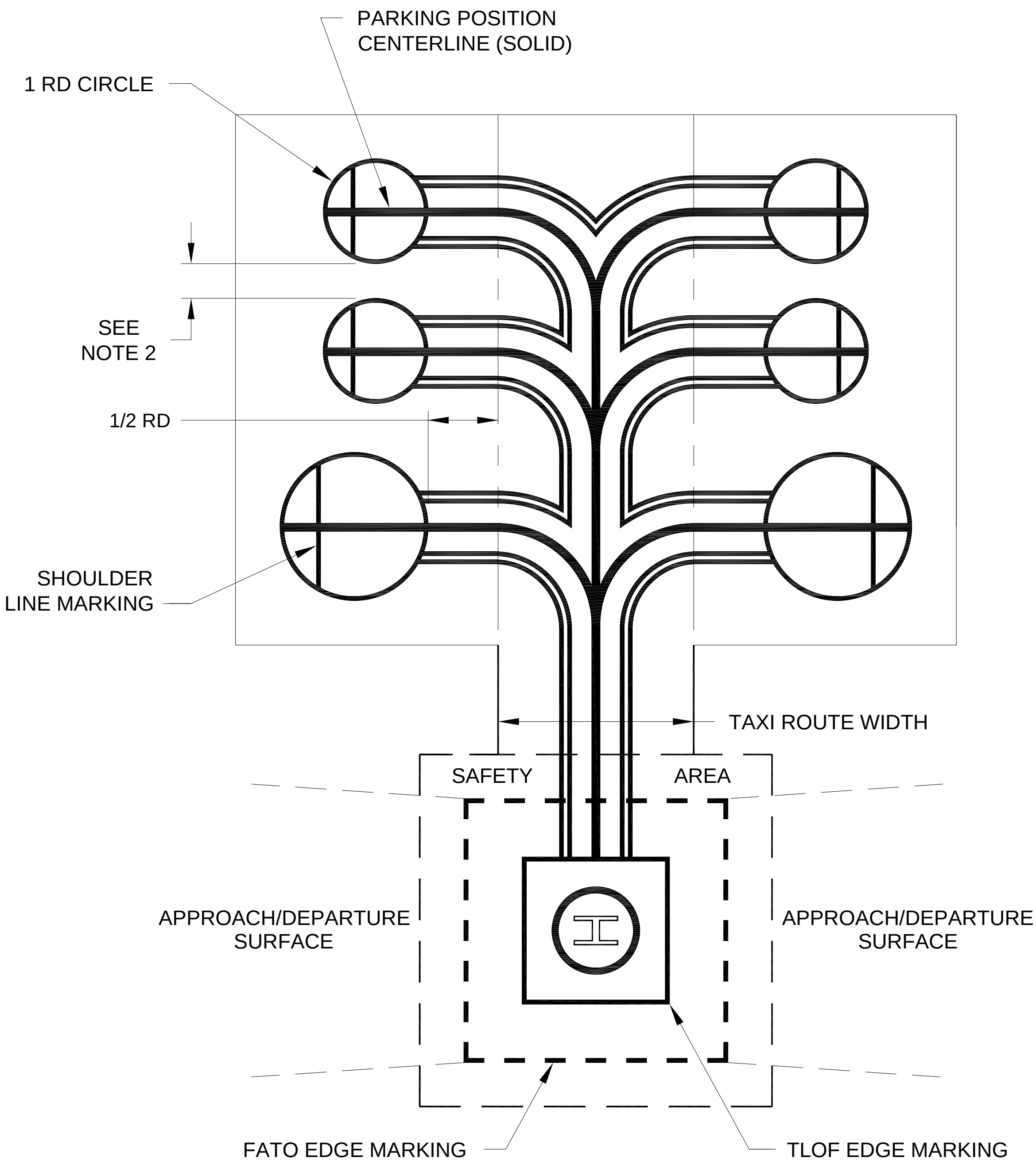


Notes:

1. Several markings (such as Parking Position Identifier and passenger walkways) have been omitted for clarity.

2. Minimum recommended clearance between the tail rotor arcs:
   - Hover taxi operations: 1/3 RD of the larger helicopter, but not less than 10 ft [3 m].
   - Ground taxi operations: 10 ft [3 m]

Figure 4-16. Parking Area Design – "Turn-around" Parking Positions: Hospital

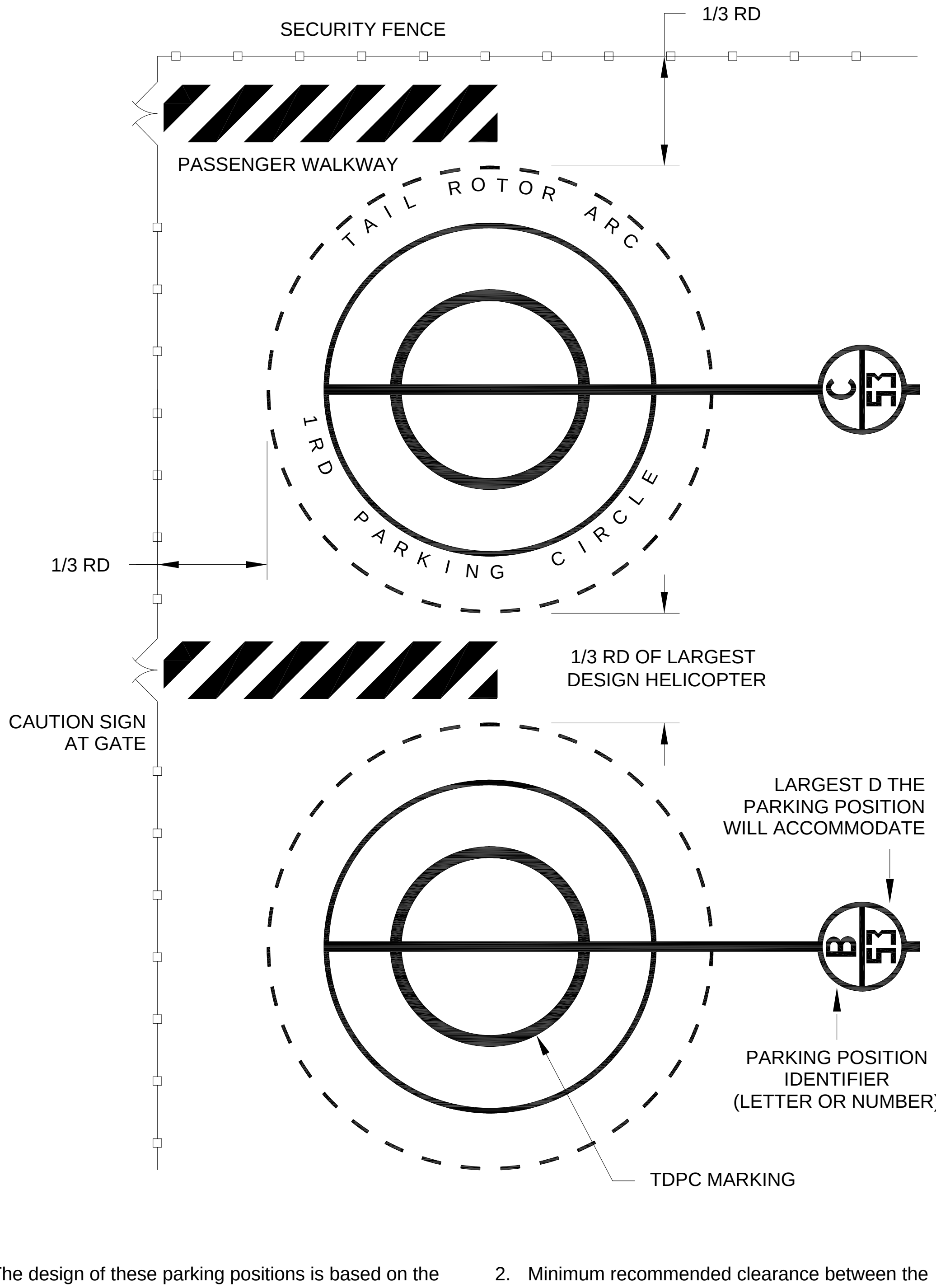


Notes:

1. Several markings (such as Parking Position Identifier and passenger walkways) have been omitted for clarity.

2. Minimum recommended clearance between the main rotor arcs :
   - Hover taxi operations: 1/3 RD of the larger helicopter, but not less than 10 ft [3 m].
   - Ground taxi operations: 10 ft [3 m]

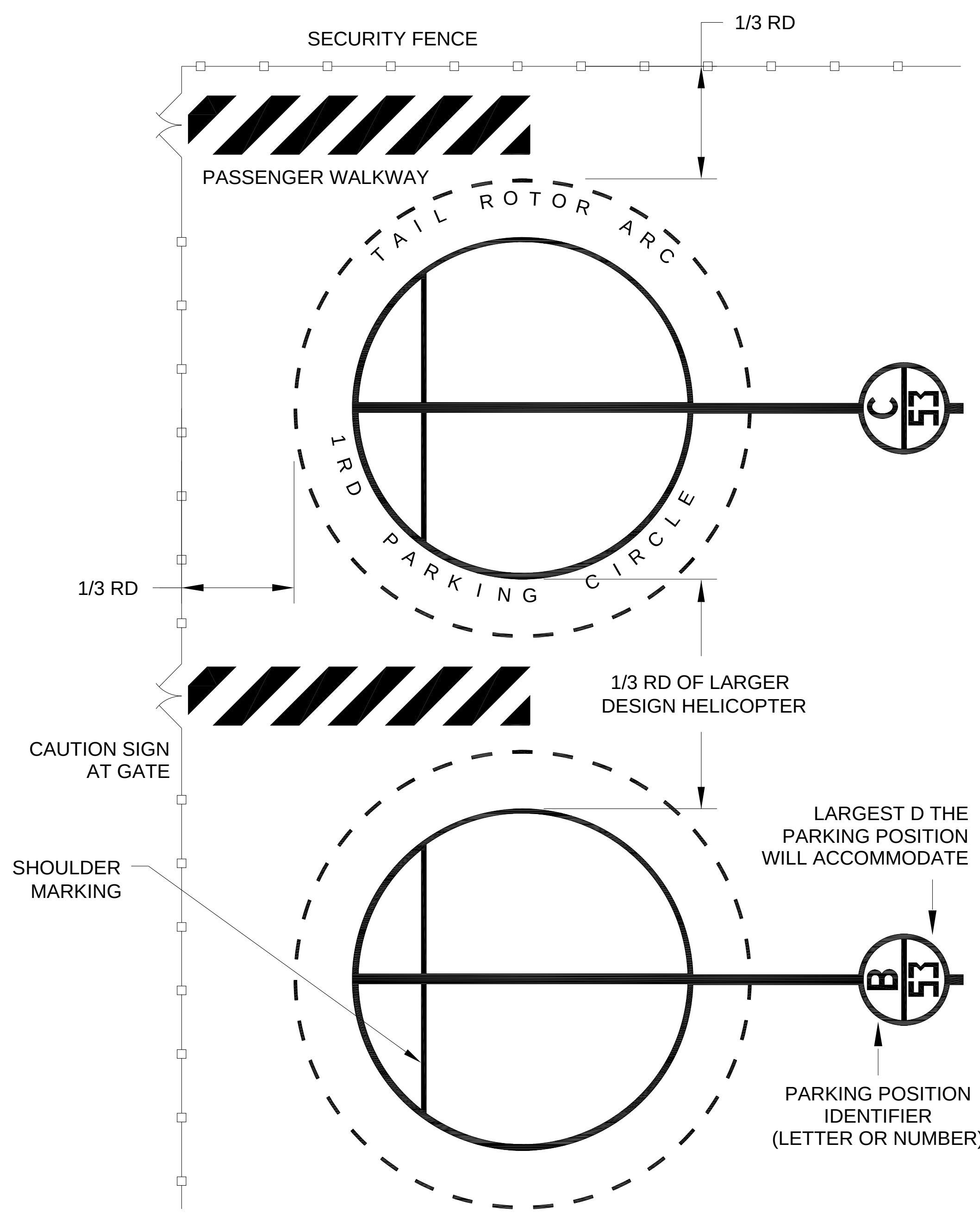
Figure 4-17. Parking Area Design – "Back-out" Parking Positions: Hospital



Notes:

1. The design of these parking positions is based on the understanding that the helicopter may pivot about the mast prior to exiting the parking position.
2. Minimum recommended clearance between the tail rotor arcs:
   - Hover taxi operations: 1/3 RD of the larger helicopter but not less than 10 ft [3 m]
   - Ground taxi operations: 10 ft [3 m]

Figure 4-18. "Turn-around" Helicopter Parking Position Marking: Hospital



Notes:

1. The design of these parking positions is based on the understanding that the helicopter may pivot about the mast prior to exiting the parking position.
2. Minimum recommended clearance between the tail rotor arcs:
   - Hover taxi operations: 1/3 RD of the larger helicopter but not less than 10 ft [3 m]
   - Ground taxi operations: 10 ft [3 m]

Figure 4-19. “Taxi-through” and “Back-out” Helicopter Parking Position Marking: Hospital

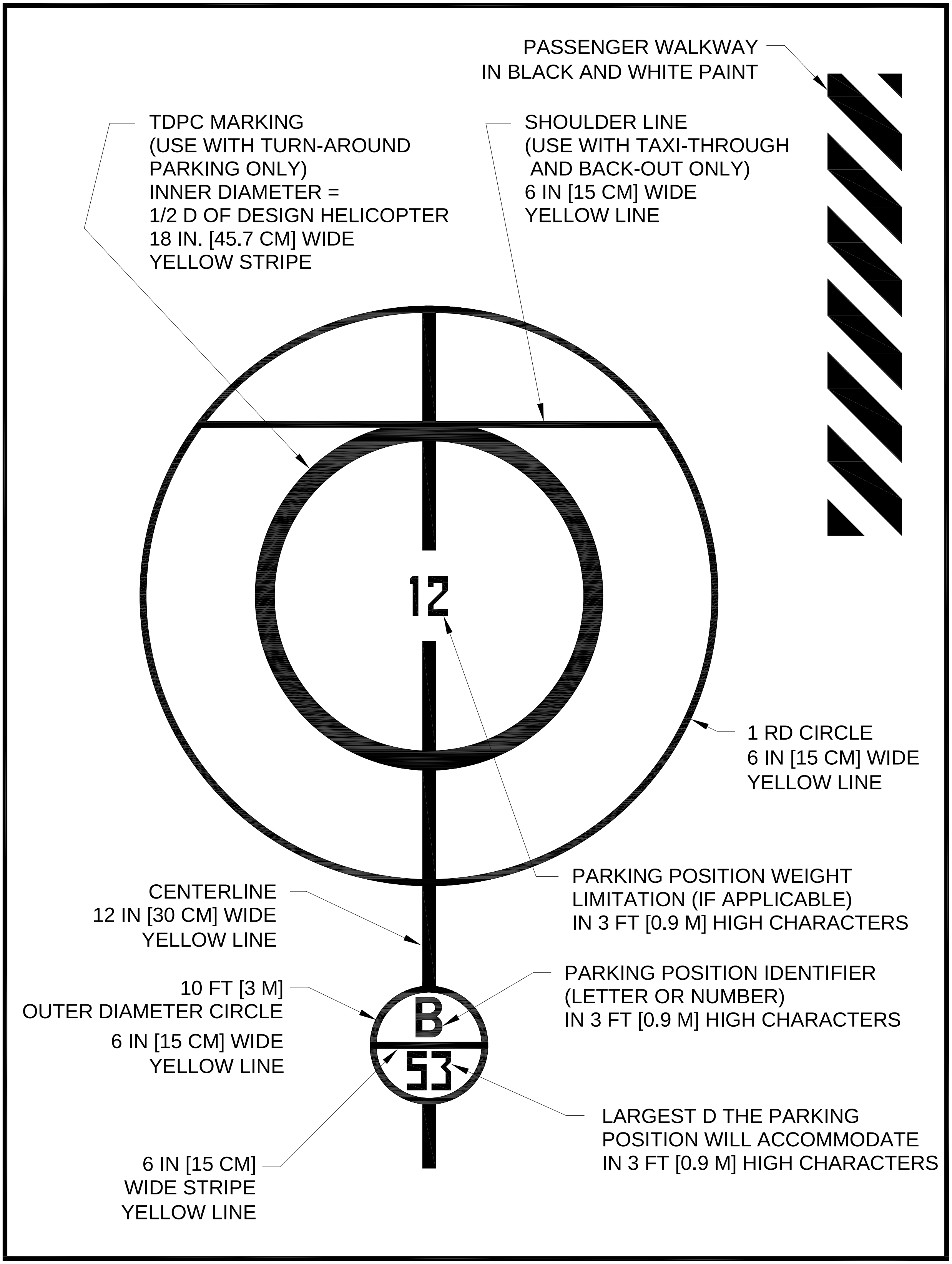


Figure 4-20. Parking Position Identification, Size, and Weight Limitations: General Aviation

(3) "Taxi-through" parking positions are illustrated in Figure 4-15 on page 135. When this design is used for parking positions, the heliport owner and operator should take steps to ensure that all pilots are informed that "turn-around" or "back-up" departures from the parking position are not permitted.

(4) "Turn-around" parking positions are illustrated in Figure 4-17.

(5) "Back-out" parking positions are illustrated in Figure 4-17 on page 137. When this design is used for parking positions, the adjacent taxiway should be designed to accommodate hover taxi operations so that the width of the taxiway will be adequate to support "back-out" operations.

c. Parking Pads. If the entire area of the parking position is not paved, the smallest dimension of a paved parking pad must be a minimum of two times the maximum dimension (length or width, whichever is greater) of the undercarriage or the RD, whichever is less, of the largest helicopter that will use this parking position. The parking pad should be placed in the center of the parking position circle**.**

d. Walkways. At parking positions, marked walkways should be provided where practicable. The pavement should be designed to drain away from walkways.

e. Fueling. Helicopter fueling is typically accomplished with the use of a fuel truck or the use of a specific fueling area with stationary fuel tanks.

(1) Systems for storing and dispensing fuel must conform to Federal, state, and local requirements for petroleum handling facilities. Guidance is found in AC 150/5230-4, *Aircraft Fuel Storage, Handling, and Dispensing on Airports*, and National Fire Protection Association (NFPA) 403, *Standard for Aircraft Rescue and Fire Fighting Services at Airports*, and NFPA 418, *Standards for Heliports*.

(2) Fueling locations must be designed and marked to minimize the potential for helicopters to collide with the dispensing equipment. Fueling areas must be designed so there is no object tall enough to be hit by the main or tail rotor blades within a distance of RD from the center point of the position where the helicopter would be fueled (providing 0.5 rotor diameter tip clearance from the rotor tips). If this is not practical at an existing facility, long fuel hoses should be installed.

(3) Lighting. The fueling area should be lighted if night fueling operations are contemplated. Care should be taken to ensure that any light poles do not constitute an obstruction hazard.

f. Tiedowns. Recessed tiedowns may be installed to accommodate extended or overnight parking of based or transient helicopters. If tiedowns are provided, they must be recessed so as not to be a hazard to helicopters. Caution should be exercised to ensure that any depression associated with the tiedowns is of a diameter not greater than 1/2 the width of the smallest helicopter landing wheel or landing skid anticipated to be operated on the heliport surface. In addition, tiedown chocks, chains, cables and ropes should be stored off the heliport surface to avoid fouling landing gear. Guidance on recessed tiedowns can be found in AC 20-35, *Tiedown Sense.*

413. HELIPORT MARKERS AND MARKINGS. Markers and/or surface markings should identify the facility as a heliport. Surface markings may be paint, reflective paint, reflective markers, or preformed material. Lines/markings may be outlined with a 6-inch wide (15 cm) line of a contrasting color to enhance conspicuity. Markings that define the edges of a TLOF, FATO, taxiway or apron are placed within the limits of those areas. The following markers and markings are used.

a. Hospital Heliport Identification Marking. The identification marking identifies the location as a hospital heliport, marks the TLOF and provides visual cues to the pilot.

(1) Standard Hospital Heliport Identification Symbol. The TLOF is marked with a red "H" in a white cross. The "H" is oriented on the axis of the preferred approach/departure path. A bar may be placed under the "H" when it is necessary to distinguish the preferred approach/departure direction. The proportions and layout of the standard hospital heliport identification symbol are illustrated in Figure 4-21 on page 143.

(2) Alternative Marking. As an alternative to the standard marking, a red "H" with a white 6 inch (15 cm) wide border within a red cross with a 12 inch (30 cm) wide white border and a surrounding red TLOF may be used. Where it is impractical for the whole TLOF to be painted red, the minimum dimension (length, width, or diameter) of the outer red area is equal to the RD of the design helicopter but not less than 40 feet (12.2 m). Figure 4-22 on page 144 illustrates this alternative marking.

(3) Winter Operations. In winter weather at a heliport with a dark TLOF surface, the marking in Figure 4-22 on page 144 will absorb more heat from the sun and more readily melt residual ice and snow. In contrast, the white area in Figure 4-21 on page 143 is more likely to be icy during winter weather. Consequently, in areas that experience ice and snow, the markings in Figure 4-22 on page 144 should be used for unheated TLOFs.

b. TLOF Markings.

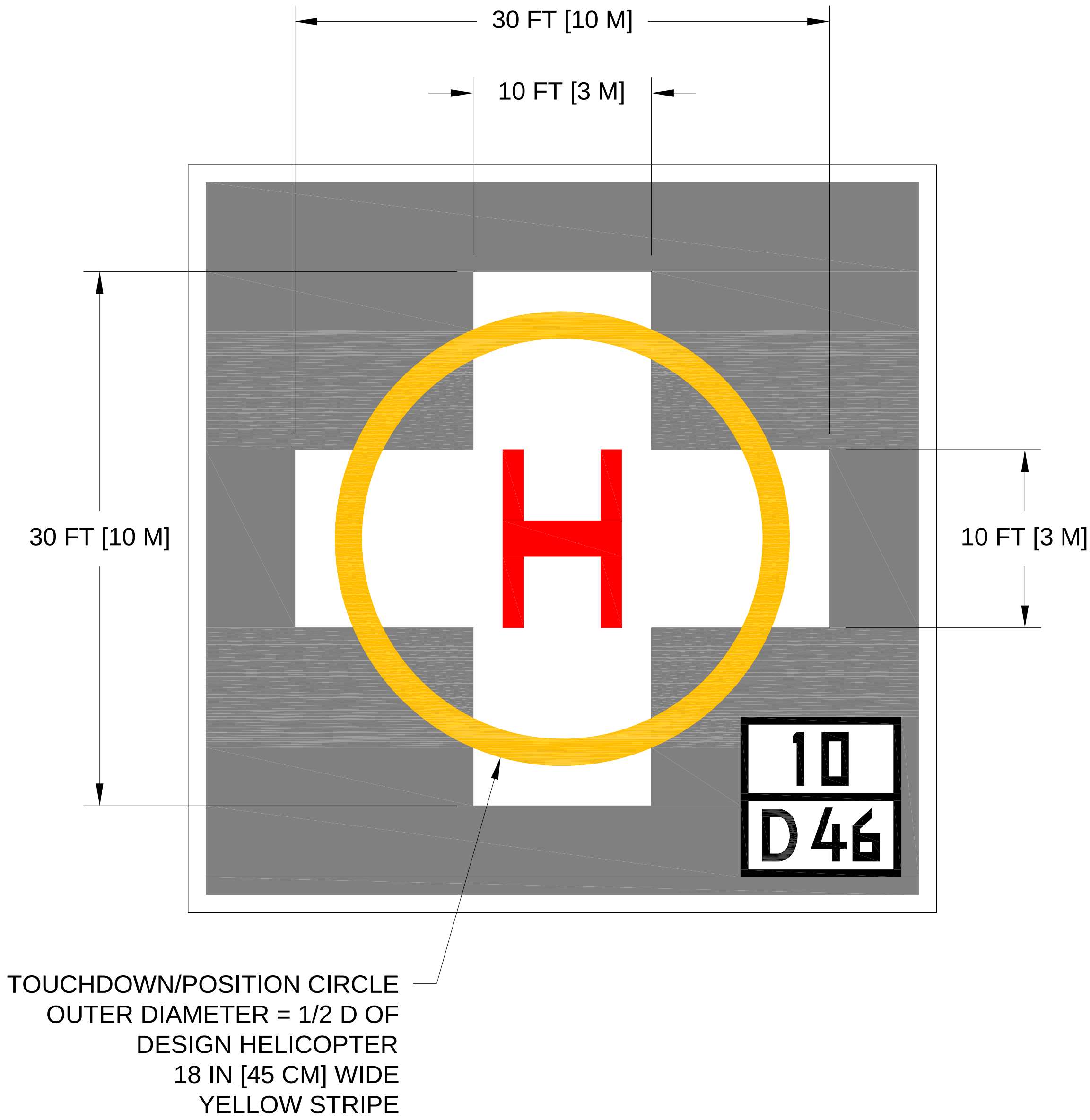
(1) TLOF Perimeter Marking. It is recommended that the TLOF perimeter be defined with markers and/or lines. See paragraph 407 above and

(2) on page 119 for guidance on increasing the size of the safety area if the TLOF perimeter is not marked.

(a) Paved TLOFs. The perimeter of a paved or hard surfaced TLOF is defined with a continuous, 12-inch-wide (30 cm), white line (see Figure 4-23 on page 145).

(b) Unpaved TLOFs. The perimeter of an unpaved TLOF is defined with a series of 12-inch-wide (30 cm), flush, in-ground markers, each approximately 5 feet (1.5 m) in length with end-to-end spacing of not more than 6 inches (15 cm). (See Figure 4-24 on page 146.)

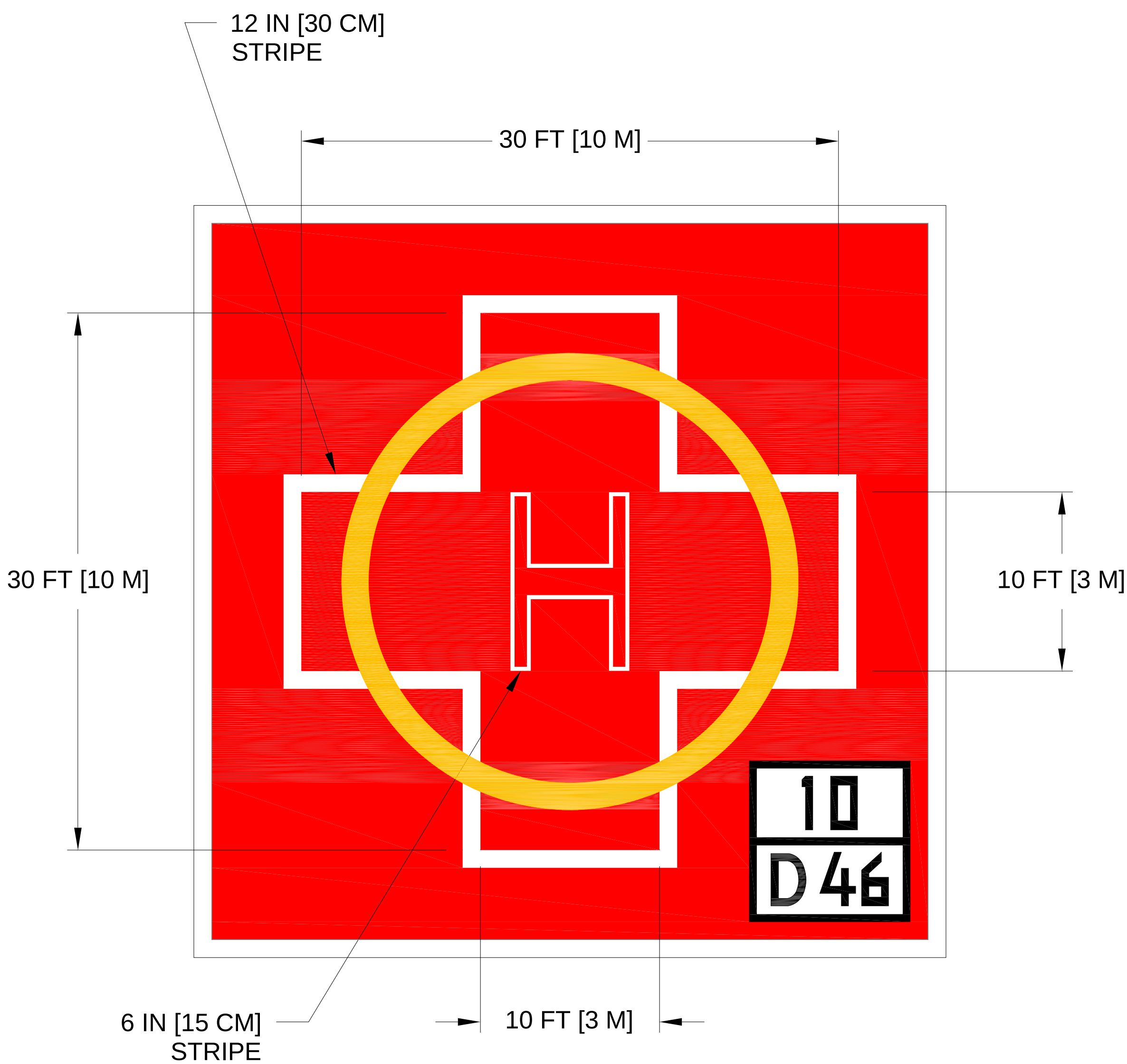
(3) Touchdown/Positioning Circle (TDPC) Marking. A touchdown/positioning circle marking is used to provide guidance to allow a pilot to touch down in a specific position on paved surfaces. When the pilot's seat is over the marking, the undercarriage will be inside the load-bearing area, and all parts of the helicopter will be clear of any obstacle by a safe margin. A TDPC marking is a yellow circle with an inner diameter of 0.5 D and a line width of 18 in (0.5 m). A TDPC marking is located in the center of a TLOF (see Figure 4-21 on page 143, Figure 4-22 on page 144, and Figure 4-23 on page 145).



Notes:

1. Standard TLOF perimeter stripe of 12 in [30 cm]. See Figure 4-25 for "H", touchdown/ positioning, overall length and weight limitation box dimensions.
2. The standard hospital identification is a red H within a white cross.
3. An option may be a red H within a white cross surrounded by a 12 in [30 cm] wide red border (not illustrated).
4. The area outside of the cross may be colored red.

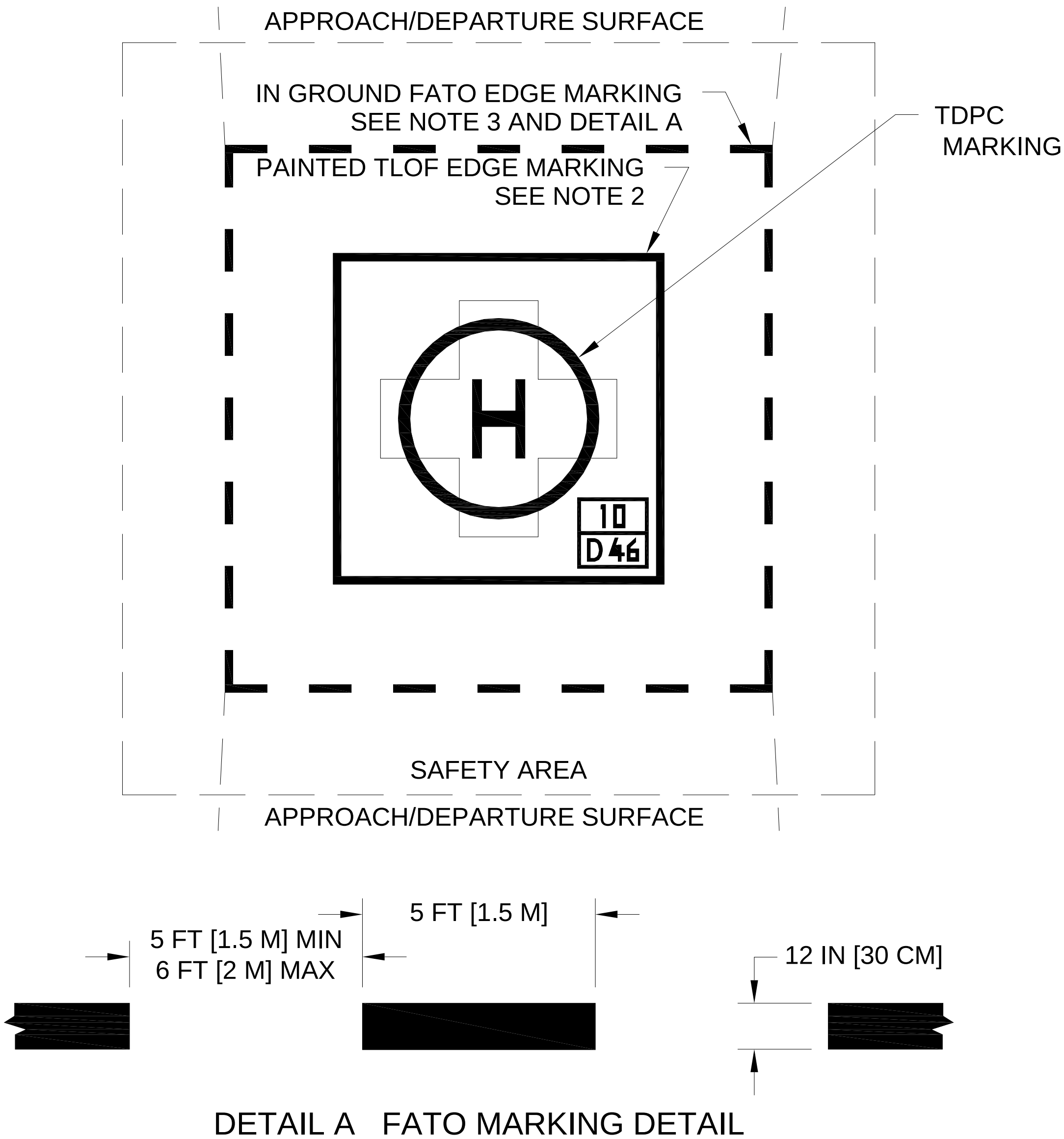
Figure 4-21. Standard Hospital Heliport Identification Symbols: Hospital



Notes:

1. Standard TLOF perimeter stripe of 12 in [30 cm]. See Figure 4-24 for "H", touchdown position, overall length and weight limitation box dimensions.

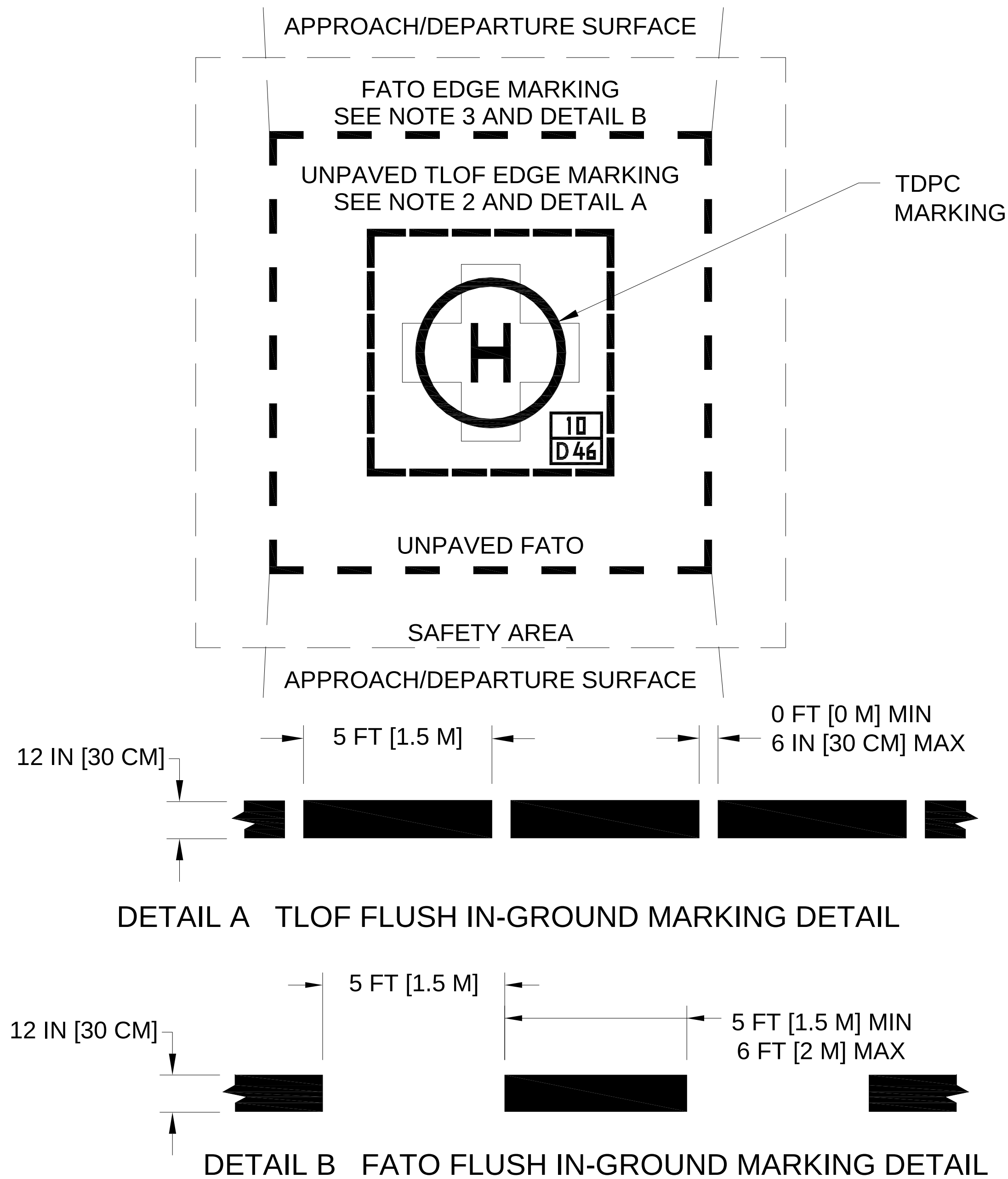
Figure 4-22. Alternative Hospital Heliport Identification Symbols: Hospital



Notes:

1. The perimeter of the TLOF and the FATO are marked.
2. The perimeter of a paved or hard surfaced TLOF is defined with a continuous 12 in [30 cm] white line.
3. Paved FATO perimeters are defined with a 12 in [30 cm] wide dashed line per Detail A.
4. Unpaved FATO perimeters are defined with a flush in-ground marker per Detail A.
5. See Figure 4-25 for " H", touchdown/position, overall length and weight limitation box dimensions.

Figure 4-23. Paved TLOF/Paved FATO – Paved TLOF/Unpaved FATO – Marking: Hospital



Notes:

1. The perimeter of the TLOF and FATO are marked.
2. An unpaved TLOF perimeter is defined with flush in-ground markers per Detail A.
3. An unpaved FATO perimeter is defined with flush in-ground markers per Detail B.
4. See Figure 4-25 for " H", touchdown/positioning, overall length, and weight limitation box dimensions.

Figure 4-24. Unpaved TLOF/Unpaved FATO – Marking: Hospital

(4) TLOF Size and Weight Limitations. The TLOF is marked to indicate the length and weight of the largest helicopter for which it is designed, as shown in Figure 4-25 on page 148. These markings are contained in a box that is located in the lower right-hand corner of the TLOF, or on the right-hand side of the "H" of a circular TLOF, when viewed from the preferred approach direction. The box is 9 feet square (2.7m), or), or for TLOFs less than 24 feet (7.3m), no less than 5 feet (1.5m) square. The numbers are 3 feet (0.9 m) high or, for smaller heliports, no less than 20 inches (51 cm). If necessary, this marking may interrupt the Touchdown/Positioning Circle marking but may not extend to within the circle, except for circular TLOFs. (See Appendix C on page 187.) The numbers are black with a white background. This marking is optional at a TLOF with a turf surface.

(a) TLOF Size Limitation. This number is the length (D) of the largest helicopter for which it is designed, as shown in Figure 4-25 on page 148. The marking consists of the letter "D" followed by the dimension in feet. Metric equivalents are not used for this purpose. This marking is centered in the lower section of the TLOF size/weight limitation box.

(b) TLOF Weight Limitations. If a TLOF has limited weight-carrying capability, it is marked with the maximum takeoff weight of the design helicopter, in units of thousands of pounds, as shown in Figure 4-25 on page 148. Metric equivalents are not be used for this purpose. This marking is centered in the upper section of a TLOF size/weight limitation box. If the TLOF does not have a weight limit, a diagonal line extending from the lower left hand corner to the upper right hand corner, should be added to the upper section of the TLOF size/weight limitation box.

c. LBA Markings. At PPR heliports, the load bearing area may be increased without a corresponding increase in the length and width or diameter of the FATO. The LBA outside the TLOF is marked with 12-inch-wide (30 cm) diagonal black and white stripes. See Figure 4-26 for marking details.

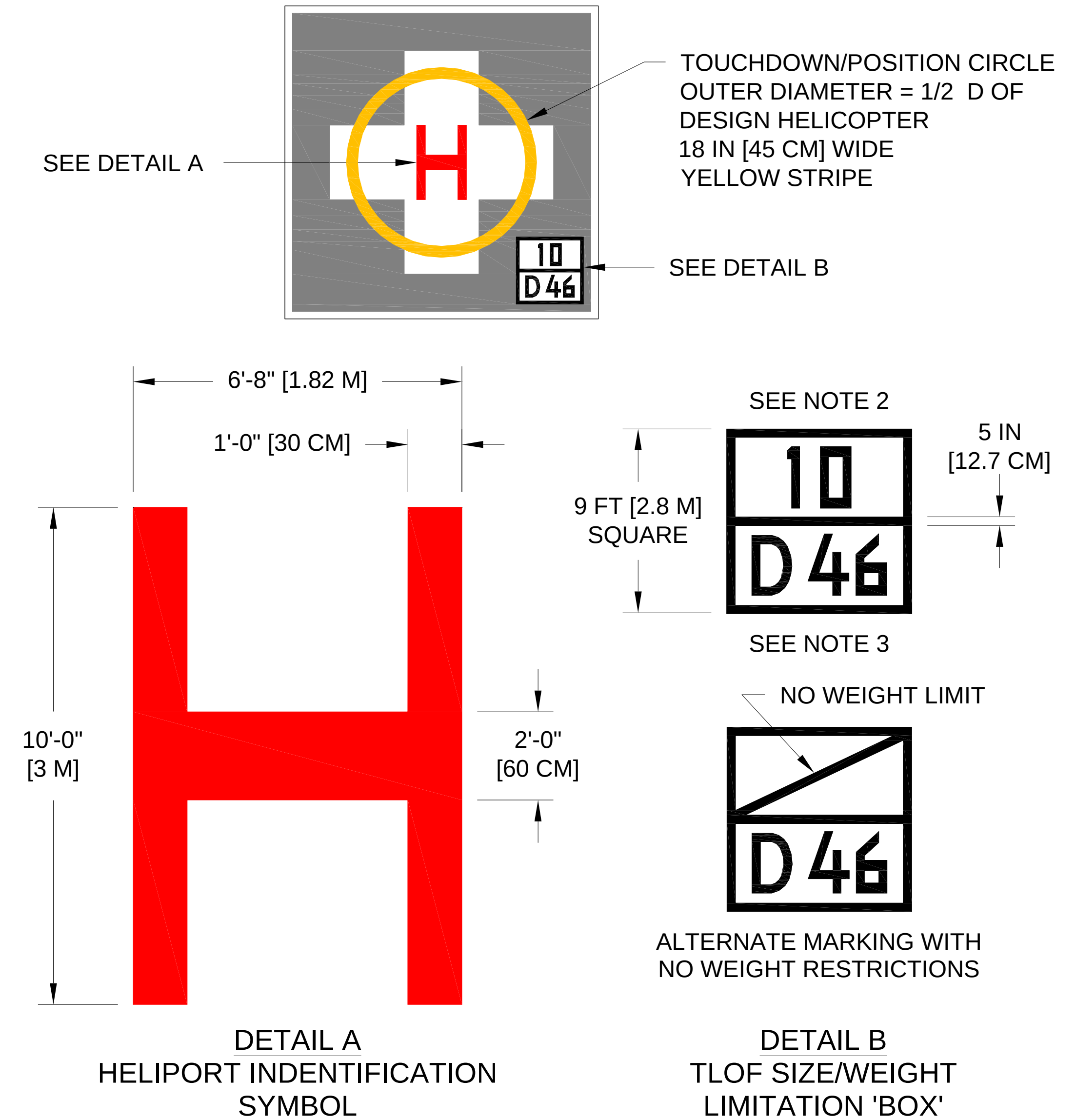
d. FATO Markings.

(1) FATO Perimeter Marking. The perimeter of a load-bearing FATO is defined with markers and/or lines. The FATO perimeter is not marked if any portion of the FATO is not a load-bearing surface. In such cases, the TLOF perimeter should be marked (see paragraph 413.b(1) above.)

(a) Paved FATOs. The perimeter of a paved load-bearing FATO is defined with a 12-inch-wide (30 cm) dashed white line. The corners of the FATO are defined, and the perimeter marking segments are 12 inches in width, approximately 5 feet (1.5 m) in length, and with end-to-end spacing of approximately 5 feet (1.5 m). (See Figure 4-23 on page 145.)

(b) Unpaved FATOs. The perimeter of an unpaved load-bearing FATO is defined with 12-inch-wide (30 cm), flush, in-ground markers. The corners of the FATO are defined, and the rest of the perimeter markers are approximately 5 feet (1.5 m) in length, and have end-to-end spacing of approximately 5 feet (1.5 m). (See Figure 4-23 on page 145 and Figure 4-24 on page 146.)

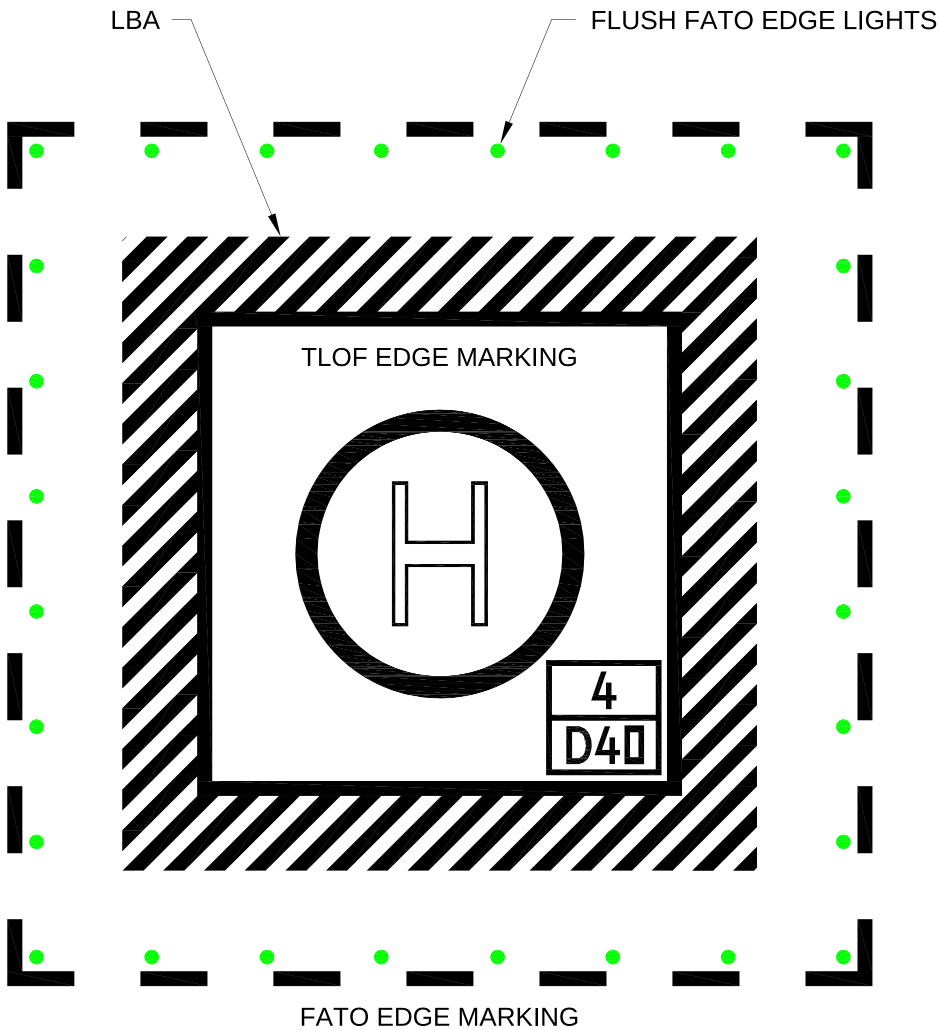
e. Flight Path Alignment Guidance Marking. An optional flight path alignment guidance marking consists of one or more arrows to indicate the preferred approach/departure direction(s). It is marked on the TLOF, FATO and/or safety area surface as shown in Figure 4-10 on page 127. The shaft of the arrow(s) is 18 in. (50 cm) in width and at least 10 feet (3 m) in length. When combined with a flight path alignment guidance lighting system described in paragraph 414.e below, it takes the form shown in Figure 4-10 on page 127, which includes scheme for marking the arrowheads. The markings must be in a color which provides good contrast against the background color of the surface on which they are marked. In the case of a flight path limited to a single approach direction or a single takeoff direction, the arrow marking is unidirectional. In the case of a heliport with only a bidirectional approach/takeoff flight path available, the arrow marking is bidirectional.



Notes:

1. See Appendix D for the form and proportion of the numbers used in the TLOF Size and Limitation Box.
2. "10" indicates the maximum takeoff weight (10,000 lbs [4,535 kg]) of the TLOF design helicopter, in units of thousands of pounds [kilograms].
3. "D46" indicates the overall length of the largest helicopter (46 ft [14.0 M]) for which the TLOF is designed.

Figure 4-25. TLOF Size and Weight Limitations: Hospital



Notes:

1. Expanded load bearing markings begin flush with TLOF edge markings and end at the edge of the LBA.
2. Expanded Load bearing markings are defined with 12 in [30 cm] wide black and white stripes on a 45° angle.

Figure 4-26. LBA Marking: Hospital

f. Taxi Route and Taxiway Markings.

(1) Paved Taxiway Markings. The centerline of a paved taxiway is marked with a continuous 6-inch (15 cm) yellow line. Both edges of the paved portion of the taxiway are marked with two continuous 6- inch wide (15 cm) yellow lines spaced 6 inches (15 cm) apart. Figure 4-12 on page 130 illustrates taxiway centerline and edge markings.

(2) Unpaved Taxiway Markings. Edge markers are used to provide strong visual cues to pilots. Edge markers may be either raised or in-ground flush markers. They are longitudinally spaced at approximately 15-foot (5 m) intervals on straight segments and at approximately 10-foot (3 m) intervals on curved segments. Figure 4-13 on page 131 and Figure 4-14 on page 132 illustrate taxiway edge markings.

(a) Raised-edge markers are blue, 4 inches (10 cm) in diameter, and 10 inches (25 cm) high, as illustrated in Figure 4-13 on page 131.

(b) In-ground, flush edge markers are yellow, 12 inches (30 cm) wide, and approximately 5 feet (1.5 m) long.

(3) Raised Edge Markers in Grassy Areas. Raised edge markers are sometimes obscured by tall grass. The heliport operator should address this problem with a 12-inch diameter (30 cm) diameter concrete pad or a solid material disk around the pole supporting the raised marker.

(4) Taxiway to Parking Position Transition Requirements. For paved taxiways and parking areas, taxiway centerline markings continue into parking positions and become the parking position centerlines.

g. Parking Position Markings. If a hospital heliport has a parking position, the following recommendations apply.

(1) Paved Parking Position Identifications. Parking position identifications (numbers or letters) are marked if there is more than one parking position. These markings are yellow characters 3 feet (0.9 m) high. (See Figure 4-20 on page 140 and Figure C–1 on page 187).

(2) Rotor Diameter Circle. A 6-inch-wide (15 cm), solid yellow line defines a circle of the rotor diameter of the largest helicopter that will park at that position. In paved areas, this is a painted line (See Figure 4-20 on page 140). In unpaved areas, this line is defined by a series of flush markers, 6 inches (15 cm) in width, a maximum of 5 feet (1.5 m) in length, and with end-to-end spacing of approximately 5 feet (1.5 m).

h. Touchdown/Positioning Circle (TDPC) Marking. An optional touchdown/positioning circle marking provides guidance to allow a pilot to touch down in a specific position on paved surfaces. When the pilot’s seat is over the marking, the undercarriage will be inside the load-bearing area, and all parts of the helicopter will be clear of any obstacle by a safe margin. A TDPC marking is a yellow circle with an inner diameter of 0.5 D and a line width of 18 in (0.5 m). A TDPC marking is located in the center of a parking area. A TDPC marking is recommended for “turn-around” parking areas. See Figure 4-20 on page 140 and Figure 4-18 on page 138.

i. Maximum Length Marking. This marking on paved surfaces indicates the D of the largest helicopter that the position is designed to accommodate (e.g., 40). This marking is in yellow characters at least 3 feet (0.9 m) high. (See Figure 4-20 on page 140 and Figure C–1 on page 187.)

j. Parking Position Weight Limit. If a paved parking position has a weight limitation, it is stated in units of 1,000 pounds as illustrated in Figure 4-20 on page 140. (A 4 indicates a weight-carrying capability of up to 4,000 pounds. Metric equivalents are not be used for this purpose.) This marking consists of yellow characters 3 feet (0.9 m) high. A bar may be placed under the number to minimize the possibility of being misread. (See Figure 4-18 on page 138 and Figure C–1 on page 187).

k. Shoulder Line Markings. Optional shoulder line markings are used for paved parking areas (See Figure 4-15 on page 135) to ensure safe rotor clearance. A 6-inch-wide (15 cm) solid yellow shoulder line, perpendicular to the centerline and extending to the RD marking, is located so it is under the pilot's shoulder such that the main rotor of the largest helicopter for which the position is designed will be entirely within the rotor diameter parking circle (See Figure 4-20 on page 140). Use 0.25D from the center of parking area to define the location of shoulder line. A shoulder line marking is recommended for "taxi through" and "back-out" parking areas.

l. Walkways. Figure 4-20 on page 140 illustrates one marking scheme.

m. Closed Heliport. All markings of a permanently closed heliport, FATO, or TLOF should be obliterated. If it is impractical to obliterate markings, a yellow "X" should be placed over the "H", as illustrated in Figure 4-27 below. The yellow "X" must be large enough to ensure early pilot recognition that the heliport is closed. The wind cone(s) and other visual indications of an active heliport must also be removed.

n. Marking Sizes. See Appendix C on page 187 for guidance on the proportions of painted numbers.

Notes:

1. A yellow "X" marking should be painted over the "H" when removal or obliteration of the heliport markings is impractical.

Figure 4-27. Marking a Closed Heliport: Hospital

414. HELIPORT LIGHTING. For night operations, the heliport must be lighted with FATO and /or TLOF perimeter lights as described below.

a. TLOF Perimeter Lights.

(1) Green lights meeting the requirements of FAA Airports Engineering Brief 87, *Heliport Lighting*[3] are used to define the TLOF perimeter. If only the TLOF is load bearing, flush lights are recommended, but raised green omnidirectional lights may be used. A minimum of three light fixtures is required per side of a square or rectangular TLOF. A light is located at each corner, with additional lights uniformly spaced between the corner lights. It is recommended each side comprise an odd number of lights, thereby including lights along the centerline of the approach. To define a circular TLOF, an even number of lights, with a minimum of eight, are uniformly spaced. The maximum spacing of lights is 25 feet (7.6 m). Flush lights are located within 1 foot (30 cm) (inside or outside) of the TLOF perimeter. Raised lights should be located outside and within 10 feet (3m) of the edge of the TLOF and should not penetrate a horizontal plane at the TLOF elevation by more than 2 inches (5 cm). In areas where it snows, the outside edge is the preferred location, as lights on the outside edge of the TLOF are prone to breakage during snow removal. Figure 4-28 on page 153 and Figure 4-30 on page 155 illustrate these lights.

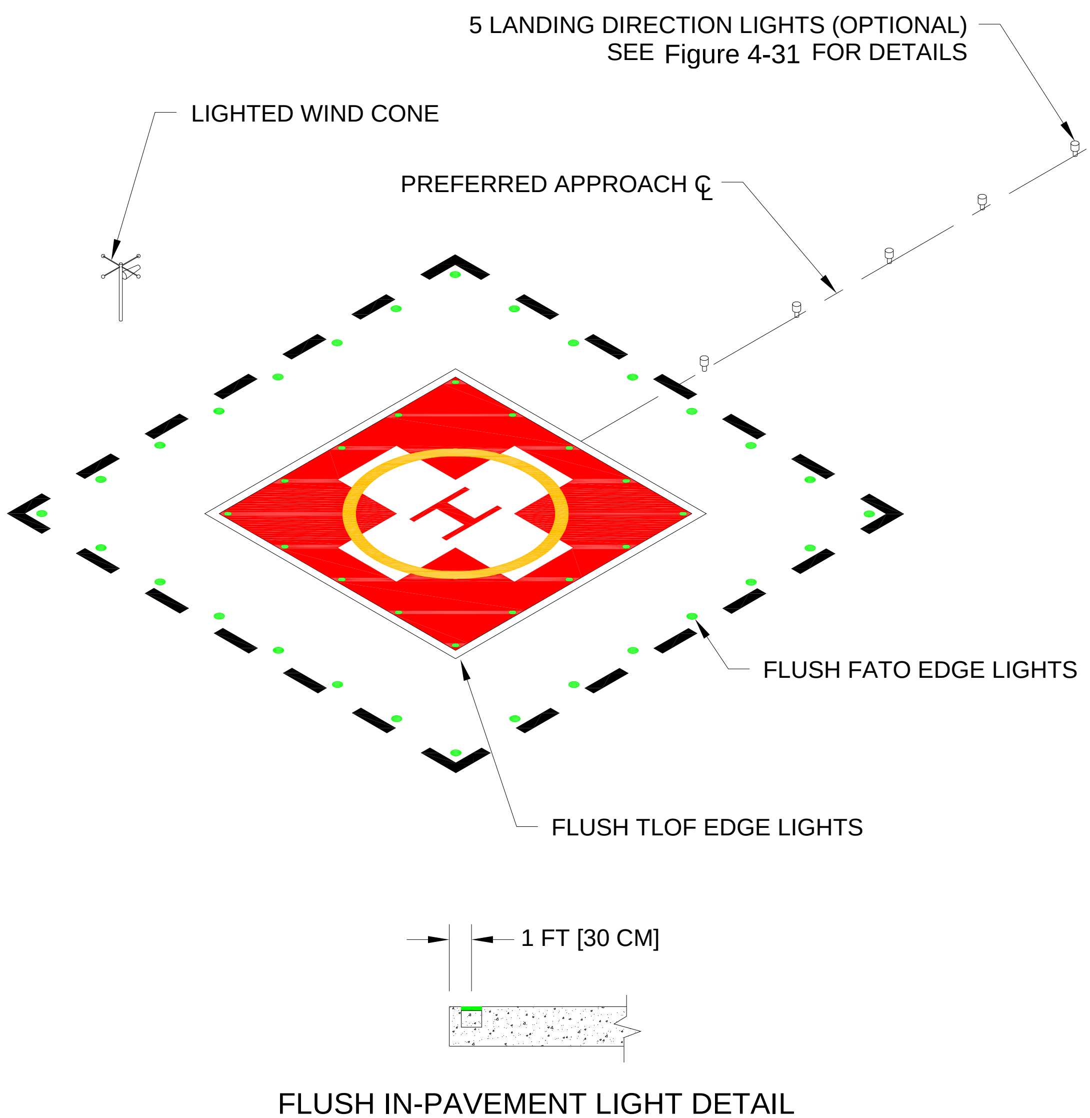
(2) Elevated TLOF Perimeter Lights. Raised, omnidirectional lights meeting the requirements of EB 87 may be used, located on the outside edge of the TLOF or the outer of the safety net, as shown in Figure 4-29 on page 154. In areas where it snows, the outer edge of the safety net is the preferred location, as lights on the outside edge of the TLOF are prone to breakage during snow removal. Lighting on the outer edge of the safety net also provides better visual cues to pilots at a distance from the heliport since it outlines a larger area. The raised lights must not penetrate a horizontal plane at the TLOF elevation by more than 2 inches (5 cm).

b. Load-bearing FATO Perimeter Lights. Green lights meeting the requirements of EB 87 define the perimeter of a load bearing FATO. The FATO perimeter is not lighted if any portion of the FATO is not a load-bearing surface. A minimum of three flush or raised light fixtures is required per side of a square or rectangular FATO. A light is located at each corner, with additional lights uniformly spaced between the corner lights. It is recommended each side comprise an odd number of lights, thereby including lights along the centerline of the approach. To define a circular FATO, an even number of lights, with a minimum of eight, are uniformly spaced. The maximum spacing of lights is 25 feet (7.6 m). Flush lights are located within 1 foot (30 cm) (inside or outside) of the FATO perimeter (See Figure 4-28 on page 153 and Figure 4-30 on page 155.). In areas where it snows in the winter, the outside edge is the preferred location, as lights on the inside edge of the FATO are prone to breakage during snow removal. A square or rectangular pattern of FATO perimeter lights are recommended even if the TLOF is circular. At a distance during nighttime operations, a square or rectangular pattern of FATO perimeter lights provides the pilot with better visual cues than a circular pattern. In the case of an elevated FATO with a safety net, the perimeter lights are mounted in a similar manner as discussed in paragraph 414.a(2) above. If raised FATO perimeter lights are used, they should be no more than 8 inches (20 cm) high, and located 10 feet (3 m) from the FATO perimeter.

c. Floodlights. If ambient light does not adequately illuminate markings for night operations, floodlights should be used to illuminate the TLOF, the FATO, and/or the parking area. To eliminate the need for tall poles, these floodlights may be mounted on adjacent buildings. Care should be taken, however, to place floodlights clear of the TLOF, the FATO, the safety area, and the approach/departure

[3] As of the date of this draft, EB 87 has not been completed. Guidance on heliport lighting will be published as soon as possible.

surfaces, and transitional surfaces. Care should be taken to ensure that floodlights and their associated hardware do not constitute an obstruction hazard. Floodlights should be aimed down and provide adequate illumination on the surface. Floodlights that might interfere with pilot vision during takeoff and landings should be capable of being turned off by pilot control or at pilot request.



Notes:

1. Flush FATO and TLOF perimeter lights may be installed inside or outside within 1 ft [30 cm] the FATO and TLOF respective perimeters.
2. Overall length and weight limitation box marking omitted for clarity.

Figure 4-28. Flush TLOF/FATO Perimeter Lighting: Hospital

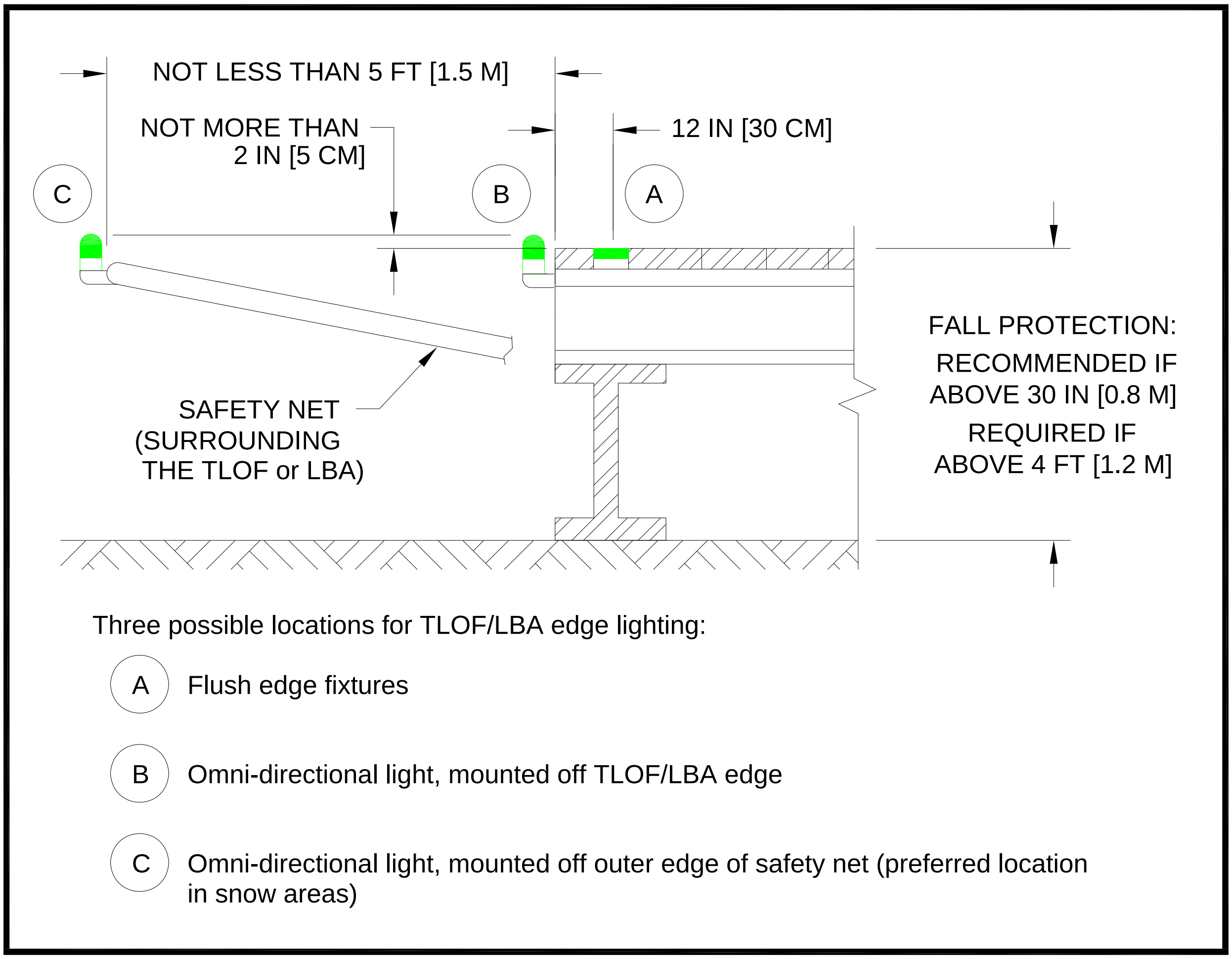
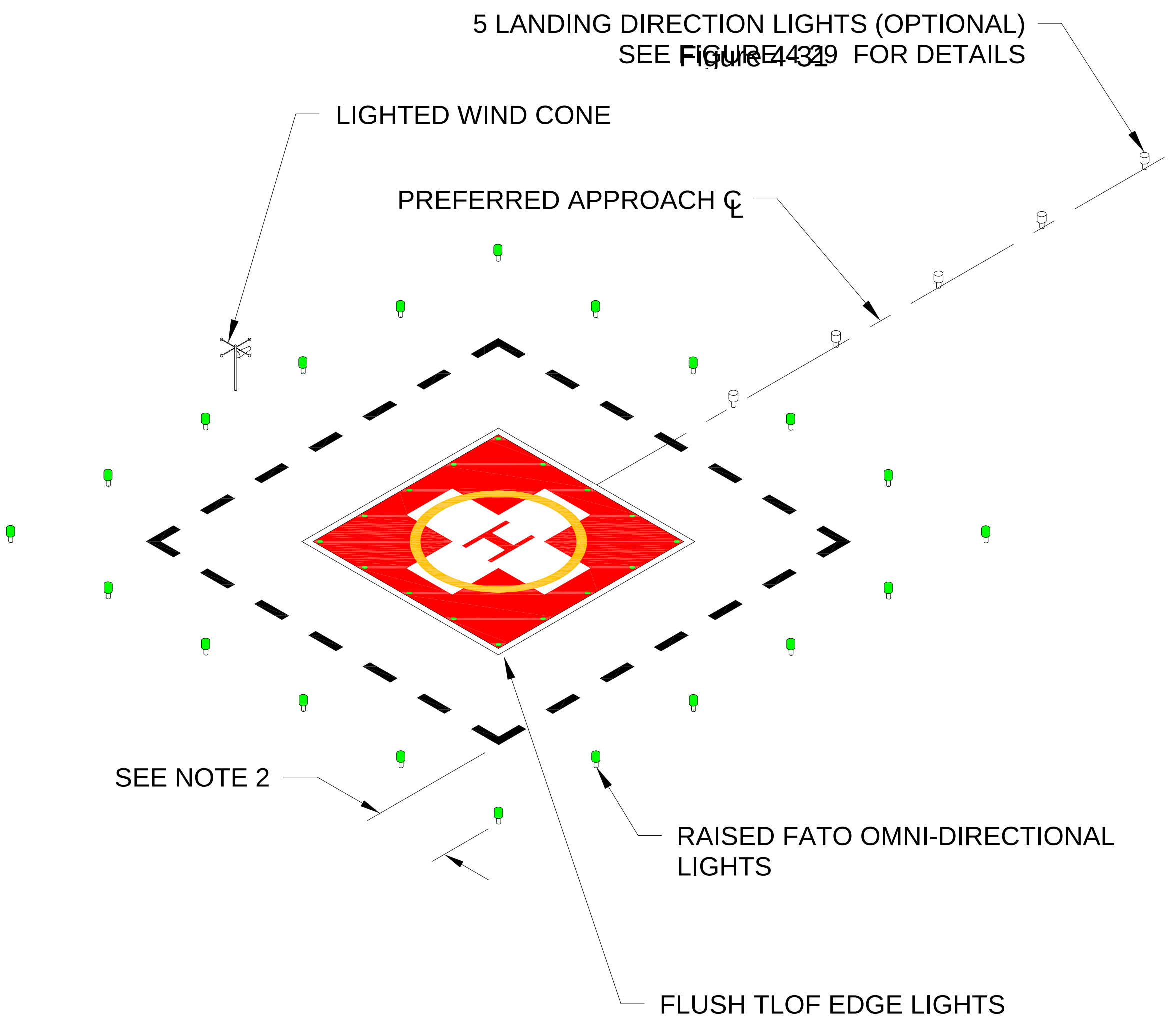


Figure 4-29. Elevated TLOF, Safety Net and Lighting Heliport Partial Elevation: Hospital



Notes:

1. Flush TLOF perimeter lights may be installed inside or outside within 1 ft [30 cm] of the FATO and TLOF respective perimeters.
2. Raised FATO lights may be installed 10 ft [3 m] outside the FATO perimeter.
3. Overall length and weight limitation box marking omitted for clarity.

Figure 4-30. Flush TLOF and Raised FATO Perimeter Lighting: Hospital

d. Landing Direction Lights. Landing direction lights are an optional feature to be installed when it is necessary to provide directional guidance. Landing direction lights are a configuration of five white, omnidirectional lights meeting the standards of EB 87, on the centerline of the preferred approach/departure path. These lights are spaced at 15-foot (5 m) intervals beginning at a point not less than 20 feet (6 m) and not more than 60 feet (18 m) from the TLOF perimeter and extending outward in the direction of the preferred approach/departure path, as illustrated in Figure 4-31 on 157.

e. Flight Path Alignment Lights. Flight path alignment lights meeting the requirements of Engineering Brief 87 are optional. They are placed in a straight line along the direction of approach and/or departure flight paths. The lights may extend across the TLOF, FATO, safety area or any suitable surface in the immediate vicinity of the FATO or safety area. Three or more white lights are spaced at (1.5 m) to (3.0 m). See Figure 4-10 on page 127.

f. Taxiway and Taxi Route Lighting.

(1) Taxiway Centerline Lights. Taxiway centerlines are defined with flush bidirectional green lights meeting the standards of AC 150/5345-46 for type L-852A (straight segments) or L-852B (curved segments). These lights are spaced at maximum 50-foot (15 m) longitudinal intervals on straight segments and at maximum 25-foot (7.5 m) intervals on curved segments, with a minimum of four lights needed to define the curve. Taxiway centerline lights may be uniformly offset no more than two feet to ease painting the taxiway centerline. Green retroreflective markers meeting requirements for type II markers in AC 150/5345-39, *Specification for L-853, Runway and Taxiway Retroreflective Markers,* may be used in lieu of the L-852A or L-852B lighting fixtures.

(2) Taxiway Edge Lights. Omnidirectional blue lights are used to light the edges of a taxiway. Blue retroreflective markers may be used to identify the edges of the taxiway in lieu of lights. When retroreflective markers are used, they must be no more than 8 inches (20 cm) tall.

(a) Straight Segments. Lights are spaced at 50 feet (15.2 m) longitudinal intervals on straight segments.

(b) Curved Segments. Curved taxiway edges require shorter spacing of edge lights. The spacing is determined based on the radius of the curve. The applicable spacing for curves is shown in Figure 17 of AC 150/5340-30, *Design and Installation Detail for Airport Visual Aids*. The taxiway edge lights are uniformly spaced. Curved edges of more than 30 degrees from point of tangency (PT) of the taxiway section to PT of the intersecting surface must have at least three edge lights. For radii not listed in Figure 17 determine spacing by linear interpolation.

(c) Paved Taxiways. Flush lights must meet the standards of AC 150/5345-46 for type L-852T.

(d) Unpaved Taxiways. Raised lights must meet the standards of AC 150/5345-46 for type L-861T . The lateral spacing for the lights or reflectors is equal to the RD of the design helicopter, but not more than 35 feet.

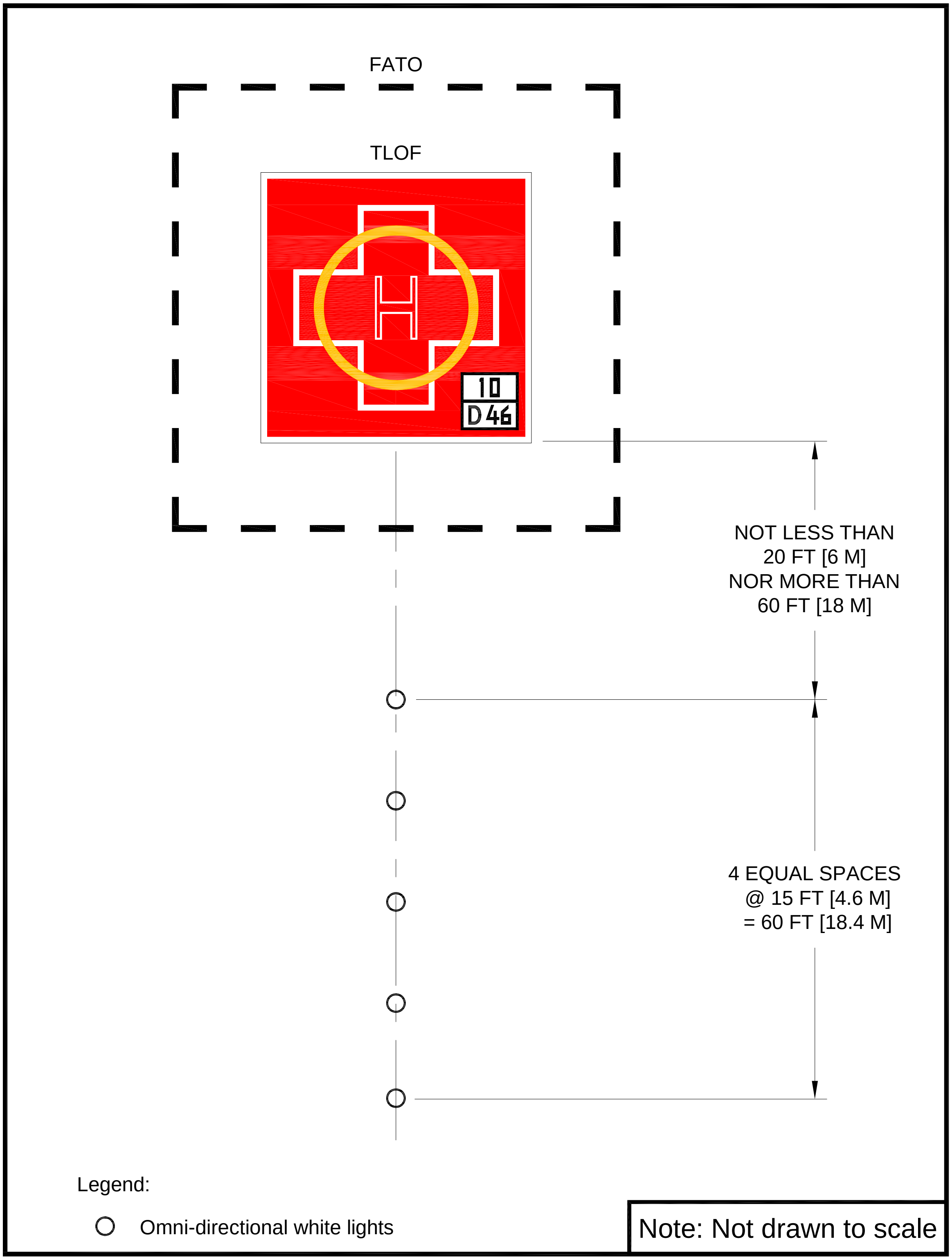


Figure 4-31. Landing Direction Lights: Hospital

g. Heliport Identification Beacon. A heliport identification beacon is optional equipment. It should be installed when it is needed to aid the pilot in visually locating the heliport. When installed, the beacon, flashing white/green/yellow at the rate of 30 to 45 flashes per minute, is located on or close to the heliport. Guidance on heliport beacons is found in AC 150/5345-12, *Specification for Airport and Heliport Beacon*. It is permissible for the beacon to be pilot controllable such that it is "on" only when required.

415. MARKING AND LIGHTING OF DIFFICULT-TO-SEE OBJECTS. Unmarked wires, antennas, poles, cell towers, and similar objects are often difficult to see, even in the best daylight weather, in time for a pilot to successfully take evasive action. While pilots can avoid such objects during en route operations by flying well above them, approaches and departures require operations near the ground where obstacles may be a factor. This paragraph discusses the marking and lighting of objects near, but outside and below the approach/departure surface. Guidance on marking and lighting objects is contained in AC 70/7460-1, *Obstruction Marking and Lighting.*

a. Airspace. If difficult-to-see objects penetrate the object identification surfaces illustrated in Figure 4-32 on page 159, these objects should be marked to make them more conspicuous. If operations are conducted at a heliport between dusk and dawn, these difficult-to-see objects should be lighted. Guidance on marking and lighting objects is contained in AC 70/7460-1, *Obstruction Marking and Lighting*. The object identification surfaces in Figure 4-32 on page 159 can also be described as follows:

(1) In all directions from the safety area, except under the approach/departure paths, the object identification surface starts at the safety area perimeter and extends out horizontally for a distance of 100 feet (30.5 m).

(2) Under the approach/departure surface, the object identification surface starts from the outside edge of the FATO and extends horizontally out for a distance of 800 feet (244 m). From this point, the object identification surface extends out for an additional distance of 3,200 feet (975 m) while rising on an 8:1 slope (8 units horizontal in 1 unit vertical). From the point 800 feet (244 m) from the FATO perimeter, the object identification surface is 100 feet (30.5 m) beneath the approach/departure surface.

(3) The width of the safety surface increases as a function of distance from the safety area. From the safety area perimeter, the object identification surface extends laterally to a point 100 feet (30.5 m) outside the safety area perimeter. At the upper end of the surface, the object identification surface extends laterally 200 feet (61 m) on either side of the approach/departure path.

b. Shielding of Objects. If there are a number of obstacles close together, it may not be necessary to mark all of them if they are shielded. To meet the shielding guidelines an object must be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and must be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation. Additional guidance on this topic may be found in 14 CFR part 77.9, *Construction or alteration requiring notice*.

c. Heliport maintenance and servicing equipment, as well as other objects used in the airside operational areas, should be made conspicuous with paint, reflective paint, reflective tape, or other reflective markings. Reference AC 150/5210-5, *Painting, Marking, and Lighting of Vehicles Used on an Airport*.

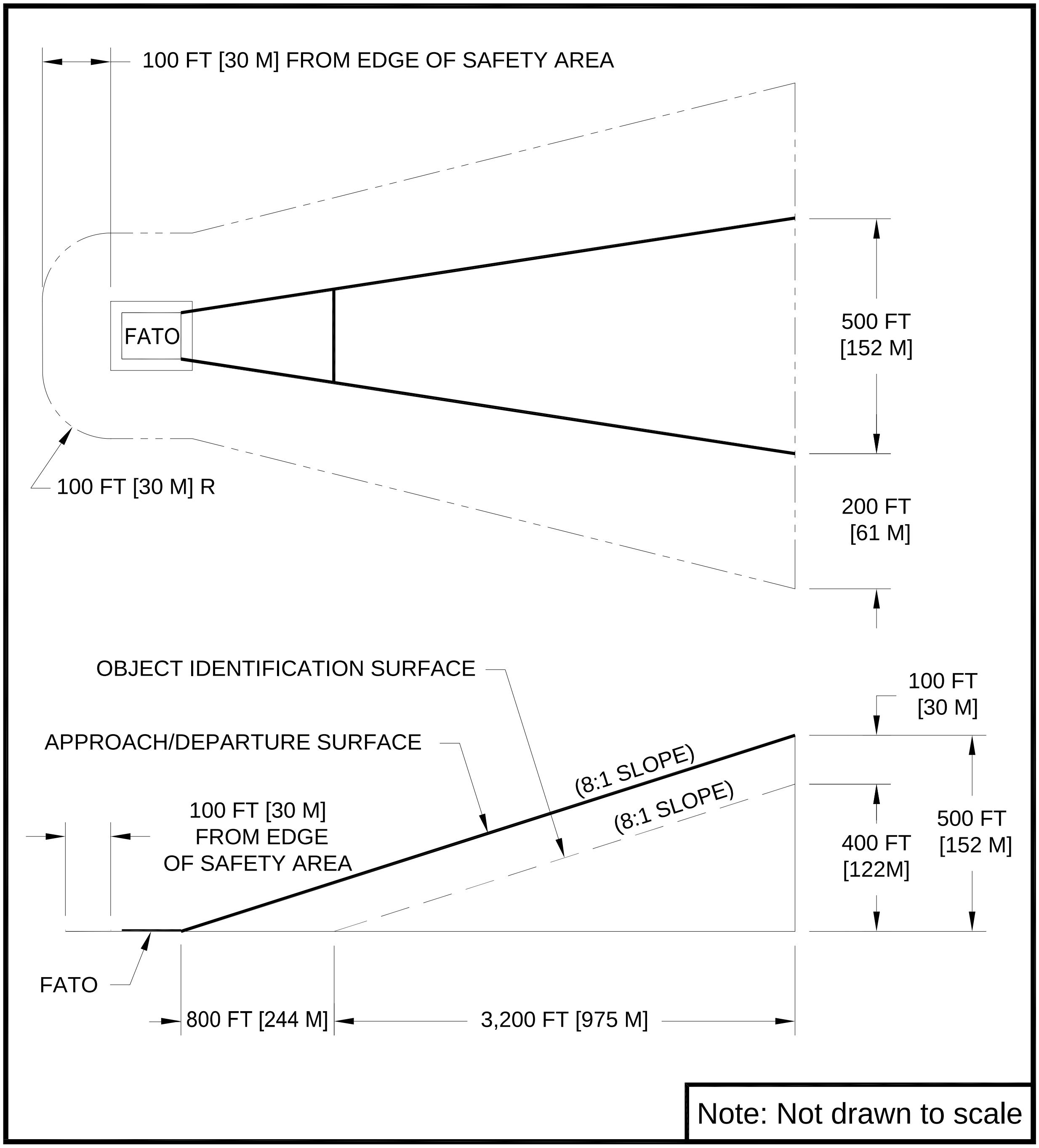


Figure 4-32. Airspace Where Marking and Lighting are Recommended: Hospital

416. SAFETY CONSIDERATIONS. Some safety enhancements to be considered in the design of a heliport are discussed below. Other areas such as the effects of rotor downwash may need to be addressed based on site conditions and the design helicopter.

a. Security. The operational areas of a hospital heliport should be kept clear of people, animals, and vehicles. The method used to control access depends upon the helicopter location and types of potential intruders.

(1) Safety Barrier. At ground-level hospital heliports, one method is to erect a safety barrier around the helicopter operational areas. This barrier may take the form of a fence, wall, or hedge. It must be no closer to the operating areas than the outer perimeter of the safety area. Barriers must not penetrate any approach/departure (primary or transitional) surface. Thus, in the vicinity of the approach/departure paths, the barrier may need to be well outside the outer perimeter of the safety area.

(2) Any barrier must be high enough to present a positive deterrent to persons inadvertently entering an operational area and yet low enough to be non-hazardous to helicopter operations.

(3) Access. At some locations, it may be appropriate to restrict access to airside areas through controlled entryways. Entryways should display a cautionary sign similar to that illustrated in Figure 4-33 on page 161. Hospital heliport operators may choose to secure their operational areas via the use of security guards and a mixture of fixed and movable barriers.

b. Rescue and Fire-Fighting Services. Heliports must meet State and local rescue and fire-fighting regulations. A fire hose cabinet or extinguisher must be provided at each access gate/door and each fueling location. At elevated TLOFs, fire hose cabinets, fire extinguishers, and other fire-fighting equipment must be located adjacent to, but below the level of, the TLOF. Information is available in NFPA 418, *Standards for Heliports*, and NFPA 403, *Standard for Aircraft Rescue and Fire-Fighting Services at Airports*. NFPA standards are available at National Fire Protection Association web site at http://www.nfpa.org.

c. Communications. A Common Traffic Advisory Frequency (CTAF) radio may be used to provide arriving helicopters with heliport and traffic advisory information but may not be used to control air traffic. The Federal Communications Commission (FCC) should be contacted for information on CTAF licensing.

d. Weather Information. An automated weather observing system (AWOS) measures and automatically broadcasts current weather conditions at the heliport site. When an AWOS is installed, it must be located at least 100 feet (30 m) and not more than 700 feet (213 m) from the TLOF. Locate the AWOS so its instruments will not be affected by rotor wash from helicopter operations. Guidance on AWOS systems is found in AC 150/5220-16, *Automated Weather Observing Systems (AWOS) for Non-Federal Applications*, and FAA Order 6560.20, *Siting Criteria for Automated Weather Observing Systems (AWOS).*

e. Winter Operations. Swirling snow raised by a helicopter's rotor wash can cause the pilot to lose sight of the intended landing point and /or hide objects that need to be avoided. At least the TLOF, the FATO, and as much of the safety area as practical should be kept free of snow. Heliport design should take into account the methods and equipment to be used for snow removal. The heliport design should allow the snow to be removed sufficiently so the snow will not present an obstruction hazard to either the tail rotor or the main rotor. Guidance on winter operations is found in AC150/5200-30, *Airport Winter Safety and Operations*.

Figure 4-33. Caution Sign: Hospital

417. ZONING AND COMPATIBLE LAND USE. Where state and local statutes permit, the hospital heliport sponsor is encouraged to promote the adoption of the following zoning measures to ensure that the heliport will continue to be available and to protect the investment in the facility.

a. Zoning to Limit Building/Object Heights. General guidance on drafting an ordinance that would limit building and object heights is contained in AC 150/5190-4, *A Model Zoning Ordinance to Limit Height of Objects Around Airports*. The ordinance should substitute the heliport surfaces on the model ordinance.

b. Zoning for Compatible Land Use. A zoning ordinance may be enacted, or an existing ordinance modified, to control the use of property within the heliport approach/departure path environment. The ordinance should restrict activities to those that are compatible with helicopter operations..

c. Air rights and property easements are options that may be used to prevent the encroachment of obstacles in the vicinity of a heliport.

418. VISUAL GLIDESLOPE INDICATORS (VGSI). A visual glideslope indicator (VGSI) provides pilots with visual vertical course and descent cues. The lowest on-course visual signal must provide a minimum of 1 degree of clearance over any object that lies within 10 degrees of the approach course centerline.

a. Siting. The optimum location of a VGSI is on the extended centerline of the approach path at a distance that brings the helicopter to a hover with the undercarriage between 3 and 8 feet (0.9 to 2.5 m) above the TLOF. Figure 4-34 on page 163 illustrates VGSI clearance criteria. This will require estimating the vertical distance from the undercarriage to the pilot's eye.

b. Control of the VGSI. It is permissible for the VGSI to be pilot controllable such that it is "on" only when required.

c. VGSI Needed. A VGSI is an optional feature. However, a VGSI should be provided if one or more of the following conditions exist, especially at night:

(1) Obstacle clearance, noise abatement, or traffic control procedures require a particular slope to be flown.

(2) The environment of the heliport provides few visual surface cues.

d. Additional Guidance. AC 150/5345-52, *Generic Visual Glideslope Indicators (GVGI)*, and AC 150/5345-28, *Precision Approach Path Indicator (PAPI) Systems*, provide additional guidance.

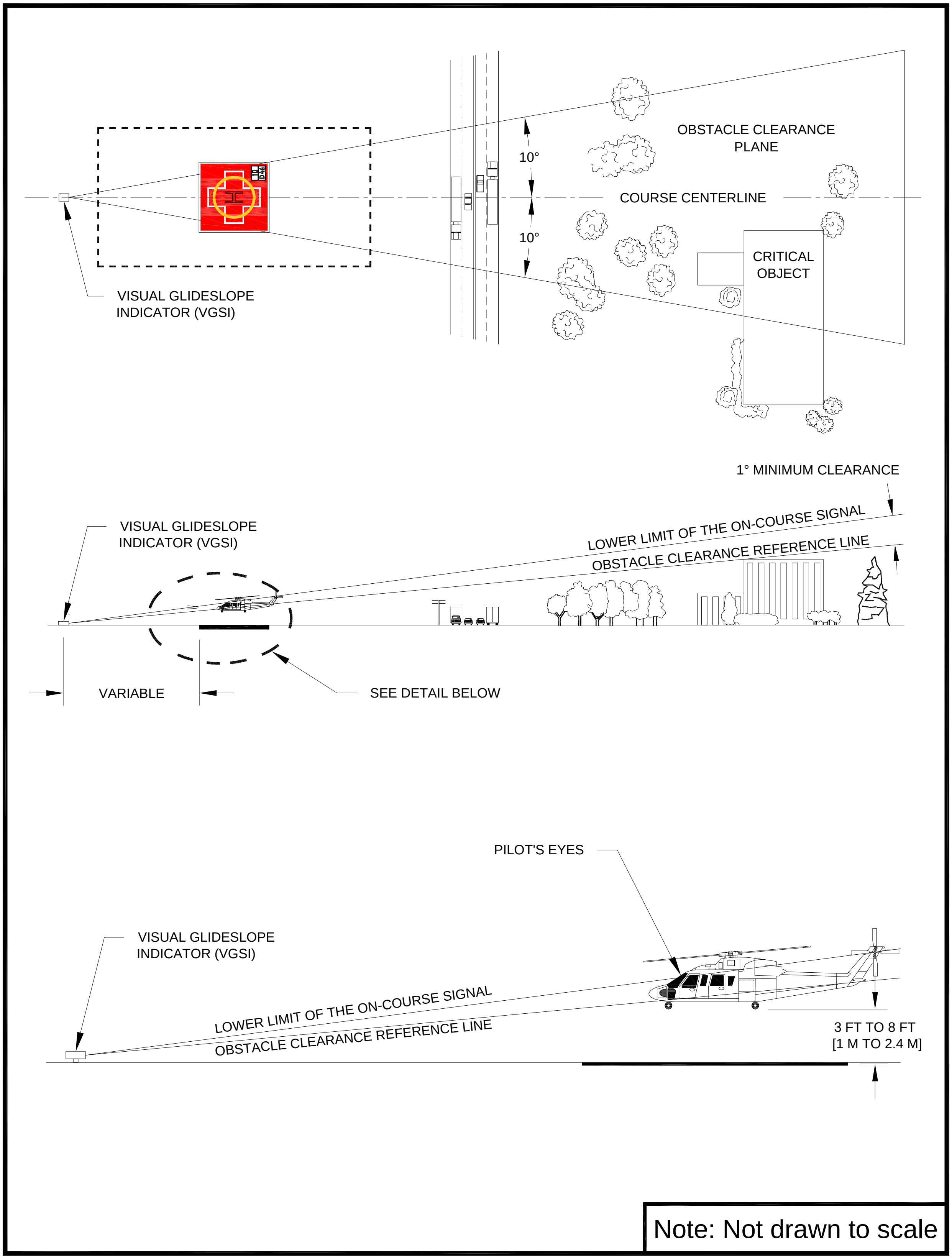


Figure 4-34. Visual Glideslope Indicator Siting and Clearance Criteria: Hospital

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CHAPTER 5. HELICOPTER FACILITIES ON AIRPORTS

501. GENERAL. Helicopters are able to operate on most airports without unduly interfering with airplane traffic. Separate facilities and approach/departure procedures may be necessary when the volume of airplane and/or helicopter traffic affects operations. At airports with interconnecting passenger traffic, the terminal apron should provide gates for helicopter boarding. Persons who use a helicopter to go to an airport generally require convenient access to the airport terminal and the services provided to airplane passengers. The airport layout plan (ALP) should identify the location of the exclusive-use helicopter facilities, TLOFs, FATOs, safety areas, approach/departure paths, and helicopter taxi routes and taxiways. This chapter addresses design considerations for providing separate helicopter facilities on airports. Figure 5-1 on page 167 shows an example of a heliport located on an airport. Other potential heliport locations are on the roofs of passenger terminals or parking garages serving passenger terminals. Unless otherwise noted, the standards in Chapter 2 starting on page 15 apply to helicopter facilities serving GA operations and the standards in Chapter 3 starting on page 67 apply to helicopter facilities serving transport operations.

502. TOUCHDOWN AND LIFTOFF AREA (TLOF). The TLOF should be located and designed to provide ready access to the airport terminal or to the helicopter user's origin or destination.

503. FINAL APPROACH AND TAKEOFF AREA (FATO). The recommended distance between the centerline of an approach to a runway and the centerline of an approach to a FATO for simultaneous, same direction, VFR operations is provided in Table 5-1.

Table 5-1. Recommended Distance Between FATO Center to Runway Centerline for VFR Operations

	Helicopter Size		
Airplane Size	Small Helicopter 6,000 lbs or less	Medium Helicopter 6,001 to 12,000 lbs	Large Helicopter over 12,000 lbs
Small Airplane 12,500 lbs or less	300 feet (91 m)	500 feet (152 m)	700 feet (213 m)
Large Airplane 12,000 lbs to 300,000 lbs	500 feet (152 m)	500 feet (152 m)	700 feet (213 m)
Heavy Airplane Over 300,000 lbs	700 feet (213 m)	700 feet (213 m)	700 feet (213 m)

504. SAFETY AREA. Safety area dimensions and clearances described in Chapter 2 are applied to facilities being developed on an airport for GA helicopter usage. safety area dimensions and clearances given in Chapter 3 are applied to facilities being developed on an airport for transport helicopter usage.

505. VFR APPROACH/DEPARTURE PATHS. To the extent practical, helicopter approach/departure paths should be independent of approaches to and departures from active runways.

506. HELIPORT PROTECTION ZONE (HPZ). Where it is practicable for the airport owner to acquire and plan the land uses within the HPZ, the HPZ must be established. Where this is not practicable, the HPZ standards have recommendation status for that portion of the HPZ not controlled by the airport owner.

507. TAXIWAYS AND TAXI ROUTES. When exclusive helicopter taxiways or taxi routes are developed at an airport, they should be located to minimize interaction with airplane operations.

508. HELICOPTER PARKING. Helicopter parking positions should be located as close to the intended destination or origination of the passengers as conditions and safety permit.

509. SECURITY. Unless screening was carried out at the helicopter passengers' departure location, Transportation Security Administration regulations may require that a screening area and/or screening be provided before passengers enter the airport's secured areas. Multiple helicopter parking positions and/or locations may be needed in the terminal area to service helicopter passenger screening and/or cargo interconnecting needs. Information about passenger screening is available at Transportation Security Administration web site http://www.tsa.gov/public/.

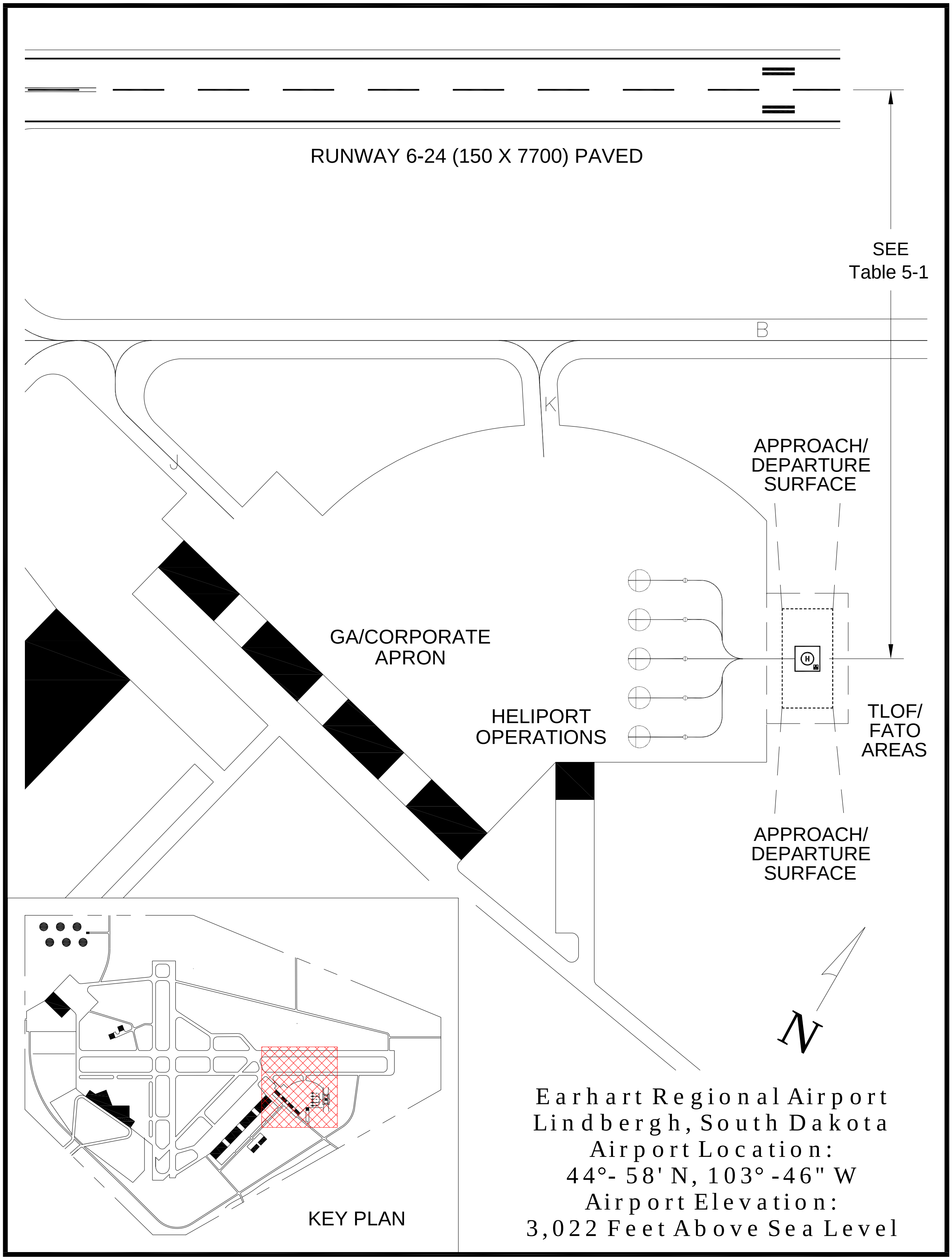

Figure 5-1. A Heliport Located on an Airport: On Airport

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CHAPTER 6. INSTRUMENT OPERATIONS

601. GENERAL. Instrument approach/departure/missed approach procedures permit helicopter operations to continue during periods of low cloud ceilings and reduced visibility. Instrument approach procedures are established in accordance with FAA 8260 series Orders published by FAA Flight Procedures Standards Branch. When a heliport does not meet the criteria of this AC, or FAA 8260 Series Orders, the helicopter instrument approach procedure will be published as a SPECIAL procedure, with annotations that special aircrew qualifications, pilot training and aircraft equipment are required to fly the specific procedure (s).

602. PLANNING. This chapter addresses issues that heliport owners should consider before requesting the development of instrument approach/departure/missed approach procedures. The recommendations and standards in this AC are not intended to be sufficient to design an instrument procedure. Heliport owners desiring instrument procedures are urged to initiate early contact with the appropriate FAA Flight Procedures Office.

603. AIRSPACE. Those who design instrument approach/departure/missed approach procedures have some flexibility in the design of such procedures. For this and other reasons, the airspace required to support helicopter instrument approach/departure operations is complex, and it does not lend itself to simple descriptions, even using figures. Refer to the latest revision of FAA Order 8260 series for more detailed information on criteria for developing helicopter instrument approach/departure/missed approach procedures.

604. FINAL APPROACH REFERENCE AREA (FARA). For precision instrument procedures only, a certificated helicopter precision approach procedure terminates with the helicopter coming to a hover or touching down within a 150-foot-wide (45 m) by at least 150-foot long (45 m) FARA. The FARA is located at the far end of a 300-foot-wide by 1,225-foot- long (91 m by 373 m) FATO required for a precision instrument procedure. For the purposes of requirements for LBA and lighting, the FARA is substituted for the FATO. Figure 6–1 on page 170 illustrates the FARA/FATO relationship.

605. IMPROVED LIGHTING SYSTEM. Lower visibility minimums may be possible if the lighting systems described below are installed (see Figure 6–2 on page 171 and Figure 6–3 on page 172).

a. FATO Perimeter Lighting Enhancement. An additional raised, green light meeting the standards of FAA Airports Engineering Brief 87, *Heliport Lighting*[4] is inserted between each light in the front and rear rows of the raised perimeter lights to enhance the definition of the FATO.

b. Heliport Instrument Lighting System. The HILS consists of 24 unidirectional PAR 56, 200-watt white lights that extend the FATO perimeter lights. The system extends both the right and left edge lights as “edge bars” and both the front and rear edge lights as “wing bars,” as shown in Figure 6–2 on page 171.

(1) Edge Bars. Edge bar lights are spaced at 50-foot (15.2 m) intervals, measured from the front and rear row of the FATO perimeter lights.

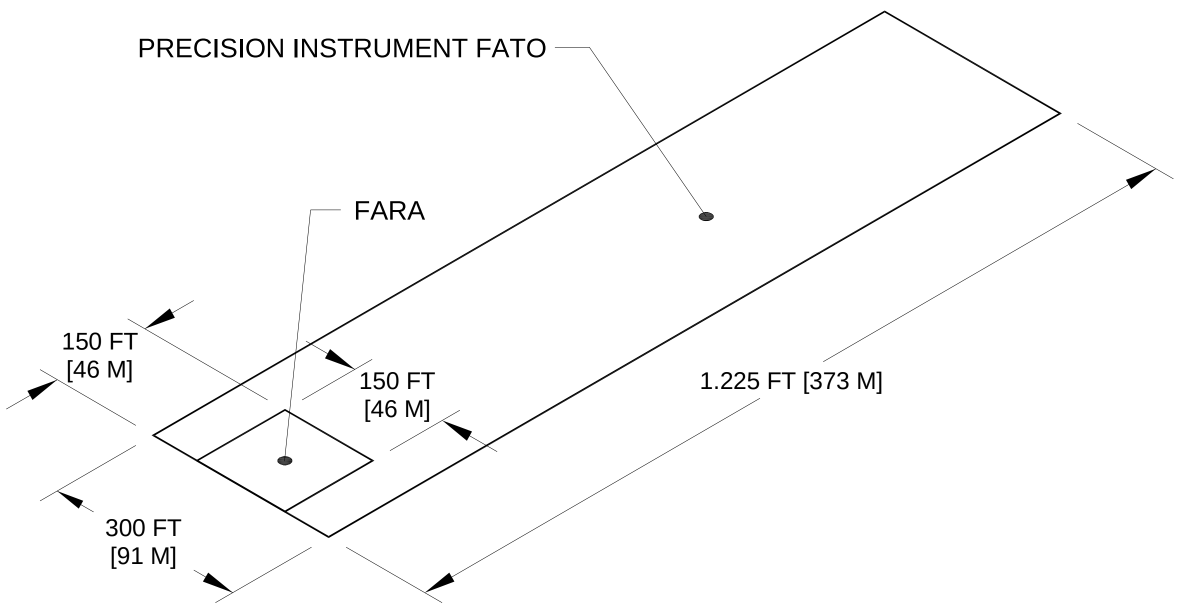
[4] As of the date of this draft, EB-87 has not been completed. Guidance on heliport lighting will be published as soon as possible.

(2) Wing Bars. Wing bar lights are spaced at 15-foot (4.57 m) intervals, measured from the line of FATO perimeter (side) lights.

(3) Optional TLOF Lights. An optional feature is a line of seven white flush lights meeting the standards of EB 87 spaced at 5-foot (1.5 m) intervals installed in the TLOF pavement. These lights are aligned on the centerline of the approach course to provide close-in directional guidance and improve TLOF surface definition. These lights are illustrated in Figure 6–2 on page 171.

c. Heliport Approach Lighting System (HALS). The HALS, depicted in Figure 6–3 on page 172 is a distinctive approach lighting configuration designed to prevent it from being mistaken for an airport runway approach lighting system.

606. OBSTACLE EVALUATION SURFACES. The helicopter instrument approach procedure design depends upon the specific heliport location, its physical characteristics, the terrain, surrounding obstructions, etc., that are all taken into consideration by the instrument procedure developer.



Note: The illustrated FARA-FATO relationship is appropriate for a heliport at an elevation up to 1,000 ft [305 M] above mean sea level.

Figure 6–1. FARA/FATO Relationship: Precision

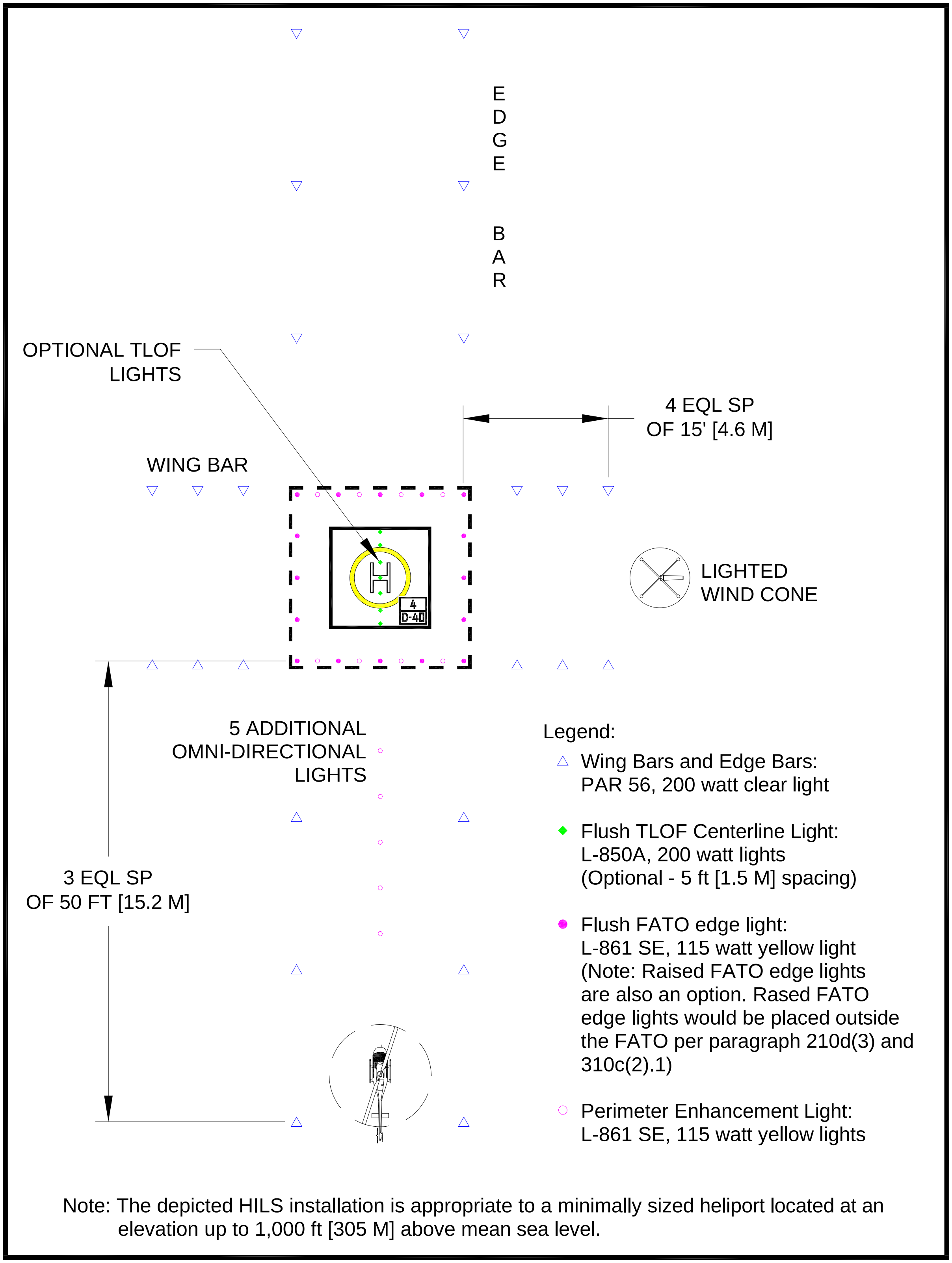


Figure 6–2. Heliport Instrument Lighting System (HILS): Nonprecision

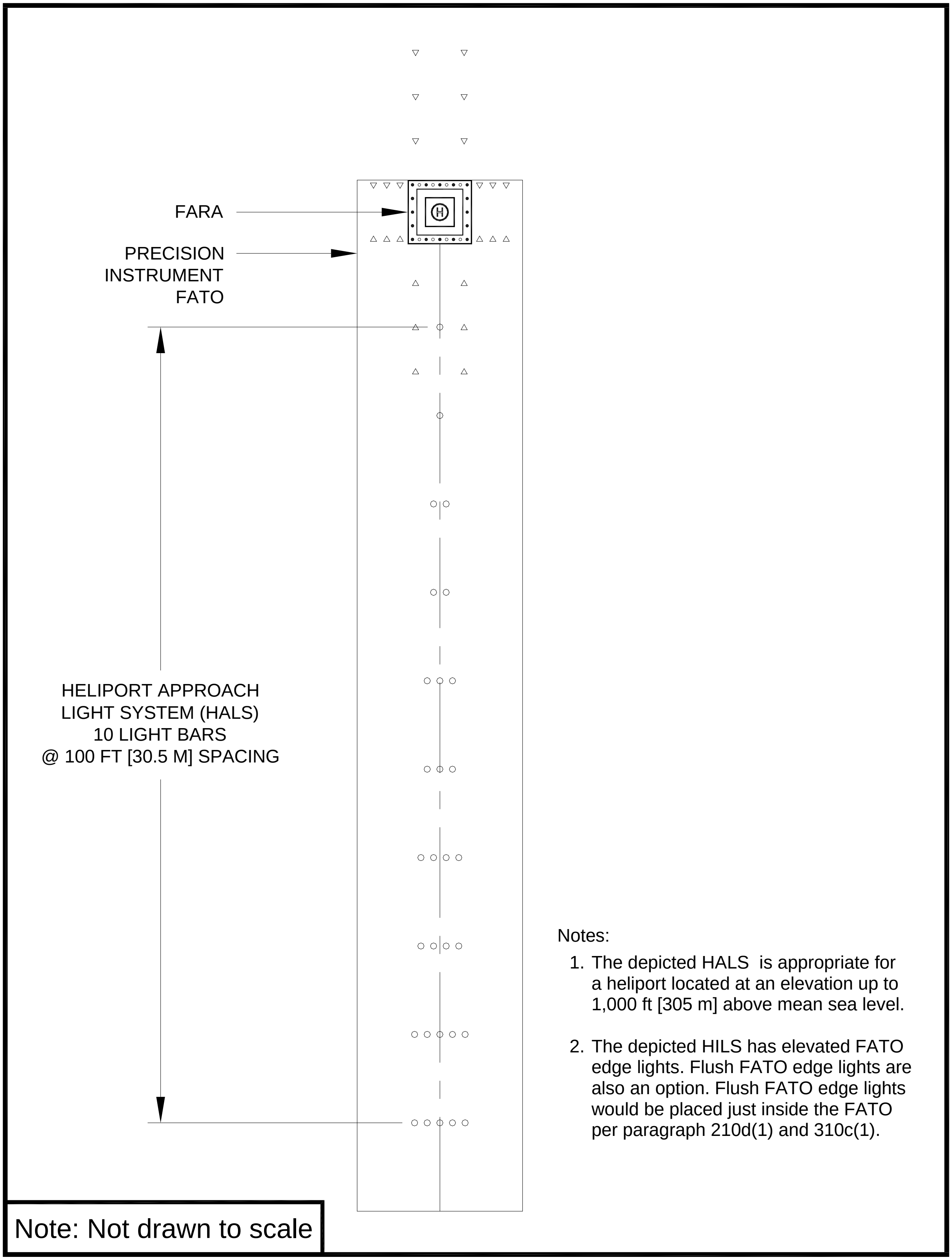


Figure 6–3. Heliport Approach Lighting System

CHAPTER 7. HELIPORT GRADIENTS AND PAVEMENT DESIGN

701. GENERAL. This chapter provides guidance on designing heliport pavements, including design loads, and addresses soil stabilization as a method of treating non paved operational surfaces. Operational surfaces such as the TLOF, FATO, safety areas, parking areas, taxi routes, and taxiways should present a reasonably smooth, uniformly graded surface. The surfaces of a heliport should be designed to provide positive drainage.

702. TLOF GRADIENTS.

a. General Aviation Heliport. To ensure drainage, the TLOF should have a minimum gradient of 0.5 percent and a maximum gradient of 2.0 percent.

b. Transport Heliport. To ensure drainage, the TLOF should have a longitudinal gradient between 0.5 and 1.0 percent and a transverse gradient between 0.5 and 1.5 percent.

c. Hospital Heliport. To ensure drainage, the TLOF should have a gradient between 0.5 and 1.0 percent and a maximum gradient of 2.0 percent.

703. FATO GRADIENTS.

a. Load Bearing FATO. The recommended gradients for a load bearing FATO range from a minimum of 0.5 percent to a maximum of 5.0 percent. FATO grades in any areas where a helicopter is expected to land should not exceed 2.0 percent. To ensure TLOF drainage, gradients of rapid runoff shoulders should range between 3.0 and 5.0 percent. These recommendations are illustrated in Figure 7-1 below for a concrete TLOF and stabilized turf FATO.

b. Non-Load Bearing FATO. When the FATO is non-load bearing and/or not intended for use by the helicopter, there are no specific requirements for the gradient of the surface. In this case the gradient should be 5 percent or more to ensure adequate drainage away from the area of the TLOF. However, non-load bearing surfaces must be stabilized (see paragraph 708.b below).

704. SAFETY AREA GRADIENTS. The surface of the safety area should not be steeper than a downward slope of 2:1 (2 units horizontal in 1 unit vertical). In addition, the surface of the safety area should not be higher than the FATO edge.

705. PARKING AREA GRADIENTS. Parking area grades should not exceed 2.0 percent in any area where a helicopter is expected to park.

706. TAXIWAY AND TAXI ROUTE GRADIENTS. Taxiway longitudinal gradients should not exceed 2.0 percent. Transverse gradients should not be less than 0.5 percent nor greater than 2.0 percent.

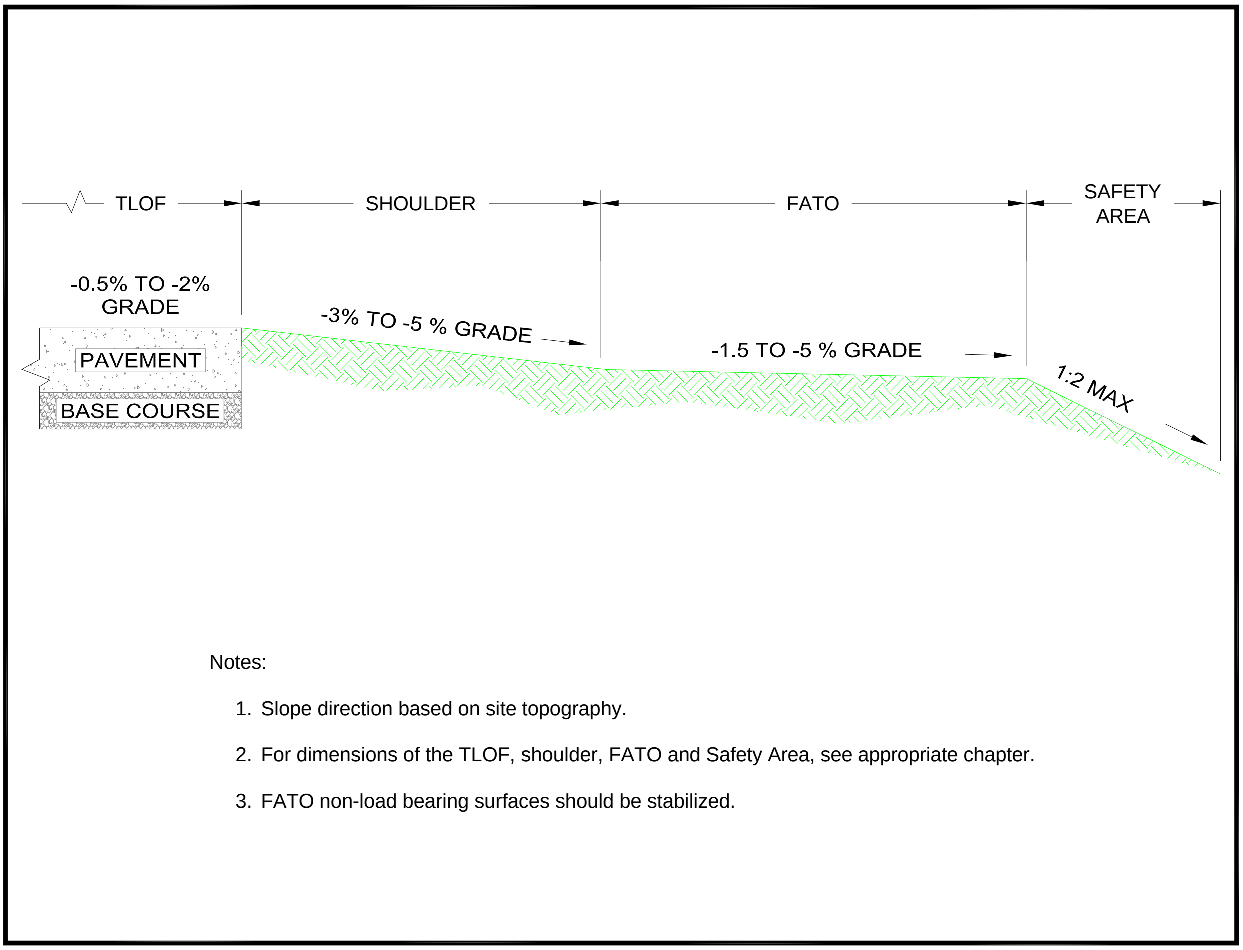


Figure 7-1. Heliport Grades and Rapid Runoff Shoulder: Gradients and Pavement

707. DESIGN LOADS. The TLOF and any load-bearing surfaces should be designed and constructed to support the weight of the design helicopter and any ground support vehicles. Loads are applied through the contact area of the tires for wheel-equipped helicopters or the contact area of the skid for skid equipped helicopters. Helicopter weights, landing gear configurations, and dimensional data are listed in Appendix B.

a. Static Loads. For design purposes, the design static load is equal to the helicopter's maximum takeoff weight applied through the total contact area of the wheels or skids. Contact the manufacturers to obtain the contact area for the specific helicopters of interest.

b. Dynamic Loads. A dynamic load of one-fifth of a second or less duration may occur during a hard landing. For design purposes, dynamic loads should be assumed at 150 percent of the takeoff weight of the design helicopter. When specific loading data is not available, assume 75 percent of the weight of the design helicopter to be applied equally through the contact area of the rear two rear wheels (or the pair rear wheels of a dual-wheel configuration) of a wheel-equipped helicopter. For a skid equipped helicopter assume 75 percent of the weight of the design helicopter to be applied equally through the aft contact areas of the two skids of a skid-equipped helicopter. (See Figure 7-2 below.) The manufacturer should be contacted to obtain the aft contact area for a specific helicopter of interest.

c. Rotor Loads. Rotor downwash loads are approximately equal to the weight of the helicopter distributed uniformly over the disk area of the rotor. Tests have established that rotor downwash loads are generally less than the loads specified in building codes for snow, rain, or wind loads typically used in structural design calculations.

708. PAVEMENT DESIGN AND SOIL STABILIZATION. Pavements distribute the helicopters' weight over a larger area of the subsurface as well as provide a water-impervious, skid-resistant wearing surface. Paving TLOFs, FATOs, taxiways, and parking aprons is encouraged to improve their load carrying ability, minimize the erosive effects of rotor wash, and facilitate surface runoff. Stabilizing unpaved portions of the FATO and taxi routes subjected to rotor wash is recommended. In some instances, loads imposed by ground support vehicles may exceed those of the largest helicopter expected to use the facility. Guidance on pavement design and on stabilizing soils is contained in AC 150/5320-6, *Airport Pavement Design and Evaluation*, and AC 150/5370-10, *Standards for Specifying Construction of Airports*. The ACs are available at the Airports web site http://faa.gov/arp.

a. Pavements. In most instances, a 6-inch thick (15 cm) portland cement concrete (PCC) pavement is capable of supporting operations by helicopters weighing up to 20,000 pounds (9,070 kg). Thicker pavements are required for heavier helicopters or where the quality of the subsurface soil is questionable. PCC pavement is recommended for all heliport surfaces used by helicopters.

b. Stabilizing Soils. Different methods of soil stabilization may be used to meet different site requirements. Helicopter weight, ground support vehicle weight, operational frequency, soil analysis, and climatic conditions should be considered in selecting the method(s) and extent of surface stabilization.

(1) Turf. A well-drained and well-established turf that presents a smooth, dense surface is generally considered to be the most cost-effective surface stabilization available. In some combinations of climates and weather conditions, turf surfaces are capable of supporting the weight of many of the smaller helicopters for low frequency use by private and corporate operators during much of the year. Turf surfaces also provide reasonable protection against wind, rotor wash, or water erosion. Climatic and soil conditions dictate the appropriate grass species to use at the site.

(2) Aggregate Turf. Heliports located on soils that have poor load-carrying capabilities when wet may be able to overcome this deficiency by mixing selected granular materials into the upper 12 inches (30 cm) of the soil. Suitable granular materials for this purpose are crushed stone, pit-run gravel, coarse sand, or oyster shells. The ratio of aggregate to soil should be sufficient to improve the stability of the soil yet retain the soil's ability to support grass. For additional guidance, see Item 217 of AC 150/5370-10, *Standards for Specifying Construction of Airports*.

c. Formed Masonry Shapes. Precast masonry shapes vary in size and shape-from a brick paver to an open block. Pavers can be laid on a prepared bed to present a solid surface. Precast blocks can be embedded in the soil with grass growing in the natural openings. Architectural catalogs identify different masonry shapes that are commercially available for this purpose.

d. Pierced Metal Panels. Perforated metal panels that allow grass to grow through the openings can be laid on the ground to provide a hard surface for helicopter operations. Engineering catalogs identify commercially available panels.

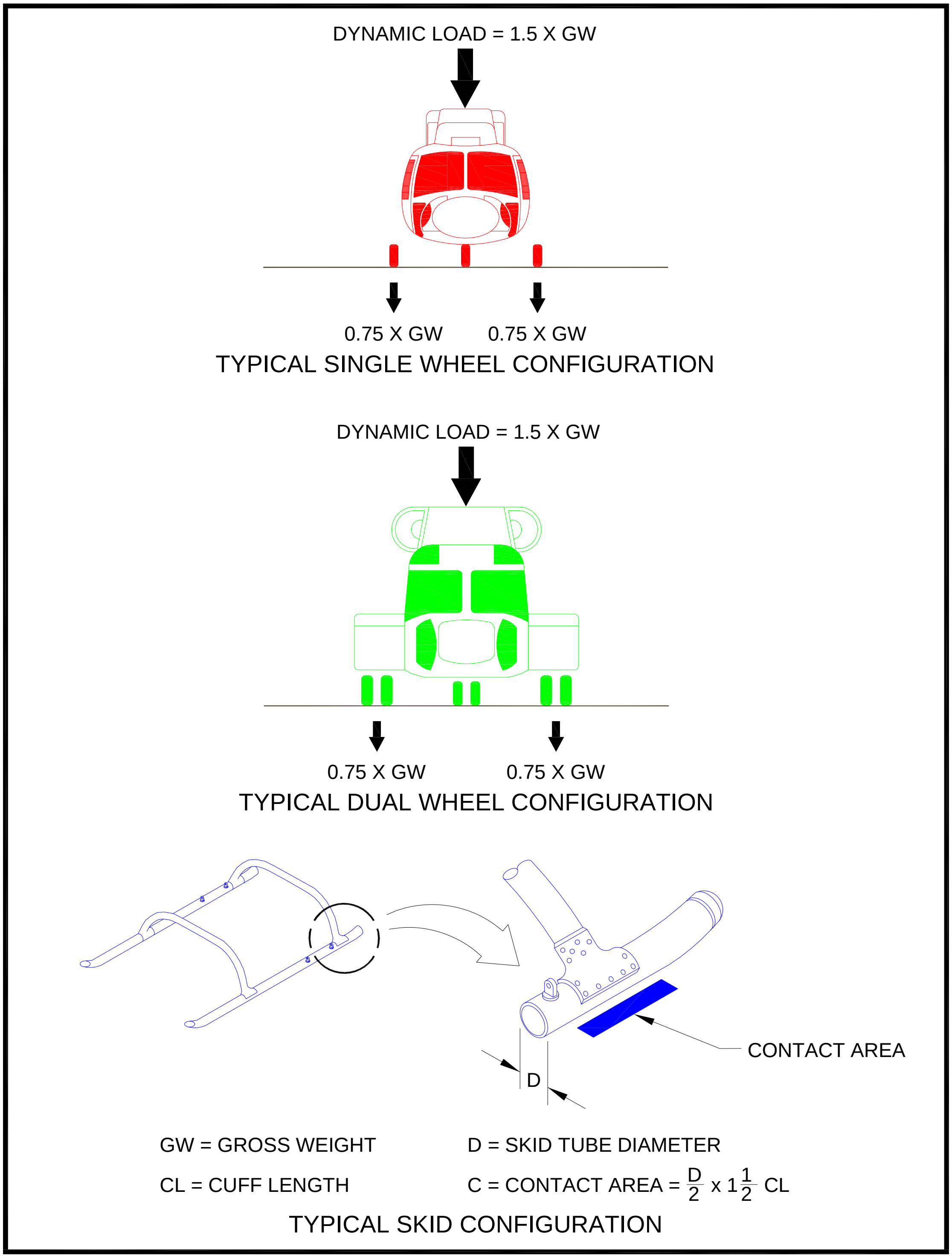


Figure 7-2. Helicopter Landing Gear Loading: Gradients and Pavement

APPENDIX A. EMERGENCY HELICOPTER LANDING FACILITIES (EHLF)

A-1. GENERAL. Preplanning emergency landing areas will result in safer and more effective air-support operations. These facilities comprise rooftop emergency facilities and medical emergency sites. The following guidance is suggested as a guide for developing emergency helicopter landing facilities (EHLF).

A-2. NOTIFICATION AND COORDINATION. Since an EHLF is not intended to function as a heliport, notification to the FAA under 14 CFR part 157 is not required. Proponents of EHLFs should advise the local Air Traffic Control facility of the EHLF.

A-3. ROOFTOP EMERGENCY FACILITIES. To facilitate fire fighting or emergency evacuation operations, local building codes may require structures over a specified height to provide a clear area on the roof capable of accommodating a helicopter.

a. Building Code Requirements. Rooftop facilities must comply with State and local building code requirements. The landing surface should be developed to the local fire department requirements based on the size and weight of the helicopter(s) expected to engage in fire or rescue operations (see Figure A-1). Additional information is available in NFPA 418, *Standards for Heliports*.

b. TLOF.

(1) Size. The TLOF should be square, rectangular or circular in configuration and centered within the EHLF. It should be at least 40 feet in length and width or diameter.

(2) Weight Capacity. The TLOF should be designed to accept a 13,500-pound gross weight (GW) helicopter plus an impact load of 1.5 times GW.

(3) Access. The TLOF should provide two pedestrian access points at least 90 degrees apart with a minimum of 60 feet TLOF perimeter separation.

(4) Drainage. Surface drainage should flow away from pedestrian access points, with a maximum slope of 1.5 percent.

c. FATO. The FATO should be at the same level as the TLOF.

(1) Size. The FATO should extend a distance of at least 45 feet in all directions from the center of the EHLF. For safe operation, clearance is required between the helicopter's main and tail rotor blades and any object that could be struck by these blades. This clearance should be one third of the rotor diameter (RD) of the largest helicopter expected but not less than 20 feet (6.1 m).

(2) Obstructions. The FATO may be an imaginary surface outside the TLOF and extend beyond the structures edge The FATO should be unobstructed and without penetration of obstacles such as parapets, window washing equipment, penthouses, handrails, antennas, vents, etc.

d. Safety Area. A clear, unobstructed area, a minimum of 12 feet wide, should be provided on all sides, outside and adjacent to the FATO.

e. Safety Net. If the platform is elevated 4 feet or more above its surroundings, title 29 CFR part 1910.23, *Guarding floor and wall openings and holes,* requires the provision of fall protection.

However, permanent railings or fences must not be used since they would be safety hazards during helicopter operations. An alternate method of installing a safety net, meeting state and local regulations but not less than 5 feet (1.5 m) wide, is suggested. The safety net should have a load carrying capability of 25 lbs/ft^2 (122 kg/m^2). The net must not project above the level of the TLOF. Both the inside and outside edges of the safety net should be fastened to a solid structure. Nets should be constructed of material that is resistant to environmental effects.

f. Markings.

(1) TLOF Perimeter. A solid 12-inch wide (30 cm) wide red or orange line should define the limits of the touchdown pad as illustrated in Figure A-1.

(2) Touchdown/Positioning Circle (TDPC) Marking. A 12-inch wide red or orange circular marking, 30 feet in diameter, should be centered within the TLOF. The background within the circle should be a contrasting color.

(3) Weight Capacity. The TLOF should be marked with the maximum takeoff weight of the design helicopter, in units of thousands of pounds (e.g. a number "9," indicating 9,000 pounds GW), with each numeral ten feet in length, should be centered within the TLOF.

(4) Markings for pedestrians. Rooftop access paths, EHLF access paths, and assembly zone(s) should be clearly marked with surface paint and instructional signage.

g. Access.

(1) Stairs. A minimum of two rooftop access stairs, with no less than 150 degrees separation, should connect to the top floor of the structure, with at least one providing access to the structure's emergency staircase.

(2) Doors. Penthouse and stairwell rooftop access doors should remain unlocked at all times to provide access to the EHLF. Doors may be equipped with "panic bar" hardware and/or alarmed.

h. Wind Cone. A wind cone assembly with an orange wind cone should be located within the line of sight from the EHLF and outside the approach/departure path(s).

i. Lighting. Ambient rooftop lighting should be shielded to avoid affecting the pilot's vision.

A-4. MEDICAL EMERGENCY SITES. Medical emergency sites are clear and level areas near the scene of an accident or incident that have been selected or designated by the local emergency response team as the place where the helicopter air ambulance is directed to land in order to transport an injured person to a hospital. Such sites should be provided in various locations within a jurisdiction to support fast response to medical emergencies and accidents. Predesignating medical emergency sites provides the opportunity to inspect potential sites in advance and to select sites that have adequate clear approach/departure airspace and adequate clear ground space.

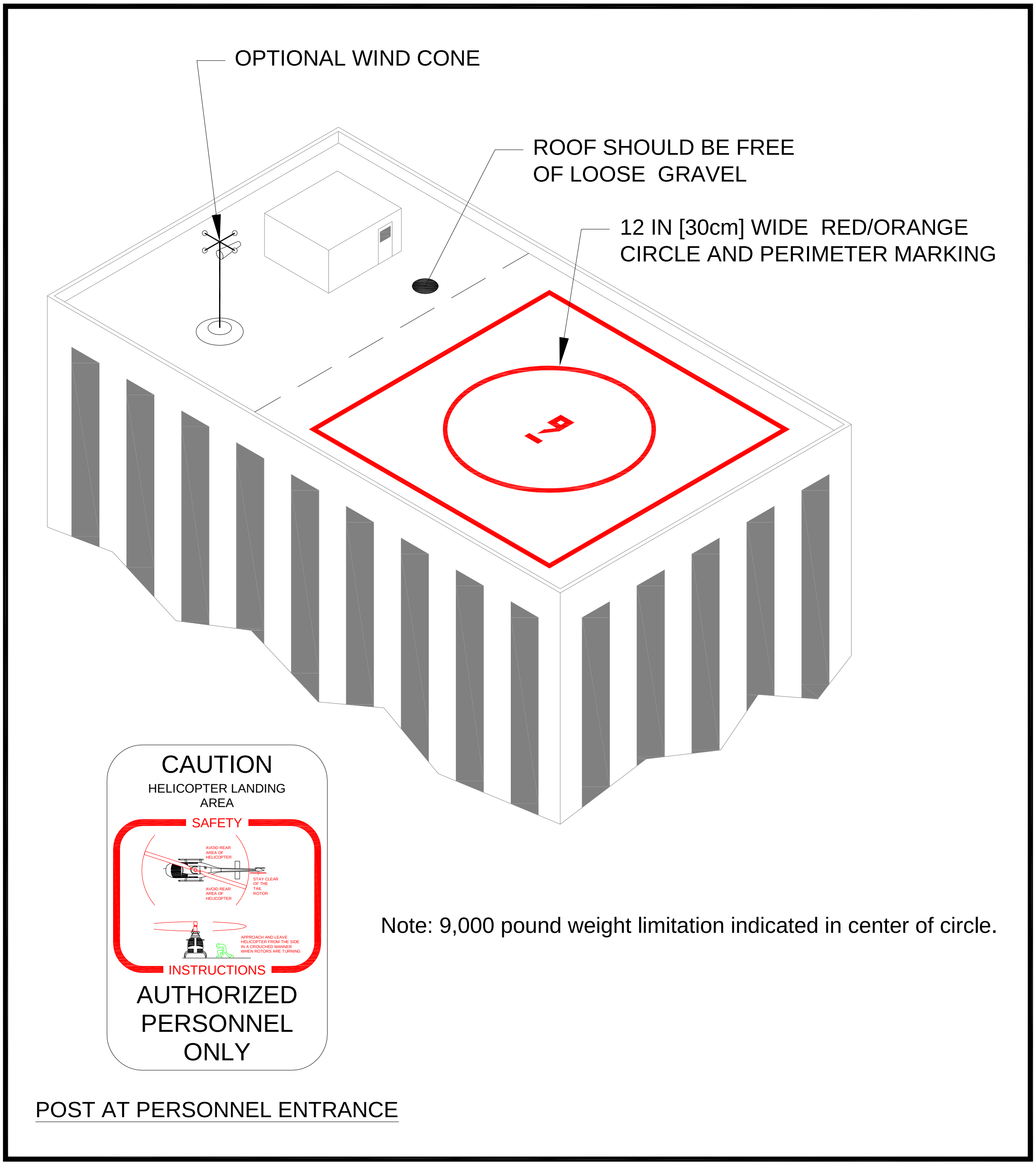


Figure A-1. Rooftop Emergency Landing Facility

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APPENDIX B. HELICOPTER DATA

B-1. INTRODUCTION. This appendix contains selected helicopter data needed by a heliport designer. These data represent the most critical weight, dimensional, or other data entry for that helicopter model, recognizing that specific versions of the model may weigh less, be smaller in some feature, carry fewer passengers, etc.

B-2. VERIFICATION. The published information has been verified by the various helicopter manufacturers but should be confirmed by contacting the manufacturer(s) of the specific helicopter(s) of interest.

Table B-1. Legend for Table B-2

A	Manufacturer name and helicopter model
B	Maximum takeoff weight in pounds.
D	Overall length in feet. (Rotors at their maximum extension.)
H	Overall height in feet. (Usually at tail rotor.)
RD	Rotor diameter in feet.
E	Number of blades.
F	Rotor plane clearance in feet.
TR	Distance from rotor hub to tip of tail rotor in feet.
I	Tail rotor diameter (in feet).
J	Number of tail rotor blades.
K	Tail rotor ground clearance in feet.
L	Type of undercarriage.
UCL	Undercarriage length in feet.
UCW	Undercarriage width in feet. (The distance between the outside edges of the tires or the skids.)
M	Number and type of engines
N	Number of crew and passengers.

Table B-2. Helicopter Data

Manufacturer/ Model	Max Takeoff Weight	Overall Length (ft)	Overall Height (ft)	Main Rotor: Diameter (ft)	Main Rotor: Number of Blades	Main Rotor: Ground Clearance (ft)	Main Rotor: Tail Rtr Arc Radius (ft)	Tail Rotor: Diameter (ft)	Tail Rotor: Number of Blades	Tail Rotor: Ground Clearance (ft)	Undercarriage: Type	Undercarriage: Length (ft)	Undercarriage: Width (ft)	Number of Engines/ Type	Crew Number/ Pax Number
A	B	D	H	RD	E	F	TR	I	J	K	L	UCL	UCW	M	N
Agusta/ Westland															
A-109A	5,732	42.8	11.2	36.1	4	10	25	6.7	2	2.3	wheel	11.6	7.5	2-T	1-2& 6-7
A-119 Koala	5,997	42.7	12.4	36.6	4	8.3	25.5	6.4	2	4.2	skid	13.4	5.5	1-T	1&6-7
AW-109E Power	6,283	42.8	11.5	36.1	4	8		6.4	2	3	wheel	11.5	7.1	2-T	1&7
AW-109S Grand	7,000	42.5	11.2	35.5	4	8		6.4	2	3.3	wheel	12.3	7.1	2-T	1-2& 6-7
AW-119 Ke	6,283	42.4	11.8	35.5	4	9.3		6.4	2	3.8	skid	11.1	7	1-T	1&6-7
AW-139	14,991	54.7	16.4	42.6	5	12.9		8.9	4	7.5	wheel	14.2	10	2-T	1-2& 15
AW-101	34,392	74.8	21.7	61	5	15.4	45	13.1		8.4	wheel	23	14.8	3-T	3&30
Westland WG30	12,800	52.2	15.5	43.7	4	12.5	31	8	4	7.5	wheel	17.9	10.1	2+T	2&19
Bell Helicopter															
47G	2,950	43.6	9.3	37.1	2	5	25	6.1	2	3.5	skid	9.9	7.5	1-P	1&2-3
205B, UH-1H, Huey II, 210	10,500	57.8	14.5	48	2	7.3	33.1	8.5	2	5.9	skid	12.1	8.8	1-T	1&14
206B-1,2,3	3,350	39.2	10.8	33.4	2	6	22.5	5.2	2	2.1	skid	8.1	6.7	1-T	1&4
206L-1,3,4	4,450	42.4	10.9	37	2	6.4	24	5.4	2	3.5	skid	9.9	7.7	1-T	1&6
212	11,200	57.3	14.9	48.2	2	7.5	22.2	8.5	2	6.1	skid	12.1	8.8	2-T	1&14
214ST	17,500	62.2	15.9	52	2	6.5	37	9.7	2	3.5	wheel/ skid	12.1	8.6	2-T	2& 16-17
222B, UT	8,250	50.3	12.2	42	2	9.2	29.2	6.9	2	2.7	wheel/ skid	12.2	7.8	2-T	1&9
230	8,400	50.3	11.7	42	2	9.2	29.2	6.9	2	2.7	wheel/ skid	12.2	7.8	2-T	1&9
407	5,250	41.4	10.2	35	4	7.8	24.3	5.4	2	3.2	skid	9.9	8.1	1-T	1&6
412EP, SP, HP	11,900	56.2	14.9	46	4	11.5	34	8.6	2	4.8	skid	12.1	9.5	2-T	1&14
427VFR	6,550	42.6	10.5	37	4	6.4	24.1	5.7	2	3.3	skid	10	8.3	2-T	1&7
429	7,000	43	13.3	36	4	8.5		5.4	2	3.5	skid	9.9	8.8	2-T	1&7
430	9,300	50.3	13.3	42	4	8.2	29.2	6.9	2	3.7	wheel/ skid	12.4	9.2	2-T	1&9

Manufacturer/ Model	Max Takeoff Weight	Overall Length (ft)	Overall Height (ft)	Main Rotor Diameter (ft)	Main Rotor Number of Blades	Main Rotor Ground Clearance (ft)	Main Rotor Tail Rtr Arc Radius (ft)	Tail Rotor Diameter (ft)	Tail Rotor Number of Blades	Tail Rotor Ground Clearance (ft)	Undercarriage Type	Undercarriage Length (ft)	Undercarriage Width (ft)	Number of Engines/ Type	Crew Number/ Pax Number
A	B	D	H	RD	E	F	TR	I	J	K	L	UCL	UCW	M	N
Boeing															
107/CH-46E	24,300	84.3	16.7	51	3	15	59	51	3	17	wheel	24.9	14.5	2-T	3&25
234/CH-47F/G	54,000	99	19	60	3	11	69	60	3	19	wheel	22.5	10.5	2-T	3&44
Brantly/ Hynes															
B-2B	1,670	28.1	6.9	23.8	3	4.8	16	4.3	2	3	skid	7.5	6.8	1-P	1&1
305	2,900	32.9	8.1	28.7	3	8	19	4.3	2	3	wheel/ skid	6.2	6.8	1-P	1&4
Enstrom															
F-28F/ 280FX	2,600	29.3	9	32	3	6	20.6	4.7	2	3.1	skid	8	7.3	1-P	1&2
480B/ TH-28	3,000	30.1	9.7	32	3	6.5	21.2	5	2	3.6	skid	9.2	8	1-T	1&4
Erickson															
S-64E/F Air Crane	42,000-47,000	88.5	25.4	72	6	15.7	53	16	4	9.4	wheel	24.4	19.9	2-T	3&0
Eurocopter															
SA-315 Lama	5,070	42.3	10.2	36.2	3	10.1	20	6.3	3	3.2	skid	10.8	7.8	1-T	1&4
SA-316/319 Alouette	4,850	33.4	9.7	36.1	3	9.8	27.7	6.3	3	2.8	wheel	11.5	8.5	1-T	1&4
SA-330 Puma	16,315	59.6	16.9	49.5	4	14.4	35	10	5	6	wheel	13.3	9.8	2-T	2&20
SA/AS-332, Super Puma	20,172	61.3	16.3	53.1	4	14.6	36	10	5	7.1	wheel	17.3	9.8	2-T	2&24
SA-341/342 Gazelle	4,100	39.3	10.2	34.5	3	8.9	23	Fenstron		2.4	skid	6.4	6.6	1-T	1&4
AS-350 A Star	4,960	42.5	11	35.1	3	10.6	25	6.1	2	2.3	skid	4.7	7.5	1-T	1&6
AS-355 Twin Star	5,732	42.5	9.9	35.9	3	10.3	25	6.1	2	2.3	skid	9.6	7.1	2-T	1&6
AS-360 Dauphin	6,600	43.3	11.5	37.7	4	10.7	25	Fenstron		2.6	wheel	23.7	6.4	1-T	1&13
AS-365 Dauphin/H-65 Dolphin	9,480	45.1	13.3	39.2	4	11.4	24	Fenstron		2.6	wheel	11.9	6.2	2-T	1&11
BO-105	5,732	38.9	11.5	32.3	4	9.8	23	6.2	2	6.1	skid	8.3	8.2	2-T	1&5
BK-117	7,385	42.7	12.6	36.1	4	11	25	6.4	2	6.3	skid	11.6	8.2	2-T	1&10
EC-120	3,780	37.8	11.2	32.8	3	10.1	24.6	Fenstron		2.1	skid	9.4	6.8	1-T	1&4

Manufacturer/ Model	Max Takeoff Weight	Overall Length (ft)	Overall Height (ft)	Main Rotor				Tail Rotor			Undercarriage			Number of Engines/ Type	Crew Number/ Pax Number
				Diameter (ft)	Number of Blades	Ground Clearance (ft)	Tail Rtr Arc Radius (ft)	Diameter (ft)	Number of Blades	Ground Clearance (ft)	Type	Length (ft)	Width (ft)		
A	**B**	**D**	**H**	**RD**	**E**	**F**	**TR**	**I**	**J**	**K**	**L**	**UCL**	**UCW**	**M**	**N**
EC-130	5,291	41.5	11.8	35.1	3	11	23.7	Fenstron		5.3	skid	10.5	7.9	1-T	1&7
EC-135	6,250	40	11.5	33.5	4	11	22.8	Fenstron		5.6	skid	10.5	6.6	2-T	1&6
EC-145/ UH-72A	7,904	42.7	13	36.1	4	11.3	28	6.4	2	10.7	skid	9.5	7.9	2-T	1&8
EC-155	10,692	46.9	14.27	41.3	5	12	23	Fenstron		3.1	wheel	12.8	6.2	2-T	2&12
EC-225	24,332	64	16.3	53.1	5	15.1	38	10.3	4	3.5	wheel	17.2	9.8	2-T	2&24
Kaman															
K-Max/ K1200	7,000	52	21	48.2	4	10.7	28	n	a	n/a	wheel	15.3	11.3	1-T	1&0
SH-2G Seasprite	14,200	52.5	15.1	44	4			8.1	4		wheel			2-T	3&8
MD Helicopters															
500E	3,000	30.8	8.4	26.4	5	8.2		4.6	2	2	skid	8.1	6.3	1-T	1&4
530F	3,100	32.1	8.1	27.4	5	8	19	4.8	2	1.3	skid	8.1	6.4	1-T	1&4
520N	3,350	32.1	9.7	27.4	5	9.2	17	NOTAR		n/a	skid	8.1	6.3	1-T	1&4
600N	4,100	36.9	9.8	27.5	6	9.2		NOTAR		n/a	skid	10.1	8.8	1-T	1&7
Explorer/ 902	6,500	38.8	12	33.8	5	12	23	NOTAR		n/a	skid	7.3	7.3	2-T	1-2& 6-7
Robinson															
R-22 Beta	1,370	28.8	8.9	25.2	2	8.8	16	3.5	2	4.1	skid	4.2	6.3	1-P	1&1
R-44 Raven	2,500	38.3	10.8	33	2	10.5	22	4.8	2	3.8	skid	4.2	7.2	1-P	1&3
R-66 Turbine	2,700	38.3	11.4	33	2	10.5		5	2	3.6	skid	4.2	7.5	1-T	1&4
Fairchild-Hiller															
Rogerson-Hiller															
360/UH-12/OH-23	3,100	40.8	10.2	35.4	2	10.1	23	6	2	4	skid	8.3	7.5	1-P	1&3
FH/RH-1100	3,500	41.3	9.2	35.3	2	9.5	24	6	2	3	skid	7.9	7.2	1-T	1&4
Sikorsky/ Schweizer															
HU-269A/A-1/B, TH55A	1,850	29	9	26	3	8.8	15	3.8	2	2.5	skid	8.3	6.5	1-P	1&1
300C	2,050	30.8	8.7	26.8	3	8.7	15.3	4.3	2	2.8	skid	8.3	6.5	1-P	1&2

Manufacturer/ Model	Max Takeoff Weight	Overall Length (ft)	Overall Height (ft)	Main Rotor				Tail Rotor			Undercarriage			Number of Engines/ Type	Crew Number/ Pax Number
				Diameter (ft)	Number of Blades	Ground Clearance (ft)	Tail Rtr Arc Radius (ft)	Diameter (ft)	Number of Blades	Ground Clearance (ft)	Type	Length (ft)	Width (ft)		
A	**B**	**D**	**H**	**RD**	**E**	**F**	**TR**	**I**	**J**	**K**	**L**	**UCL**	**UCW**	**M**	**N**
300CB/CBi	1,750	30.8	8.7	26.8	3	8.7	15.3	4.3	2	2.8	skid	8.3	6.5	1-P	1&1
330/330SP/ 333	2,550	31.2	11	27.5	3	9.2	15.3	4.3	2	3.2	skid	8.3	6.5	1-T	1&2-3
S-434	2,900	31.2	11	27.5	4	9.2	15.3	4.3	2	3.2	skid	8.3	6.5	1-T	1&2-3
S-55/H19	7,900	62.6	13.1	53	3			8.2	2		wheel			1-T	2&12
S-58/H34	14,600	65.8	15.9	56	4	11.4	38	9.5	4	6.4	wheel	28.3	14	2-T	2&16
S-61/H-3	22,000	72.8	19	62	5	12.3	40	10.3	5	8.6	wheel	23.5	14	2-T	3&28
S-76A/B/C/D	11,700	52.5	14.6	44	4	8.2	30.5	8	4	6.5	wheel	16.4	8	2-T	2&12
S-92	26,500	68.5	17.9	56.3	4	9.8	39.9	11	4	6.9	wheel	20.3	10.4	2-T	2&19
S-70i/UH-60L Blackhawk	22,000	64.8	16.8	53.8	4	7.7	38	11	4	6.6	wheel	29	9.7	2-T	3&12
CH-53K	74,000	99.5	27.8	79	7	17	59.6	20	4	9.5	wheel	27.3	13	3-T	3&55

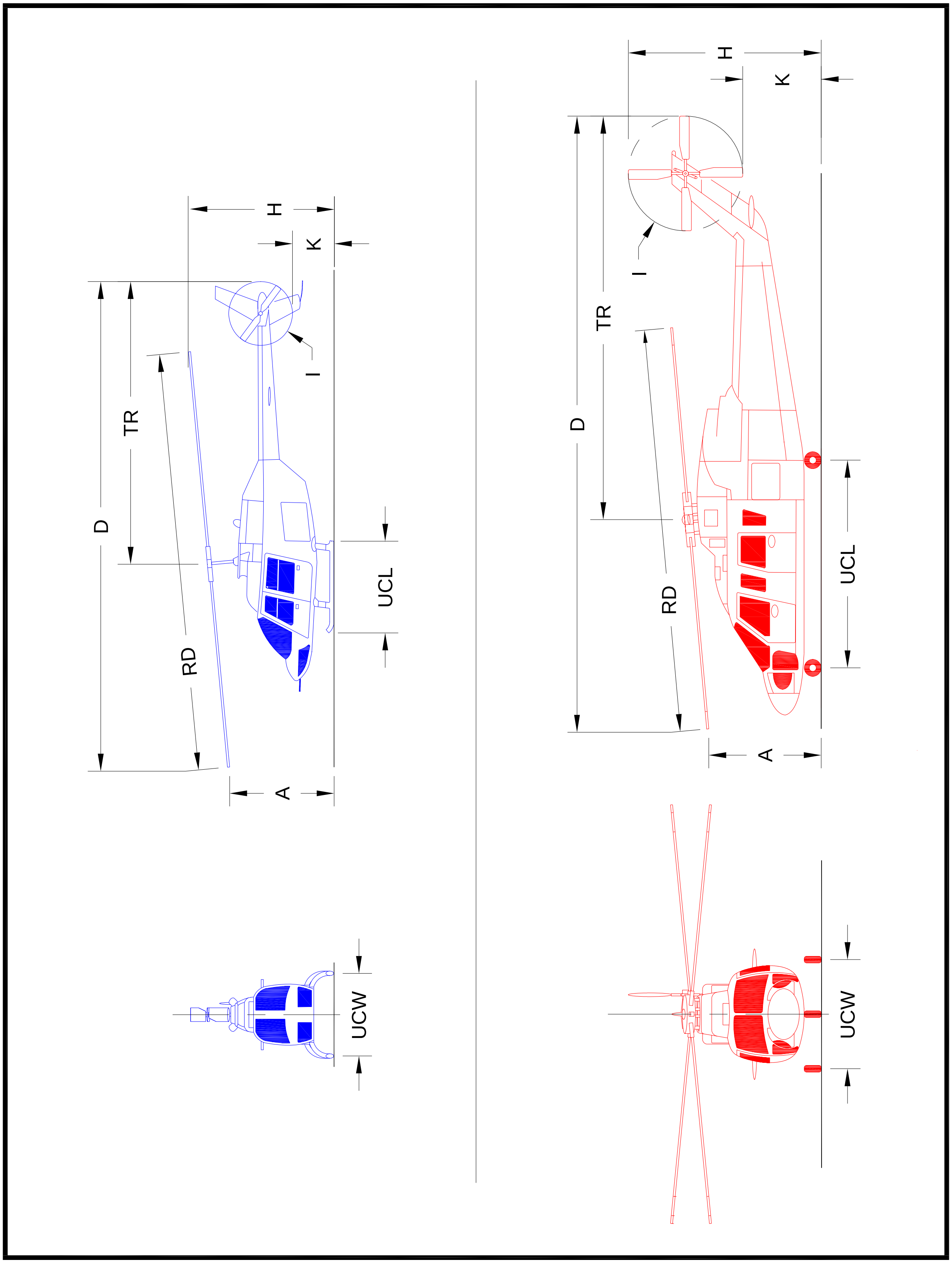

Figure B–1. Helicopter Dimensions

APPENDIX C. DIMENSIONS FOR MARKING SIZE AND WEIGHT LIMITATIONS

Introduction. The form and proportion of numbers for marking TLOF and parking area size and weight limitations are shown below.

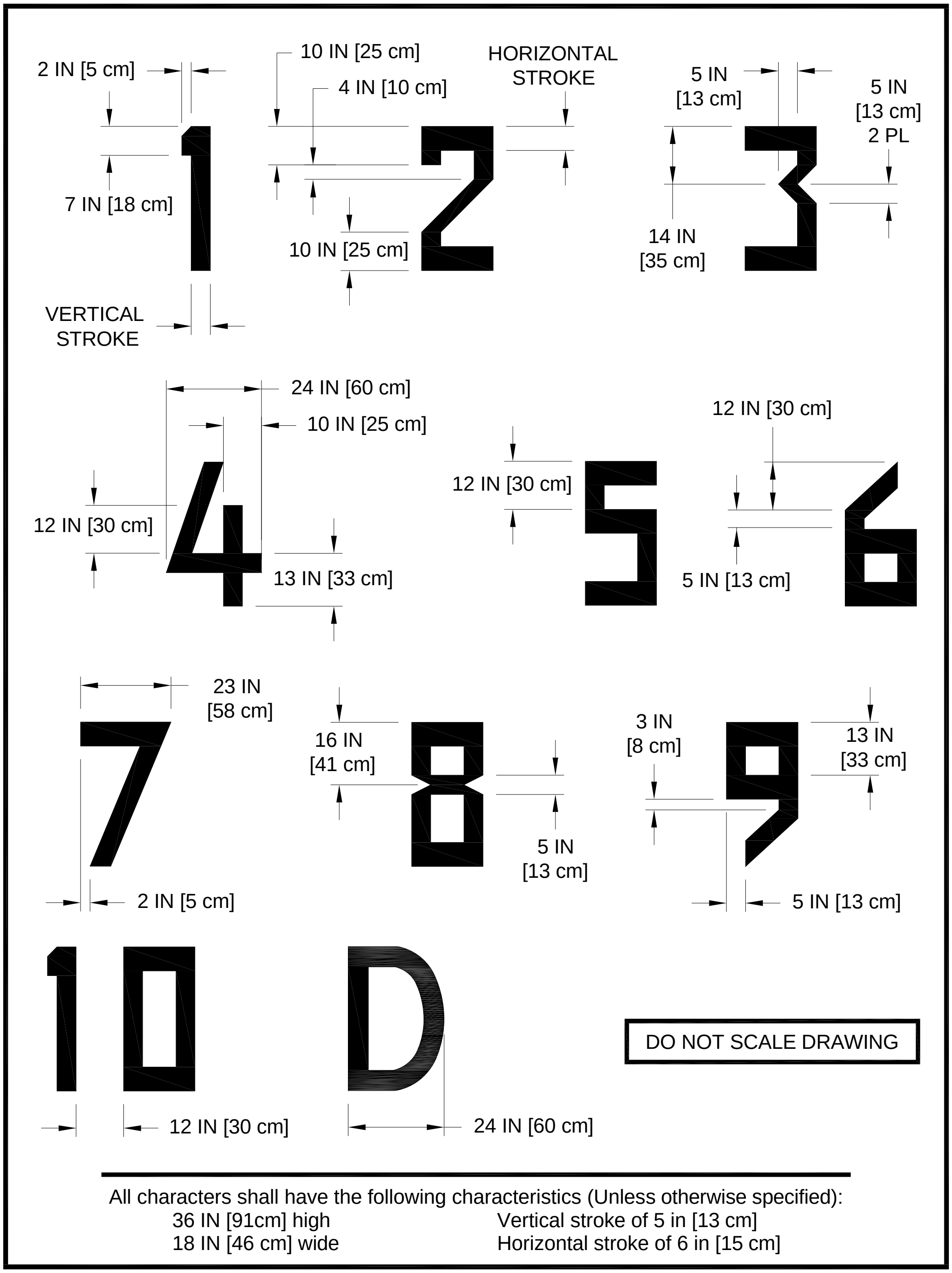

Figure C–1. Form and Proportions of 3 foot (0.9 m) Numbers for Marking Size and Weight Limitations

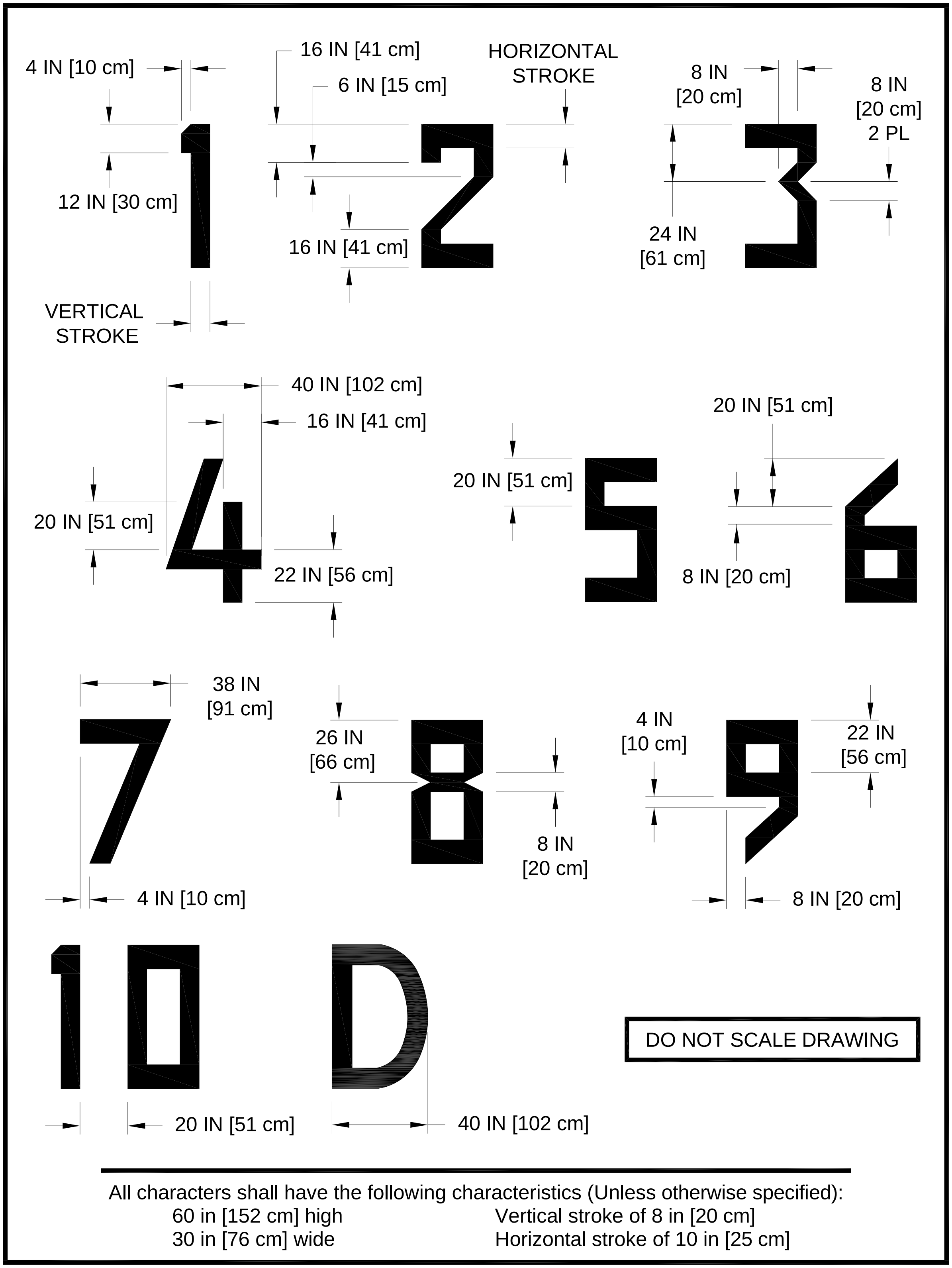

Figure C–2. Form and Proportions of 5 foot (1.5 m) Numbers for Marking Size and Weight Limitation

APPENDIX D. ASSOCIATED PUBLICATIONS AND RESOURCES

The following is a listing of related documents. Current Advisory Circulars are available from the FAA web site http://www.airweb.faa.gov/. Current Electronic Code of Federal Regulations (e-CFRs) are available from the Government Printing Office web site http://www.gpoaccess.gov/ecfr/. Airport Advisory Circulars are available at the Airports web site http://faa.gov/airports/resources/advisory_circulars/. Technical reports are available at the National Technical Information Service (NTIS) web site http://www.ntis.gov/. To find state and regional aviation offices, see http://www.faa.gov/airports/resources/state_aviation/. For information about grant assurances, see http:/www.faa.gov/airports/aip/grant_assurances/.

1. AC 70/7460-1, *Obstruction Marking and Lighting.*
2. AC 150/5190-4, *A Model Zoning Ordinance to Limit Height of Objects Around Airports.*
3. AC 150/5200-30, *Airport Winter Safety and Operations.*
4. AC 150/5220-16, *Automated Weather Observing Systems (AWOS) for Non-Federal Applications.*
5. AC 150/5230-4, *Aircraft Fuel Storage, Handling, and Dispensing on Airports.*
6. AC 150/5300-18, *General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographical Information System (GIS) Standards.*
7. AC 150/5320-6, *Airport Pavement Design and Evaluation.*
8. AC 150/5340-30 , *Design and Installation Detail for Airport Visual Aids*.
9. AC 150/5345-12, *Specification for Airport and Heliport Beacon.*
10. AC150/5345-27, *Specification for Wind Cone Assemblies.*
11. AC 150/5345-28, *Precision Approach Path Indicator (PAPI) Systems.*
12. AC 150/5345-39, *FAA Specification L-853, Runway and Taxiway Retroreflective Markers.*
13. AC 150/5345-46, *Specification for Runway and Taxiway Light Fixtures.*
14. AC150/5345-52, *Generic Visual Glideslope Indicators (GVGI).*
15. AC 150/5360-9, *Planning and Design of Airport Terminal Facilities at Non-Hub Locations.*
16. AC 150/5360-14, *Access to Airports by Individuals with Disabilities.*
17. AC 150/5370-10, *Standards for Specifying Construction of Airports.*
18. 14 CFR Part 135, *Operating Requirements: Commuter and on demand operations and rules governing persons on board such aircraft*
19. 14 CFR Part 27, *Airworthiness Standards: Normal Category Rotorcraft.*

20. 14 CFR Part 29, *Airworthiness Standards: Transport Category Rotorcraft.*

21. 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace.*

22. 14 CFR Part 91, *General Operating and Flight Rules.*

23. 14 CFR Part 121, *Operating Requirements: Domestic, Flag, and Supplemental Operations.*

24. 14 CFR Part 139, *Certification and Operations: Land Airports Serving Certain Air Carriers.*

25. 14 CFR Part 151, *Federal Aid to Airports*

26. 14 CFR Part 152, *Airport Aid Program.*

27. 14 CFR part 157, *Notice of Construction, Alteration, Activation, and Deactivation of Airports*.

28. FAA Order 1050.1 *Policies and Procedures for Considering Environmental Impacts.*

29. FAA Order 5050.4, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects.*

30. FAA Order 7400.2, *Procedures for Handling Airspace Matters*.

31. FAA Orders in the 8260 series.

32. National Fire Protection Association (NFPA) Pamphlet 403, *Aircraft Rescue Services*.

33. NFPA Pamphlet 418, *Standards for Heliports*.

34. FAA Technical Report FAA/RD-84/25, *Evaluating Wind Flow Around Buildings on Heliport Placement, National Technical Information Service (NTIS) accession number AD-A153512*.

35. FAA Technical Report FAA/RD-92/15, *Potential Hazards of Magnetic Resonance Imagers to Emergency Medical Service Helicopter Services, National Technical Information Service (NTIS), accession number AD-A278877*.

36. ICAO Annex 14, Vol. II – *Heliports*. *The Convention on International Civil Aviation*.

37. Grant Assurance No. 34, *Policies, Standards, and Specifications*

38. PFC Assurance No. 9, *Standards and Specifications*.