



U.S. Department
of Transportation
**Federal Aviation
Administration**

Advisory Circular

Subject: Vertical Flight Aircraft
Infrastructure Design

Date: Draft
Initiated By: AAS-100

AC No: 150/5390-4
Change:

1 1 **Purpose.**

2 This advisory circular (AC) provides standards for the planning, design, and
3 construction of takeoff and landing facilities serving vertical flight aircraft.

4 2 **Cancellation.**

5 This AC cancels AC 150/5390-2D, *Heliport Design*, dated January 5, 2023, and
6 Engineering Brief 105A, *Vertiport Design*, dated December 27, 2024.

7 3 **Applicability.**

8 This AC establishes Federal Aviation Administration (FAA) standards and guidelines
9 for Vertical Flight Aircraft Infrastructure Design. This AC does not constitute a
10 regulation and is not legally binding in its own right. It will not be relied upon as a
11 separate basis by the FAA for affirmative enforcement action or other administrative
12 penalty. Conformity with this AC is voluntary, and nonconformity will not affect rights
13 and obligations under existing statutes and regulations, except as described below.

14 Where applicable, the standards contained in this AC provide an acceptable means of
15 satisfying the requirements of Title 14 Code of Federal Regulations (CFR) Part 139,
16 *Certification of Airports*; and the requirements for federally obligated airport operators
17 per Grant Assurance 19 and other applicable Grant Assurances. For all other airport
18 operators, conformity with this AC is recommended. The FAA has determined the
19 standards and guidelines contained in this AC are practices which provide an acceptable
20 level of safety, performance and in support of operations for Vertical Flight Aircraft
21 Infrastructure Design.

- 22 1. For certificated airports: If an alternate means of compliance is proposed by an
23 airport operator, the FAA will evaluate the request on a case-by-case basis. If the
24 proposal is found to be acceptable by the administrator, those alternate provisions
25 must be documented in the Airports Certification Manual and the Airport Layout
26 Plan (ALP), if applicable.

2. For federally obligated airports and heliports:
 - a. Use of these standards is mandatory for projects funded under certain Federal grant assistance programs including, but not limited to, the Airport Improvement Program (AIP). See Grant Assurance 34. Airport sponsors should familiarize themselves with the obligations and assurances that apply to each grant program from which they obtained grant funds.
 - b. Use of these standards and guidelines is mandatory, as required by regulation, for projects funded by the Passenger Facility Charge program. See Passenger Facility Charge (PFC) Assurance 9 and other applicable PFC Assurances.
3. The content in this AC has been evaluated for conformity with applicable International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs) in effect at the time of publication, which may further emphasize the importance of conforming with these standards.

4 Related Documents.

ACs and Orders referenced in the text of this AC do not include a revision letter, as they refer to the latest version. See paragraph 1.5 for a list of associated publications.

5 Using this Document.

Hyperlinks (allowing the reader to access documents located on the internet and to maneuver within this document) are provided throughout this document and are identified with underlined text. When navigating within this document, return to the previously viewed page by pressing the “ALT” and “←” (left arrow) keys simultaneously.

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Figures in this document are schematic representations and are not to scale. Colors and shading used in the figures are illustrative only.

6 Use of Metrics.

This AC uses U.S. customary units followed with “soft” (rounded) conversion to metric units. The U.S. customary units govern.

7 Where to Find this AC.

You can view a list of all ACs at https://www.faa.gov/regulations_policies/advisory_circulars/. You can view the Federal Aviation Regulations at https://www.faa.gov/regulations_policies/faq_regulations/.

63 8 **Feedback on this AC.**

64 If you have suggestions for improving this AC, you may use the online AAS Advisory
65 Circular (AC) Feedback | Federal Aviation Administration form.

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CONTENTS

Paragraph		Page
66	CHAPTER 1. Introduction	1-1
67	1.1 Background.	1-1
68	1.2 Standards, Recommended Practices, and Requirements.	1-1
69	1.3 Definitions.....	1-2
70	1.4 Federal Assistance.	1-8
71	1.5 Related Documents and Federal Regulations.	1-8
72	1.6 Society of Automotive Engineers (SAE).	1-9
73	CHAPTER 2. Roles and Responsibilities	2-1
74	2.1 Notification Requirements.	2-1
75	2.2 Notice Exemptions.	2-2
76	2.3 Existing Infrastructure.	2-2
77	2.4 Closed Heliport.	2-2
78	2.5 Environmental Protection.	2-3
79	2.6 State Role.	2-4
80	2.7 Local Government Role.	2-4
81	CHAPTER 3. Infrastructure Siting.....	3-1
82	3.1 Site Selection.	3-1
83	3.2 Compatible Land Use and Zoning.	3-2
84	3.3 Selection of Approach/Departure Paths.....	3-3
85	3.4 Vertical Flight Infrastructure on Airports.	3-4
86	3.5 Air Traffic Considerations for Vertical Flight Infrastructure Siting.....	3-7
87	CHAPTER 4. Heliport Design	4-1
88	4.1 Design Approach.	4-1
89	4.2 Touchdown and Liftoff Area (TLOF).	4-2
90	4.3 Final Approach and Takeoff Area (FATO).	4-6
91	4.4 Safety Area.....	4-12
92	4.5 Heliport Protection Zone (HPZ).	4-13
93	4.6 Downwash/Outwash Caution Area (DCA).	4-15
94	4.7 VFR Approach/Departure Surfaces and Obstruction Identification.	4-18

CONTENTS

Paragraph	Page
95 4.8 Heliport Marking.	4-24
96 4.9 Heliport Lighting.	4-34
97 4.10 Identification Beacon.	4-43
98 4.11 Wind Indicator.	4-43
99 4.12 Fall Protection and Means of Egress.	4-44
100 4.13 Electromagnetic Effects.	4-45
101 CHAPTER 5. Heliport Taxiways	5-1
102 5.1 Taxiways.	5-1
103 5.2 Marking.	5-2
104 5.3 Lighting.	5-6
105 CHAPTER 6. Heliport Parking	6-1
106 6.1 Parking.	6-1
107 6.2 Marking.	6-4
108 CHAPTER 7. Soil Stabilization	7-1
109 7.1 Design Considerations.	7-1
110 CHAPTER 8. Aircraft Fueling and Charging	8-1
111 8.1 Fueling.	8-1
112 8.2 Charging and Electric Infrastructure.	8-1
113 CHAPTER 9. Site Safety	9-1
114 9.1 Fire Fighting Considerations.	9-1
115 9.2 Security and Safety.	9-1
116 9.3 Weather Information.	9-2
117 9.4 Winter Operations.	9-2
118 9.5 Access to Heliports by Individuals with Disabilities.	9-3
119 APPENDIX A. TLOF/FATO/Safety Area Relationships and Minimum	
120 Dimensions	A-1
121 APPENDIX B. Instrument Flight Procedures (IFP)	B-1
122 B.1 Criteria to Support Instrument Flight Procedure Development.	B-1
123 B.2 Visual References.	B-2

CONTENTS

Paragraph	Page
124 B.3 Visual Glideslope Indicators (VGSI).....	B-3
125 B.4 Obstacle Evaluation Surfaces.	B-3
126 APPENDIX C. Emergency Helicopter /VTOL Landing Facilities (EHLF)	C-1
127 C.1 General.....	C-1
128 C.2 Notification and Coordination.	C-1
129 C.3 Rooftop Emergency Facilities.....	C-1
130 APPENDIX D. Pre-Designated Emergency Landing Areas (PELAs)	D-1
131 APPENDIX E. Helicopter Data	E-1
132 APPENDIX F. Dimensions for Marking Size and Weight Limitations.....	F-1
133 APPENDIX G. Design Standards for Heliport Perimeter Lighting	G-1
134 G.1 Elevated and In-pavement Omnidirectional Helipad Perimeter Light.	G-1
135 G.2 Photometric Requirements.....	G-2
136 G.3 Additional Heliport Perimeter Light Requirements.....	G-2
137 G.4 L-860H and L-852H Light Fixture Testing.	G-3
138 G.5 Installation Criteria.	G-3
139 APPENDIX H. Autonomy.....	H-1
140 APPENDIX I. Short Takeoff and Landing (STOL).....	I-1
141 APPENDIX J. Electric Charging Infrastructure Best Practices and Standards.....	J-1
142 J.1 Reference Standards.....	J-1
143 J.2 Other Information.	J-3
144 APPENDIX K. Acronyms	K-1

FIGURES

146 Figure 1-1. Examples of Aircraft Controlling Dimensions	1-3
147 Figure 3-1. Example of an On-airport Helipad.....	3-6
148 Figure 4-1. Basic Heliport Features	4-2
149 Figure 4-2. Vertical Lift Aircraft Landing Gear Loading: Gradients and Pavement.....	4-5

CONTENTS

Paragraph	Page
150 Figure 4-3. Example of TLOF Separate From FATO	4-7
151 Figure 4-4. Additional FATO Length for Heliports at Higher Elevations	4-9
152 Figure 4-5. Heliport Gradients and Rapid Runoff Shoulder	4-10
153 Figure 4-6. Elongated TLOF and FATO with Two Takeoff Positions.....	4-11
154 Figure 4-7. Heliport Protection Zone.....	4-14
155 Figure 4-8. DCA	4-16
156 Figure 4-9. DCA Caution Sign Examples.....	4-17
157 Figure 4-10. VFR Heliport Approach/Departure and Transitional Surfaces	4-19
158 Figure 4-11. VFR Curved Approach/Departure and Transitional Surfaces	4-21
159 Figure 4-12. VFR HOSPITAL Heliport Lateral Extensions of the Approach/Departure Surface	4-22
160	
161 Figure 4-13. Standard Heliport Identification Marking.....	4-25
162 Figure 4-14. Standard Vertiport Identification Marking.....	4-26
163 Figure 4-15. Heliport Identification Symbol	4-27
164 Figure 4-16. HOSPITAL Heliport – Standard Identification Marking.....	4-29
165 Figure 4-17. HOSPITAL Heliport – Alternative Identification Marking.....	4-30
166 Figure 4-18. Touchdown Position Circle.....	4-31
167 Figure 4-19. Flight Path Alignment Marking and Lighting.....	4-33
168 Figure 4-20. Aiming Point Marking	4-34
169 Figure 4-21. TLOF/FATO Lighting	4-35
170 Figure 4-22. Elevated TLOF Perimeter Lighting Configuration	4-37
171 Figure 4-23. Perimeter Lighting for Elevated FATO	4-38
172 Figure 4-24. Landing Direction Lights	4-40
173 Figure 4-25. Visual Glideslope Indicator (VGSI) Siting and Clearance Criteria	4-42
174 Figure 4-26. EMI Hazard Marking	4-46
175 Figure 4-27. EMI Hazard Sign.....	4-46
176 Figure 5-1. Taxiway/Taxiway Object Free Area (TOFA) Relationship – Paved Taxiway	5-3
177 Figure 5-2. Taxiway/ Taxiway Object Free Area (TOFA) Relationship – Unpaved Taxiway with	
178 Elevated Retroreflective Edge Markers	5-5
179 Figure 5-3. Taxiway/Taxiway Object Free Area (TOFA) Relationship – Unpaved Taxiway with	
180 In-Pavement Retroreflective Edge Markers.....	5-6
181 Figure 6-1. Typical Parking Area Design – “Taxi-through” Parking Positions	6-2

CONTENTS**Paragraph****Page**

182	Figure 6-2. Typical Parking Area Design – “Back-out” and “Turn-around” Parking Positions .	6-3
183	Figure 6-3. “Turn-around” Parking Position Marking.....	6-6
184	Figure 6-4. “Taxi-through” and “Back-out” Parking Position Marking.....	6-7
185	Figure 9-1. Heliport Caution Sign Examples.....	9-2
186	Figure A-1. TLOF/FATO/Safety Area Relationships and Minimum Dimensions.....	A-1
187	Figure B-1. Heliport Instrument Lighting System (HILS): Non-precision	B-4
188	Figure B-2. Heliport Approach Lighting System	B-5
189	Figure C-1. Rooftop Emergency Landing Facility	C-2
190	Figure E-1. Helicopter Dimensions	E-2
191	Figure F-1. Form and Proportions of 36-inch (914 mm) Numbers for Marking Size and Weight	
192	Limitations	F-2
193	Figure F-2. Form and Proportions of 18-inch (457 mm) Numbers for Marking Size and Weight	
194	Limitations	F-3

TABLES

196	Table 5-1. Heliport Taxiway Dimensions.....	5-2
197	Table E-1. Helicopter Data	E-2
198	Table G-1. Approach Angles Assuming VMC.....	G-1
199	Table G-2. Perimeter Lighting Intensity Recommendations in Candelas	G-2

CHAPTER 1. Introduction

1.1 Background.

The Federal Aviation Administration (FAA) developed standards for heliport design starting in 1959, updating them as research and development was produced throughout the years that warranted changes. Advisory Circular (AC) 150/5390-2, *Heliport Design*, historically provided standards for the planning, design, and construction of heliports serving helicopters with single, tandem (front and rear), or dual (side by side) rotors.

The FAA previously provided guidance for vertiports in AC 150/5390-3, *Vertiport Design*, published on May 31, 1991. The AC was based on civil tiltrotors modeled after military tiltrotor technology and was cancelled on July 28, 2010. With the introduction of new electric vertical takeoff and landing (eVTOL) aircraft, the FAA identified a need to provide guidance for facilities serving these new aircraft. As a result, Engineering Brief (EB) 105, *Vertiport Design*, was published in 2022. Due to similarities between heliports and vertiports, EB 105 was updated to EB 105A, *Vertiport Design*, as a supplement to AC 150/5390-2.

This AC evolves heliport design to include standards for heliports serving all vertical flight aircraft. Heliports with design elements distinct for powered lift aircraft are also commonly known as “vertiports.” Throughout the document, the term “heliport” refers to all facilities designed for vertical flight aircraft, including vertiports, unless specifically stated otherwise. Additionally, terms such as “helistop” are used by industry and are considered heliports. Medical emergency sites used to provide emergency medical transport at an accident scene are not considered heliports as defined in this AC.

1.2 Standards, Recommended Practices, and Requirements.

The promulgation of the standards and recommendations contained in this AC advances the goals and objectives of the FAA’s statutory authorities and the national policies established by Congress.

The standards and recommendations in this AC do not limit or regulate the operations of aircraft or heliports. When it is not feasible to meet the standards and recommendations in this AC, or new aircraft entrants not addressed herein have an interest in operating at heliports, consult with the appropriate offices in the FAA’s Office of Airports and Flight Standards Service to identify possible modifications to these standards and/or operational procedures that will accommodate safe heliport standards.

1.2.1 Meaning of Terms.

1.2.1.1 Standard.

A physical characteristic, quality, configuration, function, operation, or procedure established by the FAA as a benchmark for uniformity, safety, capacity, performance, economy, and environmental quality.

1.2.1.2 **Recommended Practice.**

Supplemental measures and guidelines the FAA recognizes as promoting safety, capacity, or efficiency. A heliport has the discretion to implement a recommended practice to address a site-specific condition.

1.2.1.3 **Requirement.**

Mandatory language such as “must,” “shall,” “required,” or “requirements,” used in this AC describes obligations that originate in either Federal statutes or regulations. This AC does not establish or modify any statutory or regulatory requirements; it provides information regarding existing requirements under the law or agency policies.

1.2.1.4 **Design Consideration.**

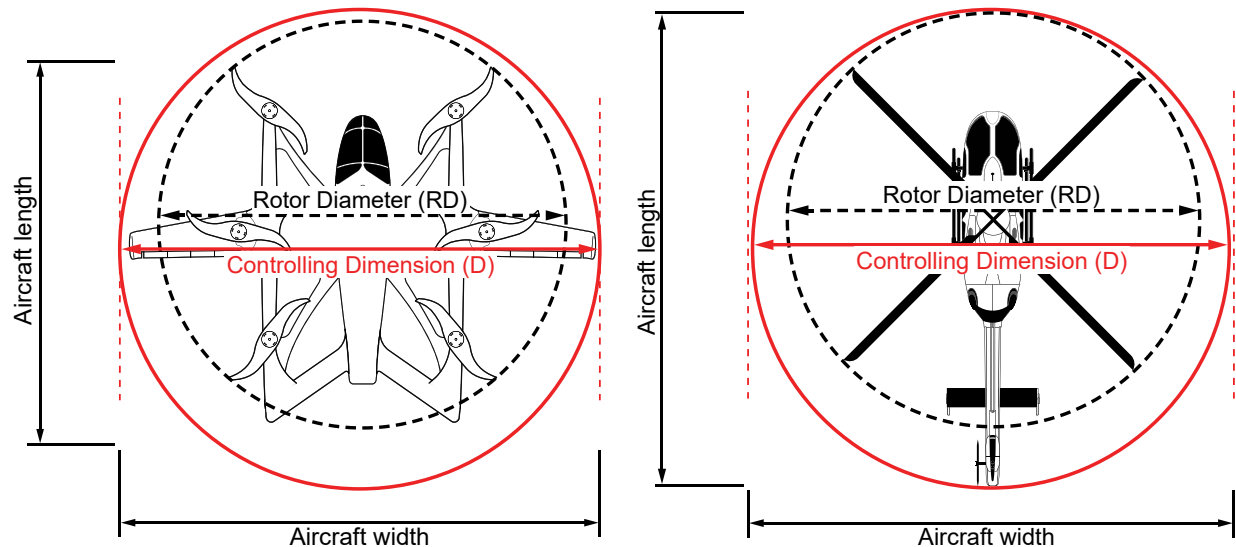
Additional factors to consider during heliport design that may influence application of a standard or recommended practice.

1.3 **Definitions.**

The Pilot/Controller Glossary of the Aeronautical Information Manual (AIM) defines terms used in the Air Traffic System. The AIM is available from the FAA website https://www.faa.gov/air_traffic/publications/. Other terms used in this publication follow.

1. *Aiming Point*. Aiming points are marked locations that serve as a specific position and visual cue for vertical flight aircraft to approach. An aiming point is not a helipad.
2. *Approach/Departure Path*. The flight track an aircraft follows when landing at or departing from a heliport. The approach/departure paths may be straight or curved.
3. *Battery*. One or more electrically connected cells, assembled in a single container having positive and negative terminals. A battery may include inter-cell connectors and other devices.
4. *Battery Pack*. Two or more battery systems.
5. *Battery System*. Comprised of the battery, the battery charger, and any protective, monitoring, and alerting circuitry or hardware inside or outside of the battery. It also includes vents (where necessary) and packaging.
6. *Controlling Dimension (D)*. The diameter of the smallest circle enclosing the entire aircraft projection on a horizontal plane, including all possible configurations with rotors/propellers turning, if applicable (Figure 1-1).

Figure 1-1. Examples of Aircraft Controlling Dimensions



7. *Critical Aircraft.* The most demanding aircraft type, or grouping of aircraft, with similar physical and operational characteristics, expected to operate at the heliport. The critical aircraft can be a composite of several different aircraft and composed of the most demanding characteristics of each that is expected to use the facility (e.g., the maximum weight, maximum contact load/minimum contact area, controlling dimension (D), overall aircraft width (OW), rotor diameter (RD), tail rotor arc radius, undercarriage dimensions, and pilot's eye height of all aircraft). If a heliport sponsor is using FAA grant funds in the facility, the critical aircraft must meet the requirements specified in AC 150/5000-17, *Critical Aircraft and Regular Use Determination*.

8. *Design Loads.*

a. *Static Load.* For design purposes, the design static load is equal to the critical aircraft's maximum takeoff weight applied through the total contact area of the wheels or skids. Loads are applied through the contact area of the tires for wheel-equipped aircraft or the contact area of the skid for skid-equipped aircraft. Consult with the aircraft's manufacturer to obtain the contact area for the specific aircraft of interest.

b. *Dynamic Load.* A dynamic load of 0.2 seconds or less duration may occur during a hard landing. For design purposes, assume dynamic loads at 150 percent of the maximum takeoff weight of the critical aircraft. When specific loading data is not available, assume 75 percent of the weight of the critical aircraft is applied equally through the contact area of the rear two wheels (or the pair of rear wheels of a dual-wheel configuration) of a wheel-equipped aircraft. For a skid-equipped aircraft, assume 75 percent of the weight of the critical aircraft is applied equally through the aft contact areas of the two skids of a skid-equipped aircraft (Figure 4-2). Consult aircraft manufacturers to obtain the aft contact area for specific aircraft of interest.

- 301 9. *Downwash/Outwash (DWOW)*. The downward and outward movement of air caused
302 by the action of rotating rotor blade, propeller, or ducted fan. When this air strikes
303 the ground or some other surface, it causes a turbulent outflow of air from the
304 aircraft.
- 305 10. *Downwash/Outwash Caution Area (DCA)*. An operational area established where
306 downwash/outwash (DWOW) potentially meets or exceeds 34.5 mph.
- 307 11. *Elevated Heliport*. A heliport located on a rooftop or other elevated structure where
308 the touchdown and liftoff area (TLOF) is at least 30 inches (0.8 m) above the
309 surrounding surface (a ground-level heliport with the TLOF on a mound made of
310 earth is not an elevated heliport).
- 311 12. *Effective Translational Lift (ETL)*. A phenomenon that occurs when the rotor/lifting
312 blade system becomes more efficient with forward air speed as the rotor/lifting
313 system disk outruns the recirculation of old vortices into undisturbed air resulting in
314 less induced flow and drag on the rotor/lifting system.
- 315 13. *Emergency Helicopter Landing Facility (EHLF)*. A clear area at ground level or on
316 the roof of a building capable of accommodating aircraft engaged in firefighting
317 and/or emergency evacuation operations and are not for routine aircraft operations.
318 An EHLF meets the definition of a heliport in this AC and under 14 CFR Part 157,
319 *Notice of Construction, Alteration, Activation, and Deactivation of Airports*.
- 320 14. *Final Approach and Takeoff Area (FATO)*. A defined area over which the pilot
321 completes the final phase of the approach to a hover or a landing and from which
322 the pilot initiates takeoff. The FATO and TLOF are normally co-located but may be
323 located separately. The FATO is associated with all instrument approach/departure
324 procedures. See paragraph 4.3.
- 325 15. *Frangible Mounting*. A physical characteristic whereby an object retains its
326 structural integrity and stiffness up to a designated maximum load, but upon impact
327 from a greater load, breaks, distorts, or yields in such a manner as to present the
328 minimum hazard to aircraft.
- 329 16. *Ground Effect*. A condition of usually improved aerodynamic performance
330 encountered when the aircraft is operating very close to the ground or a surface. It
331 results from a reduction in upwash, downwash, and/or blade tip vortices, which
332 provide a corresponding decrease in induced drag.
- 333 17. *Hazard to Air Navigation*. An existing or proposed object that the FAA, as a result
334 of an aeronautical study, determines will have a substantial adverse effect upon the
335 safe and efficient use of navigable airspace by aircraft, operation of air navigation
336 facilities, or existing or potential airport capacity.
- 337 18. *Helipad*. A small, designated area, usually with a prepared surface, on a heliport or
338 an airport, used for takeoff, landing, or parking of vertical flight aircraft. A helipad
339 is a TLOF and its associated FATO, and safety area, and approach/departure
340 surfaces. The sizing and dimension criteria are based on the critical aircraft. A
341 vertipad is a helipad designed to the specific requirements to serve powered lift
342 aircraft.

- 343 19. *Heliport*. An area of land, water, or structure used or intended to be used for
344 landings and takeoffs by vertical flight aircraft and includes associated buildings
345 and facilities. Two distinct types of heliports that warrant further definition include
346 the following:
- 347 a. *Hospital*. A hospital heliport services aircraft used by air ambulance providers.
348 A hospital heliport may be designed to accommodate large military aircraft in
349 some emergencies. Air ambulance aircraft are often used to transport injured
350 people from the scene of an accident to a hospital and to transfer patients from
351 one hospital to another. A designated landing area located at a hospital or
352 medical facility is a heliport and not a medical emergency site.
- 353 b. *Vertiport*. A heliport that is designed to the specific requirements to serve
354 powered lift aircraft.¹
- 355 20. *Heliport Elevation*. The highest elevation of all aircraft landing areas (TLOFs)
356 within the heliport, expressed as the distance above mean sea level (MSL).
- 357 21. *Heliport Imaginary Surfaces*. The imaginary planes defined in 14 CFR Part 77,
358 *Safe, Efficient Use, and Preservation of the Navigable Airspace*, centered about the
359 FATO and the approach/departure paths, which are used to identify the objects
360 where notice to and evaluation by the FAA is required. Imaginary surfaces include
361 the primary surface, approach/departure surfaces, and transitional surfaces.
- 362 22. *Heliport Layout Plan*. The plan of a heliport showing the layout of existing and
363 proposed heliport facilities including all safety related dimensional standards
364 (approach/departure paths and dimensions of TLOF, FATO, safety area, heliport
365 protections zone (HPZ), and all other standards described in this AC). See AC
366 150/5300-20, *Submission of On-Airport Proposals for Aeronautical Study*,
367 paragraph 1.9.5 (defining “Airport” to include heliports).
- 368 23. *Heliport Protection Zone (HPZ)*. An area off the end of the FATO and under the
369 approach/departure path intended to enhance the protection of people and property
370 on the ground.
- 371 24. *Heliport Reference Point (HRP)*. The geographic position of the heliport expressed
372 as the latitude and longitude at the center of the FATO, or the centroid of multiple
373 FATOs.
- 374 25. *Hover*. The word “hover” applies to an aircraft that is airborne and remaining in one
375 place at a given altitude over a fixed geographical point regardless of wind.
- 376 26. *Hover in Ground Effect (HIGE)*. The ability to achieve hover close to the ground
377 because of the increased efficiency of the propulsion units caused by the ground.
- 378 27. *Hover Out of Ground Effect (HOGE)*. The ability to achieve hover without the
379 benefit of the ground or a surface, and where ground effect no longer enhances lift.

¹ This definition is distinct from the FAA Reauthorization Act of 2024.

- 380 28. *Induced Flow*. The component of air flowing vertically through the propulsion
381 system resulting from the production of lift.
- 382 29. *Load-Bearing Area (LBA)*. Any surface capable of supporting the static or dynamic
383 load of the critical aircraft (e.g., TLOF, parking, taxiway).
- 384 30. *Obstacle Clearance Surface (OCS)*. A level or sloping surface used for obstacle
385 evaluation. The separation between this surface and specified minimum altitude,
386 glidepath angle, or minimum required climb path defines the MINIMUM required
387 obstruction clearance at any given point.
- 388 31. *Obstruction to Air Navigation*. Any fixed or mobile object, including a parked
389 aircraft, of greater height than any of the heights or surfaces presented in subpart C
390 of 14 CFR Part 77.
- 391 32. *Overall Aircraft Length (OL)*. The overall length of the aircraft, which is the
392 dimension from the most forward point of the aircraft (including tip of the main or
393 forward rotor) to the most rearward point of the aircraft (including the tip of the tail
394 rotor and fin, when applicable). This value is with the rotors/propellers at their
395 maximum extension.
- 396 33. *Overall Aircraft Width (OW)*. The OW is defined as the maximum outer dimension
397 of the aircraft rotors/propellers or wings.
- 398 34. *Parking Position*. The center portion of an aircraft parking position, whether paved
399 or grass. "Parking position" is synonymous with "parking stand."
- 400 35. *Powered Lift*. A heavier-than-air aircraft capable of vertical takeoff, vertical
401 landing, and low speed flight that depends principally on engine-driven lift devices
402 or engine thrust for lift during these flight regimes and on nonrotating airfoil(s) for
403 lift during horizontal flight.
- 404 36. *Pre-designated Emergency Landing Areas (PELAs)*. PELAs are clear and level
405 areas near the scene of an accident or incident that the local emergency response
406 team designates as the place where the air ambulance is directed to land to transport
407 an injured person to a hospital. Provide such sites in various locations within a
408 jurisdiction to support fast response to medical emergencies and accidents. Pre-
409 designating these areas provides the opportunity to inspect potential sites in advance
410 and to select sites that have adequate clear approach/departure airspace and adequate
411 clear ground space. See the AIM, Chapter 10, for guidance on setting up offsite
412 scene or PELA landing sites.
- 413 37. *Private-use Heliport*. A heliport developed for exclusive use of the owner and
414 people authorized by the owner. Private-use heliports are also commonly known as
415 Prior Permission Required (PPR) heliports.
- 416 38. *Propulsion System Downwash Loads*. Traditional helicopter rotor downwash
417 (induced flow or the downward flow of air through the rotor(s) disk area) loads are
418 approximately equal to the weight of the helicopter distributed uniformly over the
419 disk area of the rotor. Rotor downwash loads are generally less than the loads
420 specified in building codes for snow, rain, or wind loads typically used in structural
421 design calculations. Vertical flight aircraft with three or more propulsion units have

a more complex downwash flow field and no general equations are available.
Consult the aircraft manufacturer to obtain downwash loading calculations.

39. *Public-use Heliport*. A heliport available for use by the public without a requirement for prior approval of the owner or operator.
40. *Rotor Diameter (RD)*. The largest length of all the blades from tip to tip. It can be computed by finding the diameter of the smallest circle enclosing all the lift producing propulsion units, including their propellers, rotors, fans, etc., on a horizontal plane, while the aircraft is in the vertical takeoff or landing configuration, with rotors/propellers/fans turning, if applicable. The RD incorporates all landing gear and surface touch points (Figure 1-1 under Controlling Dimension).
41. *Safety Area*. A defined area on a heliport surrounding the FATO intended to reduce the risk of damage to aircraft accidentally diverging from the FATO.
42. *Shoulder Line*. A marking line perpendicular to an aircraft parking position centerline that is intended to provide the pilot with a visual cue to assist in parking.
43. *Tail Rotor Arc Radius*. The distance from the hub of the main rotor to the outermost tip of the tail rotor or the rear-most point of the tail, whichever is farther.
44. *Takeoff Position*. An area, normally located on the centerline and at the ends of an elongated TLOF, from which the aircraft takes off. Typically, there are two such positions on an elongated TLOF, one at each end.
45. *Taxi*. The movement of an aircraft under its own power on or just above the surface of a heliport.
- a. *Air Taxi*. Used to describe a vertical flight aircraft movement conducted above the surface but normally not above 100 feet (30.5 m) above ground level (AGL). The aircraft may proceed either via hover taxi or flight at speeds more than 20 knots. The pilot is solely responsible for selecting a safe air speed/altitude for the operation.
 - b. *Ground Taxi*. The surface movement of a wheeled aircraft under its own power with wheels touching the ground.
 - c. *Hover Taxi*. Used to describe a vertical flight aircraft movement conducted above the surface and in ground effect at air speeds less than approximately 20 knots. The actual height may vary, and some aircraft may require hover taxi above 25 feet (7.6 m) AGL to reduce ground effect turbulence or provide clearance for cargo sling loads.
46. *Taxiway*. A marked route between the TLOF and other areas on the heliport. This AC defines two types of taxiways:
- a. *Ground Taxiway*. A taxiway intended to permit the surface movement of a wheeled aircraft under its own power with wheels on the ground.
 - b. *Hover Taxiway*. A taxiway intended to permit hover taxiing.
47. *Taxiway Object Free Area (TOFA)*. The area that is free of objects either side of the taxiway centerline.

48. *Touchdown and Liftoff Area (TLOF)*. A load-bearing (generally paved) area normally centered in the FATO, on which the aircraft performs a touchdown or liftoff.
49. *Touchdown Position Circle (TDPC) Marking*. A circular marking located in the center of a TLOF or a parking position.
50. *Undercarriage Width (UCW)*. The distance between the outside edges of the outer tires or skids (Figure E-1).
51. *Vertical Flight Aircraft*. Aircraft capable of vertical takeoffs and landings. Vertical-lift aircraft include:
- Rotorcraft/Helicopters (excluding gyrocopters)
 - Special Class Rotorcraft
 - Powered lift
 - Vertical Takeoff and Landing (VTOL)

1.4 **Federal Assistance.**

The FAA administers grant programs that provide 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 website, www.faa.gov/airports.

1.5 **Related Documents and Federal Regulations.**

The following are links to lists of documents referenced in this AC and additional related information. Unless otherwise stated, non-FAA documents do not supersede FAA regulations, policies or standards. All references to ACs, FAA Orders, and other relevant FAA guidance within this document are to the most recent versions.

- Advisory Circulars (ACs) are available at Advisory Circulars (ACs).
- Engineering Briefs (EBs) are available at Airport Engineering Briefs | Federal Aviation Administration.
- FAA Orders are available at Orders & Notices.
- FAA Forms are available at <https://www.faa.gov/forms/>.
- Other FAA Documents.

Aeronautical Information Manual (AIM),
https://www.faa.gov/air_traffic/publications/

FAA/USDA Manual, *Wildlife Hazard Management at Airports*,
https://www.faa.gov/airports/airport_safety/wildlife/resources.

Grant Assurances *Policies, Standards, and Specifications*
https://www.faa.gov/airports/aip/grant_assurances.

FAA/RD-84/25 *Evaluating Wind Flow Around Buildings on Heliport Placement*, National Technical Information Service (NTIS) accession number AD-A153512

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

6. Non-FAA Documents.

a. Federal Regulations are available at <https://www.ecfr.gov/>.

b. United States Code (U.S.C.) is available at <https://www.govinfo.gov/>.

c. International Civil Aviation Organization (ICAO).

ICAO Annex 14 – *Aerodromes* Volume II, *Heliports*

d. International Codes.

International Building Code

International Fire Code

e. National Fire Protection Association (NFPA).

NFPA 10 *Standard for Portable Fire Extinguishers*

NFPA 70 *National Electrical Code (NEC)*

NFPA 407 *Standard for Aircraft Fuel Servicing*

NFPA 409 *Standard on Aircraft Hangars*

NFPA 415 *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*

NFPA 418 *Standard for Heliports and Vertiports*

NFPA 460 *Standard for Aircraft Rescue and Fire-Fighting Services at Airports*

NFPA 855 *Standard for the Installation of Stationary Energy Storage Systems*

1.6 Society of Automotive Engineers (SAE).

SAE AS25050 *Colors, Aeronautical Lights and Lighting Equipment, General Requirements For*

SAE J1772 *SAE Electric Vehicle and Plugin Hybrid Electric Vehicle Conductive Charge Coupler*

SAE AIR7357 *Megawatt and Extreme Fast Charging for Aircraft (under development)*

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CHAPTER 2. Roles and Responsibilities

2.1 Notification Requirements.

14 CFR Part 157 sets requirements for persons proposing to construct, activate, deactivate, or alter a heliport to give advance notice of their intent to the FAA. Failure to give notice is subject to civil penalty under Title 49 U.S.C. 46301, *Civil Penalties*. This includes but is not limited to the following changes:

1. changing the size or number of FATOs;
2. adding, deleting, or changing an approach or departure route;
3. change a heliport status (for example, private to public use or vice versa).

For development on non-federally obligated airports or heliports or for non-federally funded standalone heliport sites, and in compliance with 14 CFR Part 157 the proponent must submit FAA Form 7480-1, *Notice for Construction, Alteration and Deactivation of Airports*, at least 90 days in advance of the day that construction work is to begin on the takeoff and landing facility (see § 157.5 for other scenarios). **Note:** The 90-day advance notice requirement governs when the proponent must submit Form 7480-1; it does not establish a timeline for the FAA's airspace determination, which proceeds independently. The FAA encourages proponents to engage the appropriate FAA Airports Regional or District Office before submitting Form 7480-1; however, the FAA's formal evaluation cannot begin until a complete Form 7480-1 is received.

For non-federally obligated heliport facilities that are modified in geometry to a different type of heliport, the sponsor must submit a new Form 7480-1 at least 90 days in advance of the day that work is to begin. See 14 CFR Part 157. The Form 7480-1 can be submitted electronically as a Digital 7480 at <https://adip.faa.gov>. The FAA's Flight Standards organization will determine when to do an onsite evaluation using risk-based analysis (FAA Order 8900.1, *Flight Standards Information Management System*).

For vertical flight infrastructure development on airports or heliports identified under 14 CFR § 77.9(d), a sponsor must submit a Form 7460-1, *Notice of Proposed Construction or Alteration*, at least 45 days before the start date of the proposed construction or alteration or the date an application for a construction permit is filed, whichever is earliest. Guidance is in AC 150/5300-20.

For federally obligated airports, vertical flight infrastructure or equipment must be depicted on the ALP. See AC 150/5070-6, *Airport Master Plans*. Construction must not begin until the FAA has completed its review of the ALP and airspace case and issued a non-objectionable airspace determination.

Do not begin construction on public use unobligated airports or heliports until a non-objectionable airspace determination has been issued.

Coordinate potential sites with any nearby landing facilities and state and local officials. Lack of early coordination can cause airspace, operational, safety, capacity, and financial impacts. While the FAA will review all new heliport proposals for the safe and efficient utilization of navigable airspace by aircraft and the safety of people and

property on the ground, early coordination with all applicable entities offers insight into airspace and capacity conflicts before investments are made.

2.2 Notice Exemptions.

14 CFR Section 157.1, Applicability, exempts sites meeting one of the conditions below from the requirement to submit notice. These exemptions do not negate a notice or formal approval requirement prescribed by state law or local ordinance. For the purposes of applying the 14 CFR Part 157 exemption criteria cited in (2) and (3) below, a landing and associated takeoff is considered one operation. Section 157.1 projects are:

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, or
2. [A heliport] at which flight operations will be conducted under visual flight rules (VFR) and which is used or intended to be used for a period of less than 30 consecutive days with no more than ten operations per day.
3. The intermittent use of a site that is not an established airport, which is used or intended to be used for less than one year, and at which flight operations will be conducted only under VFR. For this part, “intermittent use of a site” means:
 - a. the site is used or is intended to be used for no more than three days in any one week, and
 - b. no more than ten operations will be conducted in any one day at that site.

2.3 Existing Infrastructure.

Prior to a change or alteration to an existing heliport, the proponent is required to submit FAA Form 7460-1 for federally obligated airports or heliports, or airports or heliports that meet 14 CFR Part 77.9(d). FAA Form 7480-1 must be submitted for non-federally obligated facilities. Consider taking necessary actions, as practical, to bring the heliport up to current design standards.

The sponsor is responsible for regularly ensuring that the Airport Data and Information Portal (ADIP) includes accurate information on the facility and its layout plan. (<https://adip.faa.gov/agis/public/#/public>)

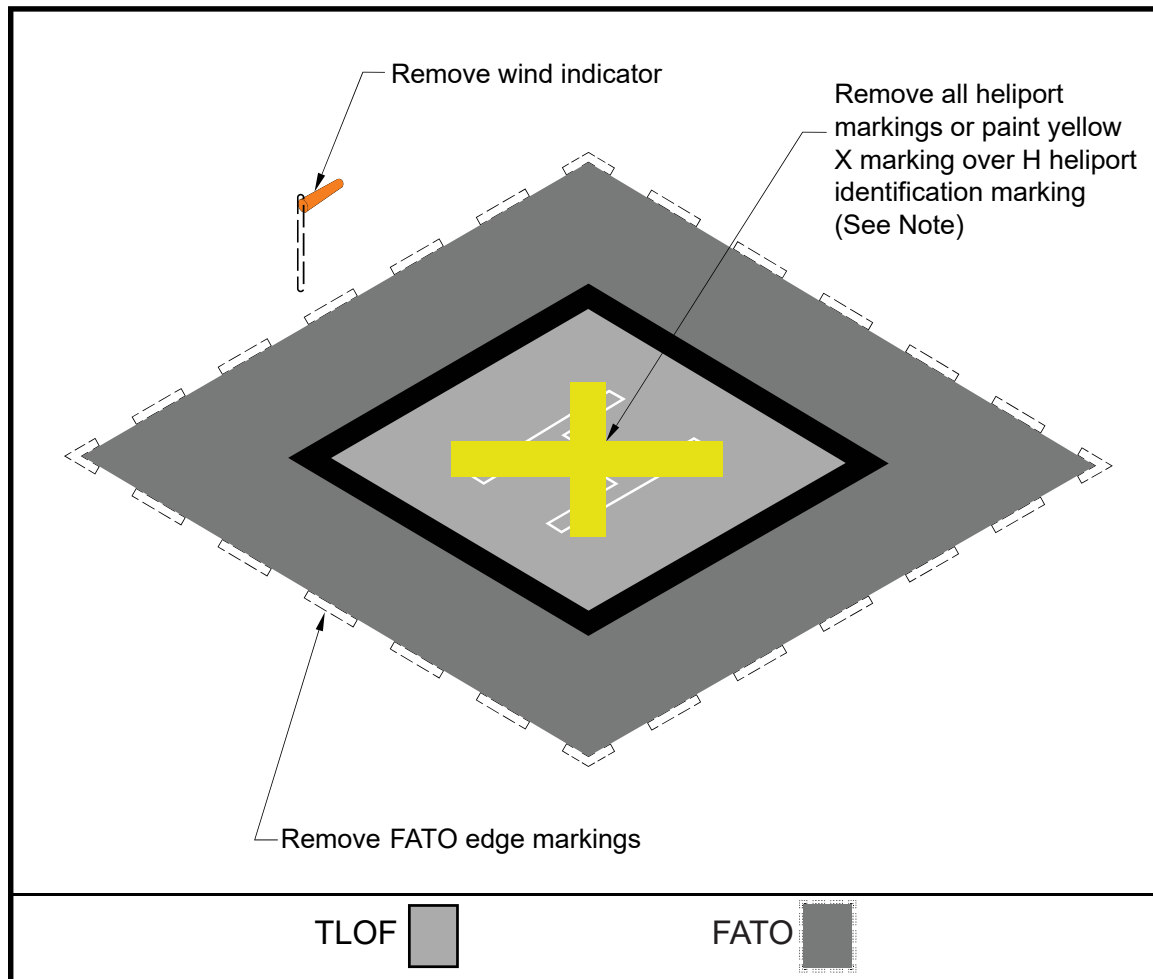
2.4 Closed Heliport.

When permanently closing a heliport, submit a Form 7480-1, and do the following:

1. Remove all markings of a permanently closed heliport, FATO, or TLOF. If it is impractical to remove the markings, place a yellow “**X**” over the “**H**”, as illustrated in Figure 2-1.
2. For temporary heliport closures, as an option, place a yellow “**X**” over the “**H**” (Figure 2-1).
3. Make the yellow “**X**” large enough to ensure early pilot recognition that the heliport is closed.

4. Remove the wind indicator(s) and other visual indications.
5. Turn off and disconnect heliport perimeter lighting and other lighting for the heliport.

Figure 2-1. Marking a Closed Heliport



Note: See paragraph 2.4 for guidance on removal of markings for permanent or temporary heliport closures.

2.5 Environmental Protection.

The National Environmental Policy Act (NEPA) requires Federal agencies to consider the environmental effects of major Federal actions and their reasonable alternatives. Federal assistance for heliport development projects and ALP approvals, where required by statute, are Federal actions that require the FAA to follow the procedures of NEPA. FAA compliance with NEPA is a legal requirement and aligns with the national policy of protecting and enhancing natural resources and the quality of the environment of the United States. For additional guidance and information, see the following FAA documents:

1. FAA Order 1050.1, *Environmental Impacts: Policies and Procedures*.
2. FAA Order 5050.4, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*.

The circumstances in which the FAA must approve ALPs are addressed in 49 U.S.C. § 47101(a)(16).

2.6 **State Role.**

Many state departments of transportation, aeronautical commissions, or similar authorities require prior approval and, in some instances, a license or permit for the establishment and operation of a heliport. Several states administer a financial assistance program like the federal program and are staffed to provide technical advice. Contact your respective state aeronautics commissions or departments for specifics on licensing and assistance programs. Contact information for state aviation agencies is available at https://www.faa.gov/airports/resources/state_aviation.

State agencies may also choose to educate local officials throughout their state, advocate, or provide tools for the harmonization of applicable state and local policies. State regulators, departments of transportation, and local communities can use the guidance and best practices outlined in this AC when reviewing a proposed heliport facility or developing independent standards.

2.7 **Local Government Role.**

Many local communities have enacted comprehensive land use plans, zoning laws, building codes, fire regulations, etc., that can affect heliport establishment, operation, and long-term compatibility for the heliport and its associated approach/departure surfaces. Most municipalities have a formal process such as a “Conditional/Special Use Permit” in place for the establishment of a heliport. Check with your local planning and zoning authority for details. Some communities have developed 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, make early contact with officials or agencies representing the local zoning board/authority, the fire, police, or sheriff’s departments, and stakeholders and elected personnel who represent the area where the heliport is to be located.

CHAPTER 3. Infrastructure Siting

3.1 Site Selection.

Proper heliport siting is critical to ensuring safe, efficient, and compatible facility operations for helicopters and powered lift aircraft. Proper site selection is comprised of numerous components, including compatible land use planning, utility coordination, analysis of wind and turbulence created by objects, and approach/departure path selection. The changing dynamics of the built environment around heliports can negatively impact the heliport's operations, requiring a continued effort to ensure the site selected remains viable for heliport operations and the protection of the heliport investment. As novel aircraft designs are incorporated into heliports, careful site selection planning is vital to the long-term success of a facility.

3.1.1 Long-Term Planning.

The future facility needs and surrounding land uses are critical to long-term planning and ensuring clear approach/departure surfaces to maintain the utility of the site.

3.1.1.1 **Recommended Practices.**

1. Consider the possible future need for instrument operations, alternative fuels (including electrification), and facility expansion when planning a heliport.
2. Consider any current or future potential use by powered lift, larger, and/or military aircraft during planning.
3. Plan for critical aircraft with distinct approach/departure surfaces that may differ from 8:1 slope.
4. Evaluate local electrical grid capacity and utility constraints.

3.1.2 Property Size.

The property needed for a heliport depends on the volume and types of users, aircraft types and sizes, and the scope of amenities provided for each type of heliport facility. Property for aircraft operators and for passenger amenities may also be needed. The area needed for heliport operations minimally includes a cleared area absent of structures that will create turbulence for the aircraft, a wind indicator, a clear approach/departure path, and a DCA.

3.1.2.1 **Recommended Practice.**

Consider the property, land use, and design of areas adjacent to the heliport for HPZ or DCAs.

3.1.2.2 **Design Consideration.**

Mitigation efforts may limit the DWOW effects that can be felt beyond the property boundary.

3.1.3 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 aircraft operations.

3.1.3.1 **Standards.**

1. Assess the turbulence and airflow characteristics near and across the surface of the TLOF and associated FATO, and along the final section of the approach/departure path to determine if an air gap among the roof, roof parapet or supporting structure, and/or some other turbulence mitigating design measure is necessary for elevated heliports.
2. Perform the assessment where the TLOF and associated 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 (refer to the FAA's Technical Report FAA/RD-84/25).
3. Locate the landing and takeoff area away from buildings, trees, and other large objects to minimize air turbulence near the TLOF, FATO, safety area, and associated approach/departure paths.
4. For rooftop heliports:
 - a. Locate the TLOF, FATO, and safety area at or above the highest point of the main structure and in positions that carry the prevailing winds away from the approach path.
 - b. Assess the air flow around the heliport using airflow and turbulence measuring equipment.
 - c. Establishing a 6-foot (1.8 m) or more air gap on all sides above the roof level will generally minimize the turbulent effect of air flowing over the roof edge.
 - i. If an air gap is included in the elevated heliport design, keep it free of objects that would obstruct the airflow.
 - ii. Where it is impractical to include an air gap or other turbulence mitigating design measures, operational limitations may be necessary under certain wind conditions.

3.2 **Compatible Land Use and Zoning.**

Controlling the use of property around the heliport, including the HPZ and the approach/departure path environment, and restricting activities around the heliport to those that are compatible with aircraft operations will ensure the long-term viability of the heliport.

3.2.1 Recommended Practices.

1. Promote the adoption of state and local measures such as zoning and/or the purchase of air rights and property easements.
2. Review general guidance on compatible land uses in AC 150/5190-4, *Airport Land Use Compatibility Planning*. While this is tailored to airports, many of the same issues will apply to heliports.
3. Plan for noise compatibility around the heliport.

3.3 **Selection of Approach/Departure Paths.**

Wind, obstructions, and environmental considerations impact the number and location of approach/departure paths. Create multiple approach/departure paths to increase flexibility and utility.

3.3.1 Wind.

3.3.1.1 **Standards.**

1. Use a wind analysis to determine the primary approach path to the heliport (AC 150/5300-13B, *Airport Design*, Appendix B).
 - a. The FAA recommends a data period covering at least the last ten consecutive years of wind observations for this analysis.
 - b. Include calm wind conditions in the wind data.
2. Align the preferred approach/departure paths with the predominant wind direction as much as possible to avoid downwind operations and keep crosswind operations to a minimum.
3. Provide at least two approach/departure paths that are reciprocal in magnetic heading or, when not feasible, are at least 135 degrees apart.
4. Ensure the primary approach/departure path alignment supports the performance envelope of the critical aircraft, recognizing that some aircraft may have limited crosswind capability and may require additional wind direction indicator placement.

3.3.1.2 **Design Consideration.**

If it is not feasible to provide complete coverage of wind conditions through multiple approach/departure paths, operational limitations may be necessary under certain wind conditions.

3.3.2 Obstructions.

Once established, 14 CFR Part 77 provides the standards for identifying obstructions to air navigation, and the FAA utilizes three such surfaces defined to evaluate and protect a public use heliport and a heliport with at least one FAA-approved instrument approach procedure: the primary surface, the approach and departure surface, and the

transitional surface. The FAA presumes obstructions to these 14 CFR Part 77 surfaces are hazards to air navigation unless further aeronautical study concludes otherwise.

3.3.2.1 Standard.

Mitigate obstructions to air navigation by realigning approach/departure paths or removal, lowering, marking, and lighting of obstructions.

3.3.2.2 Design Consideration.

Consider any proposed (future) obstructions near the heliport and those likely to be a hazard to air navigation.

3.3.3 Environmental Considerations.

Typical environmental considerations include wildlife, noise, electric tonal emissions, electromagnetic compatibility (EMC), and battery hazardous energy release impacts.

3.3.3.1 Standard.

Select the final approach/departure path(s) to minimize any environmental impact, providing it does not decrease flight safety.

3.4 Vertical Flight Infrastructure on Airports.

Operations can occur on existing airport infrastructure for its intended purpose or on dedicated infrastructure (helipad or aiming point). Airports may have operational or capacity constraints on their runways that require dedicated vertical flight infrastructure.

3.4.1 Siting on Airports.

When dedicated vertical flight infrastructure is determined necessary, it can be in the form of a helipad or vertical flight aiming point.

3.4.1.1 Standards.

1. Site this infrastructure in locations that do not interfere with airplane traffic and operations or impact capacity.
 - a. Site a helipad when required by the FAA for safety, operational, airspace, or infrastructure considerations.
 - b. Site a helipad when developing instrument flight rules (IFR) procedures to the helipad.
2. Ensure helipad lighting does not conflict with airport lighting.
3. Follow Chapter 6 for designing vertical flight aircraft parking positions on airports.

3.4.1.2 Recommended Practice.

Site vertical flight aiming points at facilities having no more than ten VFR piloted vertical flight operations per day.

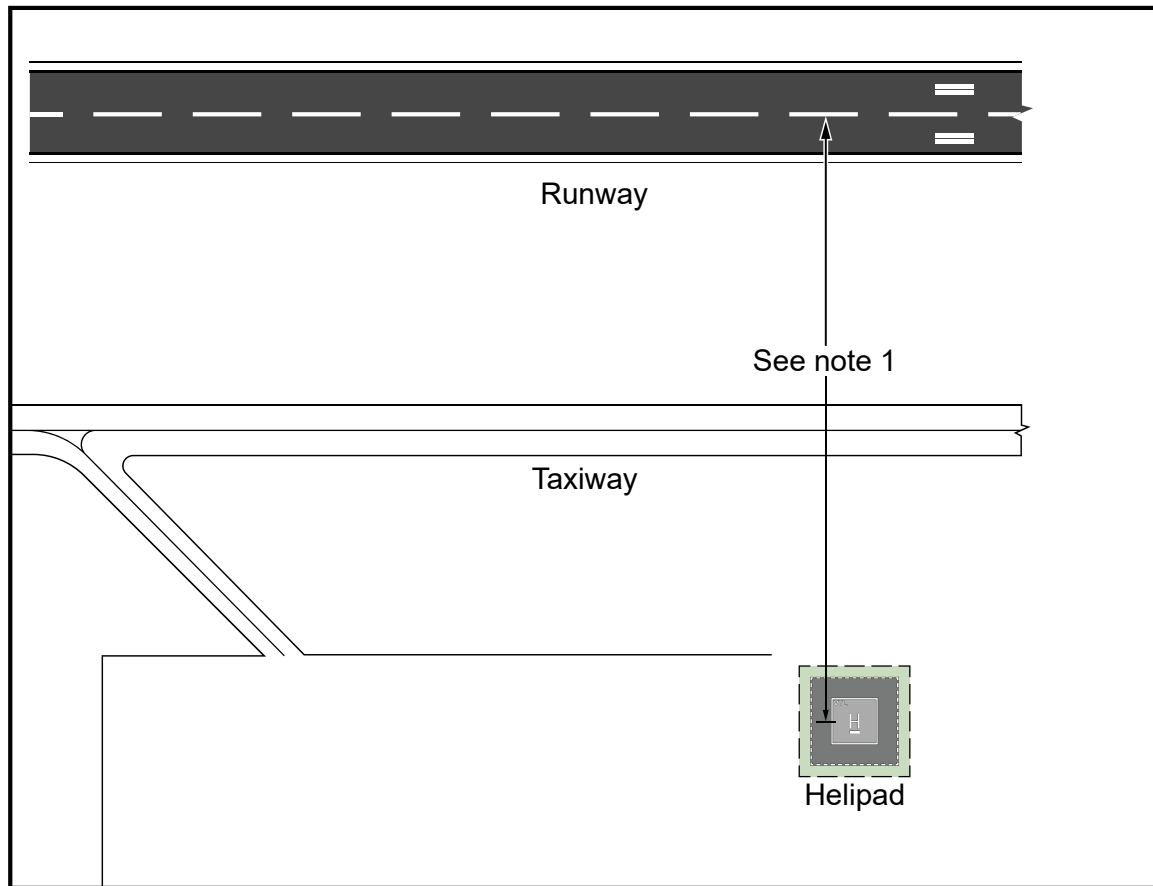
3.4.2 Helipads on Airports.

A helipad on an airport does not constitute a heliport. A helipad on an airport does not require an individual Loc ID and duplicate beacons. If an existing wind indicator is visible from the helipad, do not duplicate wind indicators. On 14 CFR Part 139 airports, helipads with access to the airfield via ground taxi are considered movement areas under 14 CFR Part 139.5. (**Note:** Not all movements are controlled by Air Traffic Control (ATC). This is determined through a Letter of Agreement (LOA) between the airport sponsor and the local air traffic facility.)

3.4.2.1 **Standards.**

1. Site on-airport helipads to avoid any interaction and/or conflicts with runways, runway safety areas, runway approach/departure surfaces, runway protection zone (RPZ), obstacle free zone (OFZ), and taxiways.
2. Size helipads to the most demanding characteristics of the aircraft expected to use the helipad according to the Chapter 4.
3. Include all helipad elements during design and development, including the DCA, HPZ, and parking area.
4. Design dedicated parking or taxiways to minimize interaction and/or conflict with airplane operations.
5. Markings distinguishing movement areas from nonmovement areas are located on the boundary between the two areas. See FAA AIM 2-3-6, *Other Markings*, and AC 150/5340-1, Standards for Airport Markings.
6. For simultaneous independent landings and takeoffs using VFR, the minimum separation between FATO center and a runway centerline is 700 feet (213 m) at a towered or non-towered airport (also when the tower is not operating) (Figure 3-1 and AC 150/5300-13).
7. With an operating control tower, the minimum separation for dependent landings and takeoffs under VFR is 300 feet (91 m) (Figure 3-1 and AC 150/5300-13).

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Figure 3-1. Example of an On-airport Helipad

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Note 1: See paragraph 3.4.2.1 for separation between FATO center and a runway centerline.

Note 2: Figure does not reflect every type of configuration.

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3.4.3 Aiming Points.

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Aiming points are marked positions on airports that serve as a specific location and visual cue for vertical flight aircraft to approach.

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3.4.3.1 **Standards.**

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1. Mark aiming points with an aiming point marking (paragraph 4.8.4).

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- a. The aiming point marking is an equilateral triangle with the bisector of one of the angles aligned with the preferred approach direction.

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- b. Inside the triangle is a marked **H** preceded by the number of the aiming point if there is more than one aiming point on the airport.

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2. Depict aiming points on the ALP and ensure a clear approach and departure surface for the most demanding aircraft expected to use the aiming point.

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3.4.4 Security.

Unless screening was carried out at the passengers' departure location, Transportation Security Administration regulations may require screening be provided before passengers enter the airport's secured areas of the terminal for connecting flights. Find information about passenger screening on the Transportation Security Administration website <https://www.tsa.gov/>.

3.5 **Air Traffic Considerations for Vertical Flight Infrastructure Siting.**

When selecting a site, understand how the following air traffic considerations may impact the proposed site operations. Failing to consider these in the site selection process may result in delays or operational limitations on the proposed site, reducing its operational efficiency. FAA Order JO 7110.65, *Air Traffic Control*, establishes applicable operating criteria which are applied to locate the site.

3.5.1 Impacts Due to Wake Turbulence Separation.

To avoid dangerous wake turbulence encounters, apply appropriate wake turbulence lateral and vertical separation between an airborne vertical flight aircraft and larger aircraft.

3.5.1.1 **Design Considerations.**

1. The closer a helipad FATO is to a runway, the more likely wake turbulence will impact its operations. As such:
 - a. A FATO located less than 2,500 feet (762 m) from the runway centerline may impact both runway and helipad operations. At this distance, the effects of wake turbulence must be mitigated for airborne vertical flight aircraft during simultaneous operations with most aircraft.
 - b. A FATO located 2,500 feet (762 m) or more from a runway centerline has the greatest potential for independent flight paths and minimal disruption to runway operations.
2. Vertical flight aircraft operating under VFR must be able to enter ingress/egress routes at an altitude at least 500 feet (152 m) above/below aircraft arriving or departing from the runway.
3. If the vertical flight aircraft is following or passing underneath a heavy/super aircraft, a minimum of 1,000 feet (305 m) separation is required.

3.5.2 Impacts Due to Missed Approach Procedures for Fixed-Wing Aircraft.

Many airports have instrument approach procedures to safely guide aircraft to land when cloud ceilings or visibility are reduced. One important component of an instrument approach procedure is the missed approach procedure. A missed approach procedure gives pilots instructions on how to proceed in case a safe landing cannot be continued. When an aircraft is on final approach, ATC ensures that the missed approach

procedure path is clear of other traffic. At airports with a significant number of operations, this can cause additional delays to vertical flight aircraft arriving or departing the helipad.

3.5.2.1 Standard.

Coordinate with the affected air traffic facility to identify and account for any published and non-published local missed approach procedures.

3.5.3 Impacts Due to Departure Procedures.

Existing Area Navigation (RNAV) instrument departures (or other departure procedures) allowing aircraft to fly headings that diverge from the runway centerline may limit arrival/departure flexibility from the helipad and must be assessed on a site-specific basis.

3.5.4 Impacts Due to Visual Flight Pattern.

Airports have established visual traffic patterns to better organize the flow of VFR aircraft arrivals and departures. These traffic patterns are typically 1,000 feet (305 m) AGL and can be on either side of a runway.

At airports with a significant number of VFR operations, the visual traffic pattern can become congested, with numerous aircraft in the pattern simultaneously. For this reason, a helipad that is located below the visual traffic pattern may experience additional delays as controllers sequence vertical flight aircraft arrivals and departures with aircraft in the visual traffic pattern.

3.5.5 Heliport Location Off the End of Airport Runways.

Heliports located near the approach or departure end of an airport runway may present significant challenges for ATC.

3.5.5.1 Design Consideration.

Locations closer to the runway arrival threshold or departure ends will present greater difficulty than those farther away and incur more delays and/or operational restrictions.

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CHAPTER 4. Heliport Design

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This chapter provides guidance on the design of heliports and helipads based on the critical aircraft chosen.

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Design Approach.

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A heliport consists of the following:

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1. A TLOF that is typically located within a FATO but can be located separate from the FATO. See paragraph 4.2.

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2. A FATO where arriving aircraft terminate their approach and from which departing aircraft take off. See paragraph 4.3.

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3. A safety area which surrounds the TLOF and FATO. See paragraph 4.4.

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4. An HPZ, which is recommended for all heliports and required for those with IFR procedures. See paragraph 4.5.

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5. A DCA, which is an operational area in effect when aircraft are operating. See paragraph 4.6.

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6. Approach/departure surfaces to allow safe approaches to and departures from the FATO. See paragraph 4.7.

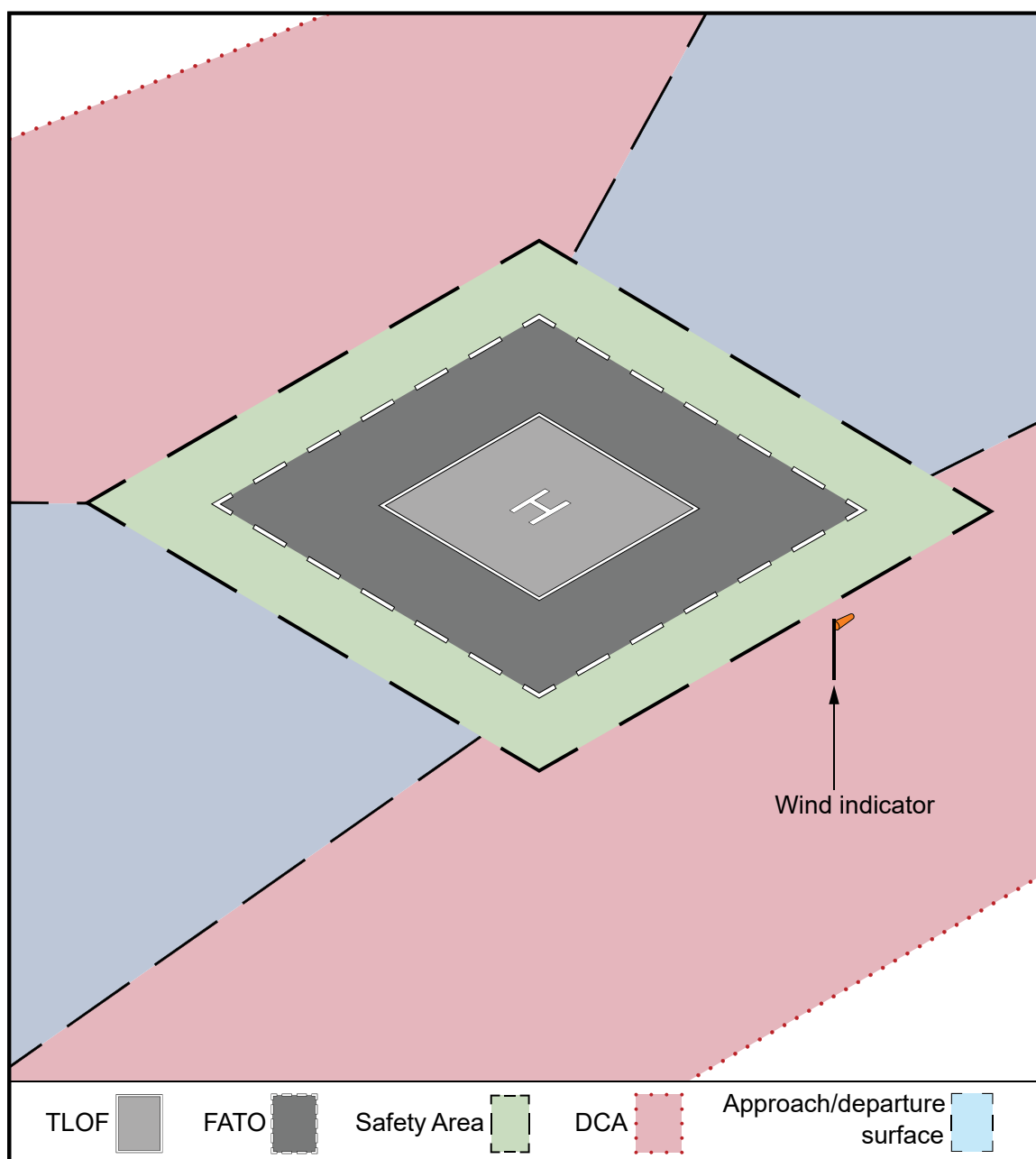
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The design standards in this chapter assume that there will never be more than one aircraft within the FATO and its associated safety area. See Figure 4-1 and Figure A-1.

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Figure 4-1. Basic Heliport Features

Note 1: The DCA is an operational area. See paragraph 4.6 for more information.

Note 2: See paragraph 4.11 for guidance on wind indicators.

Note 3: See paragraph 4.8 for guidance on heliport markings.

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4.2 Touchdown and Liftoff Area (TLOF).

The TLOF is a load-bearing, generally paved, area on which the aircraft performs a touchdown or liftoff.

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4.2.1 Standards.

1. Every heliport has at least one TLOF. The TLOF can be at ground level or elevated (e.g., on top of a building).
2. A TLOF is considered elevated if it is located on a building top or other elevated structure where the TLOF and associated FATO are at least 30 inches (0.8 m) above the surrounding surface.

4.2.1.1 **Location.**

1. Locate the TLOF on the ground, elevated structures, water-based vessels, or water-based stationary structures.
2. Every TLOF is associated with at least one FATO, with the TLOF either located within a FATO or separate from it.
3. When located within the FATO, the TLOF is centered within the FATO and along the major axis of the FATO.
4. When located separately from the FATO, the TLOF is centered within its own safety area.
5. The TLOF can be located separately from the FATO on ground or water-based facilities only if there are sufficient unobstructed area and airspace for the aircraft to air/hover taxi from the FATO to the TLOF.
6. Avoid TLOF locations that direct engine exhaust or DWOW into fresh air intakes or pedestrian areas.

4.2.1.2 **Obstructions.**

1. Design the TLOF to be free of any penetrations.
2. Locate the TLOF so that surrounding buildings, structures, terrain, and rooftop elements do not create adverse turbulence, recirculating downwash, or line of sight issues for the aircraft during hover, approach, and departure.

4.2.1.3 **Shape.**

1. A TLOF may be circular, square, or rectangular in shape.
2. Design the TLOF with the same shape as the FATO and safety area, with the exception that a FATO and safety area can be rectangular with a square TLOF.

4.2.1.4 **Size.**

1. The minimum TLOF size is 1 RD+10 feet (3 m) (length and width or diameter) which assumes the environmental conditions allow the aircraft to HOGE.
2. Review the critical aircraft's flight/operating manual for specified aircraft dimensions and facility requirements because it may provide

minimum sizes required for operations that are bigger than shown here.

3. The separation between the TLOF and FATO perimeters is a minimum of 0.34 D.
4. For elevated heliports, if the FATO is not load-bearing, increase the TLOF length and width or diameter by 20 percent.

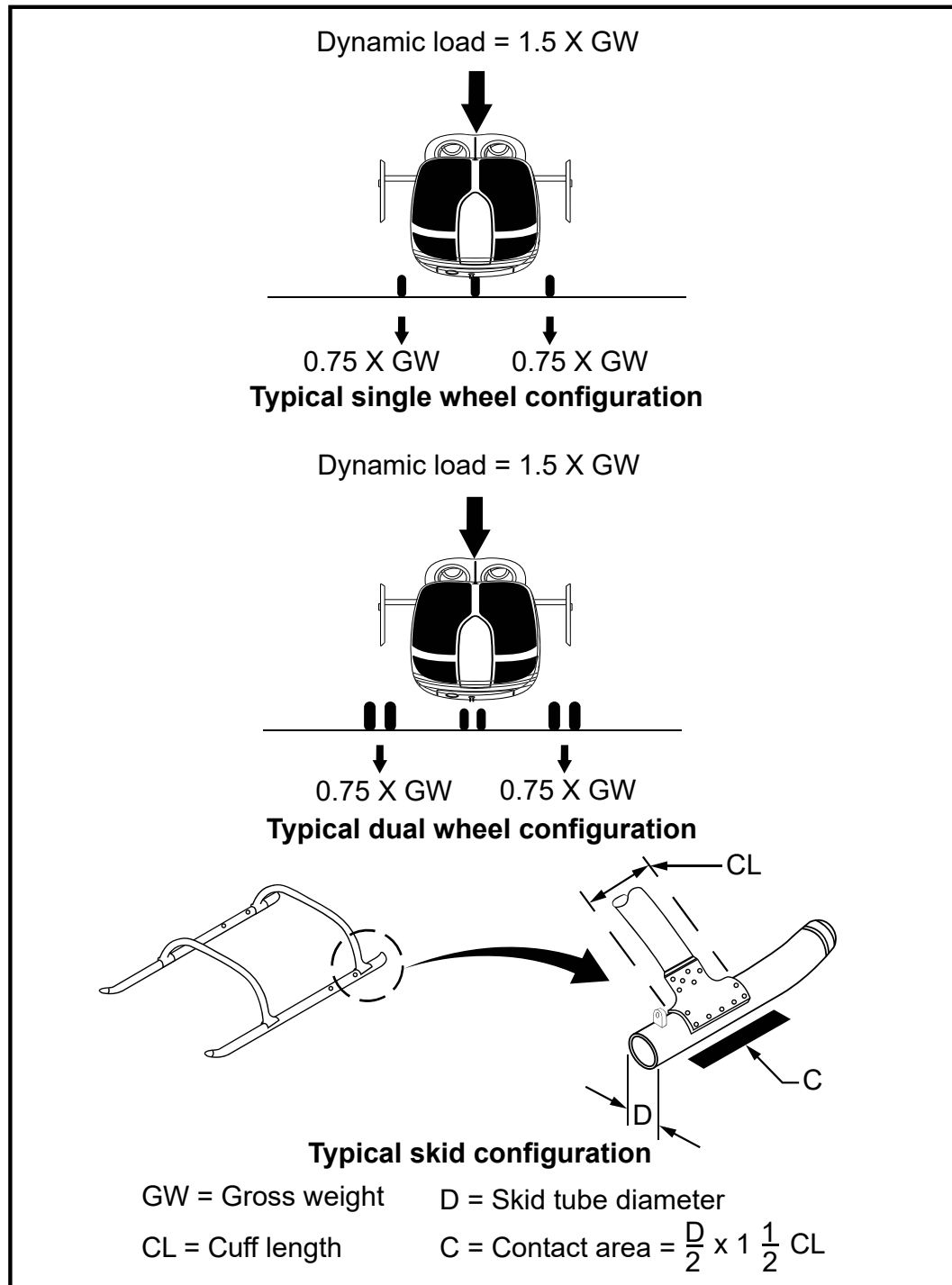
4.2.1.5 **Design Loads.**

1. Design the TLOF to support the dynamic loads of the critical aircraft, its downwash, and the static loads of any ground support vehicles (see paragraph 1.3).
2. Design the pavement to handle the distribution of an aircraft's weight over a larger area of the subsurface (Figure 4-2).

4.2.1.6 **Surface Characteristics.**

1. Design and construct the TLOF with either a paved or aggregate-turf surface (see AC 150/5370-10, *Standard Specifications for Construction of Airports*, Items P-217, Aggregate-Turf Pavement, and P-501, Cement Concrete Pavement).
2. Use a roughened pavement finish (e.g., brushed or broomed concrete) to provide a skid-resistant, non-slippery surface.
3. Design elevations between any paved and unpaved portions of the TLOF and FATO to be equal.
4. Stabilize the surface to prevent erosion or damage from rotor/propeller DWOW. (Find guidance on pavement design and soil stabilization in AC 150/5320-6, *Airport Pavement Design and Evaluation*, and AC 150/5370-10.)
5. For rooftop and other elevated heliports, construct TLOFs of aluminum, metal, or concrete (or other materials subject to local building codes).
6. If the surface is metal, insulate or ground it to the extent feasible to eliminate the threat of conducting electricity in the case of a short circuit or lightning strike.

Figure 4-2. Vertical Lift Aircraft Landing Gear Loading: Gradients and Pavement



4.2.1.7 Gradient.

1. Design the TLOF to provide for positive drainage by using a negative gradient between 0.5% and 2%.
2. Provide a 10-foot (3 m) wide rapid runoff shoulder at the edge of the TLOF at a negative 3-5% gradient.

4.2.2 Recommended Practices.

1. Increasing the size of the TLOF may provide enhanced safety and operational advantages for all aircraft including those that need HIGE and when sited at higher elevations.
2. Portland cement concrete (PCC) is preferred.
 - a. An asphalt surface may rut under the wheels or skids of a parked aircraft.
 - b. In hot conditions sections of asphalt may adhere to an aircraft's skids only to fall off after takeoff, creating a hazard to vehicles, buildings, and people on the ground.

4.2.3 Design Considerations.

1. On elevated TLOFs, elevators, cooling towers, exhaust vents, fresh-air vents, and other elevated features can affect heliport operations.
2. A square TLOF may provide the pilot with better alignment cues than a circular shape.²
3. A circular TLOF may be more recognizable in an urban environment.

4.3 Final Approach and Takeoff Area (FATO).

A heliport has at least one FATO. The FATO is where arriving aircraft terminate their approach and departing aircraft take off from. The FATO size is a function of the critical aircraft and environmental factors.

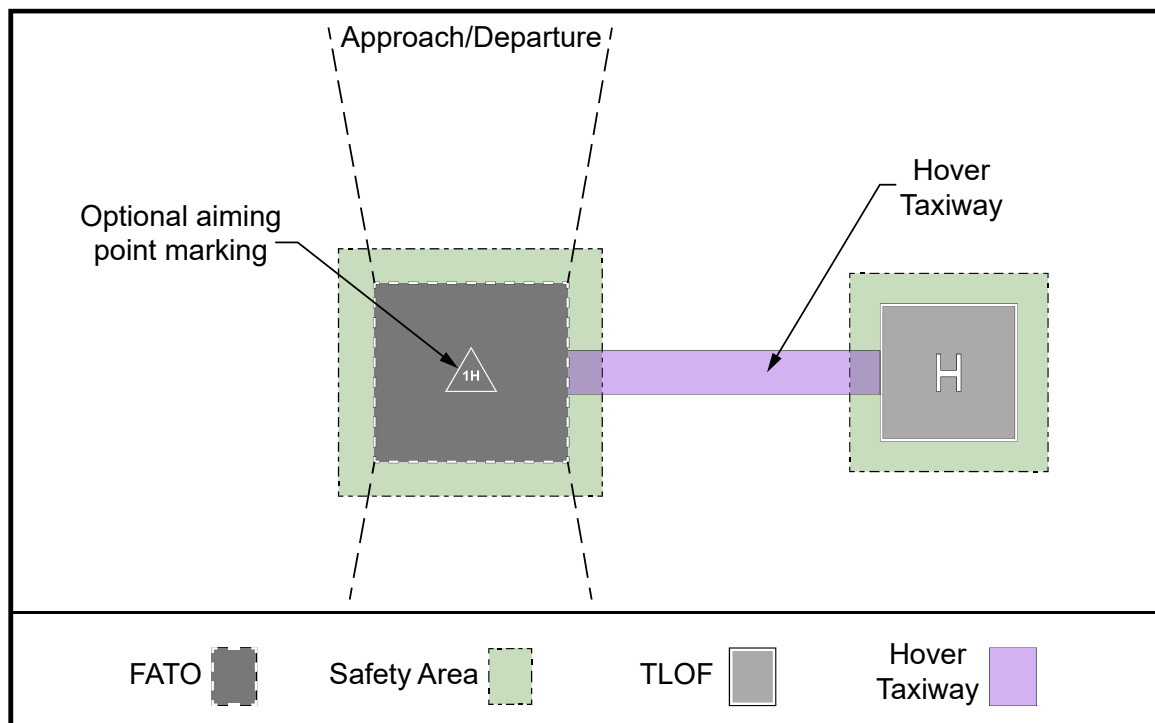
4.3.1 Standards.**4.3.1.1 Location.**

1. A FATO is at ground level, elevated or, when non-load-bearing, over clear airspace or water.
2. A FATO is located with a TLOF or separate from a TLOF.

² In 2011, the National EMS Pilots Association (NEMSPA) conducted a survey of 1,314 emergency medical service (EMS) pilots and found that the square was the preferred visual cue for judging aircraft closure rate, altitude, attitude, and angle of approach. It was rated higher than a circle, triangle, or octagon.

- a. When the FATO is separate from a TLOF, it is known as an aiming point.
- b. Mark aiming points on an airport (Figure 4-3).
3. Center a FATO within its own safety area.
4. Design a FATO to be at least 200 feet (61 m) from another FATO and ensure the corresponding approach/departure paths do not conflict.
5. If a heliport has more than one FATO, separate the perimeters of the two FATOs so the respective safety areas do not overlap.
6. Avoid FATO locations that direct engine exhaust or downwash into fresh air intakes or pedestrian areas.

Figure 4-3. Example of TLOF Separate From FATO



4.3.1.2 Obstructions.

1. Design the FATO to be clear with no penetrations or obstructions except for navigational aids that are fixed-by-function (e.g., flight path alignment marking and lighting, approach lighting, TLOF lights).³

³ An air navigational aid that must be positioned in a particular location to provide an essential benefit for aviation is fixed-by-function. See [AC 150/5300-13](#).

2. Ensure fixed-by-function equipment is of the lowest mass practicable and on frangible mounts.
3. Locate any object on frangible mounts no higher than 2 inches (51 mm) above the adjacent TLOF elevation (see AC 150/5220-23, *Frangible Connections*).

4.3.1.3

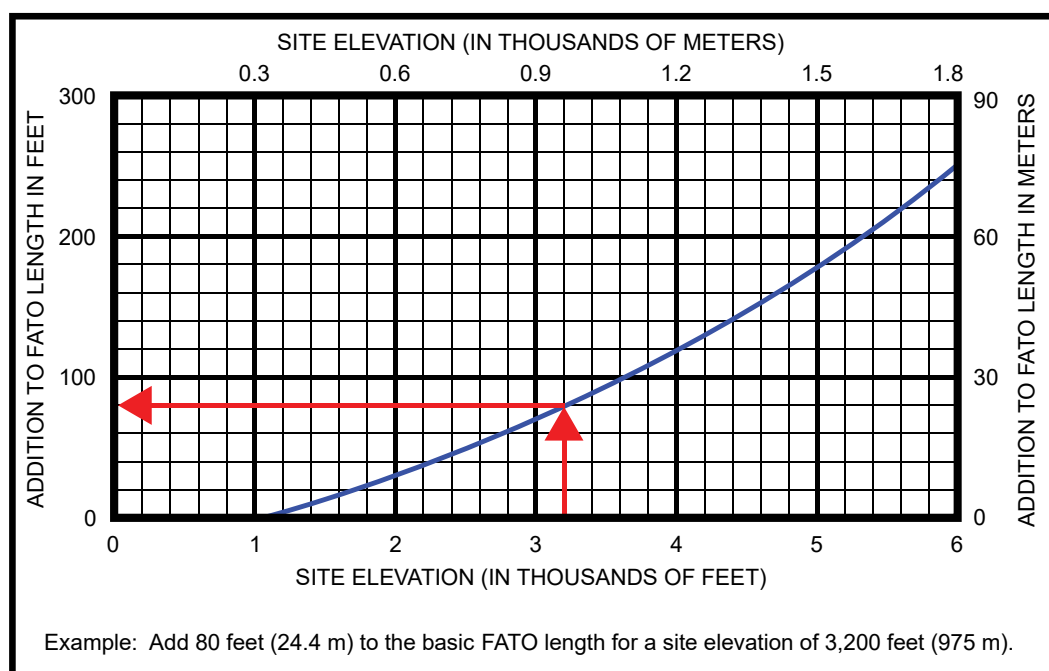
Shape.

Design a FATO to the same geometric shape as the TLOF except for the elongated FATO, where the FATO can be rectangular with a square TLOF.

4.3.1.4

Size.

1. The minimum FATO size is 1.5 D (length and width or diameter) which assumes the environmental conditions allow the aircraft to HOGE.
2. Review the critical aircraft's flight/operating manual for specified aircraft dimensions and facility requirements because it may provide minimum sizes required for operations that are bigger than shown here.
3. If the FATO is elongated, maintain 1.5 D as the width for the entire length.
4. The minimum separation between the TLOF and FATO perimeters is 0.34 D.
5. Design the FATO to accommodate the critical aircraft size, ground effect performance, and climate.
6. Design the distance between the opposing sides of the FATO and the safety area perimeters to be equidistant.
7. Design the distance between the opposing sides of the FATO and the TLOF perimeters to be equidistant if the TLOF is inside of the FATO.
8. For heliports at elevations above 1000 feet (305 m) MSL, provide the additional FATO length required (Figure 4-4).

Figure 4-4. Additional FATO Length for Heliports at Higher Elevations**4.3.1.5 Design Loads.**

1. Design any part of the FATO intended to provide HIGE to meet load-bearing standards outlined below.
 - a. Design FATOs to support the dynamic loads of the critical aircraft, its downwash, and the static loads of any ground support vehicles (see paragraph 1.3).
 - b. The load-bearing capability is not needed for an elevated heliport when a pinnacle-type departure is used to produce lift instead of HIGE.

4.3.1.6 Surface Characteristics.

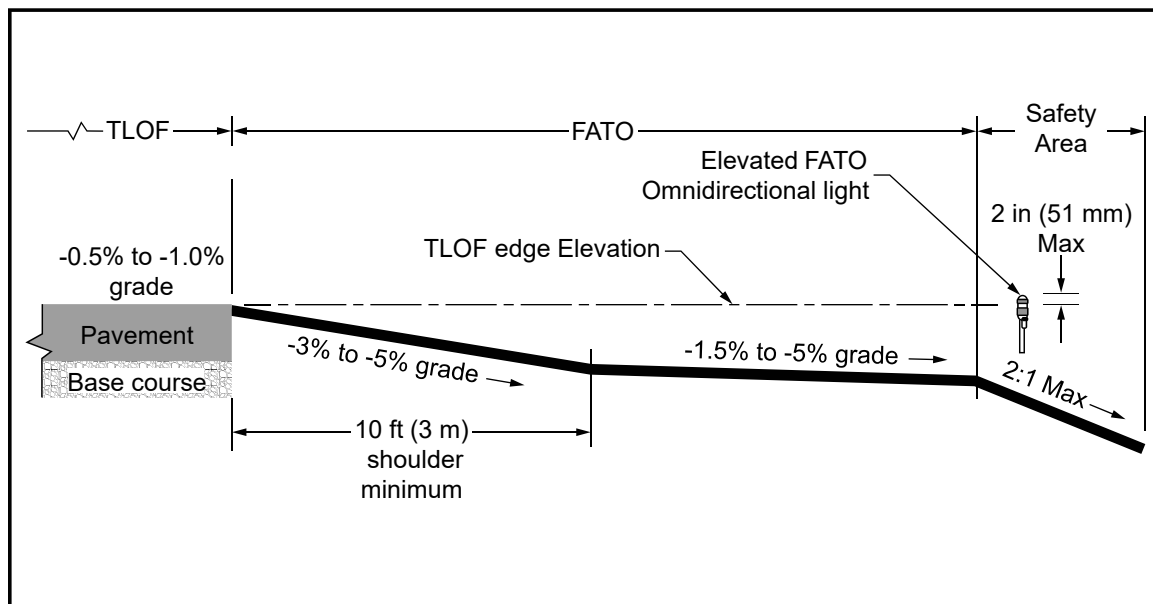
1. Design the edge of the FATO abutting the TLOF to be the same elevation as the TLOF.
2. For elevated heliports, design the FATO to be above the level of any obstacle in the safety area that are fixed-by-function and cannot be removed.
3. Design the FATO surface to prevent erosion, loose stones, and any other flying debris caused by propulsion system DWOW.
4. When load-bearing, provide either a paved or aggregate-turf surface (see AC 150/5370-10, Items P-217, Aggregate-Turf Pavement, and P-501, Cement Concrete Pavement).

5. If the surface is metal, insulate or ground it to the extent feasible to eliminate the threat of conducting electricity in the case of a short circuit or lightning strike.
6. Design elevations between any paved and unpaved portions of the FATO to be equal.

4.3.1.7 Gradient.

1. Design the gradient to provide positive drainage (between 1.5 and 5.0 percent) off and away from the pavement, with a minimum 10-foot (3 m) wide rapid runoff shoulder sloped between 3.0 and 5.0 percent, as shown in Figure 4-5.
2. Design a negative gradient of not more than 2 percent in any areas where an aircraft is expected to land.
3. Meet NFPA 415 requirements if edge drains are used.

Figure 4-5. Heliport Gradients and Rapid Runoff Shoulder



Note 1: The slope direction is based on the topography of the site.

Note 2: Grade the TLOF, FATO, and safety area to provide positive drainage of the entire area for the TLOF, FATO, and safety area.

Note 3: 2:1 maximum safety area gradient for heliports at ground level or where applicable at elevated structures.

4.3.2 Recommended Practices.

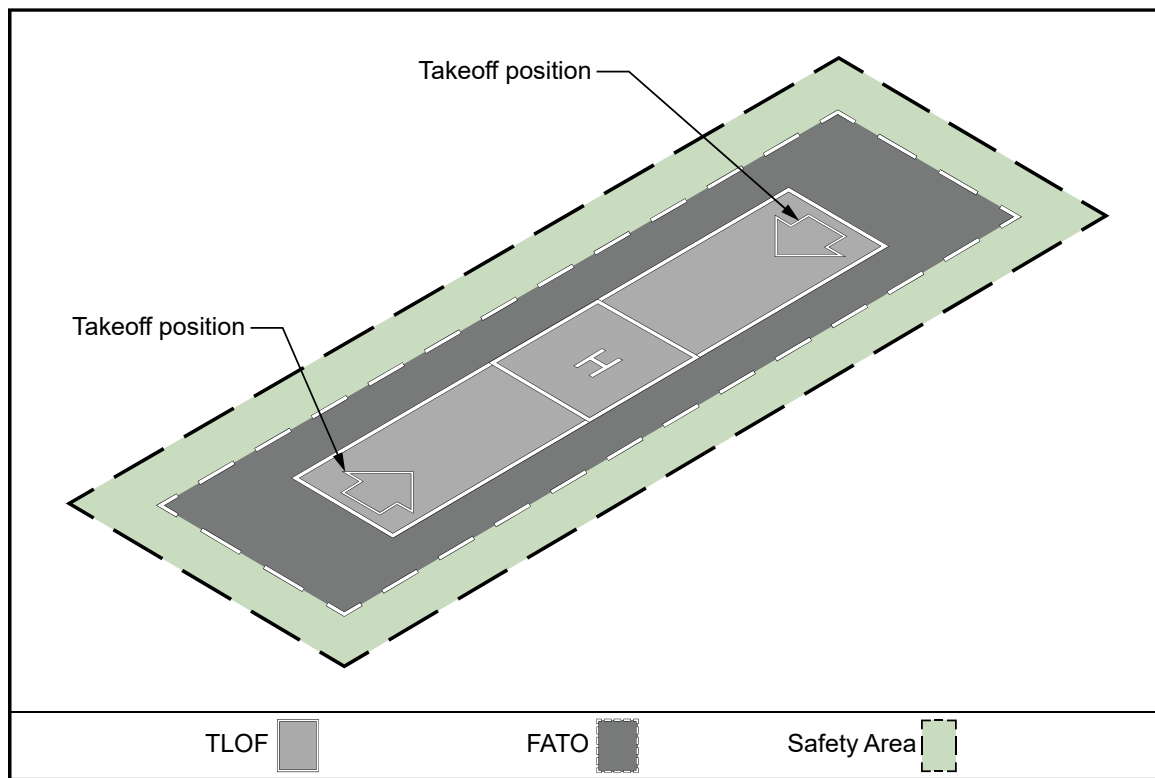
1. Locate the FATO so there are no obstacles (e.g., buildings, structures) in its vicinity that could cause turbulence or difficulties with aircraft maneuvering on takeoff and landing.

2. Increasing the size of the FATO may provide enhanced safety and operational advantages for all aircraft including those that need ETL (Figure 4-4).
3. PCC is preferred for hard surfaces.
 - a. An asphalt surface is less desirable because it may rut under the wheels or skids of a parked aircraft, which has been a factor in some rollover accidents.
 - b. In hot conditions sections of asphalt may adhere to an aircraft's skids only to fall off after takeoff, creating a hazard to vehicles, buildings, and people on the ground.
4. Use a roughened pavement finish (e.g., brushed or broomed concrete) to provide a skid-resistant, non-slippery surface.

4.3.3 Design Considerations.

1. Aircraft performance characteristics, like HOGE, and environmental factors (e.g., elevation, density altitude, temperature, humidity, etc.) will influence the needed FATO length.
2. An elongated FATO provides for enhanced safety and operational flexibility by improving obstruction clearance both longitudinally (along the approach/departure surfaces) and laterally (due to the longer transitional surfaces) (Figure 4-6).

Figure 4-6. Elongated TLOF and FATO with Two Takeoff Positions



4.4 Safety Area.

A safety area always surrounds the FATO. If the TLOF is separate from the FATO, a safety area also surrounds the TLOF.

4.4.1 Standards.

4.4.1.1 **Location.**

Design a safety area to be at ground level, elevated, over clear airspace, or over water.

4.4.1.2 **Obstructions.**

Design the safety area to be clear of objects projecting above the elevation of the FATO except for navigational aids that are fixed-by-function (e.g., flight path alignment marking and lighting, approach lighting, TLOF lights).⁴ Any fixed-by-function equipment must be on frangible mounts (AC 150/5220-23).

4.4.1.3 **Shape.**

Design the safety area to be the same geometric shape as whichever area it surrounds (i.e., TLOF or FATO).

4.4.1.4 **Size.**

1. Add a 0.28 D, but not less than 20 feet (6.1 m), safety area to all sides of the FATO or all sides of the TLOF if the FATO is separate from the TLOF.
2. Design the distance between the opposing sides of the safety area and TLOF or FATO perimeters to be equidistant regardless of the shape of the safety area.
3. Increase the size of the safety area by 10 feet (3 m) when the standard heliport identification symbol **H** is not used (paragraph 4.8.1).

4.4.1.5 **Surface Characteristics.**

Design the surface to prevent loose stones and any other flying debris caused by downwash or outwash.

4.4.1.6 **Gradient.**

1. Ensure the gradient provides positive drainage away from the FATO no steeper than 2:1, horizontal units and vertical units, respectively (Figure 4-5).

⁴ An air navigational aid that must be positioned in a particular location to provide an essential benefit for aviation is fixed-by-function. See AC 150/5300-13.

2. Meet NFPA 415 if edge drains are used.

4.4.2 Recommended Practice.

Locate the safety area so there are no obstacles (e.g., buildings, structures) in its vicinity that could cause turbulence or difficulties with aircraft maneuvering in crosswind conditions.

4.4.3 Design Consideration.

For hospital heliports only, the minimum safety area may be reduced by 5 feet (1.5 m) on all sides if it is not practicable to meet the standard size.

4.5 **Heliport Protection Zone (HPZ).**

The FAA recommends establishing an HPZ for each approach/departure surface. The HPZ is intended to enhance the protection of people and property on the ground. This is best achieved through heliport owner control over the HPZ.

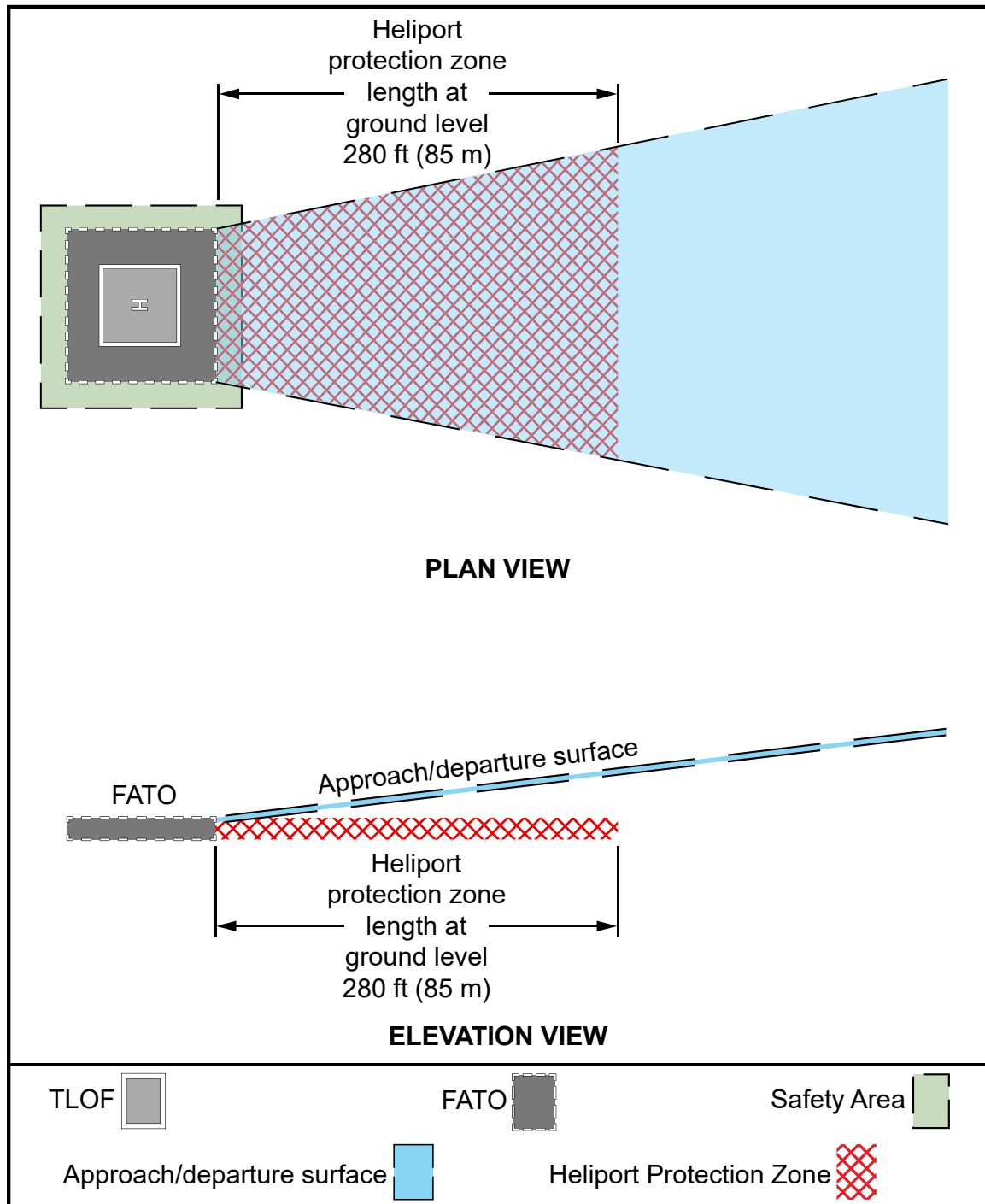
4.5.1 Standards.

1. Design the HPZ to be under the approach/departure surface starting at the FATO perimeter and extending outward 280 feet (85 m) (Figure 4-7).
2. Periodically evaluate and clear the HPZ of incompatible objects and activities.
3. Do not locate hazardous materials, including fuel, electric charging, compressed oxygen, or other hazardous materials, within the HPZ.
4. Do not locate residences and places of public assembly in an HPZ (examples: churches, schools, hospitals, office buildings, parking lots, shopping centers, and other uses with similar concentrations of people).

4.5.2 Recommended Practice.

In urban areas where space may be limited, the FAA encourages the heliport owner to control the maximum HPZ area where practical.

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Figure 4-7. Heliport Protection Zone

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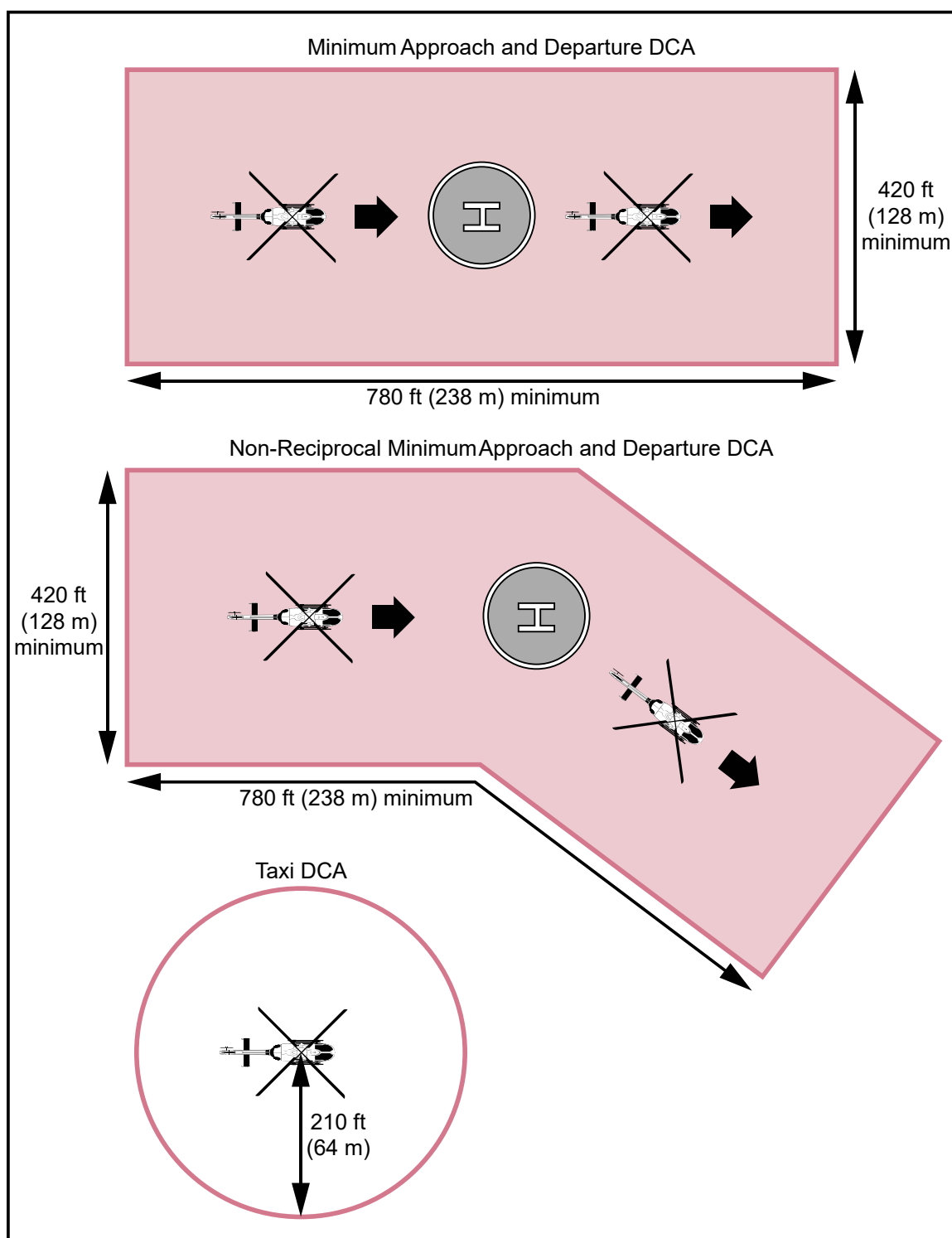
4.6 Downwash/Outwash Caution Area (DCA).

Downwash is the airflow created by the propulsion units producing lift in vertical flight. When the downwash hits the ground, it moves horizontally as outwash. The DWOW created from the propulsion units of aircraft can be dangerous to people, property, equipment, and other aircraft. This downward and outward flow can result in ground surface erosion, wake recirculation, foreign object debris (FOD) and wind hazards. Air velocities of approximately 34.5 mph (55.5 kph) or greater can impact heliport safety⁵.

4.6.1 Standards.

1. Establish DCAs anywhere that DWOW wind velocity can potentially meet or exceed 34.5 mph (55.5 kph).
2. Design DCAs in the form of operational boundaries, or areas of restriction/control on movement of people during aircraft operations.
3. The DCA is in effect during any aircraft operations creating DWOW.
4. Design the DCA size to accommodate all aircraft types operating at the facility that will generate the strongest DWOW effect.
 - a. Use the greatest anticipated DWOW effect to determine distances used in the design considerations, signage, or movement restrictions.
5. For aircraft 7,000 lbs and lighter, design the DCA to be a minimum of 420 feet (128 m) wide and 780 feet (238 m) long centered on the TLOF/FATO under each approach and departure surface (Figure 4-8).
6. For aircraft 7,000 lbs and lighter, attach a 210-foot (64 m) radius DCA centered on the aircraft to wherever the aircraft will taxi (Figure 4-8).

⁵ Rotorwash Analysis Handbook, Federal Aviation Administration, 1994, p. 317, "...the majority of rotorwash-related mishaps can be avoided if separation distances are maintained so that impacting rotorwash-generated velocities do not exceed 30 to 40 knots across the ground."

Figure 4-8. DCA

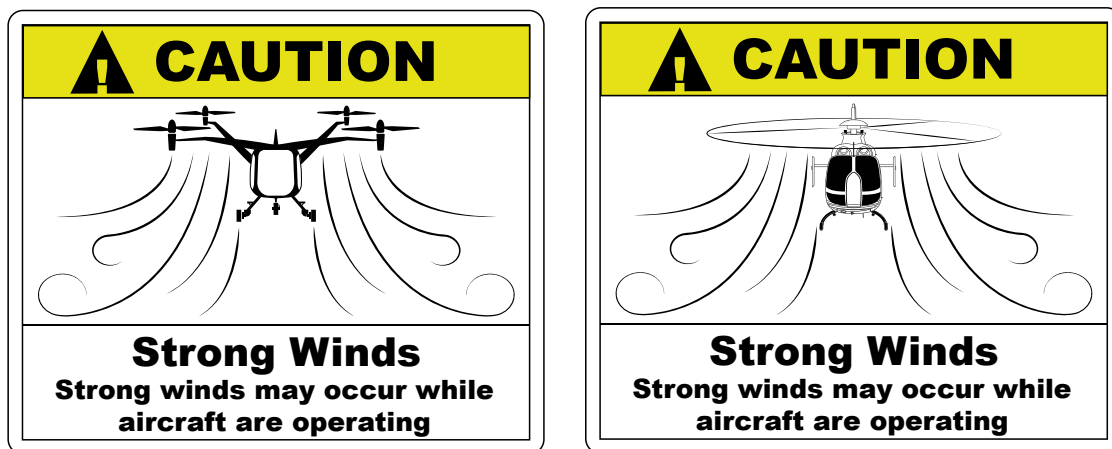
4.6.2 Recommended Practices.

1. Design and manage heliport development, landscaping, and other facility elements located inside the DCA to mitigate objects that can become FOD or projectiles,

protecting the aircraft and people from injury (examples of mitigation include tying down aircraft in the DCA, securing loose objects, restricting access to only trained individuals).

2. The primary way to mitigate the risks of DWOW to bystanders is to physically prohibit them from entering the DCA while it is in effect.
3. Since the DCA can extend beyond the boundaries of the heliport itself, take appropriate measures to mitigate the risks of DWOW in these areas.
4. Use DCA caution signage to provide situational awareness (Figure 4-9).

Figure 4-9. DCA Caution Sign Examples



4.6.3 Design Considerations.

1. The DWOW of an aircraft flying a shallow slope will impact the ground more than the DWOW of an aircraft on a steeper slope.
2. When designing the DCA consider that DWOW is not restricted to the hover-over-the-landing point, DWOW will also be prevalent wherever the aircraft is operating, including while taxiing and in parking areas.
3. A heliport may require supervision of vehicular and pedestrian traffic during aircraft movements, provision of robust maintenance and FOD prevention processes, and protecting the DCA from future development.
4. Consider the as-built environment around the heliport because certain types of structures or moveable objects like vehicles may result in narrow venturi effect channels where the DWOW velocity is increased.
5. Ensure that any measures do not become obstacles or promote an undesired venturi effect, which may increase risk to both bystanders and aircraft.
6. Winds recirculating back to the aircraft can impact control inputs, particularly during critical phases of flight, and structures near the TLOF can create turbulence patterns that may not be reflected by wind indicators.

4.7 VFR Approach/Departure Surfaces and Obstruction Identification.

The approach, departure, and transitional surfaces provide clear airspace to allow safe approach and departure to and from the FATO. A heliport approach/departure surface (herein referred to as “approach surface”) may be different from approach preservation surfaces found in the 14 CFR Part 77 and used by the FAA for obstruction identification (see paragraph 4.7.2). The approach slope flown by vertical flight aircraft may be shallower than this slope, especially if the aircraft needs HIGE because of takeoff weight, outside air temperature, or altitude or the aircraft has been certified in the powered lift category. While the maximum approach surface for a heliport is 8:1 and this is the only slope the FAA considers when evaluating obstructions under 14 CFR Part 77, a heliport sponsor may choose to design a shallower approach slope.

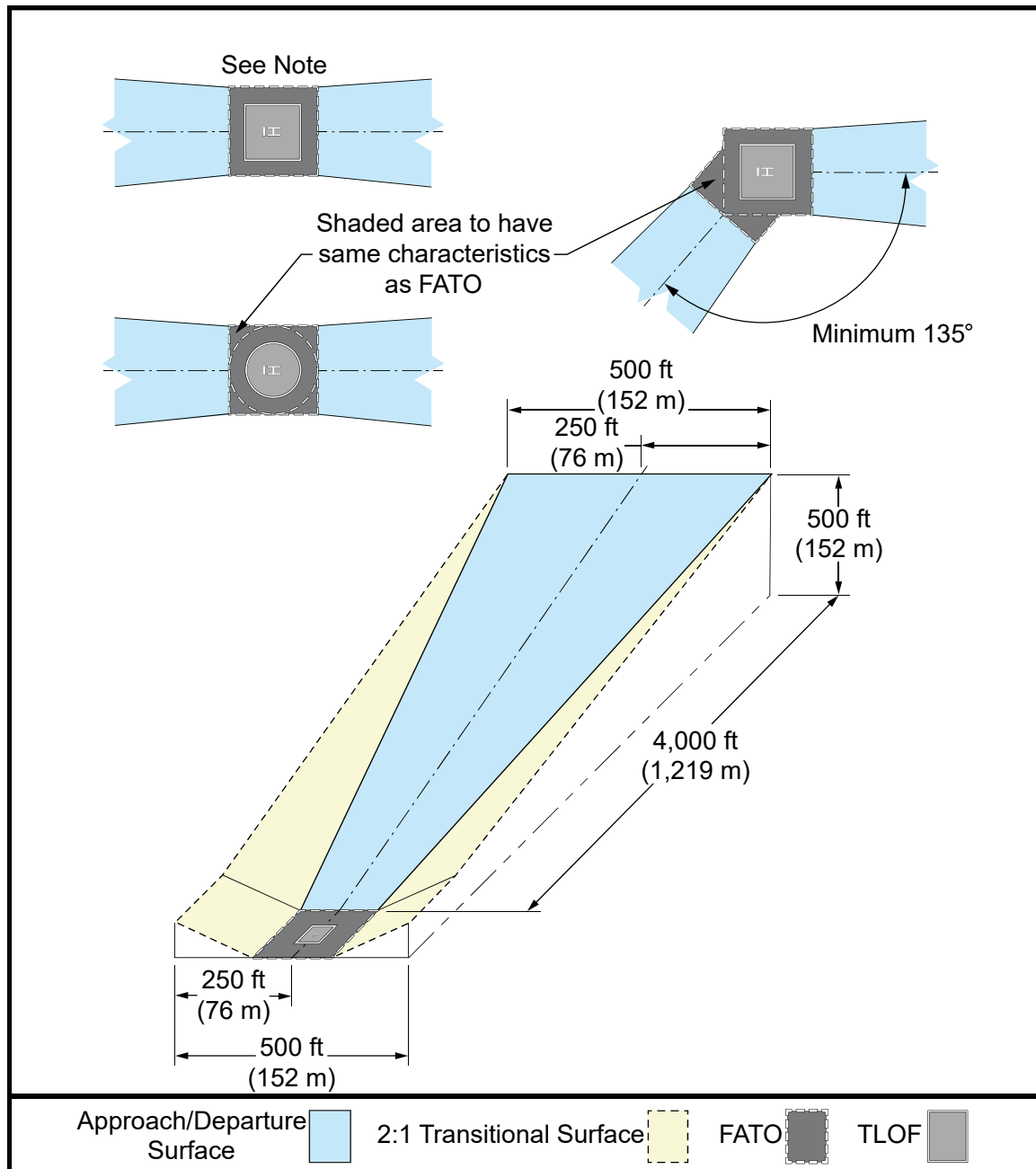
VFR approach and departure surfaces may be curved; however, only the straight VFR approach/departure and transitional surfaces are addressed in 14 CFR Part 77, *Safe, Efficient Use and Preservation of the Navigable Airspace*. Therefore, while they may be used, curved approaches are not evaluated by the FAA for the effect of objects (temporary or permanent, existing or new) on aeronautical operating procedures. These curved approaches are also not considered in aeronautical charting for new objects.

4.7.1 Approach Surface.

4.7.1.1 **Standards.**

1. The primary surface is a horizontal plane at the elevation of the established heliport elevation that coincides in size and shape with the designated FATO.
2. Design the approach surface to begin at the edge of the primary surface (edge of the FATO) with the same width as the FATO and extending outward and upward for a horizontal distance of 4,000 feet (1,219 m) where its width is 500 feet (152 m) (Figure 4-10).
3. The maximum approach surface slope for ingress and egress to the FATO is 8:1 (horizontal units and vertical units, respectively).

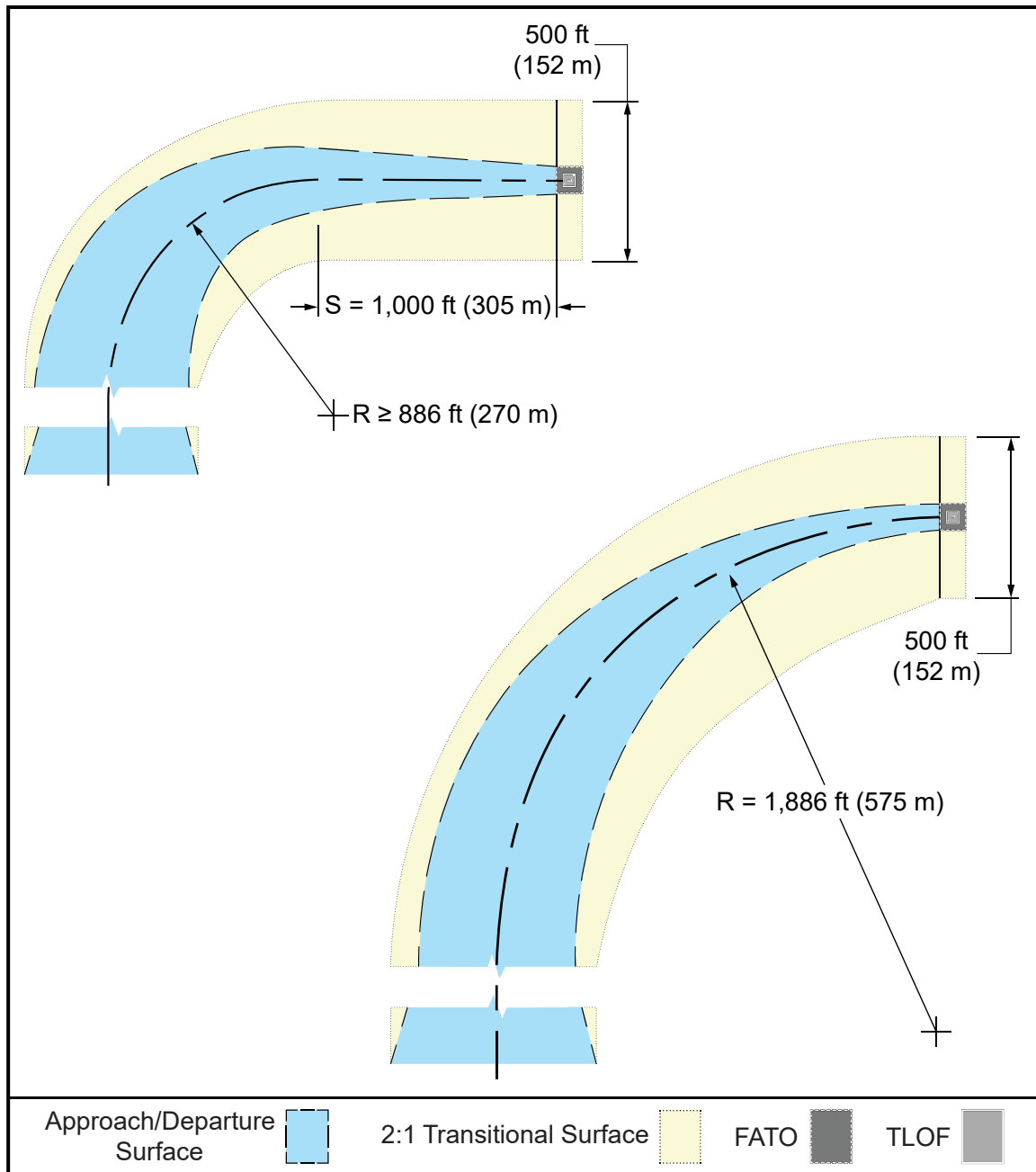
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Figure 4-10. VFR Heliport Approach/Departure and Transitional Surfaces

Note: The preferred approach/departure surface is based on the predominant wind direction. Where a reciprocal approach/departure surface is not possible in the opposite direction, use a minimum 135-degree angle between the two surfaces.

4. If the critical aircraft is powered lift, the maximum approach surface is 15:1 or shallower.
 - a. Slopes shallower than the 14 CFR Part 77.23(b) 8:1 obstruction preservation surface are not evaluated by the FAA and are not considered in aeronautical charting for new objects.
 - b. Note any approach surface slopes shallower than the 8:1 through the ADIP system.
5. The heliport sponsor defines the approach surface slope (e.g., 8:1, 15:1 or 20:1).
6. The transitional surfaces start from the edges of the FATO parallel to the flight path centerline, and from the outer edges of the approach surface and extends outwards at a slope of 2:1 (2 units horizontal in 1 unit vertical) for 250 feet (76 m) from the centerline or the primary and approach surfaces.
7. The transitional surfaces extend longitudinally from the edge of the FATO to the far end of the approach surface.
8. Ensure the approach, transitional, and primary surfaces are clear of penetrations (except for navigational aids that are fixed-by-function) unless an FAA aeronautical study determines any penetrations to these surfaces are not hazards (see paragraph 4.7.2).
9. Design these paths to use the airspace above public lands, such as freeways, railroads, lakes, or rivers where feasible.
10. When including a curved portion in the approach path:
 - a. Confirm the sum of the radius of the arc defining the centerline and the length of the straight portion originating at the FATO is not less than 1,886 feet (575 m) (Figure 4-11).
 - b. Design the approach path so the minimum radius of the curve is 886 feet (270 m) and that the curve follows a 1,000-foot (305 m) straight section.
 - c. Design the approach path so the combined length of the centerline of the curved portion and the straight portion is 4,000 feet (1,219 m).

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Figure 4-11. VFR Curved Approach/Departure and Transitional Surfaces1325
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Note: The minimum total length of the centerline of the straight and curved portion is 4,000 feet (1,219 m).

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4.7.1.2 Recommended Practices.

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1. Designing a 15:1 or 20:1 slope supports a greater fleet mixture of vertical flight aircraft than the maximum 8:1 providing for more demanding aircraft and environmental factors.

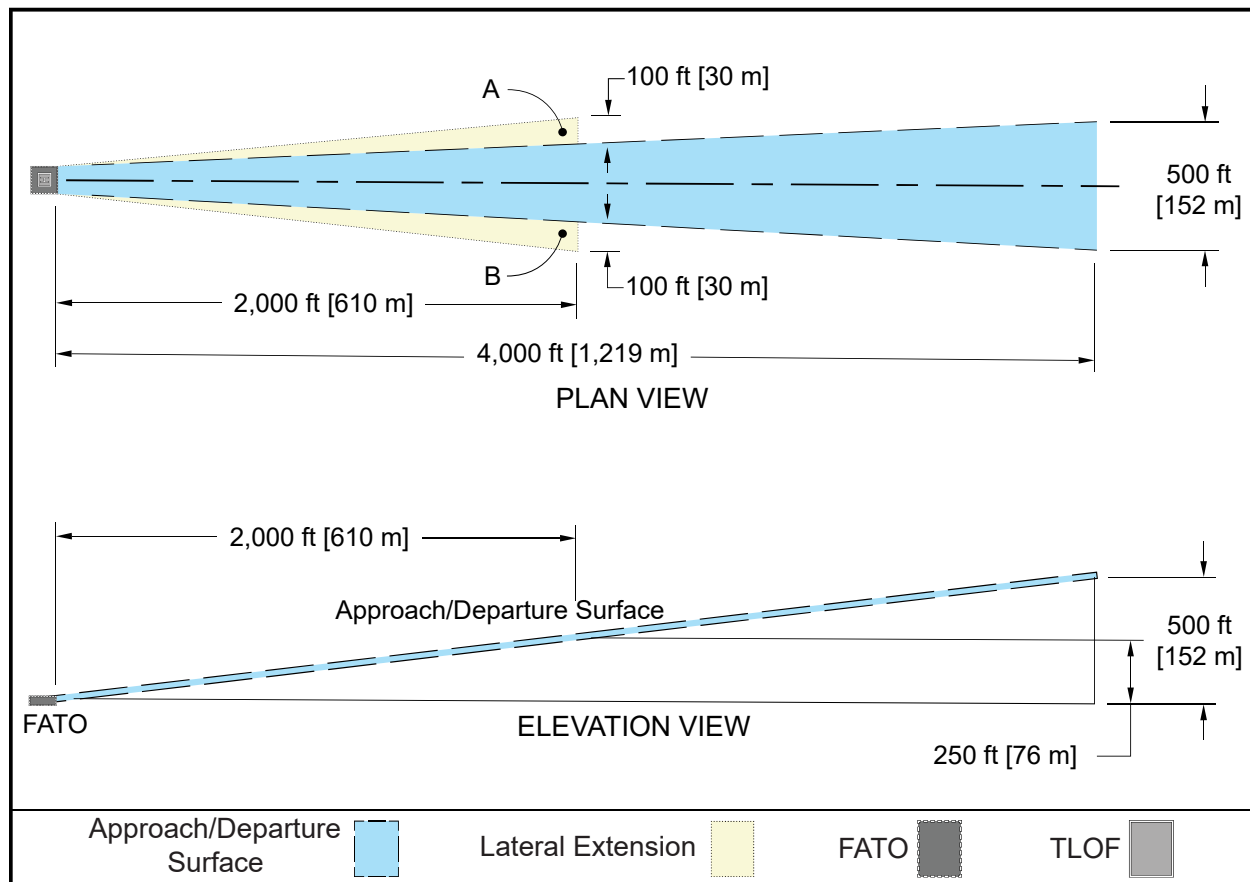
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2. For hospitals, lateral extensions can be added by increasing the size of the approach/departure surface by 2,000 feet (610 m) (Figure 4-12).

- a. Lateral extensions replace transitional surfaces.
- b. The lateral extensions on each side of the approach/departure surface start at the width of the FATO and are increased so that at 2,000 feet (610 m) from the FATO, they are 100 feet (30.5 m) wide.
- c. Ensure that obstacles do not penetrate both Area A and Area B.
- d. Lateral extensions are not evaluated by the FAA for the effect of objects (temporary or permanent, existing or new) on aeronautical operating procedures. These extensions are also not considered in aeronautical charting for new objects.

Figure 4-12. VFR HOSPITAL Heliport Lateral Extensions of the Approach/Departure Surface



Note 1: Allow penetration(s) of Area A or Area B lateral extensions but not both, if obstacles are marked or lighted and obstacles are not determined to be a hazard by the FAA.

Note 2: Lateral extensions are not evaluated by the FAA for the effect of objects (temporary or permanent, existing or new) on aeronautical operating procedures. These extensions are also not considered in aeronautical charting for new objects.

4.7.1.3 **Design Consideration.**

For curved approaches, consider a straight portion along the takeoff climb surface prior to the start of the curve to allow for acceleration, as aircraft takeoff performance may be reduced in a curve.

4.7.2 14 CFR Part 77 Imaginary Surfaces for Obstruction Identification.

The imaginary surfaces defined in 14 CFR Part 77, for heliports include the primary surface, approach, and transitional surfaces. 14 CFR Part 77 establishes standards and notification requirements for objects affecting navigable airspace. This notification provides the basis for:

- evaluating the effect of construction or alteration on aeronautical operating procedures.
- determining the potential hazardous effect of proposed construction on air navigation.
- identifying mitigating measures to enhance safe air navigation; and
- aeronautical charting for new objects.

The following applies to these imaginary surfaces:

1. The heliport primary surface described in 14 CFR Part 77 coincides in size and shape with the designated FATO. This surface is a horizontal plane at the elevation of the established heliport elevation.
2. The approach surface (and, by reciprocal, the departure surface) begins at the edge of the heliport primary surface with the same width as the primary surface and extends outward and upward for a horizontal distance of 4,000 feet (1,219 m) where its width is 500 feet (152 m). The slope of the approach surface is 8:1, horizontal units and vertical units respectively.
3. The transitional surfaces extend outward and upward from the lateral boundaries of the primary surface and from the approach surfaces at a slope of 2:1, horizontal units and vertical units respectively, for 250 feet (76 m) measured horizontally from the centerline of the primary and approach surfaces. The transitional surfaces extend longitudinally from the edge of the FATO to the far end of the approach/departure surface. The transitional surface does not apply to the FATO edge opposite the approach/departure surface.

Ensure the approach, transitional, and primary surfaces are clear of penetrations (except for navigational aids that are fixed-by-function) unless an FAA aeronautical study determines any penetrations to these surfaces are not hazards. See 14 CFR Part 77.9(d) to determine when notification is required and when aeronautical studies are conducted.

4.7.3 Obstructions.

All imaginary surfaces must be clear of obstructions unless an FAA aeronautical study determines otherwise.

The FAA conducts such aeronautical studies at:

1. A public use airport listed in the Airport/Facility Directory, Alaska Supplement, or Pacific Chart Supplement of the U.S. Government Flight Information Publications.
2. A military airport under construction, or an airport under construction that will be available for public use.
3. An airport operated by a Federal agency or the Department of Defense (DoD).
4. An airport or heliport with at least one FAA-approved instrument approach procedure.

Traverse ways are considered obstructions. The mobile objects that go over roads, railroads, waterways, or other traverse ways, must be accounted for within the limits of the approach, departure, and transitional surfaces. For evaluating traverse ways, use the following guidelines:

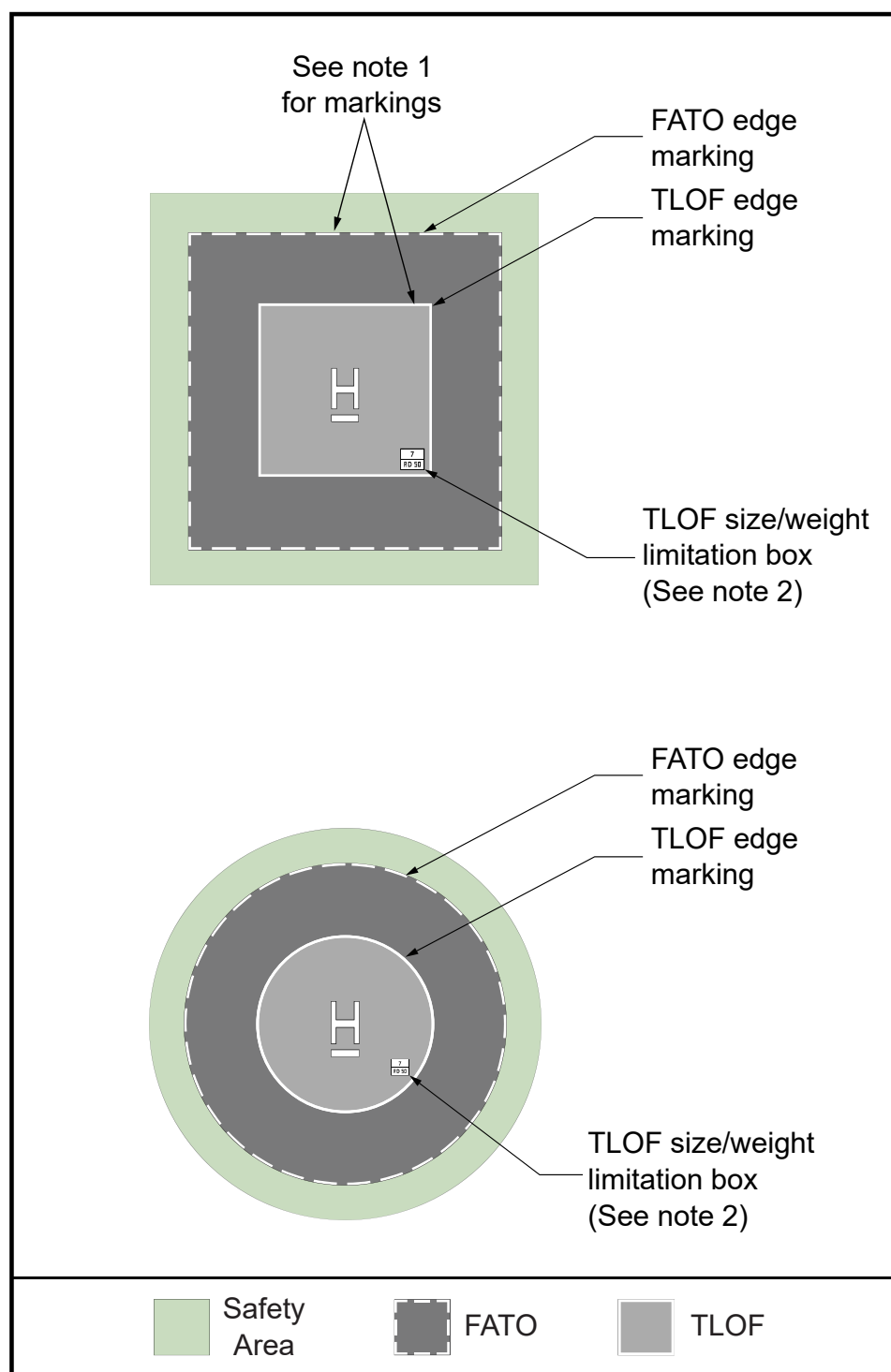
1. Consider the height of the highest mobile object that normally traverses the area under the approach surface.
2. If unknown, apply the following typical values above the traverse way surface:
 - a. interstate highways: 17 feet (5.2 m)
 - b. railroads: 23 feet (7 m)
3. access controlled roads: 10 feet (3 m)
4. all other public roads, highways, and vehicle parking areas: 15 feet (4.6 m).

If approach and departure paths are provided that are shallower than an 8:1, clear the path of obstructions. Regularly re-examine obstacles near approach/departure paths to prevent the encroachment of hazards. Include an appraisal of tree growth near approach and departure paths in this re-examination.

4.8 **Heliport Marking.**

See Figure 4-13 and Figure 4-14 for standard heliport markings.

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Figure 4-13. Standard Heliport Identification Marking

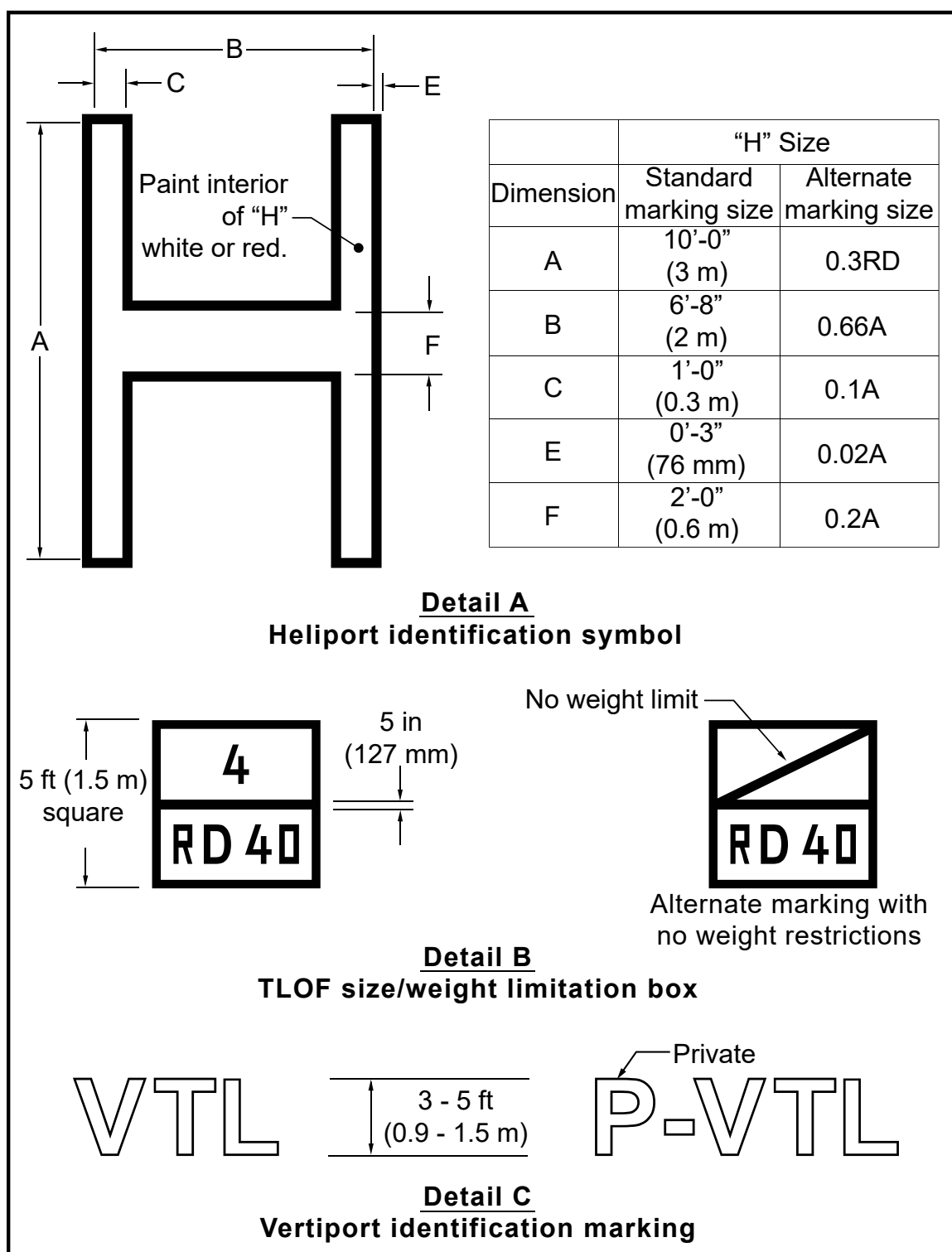
Note 1: Solid and dashed white lines are 12 inches (305 mm) in width. Dashed lines are 5-foot (1.5 m) in length with 5-6-foot (1.5-1.8 m) spaces.

Note 2: See [Figure 4-15](#) for details on the TLOF size/weight limitation box.

Note 3: See [Figure 4-15](#) for details on the “H”.

Note 4: The 1-foot (0.3 m) white bar 2 feet (0.6 m) below the “H” is recommended to distinguish the preferred approach/departure direction.

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Figure 4-15. Heliport Identification Symbol

Note 1: See Figure F-1 and Figure F-2 for the form and proportion of the numbers used in the TLOF Size and Weight Limitation Box.

Note 2: The minimum size of the box is 5 feet (1.5 m) square. Where possible, increase this dimension to a 10 feet (3 m) square for improved visibility.

4.8.1 TLOF.

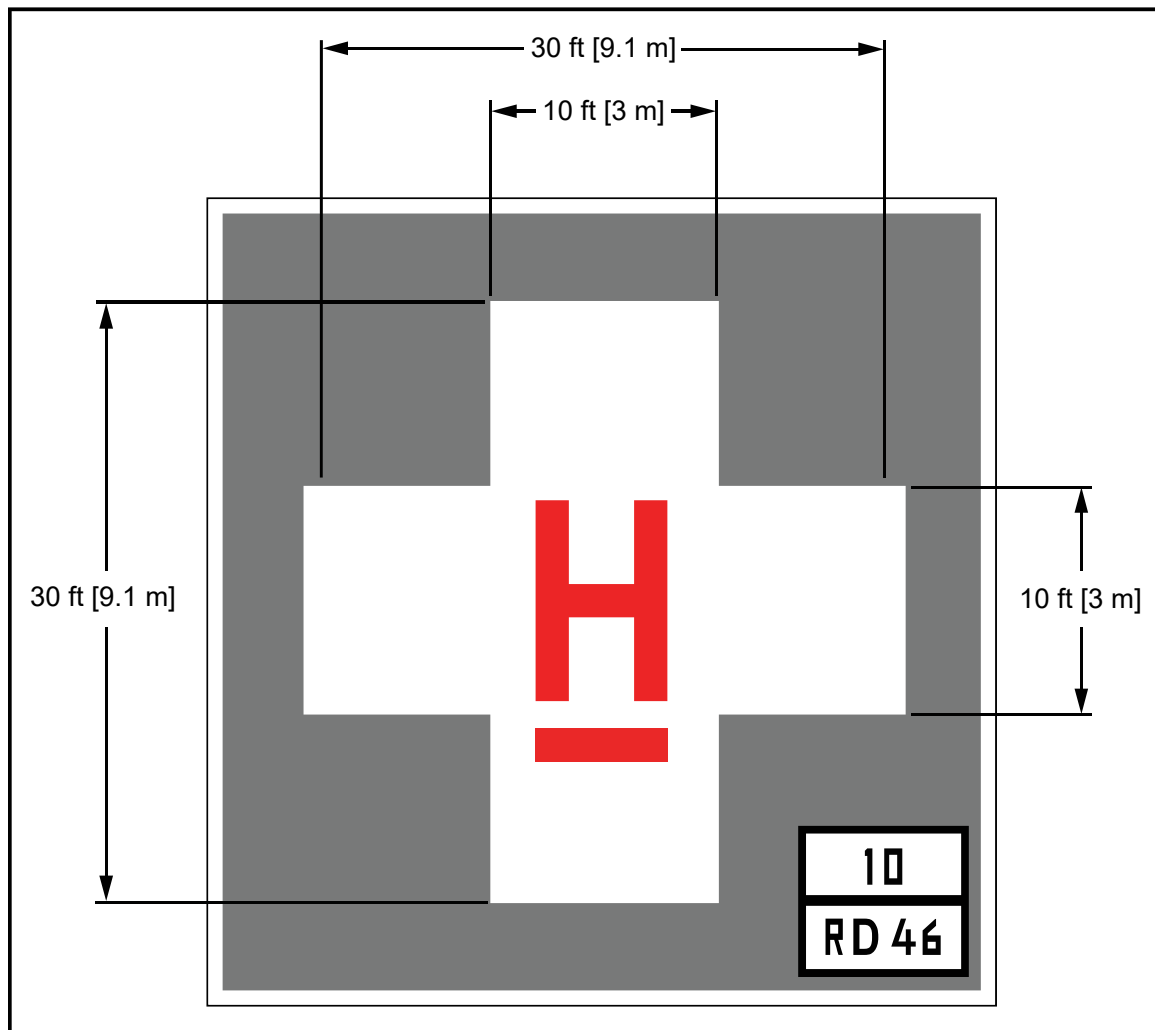
The FAA recommends using standard markings at all heliports.

4.8.1.1 **Standards.**

1. Standard markings are required at facilities with commercial operations and instrument approaches.
2. Use paint or preformed materials to define the TLOF within the limits of those areas. See AC 150/5370-10, Item P-620, for specifications.
3. Design perimeter marking to be a 12-inch-wide (305 mm wide) solid white line (Figure 4-13).
4. Locate perimeter markings along the edge of the TLOF with the outer edge of each line approximately on the edge of the usable TLOF.
5. Place a heliport identification symbol centered inside the TLOF to identify the location as a heliport, mark the TLOF, and provide visual cues to the pilot:
 - a. Use **H** symbol for heliports (Figure 4-15).
 - b. Use **+** symbol for hospital heliports (Figure 4-16).
6. Add an additional marking to the top left corner of the TLOF to indicate type, as indicated below.
 - a. **VTL**: Heliport – Critical aircraft is a powered lift aircraft. (Figure 4-15).
 - b. **VTL**: Hospital Heliport – Critical aircraft is a powered lift aircraft (Figure 4-16 and Figure 4-17).
 - c. **PVT**: Private-use heliport – Critical aircraft is a rotorcraft (Figure 4-15).
 - d. **P-VTL**: Private-use heliport – Critical aircraft is a powered lift aircraft (Figure 4-15).
7. Place a size/weight limitation box to indicate the rotor diameter and the maximum takeoff weight of the critical aircraft that can use the heliport (Figure 4-15 and Appendix F).
 - a. Include the letters “RD” and the weight of the critical aircraft in a box in the lower right-hand corner of a rectangular TLOF, or on the right-hand side of the symbol of a circular TLOF, when viewed from the preferred approach direction.
 - b. Use black numbers on a white background.
 - c. Center the maximum takeoff weight of the critical aircraft in thousands of pounds in the top half of the box.

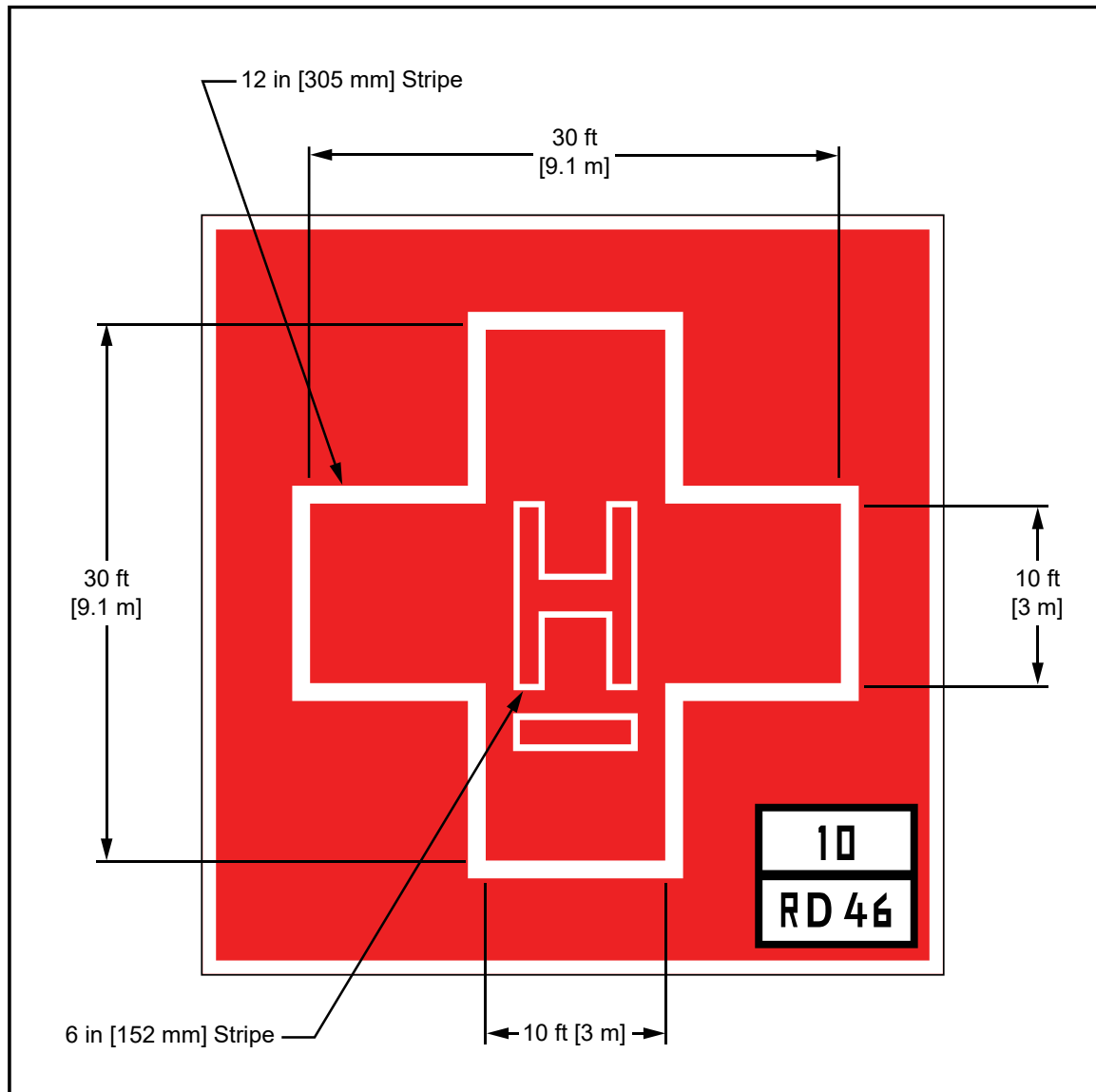
- d. Center the rotor diameter of the critical aircraft in the bottom half of the box preceded by the letters “RD.”
- e. Mark a TLOF without a weight limit with a diagonal line extending from the lower left-hand corner to the upper right-hand corner in the upper section of the TLOF size/weight limitation box.
- f. Allow the size and weight limitation box marking to interrupt the TDPC marking, if needed.

Figure 4-16. HOSPITAL Heliport – Standard Identification Marking



Note: Standard TLOF perimeter stripe of 12 inches (0.3 m) wide. See [Figure 4-14](#) for “H”, controlling rotor diameter RD, and weight limitation box dimensions.

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Figure 4-17. HOSPITAL Heliport – Alternative Identification Marking

- Note 1:** Standard TLOF perimeter stripe of 12 inches (0.3 m) wide. See [Figure 4-14](#) for “H”, rotor diameter RD, and weight limitation box dimensions.
- Note 2:** Place a 1-foot (0.3 m) white bar 2 feet (0.6 m) below the “H” marking when it is necessary to distinguish the preferred approach/departure direction.

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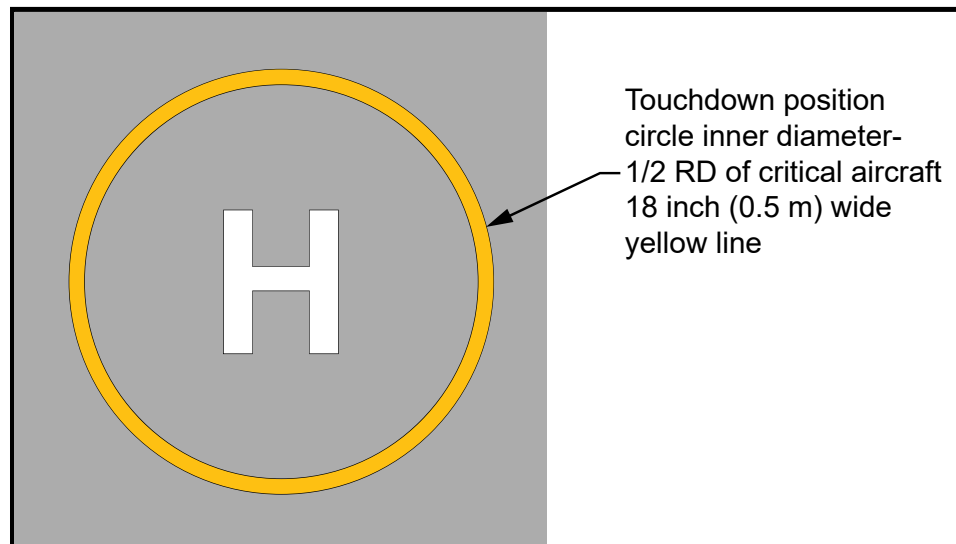
4.8.1.2 Recommended Practices.

1. Outline markings and lines with a 2 to 6-inch (55-152 mm)-wide line with a contrasting color to enhance conspicuity for day, night, and/or with enhanced flight vision systems (EFVS).
2. Place a one-foot-wide bar 2 feet (0.6 m) below the “H”, the width of the “H”, when it is necessary to distinguish the preferred approach/departure direction ([Figure 4-13](#)).
3. Place a size/weight limitation box on TLOFs with a turf surface.

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4. Place a TDPC marking located in the center of the TLOF to provide guidance to allow a pilot to touch down in a specific position within the TLOF.
 - a. Design the TDPC to be a yellow circle with an inner diameter of 1/2 RD and a line width of 18 inches (0.5 m) (Figure 4-18).
 - b. This marking is intended for the pilot's seat to be over the marking, the undercarriage to be inside the LBA, and all parts of a aircraft to be clear of any obstacle by a safe margin.
 - c. When the critical aircraft is a powered lift, consider their unique design to determine the dimensions of the TDPC.

Figure 4-18. Touchdown Position Circle



4.8.1.3 Design Considerations.

1. Use reflective paint and retroreflective markers with caution; overuse of reflective material can be blinding to a pilot when using landing lights and/or night vision imaging system (NVIS)/ night vision goggles (NVG) (see Federal Specification TT-B-1325, *Federal Specification Beads (Glass Spheres) Retro-Reflective*, for technical specifications on reflectorizing markings and AC 150/5370-10 for application rates).
2. Use of a distinctive marking, such as a company logo, to identify the facility as a private use heliport (paragraph 4.8.1.1, item 1a) is nonstandard and does not necessarily provide the pilot with the same degree of visual cueing as the standard heliport identification symbol.

4.8.2 FATO.

FATO markings may be used when the FATO is load-bearing.

4.8.2.1 Standards.

1. Do not mark non-load-bearing FATOs.
2. Use paint or preformed materials to define the FATO within the limits of those areas. See AC 150/5370-10, Item P-620, for specifications.
3. Design FATO perimeter markings on a paved, load-bearing surface to include 12-inch-wide (0.3 m wide) dashed white lines that are 5 feet (1.5 m) in length with end-to-end spacing of 5 to 6 feet (1.5 to 1.8 m) apart. Ensure corners are marked (Figure 4-13).
4. Design FATO perimeter markings on an unpaved, load-bearing surface to include 12-inch-wide (0.3 m) retroreflective markers that are 5 feet (1.5 m) in length and have end-to-end spacing of approximately 5 feet (1.5 m).
5. Place markings along the edge of the FATO with the outer edge of each line approximately on the edge of the usable FATO.

4.8.2.2 Recommended Practice.

Mark the FATO if it is completely load-bearing.

4.8.3 Flight Path Alignment Marking.

Flight path alignment marking may be used when it is practicable to indicate available approach and/or departure flight path direction(s) (Figure 4-19).

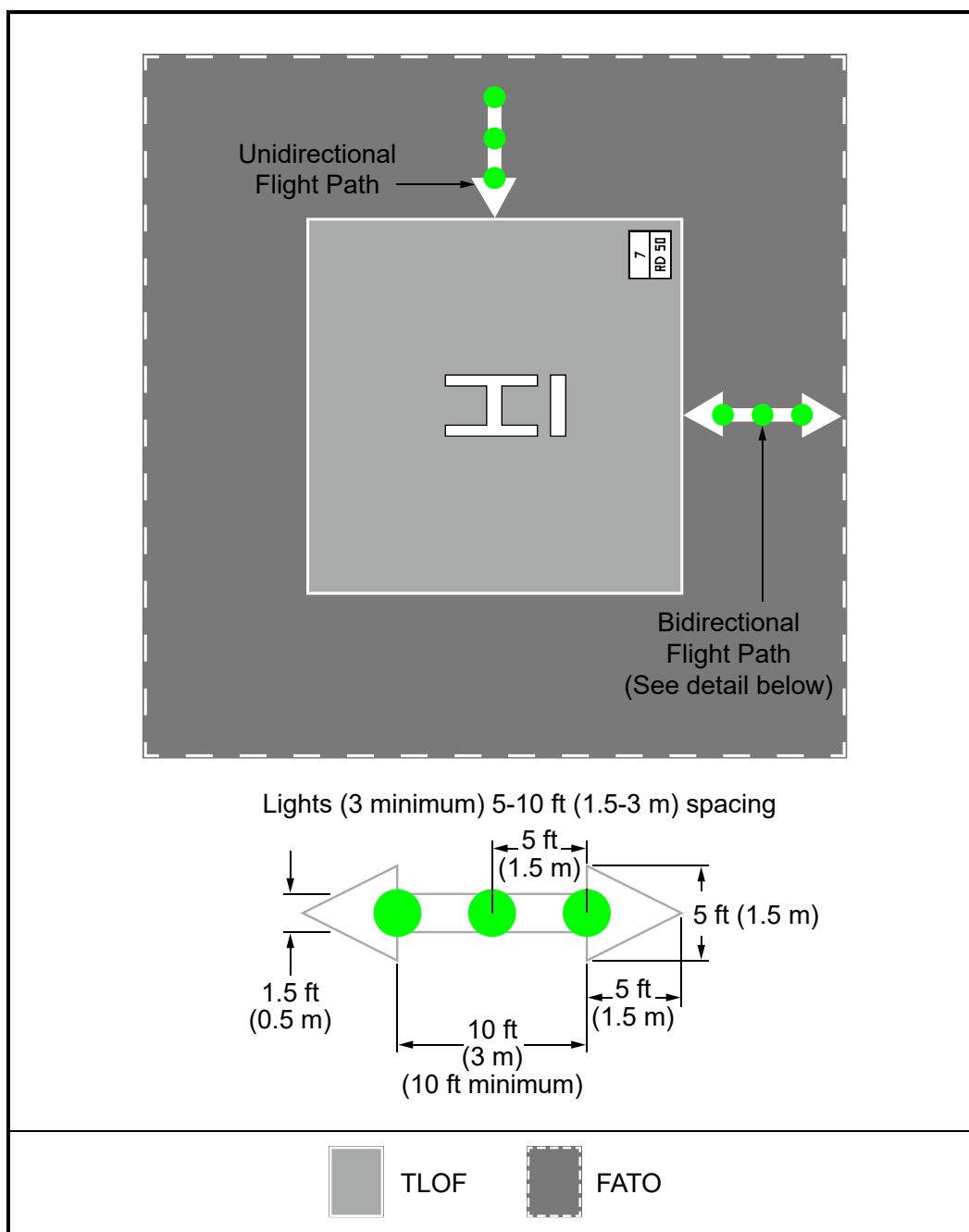
4.8.3.1 Standards.

1. Design the shaft of each arrow to be 1.5 feet (0.5 m) wide and at least 10 feet (3 m) long.
2. Design the arrow heads to be 5 feet (1.5 m) wide and 5 feet (1.5 m) tall.
3. Ensure the color of the arrow provides good contrast against the background color of the surface.
4. Provide a contrasting border around the arrows if needed to increase visibility for the pilot.
5. Use an arrow pointing toward the center of the TLOF to depict an approach direction.
6. Use an arrow pointing away from the center of the TLOF to depict a departure direction.

4.8.3.2 Recommended Practice.

Use flight path alignment markings.

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Figure 4-19. Flight Path Alignment Marking and Lighting

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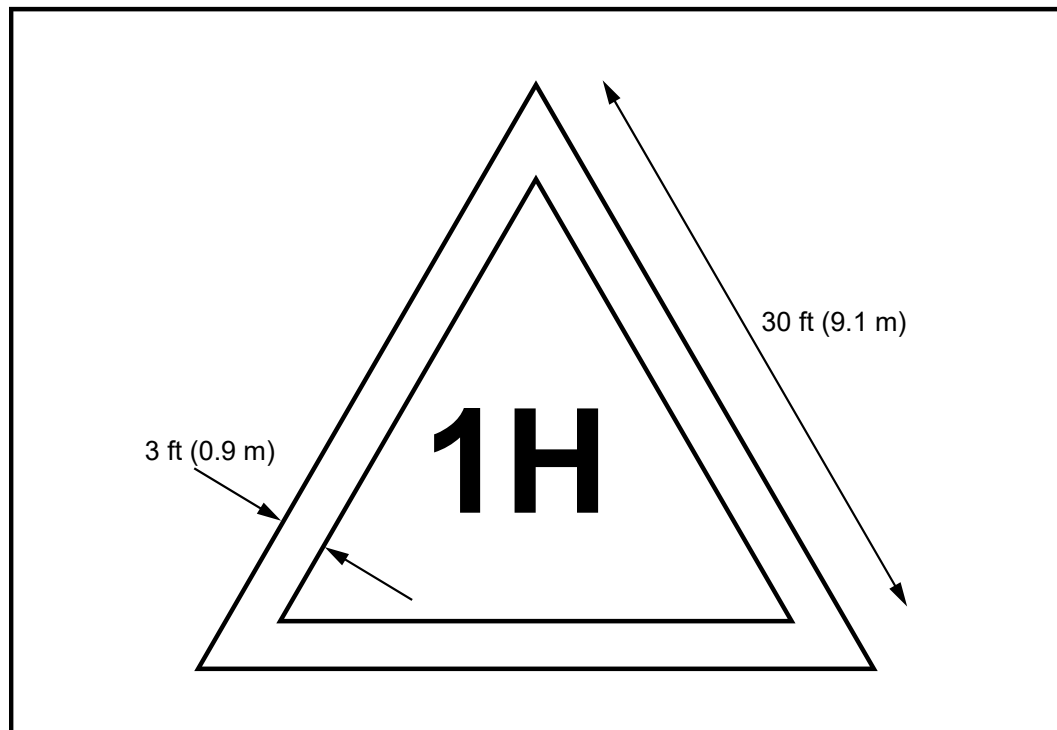
Note 1: Arrowheads have consistent dimensions.**Note 2:** If necessary, adjust stroke length to match length available. Minimum length = 10 feet (3 m).**Note 3:** Light type: omnidirectional green lights, Type L-861H or L-852H.**Note 4:** If necessary, locate the lights outside of the arrow.**Note 5:** In-pavement flight path alignment lighting is recommended.**Note 6:** Flight path alignment marking and lighting may extend into the TLOF.

4.8.4 Aiming Points.

4.8.4.1 **Standards.**

1. Mark the aiming point as a triangle with continuous white lines (red at hospital sites) that are 30 feet (9.1 m) long and three feet (0.9 m) wide.
2. Place an “H” in the center preceded by the number of the aiming point (Figure 4-20 and Appendix F).

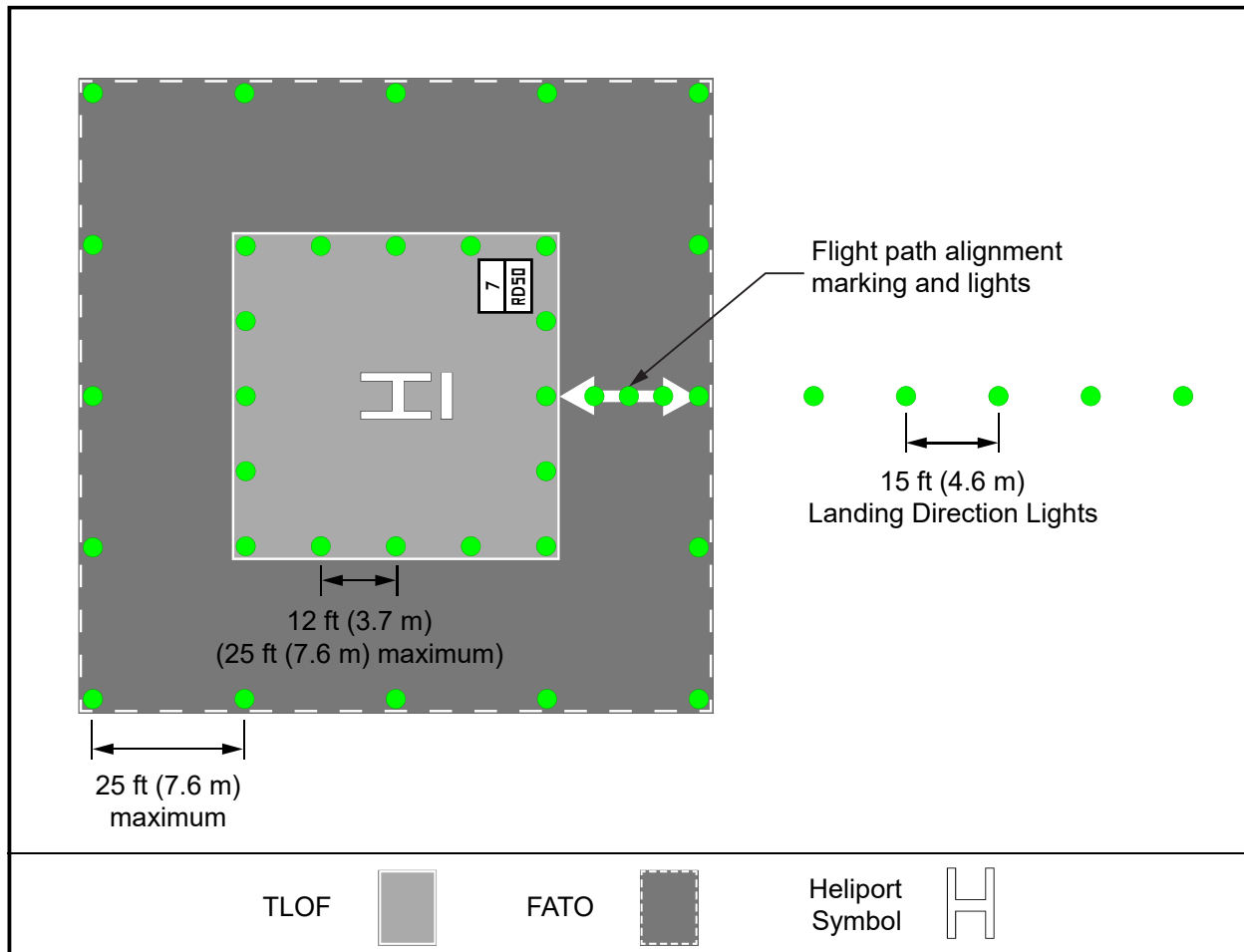
Figure 4-20. Aiming Point Marking



4.9 **Heliport Lighting.**

Lighting is required for heliports that support night operations. The lighting enables the pilot to establish the location of the heliport and identify the perimeter of the operational area. Figure 4-21 depicts heliport perimeter lighting. See Appendix G for design standards for heliport perimeter lighting.

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Figure 4-21. TLOF/FATO Lighting

Note 1: In-pavement lights are within 1 foot (0.3 m) of the inside or outside of the TLOF and FATO respective perimeters.

Note 2: Elevated lights are outside and within 10 feet (3 m) of TLOF and FATO respective perimeters.

Note 3: Exhibit is configured for 50-foot (15.2 m) TLOF.

4.9.1 Standards.

1. Follow the specifications for heliport lighting fixtures in AC 150/5345-46, *Specification for Runway, Taxiway, Heliport, and Vertiport Light Fixtures*, and EB 67, *Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures*. For flight path alignment lights or landing direction lights:
 - a. See FAA type L-861H for elevated omnidirectional green.
 - b. See FAA type L-852H for in-pavement omnidirectional green.
2. Meet light fixture chromaticity requirements for “aviation green” per SAE AS 25050 when using incandescent lights.
3. Meet EB 67 when using LEDs.
4. Follow photometric standards for light fixtures (Appendix G).

5. Install lighting according to AC 150/5340-30, *Design and Installation Details for Airport Visual Aids*.
6. Install elevated perimeter light fixtures in either a load-bearing light base (L-868, Size B) or non-load-bearing light base (L-867, Size B) per AC 150/5345-42, *Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories*.
7. Do not use shallow base type light bases.

4.9.2 Recommended Practice.

In-pavement lighting is preferred to elevated lighting.

4.9.3 Design Consideration.

Some light emitting diode (LED) light fixtures may not be compatible with the use of some night vision goggle systems.

4.9.4 TLOF Perimeter Lights.

4.9.4.1 **Standards.**

1. Use green TLOF perimeter lights and FAA type L-861H (AC 150/5345-46) or FAA type L-852H (LED versions of FAA type L-861H and L-852H are found in AC 150/5345-46 and EB 67).
2. Install lights no more than 25 feet (7.6 m) apart, uniformly between the corners with no less than five lights on each side including the corners on a square or rectangular TLOF.
3. Install an even number (minimum of eight) of in-pavement lights uniformly spaced, within 1 foot (0.3 m) inside or outside the perimeter of a circular TLOF.
4. Mount elevated lights on frangible mounts no more than 10 feet (3m) outside of the edge of the TLOF perimeter and not penetrating a horizontal plane at the TLOF elevation by more than 2 inches (51 mm).
5. Ensure elevated lights do not interfere with the landing gear of aircraft while maneuvering or taxiing.

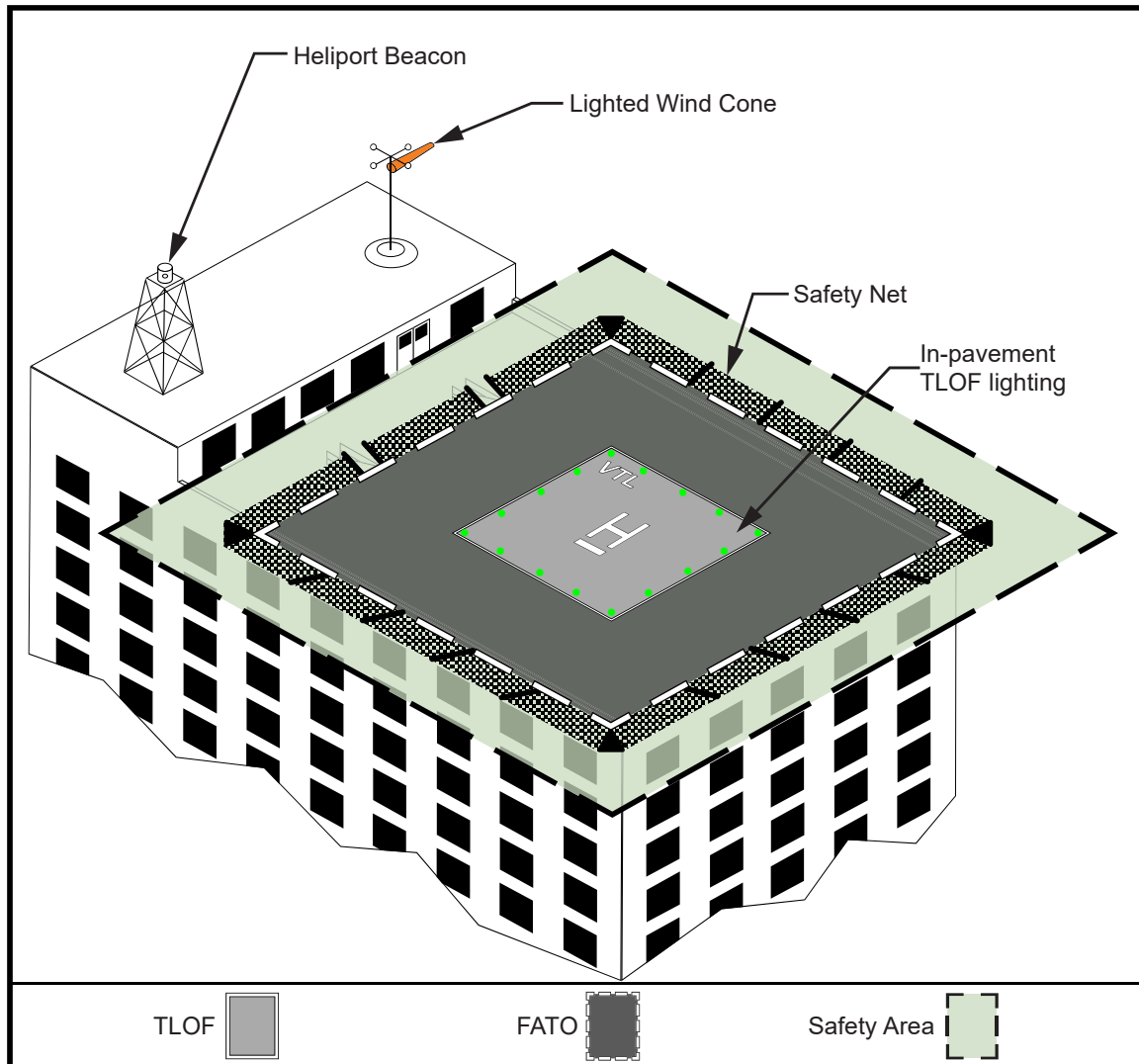
4.9.4.2 **Recommended Practices.**

1. For TLOFs without a load-bearing FATO, use elevated, omnidirectional lights meeting the requirements of Appendix G.
 - a. Locate these lights on the outside edge of the TLOF (Figure 4-22).
 - b. Ensure the elevated lights do not penetrate a horizontal plane at the TLOF edge elevation by more than 2 inches (51 mm).
2. Place a light along the centerline of the approach.

4.9.4.3 Design Consideration.

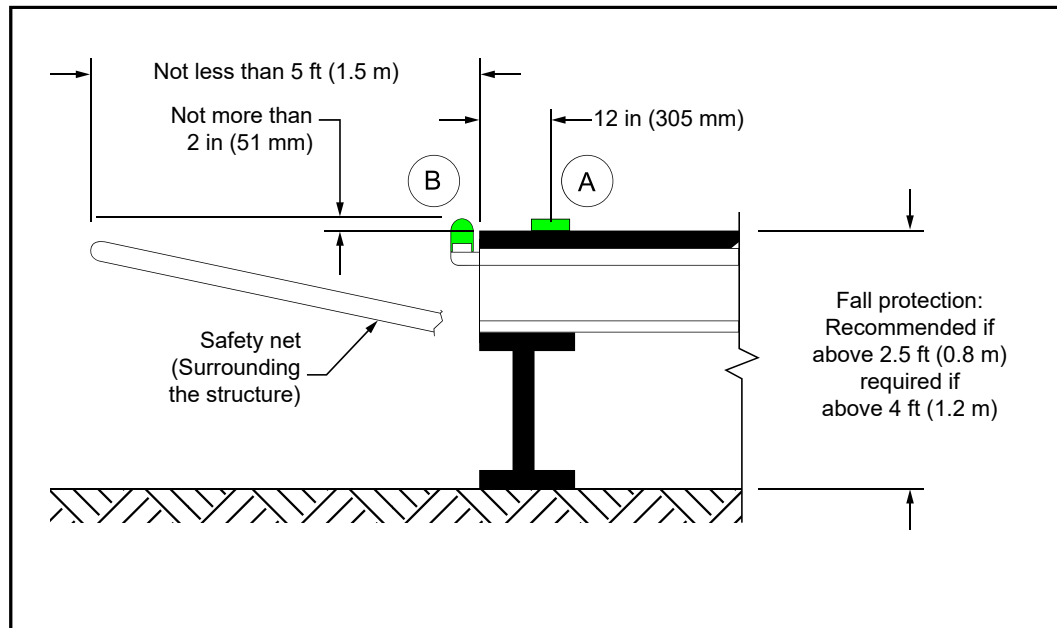
Mixing of elevated and in-pavement light fixtures in the same group may result in inconsistent light output.

Figure 4-22. Elevated TLOF Perimeter Lighting Configuration



4.9.5 FATO Perimeter Lights.

FATO perimeter lights may be used if the entire FATO is load-bearing (Figure 4-23).

Figure 4-23. Perimeter Lighting for Elevated FATO

Note 1: Install either “A” Type L-852H, or “B” Type L-861H.

Note 2: In-pavement edge light fixture Ⓐ (Type L-852H).

Note 3: Omnidirectional light Ⓑ, mounted off the structure edge (Type L-861H).

Note 4: Ensure elevated lights do not penetrate a horizontal plane at the TLOF elevation by more than 2 inches (51 mm).

Note 5: For TLOF and FATO lighting standards, see AC 150/5345-46 and EB 67.

Note 6: Locate a safety net’s supporting structure below the safety net.

4.9.5.1 Standards.

1. FATO perimeter lights are green and FAA type L-861H (AC 150/5345-46 and EB 67) or FAA type L-852H.
 - a. LED versions of FAA type L-861H and L-852H are per AC 150/5345-46 and EB 67.
2. Install lights no more than 25 feet (7.6 m) apart, uniformly between the corners (minimum of five) on each side including the corners on a square or rectangular FATO.
3. Install an even number (minimum of eight) of in-pavement lights spaced uniformly within 1 foot (0.3 m) inside or outside of the perimeter on a circular FATO.
4. Mount elevated lights on frangible mounts no more than 10 feet (3m) from the FATO perimeter and not penetrating a horizontal plane at the adjacent TLOF elevation by more than 2 inches (51 mm).
5. Ensure elevated lights do not interfere with the landing gear of aircraft while maneuvering or taxiing.

4.9.5.2 **Recommended Practice.**

Place a light along the centerline of the approach.

4.9.6 Flight Path Alignment Lights.

Flight path alignment lights (FPAL) may be used. They provide approach and/or departure path directions in a straight line along the direction of approach and/or departure flight paths as shown in Figure 4-19 and Figure 4-21. These are not to be confused with landing direction lights (LDL) shown in Figure 4-24.

4.9.6.1 **Standards.**

1. If FPALs are used in conjunction with LDLs, ensure they do not conflict.
2. Install three or more green lights spaced at 5 feet (1.5 m) to 10 feet (3 m).
3. Ensure FPAL does not penetrate a horizontal plane at the adjacent TLOF elevation by more than 2 inches (51 mm).
4. Ensure elevated lights do not interfere with the landing gear of aircraft while maneuvering or taxiing.
5. Ensure the elevated lights do not penetrate the approach/departure surface or the transitional surface.
6. Install flight path alignment lights meeting the requirements of Appendix G.
7. Place these lights in a straight line along the direction of approach and/or departure flight paths.
8. Extend the lights across the TLOF, FATO, safety area, or any suitable surface in the immediate vicinity of the FATO or safety area, if necessary.

4.9.7 Landing Direction Lights.

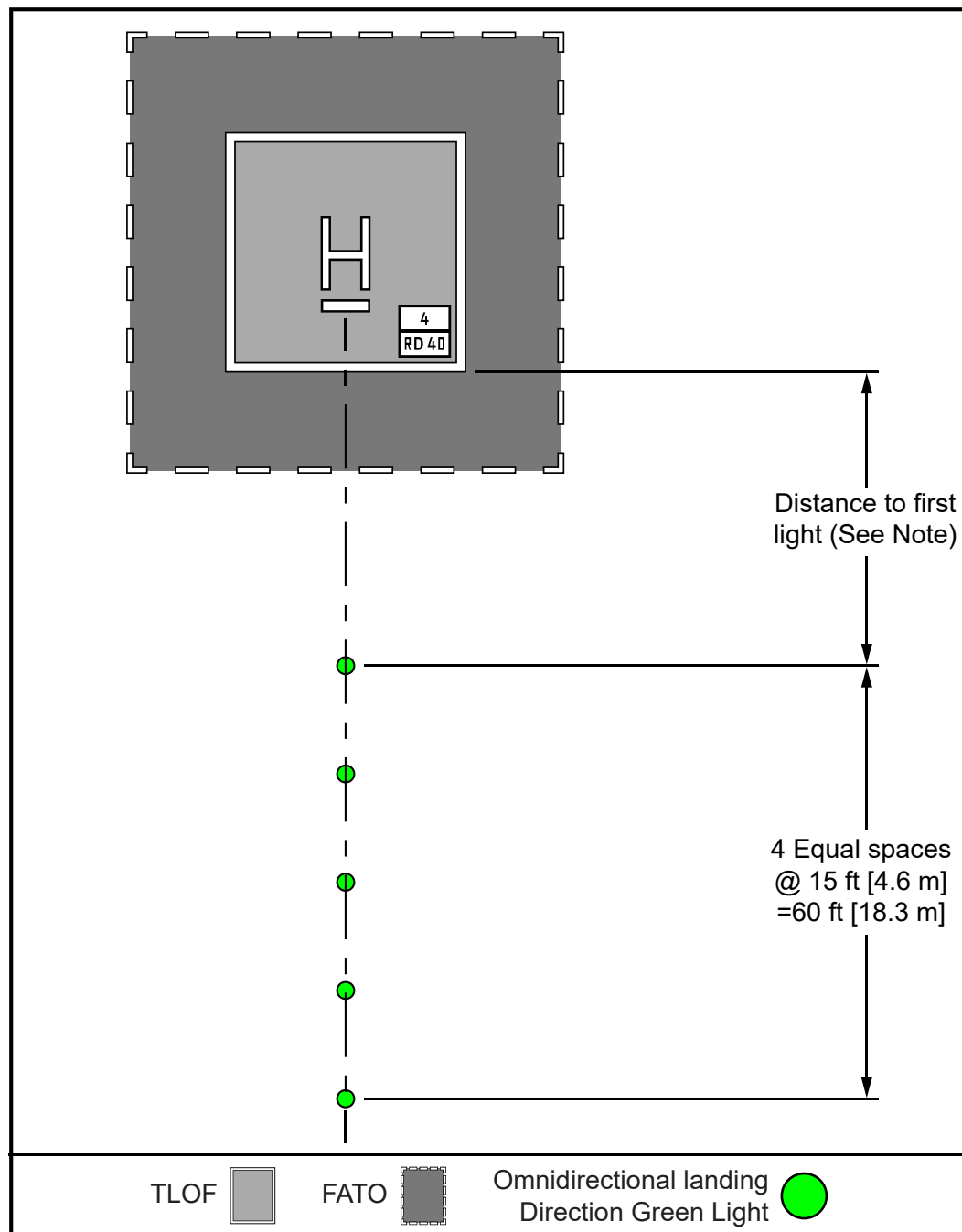
Landing direction lights (LDL) provide directional guidance to indicate available approach and/or departure path directions when necessary.

4.9.7.1 **Standards.**

1. Install five green, omnidirectional lights meeting the standards of Appendix G, located on the centerline of the preferred approach/departure paths.
2. Space lights at 15-foot (4.6 m) intervals extending outward in the direction of the preferred approach/departure paths, with spacing and layout (Figure 4-24).
3. Locate the first light 20-60 feet (6.1-18.3 m) from the TLOF.

4. Ensure elevated lights do not interfere with the landing gear of aircraft while maneuvering or taxiing.
5. Ensure the elevated lights do not penetrate the approach/departure surface, transitional surface, or the transitional surface.

Figure 4-24. Landing Direction Lights



Note: Locate the first omnidirectional landing direction light 20-60 feet (6.1-18.3 m) from the TLOF.

4.9.8 Visual Glideslope Indicators (VGSI).

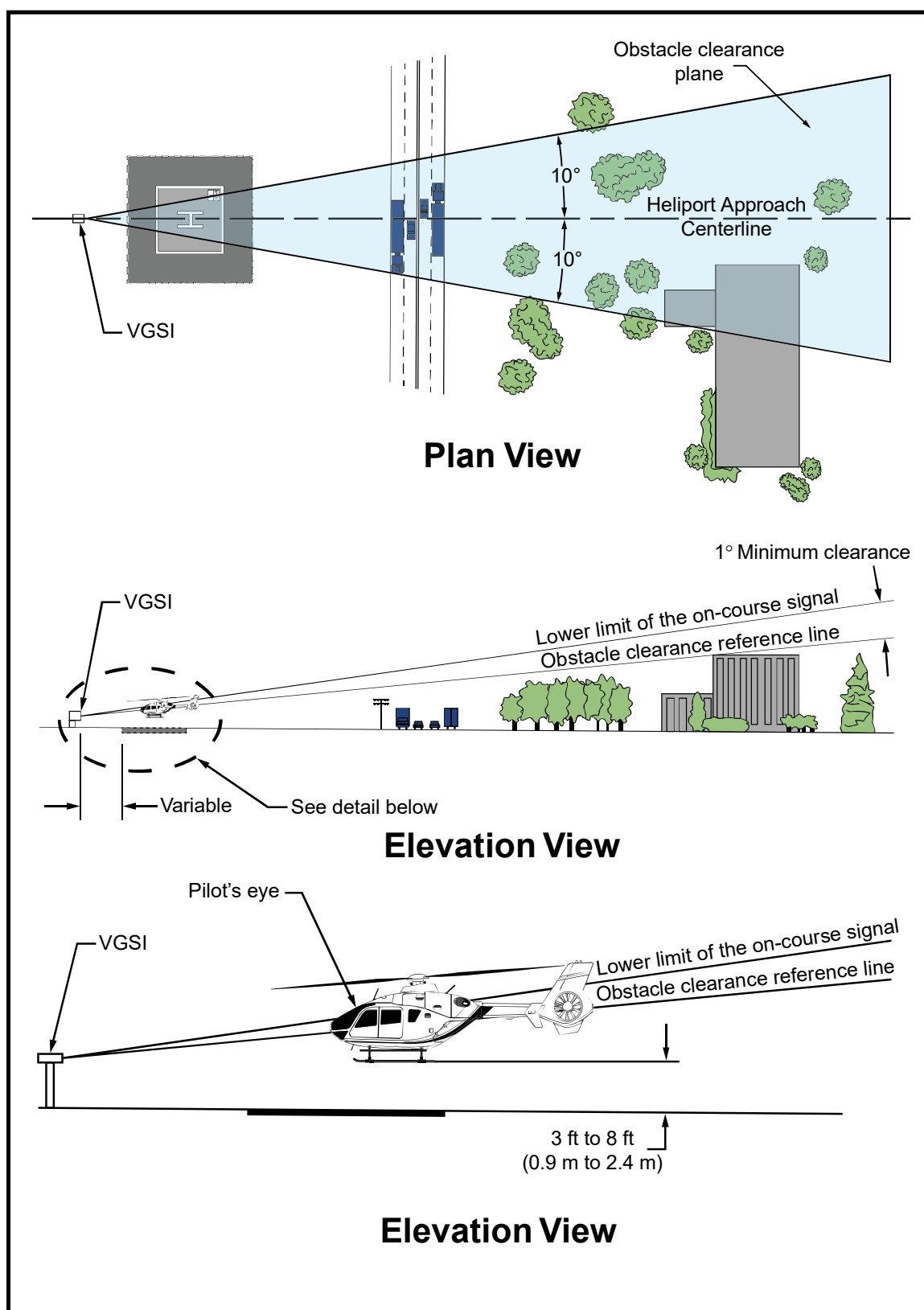
A VGSI is equipment that provides pilots with visual vertical course and descent cues (Figure 4-25). A VGSI can be in the form of a Precision Approach Path Indicators (PAPI), Visual Approach Slope Indicator (VASI), Tricolor VASI, Pulsating VASI, and Helicopter Approach Path Indicator (HAPI) systems. Install a VGSI when one or more of the following conditions exist, especially at night:

1. Site specific obstacle clearance conditions require a unique slope to be flown.
2. Noise abatement or traffic control procedures necessitate a specific slope to be flown.
3. The environment of the heliport provides few visual surface cues.

4.9.8.1 **Siting and Installation.**

1. The optimum location of a VGSI is on the extended centerline of the approach path at a distance that brings the aircraft to a hover with the undercarriage between 3 and 8 feet (0.9 to 2.4 m) above the TLOF.
2. To properly locate the VGSI, estimate the vertical distance from the undercarriage to the pilot's eye.
3. Install the VGSI so the lowest on-course visual signal provides a minimum of one degree of clearance over any object that lies within ten degrees of the approach course centerline.
4. The VGSI may be pilot controlled so that is it only "on" when needed.

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Figure 4-25. Visual Glideslope Indicator (VGSI) Siting and Clearance Criteria

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4.9.8.2 **Additional Guidance.**

Follow additional guidance in:

AC 150/5345-52 *Generic Visual Glideslope Indicators (GVGI)*

AC 150/5345-28 *Precision Approach Path Indicator (PAPI) Systems*

EB 95 *Additional Siting and Survey Considerations for
Precision Approach Path Indicator (PAPI) and
Other Visual Glide Slope Indicators (VGSI)*

4.10 **Identification Beacon.**

An FAA type L-801H medium intensity heliport beacon is required for night operations on heliports. (**Note:** A helipad on an airport does not constitute a heliport and is not required to have a heliport beacon.)

4.10.1 Standards.

1. Install an identification beacon that flashes white/yellow/green at a rate of 30 to 45 flashes per minute.
2. Follow the heliport guidance found in AC 150/5345-12, *Specification for Airport and Heliport Beacons*, and AC 150/5340-30.

4.11 **Wind Indicator.**

Wind indicators provide the direction and magnitude of the wind.

4.11.1 Standards.

1. Provide a minimum of one wind indicator that conforms to AC 150/5345-27, *FAA Specification for Wind Cone Assemblies*.
2. Follow installation details specified in AC 150/5340-30.
3. Follow AC 150/5345-27 and AC 150/5340-30 for primary and secondary wind indicators for multiple wind indicator requirements.
4. Locate wind indicators to provide valid wind direction and speed information near the heliport under all wind conditions.
5. Ensure wind indicators are visible to pilots while on the TLOF and while on the approach path when the aircraft is 500 feet (152 m) away.
6. Locate wind indicators within 500 feet (152 m) horizontal of the TLOF.
7. Locate wind indicators outside the safety area and ensure they do not penetrate the approach/departure or transitional surfaces.
8. Light wind indicators internally or externally for night operations.

4.11.2 Recommended Practices.

1. Wind indicators that are orange in color provide the best possible contrast to their location's background.
2. If one wind indicator location does not provide for all the above, multiple locations may be necessary to provide pilots with all the wind information needed for safe operations.

4.12 **Fall Protection and Means of Egress.**

If the heliport is elevated, consult Title 29 CFR Part 1926.34, *Means of Egress*, for access to the surface. Title 29 CFR Part 1926.34 requires two separate access points for an elevated structure such as an elevated TLOF or FATO.

4.12.1 Standards.

1. Design stairs in compliance with 29 CFR Part 1910.25, *Stairways*.
2. Design handrails described in this regulation to fold down or be removable to below the level of the TLOF or FATO so they will not be hazards during aircraft operations.
3. For hospital heliports, provide access to and from the TLOF surface via a ramp to provide for quick and easy transportation of a patient on a gurney.
 - a. Build ramps in accordance with state and local requirements.
 - b. Design the width of the ramp, and any turns in the ramp, to be wide enough to accommodate a gurney with a person walking on each side.
 - c. Design straight segments of the ramp at least 6 feet (1.8 m) wide.
 - d. Add additional width in segments of the ramp where it turns.
 - e. Provide the ramp with a slip-resistant surface.
4. Design elevated heliports to include fall protection around areas where people will have access (e.g., at edge of TLOF or FATO).
 - a. Title 29 CFR § 1910.28, *Duty to Have Fall Protection and Falling Object Protection*, requires that the provision of fall protection if the platform is elevated 4 feet (1.2 m) or more above its surroundings.
 - b. Do not use permanent railings or fences that would be safety hazards, such as those obstructing or penetrating an imaginary surface, during aircraft operations.
5. Ensure fall protection devices do not penetrate the approach/departure surface or transitional surface.

4.12.2 Recommended Practices.

1. Add fall protection for all platforms elevated 30 inches (0.8 m) or more.
2. Safety nets are a potential solution to protect against falls and falling objects.

- a. Ensure safety nets meet state and local regulations.
- b. Install safety nets at least 5 feet (1.5 m) wide.
- c. Fasten the insides and outside edges of the nets to a solid structure.
- d. Ensure the net is made with materials that are resistant to environmental effects.
- e. Inspect the net annually for integrity.
- f. Ensure the net has a load carrying capability of 25 lbs per square foot (122 kg/sq m).
- g. For heliports with non-loadbearing FATOs, attach the net to the outer TLOF perimeter frame at or below the edge elevation of the TLOF.

4.13 **Electromagnetic Effects.**

Aircraft are susceptible to electromagnetic effects. Nearby electromagnetic devices, such as a large ventilator motor, elevator motor, magnetic resonance imaging machine (MRI), or other devices that consume large amounts of electricity may cause temporary abnormalities in the aircraft magnetic compass and interfere with other onboard navigational equipment. Buried rebar or other objects made of iron/steel below the heliport surface have also been shown to interfere with an aircraft's navigation instruments.

For additional information, see the FAA's Technical Report FAA/RD-92/15.

4.13.1 Recommended Practices.

1. Install electromagnetic interference (EMI) hazard marking and signage to alert pilots if electromagnetic devices are nearby (Figure 4-26 and Figure 4-27).
2. Inform pilots of the MRI locations or other electromagnetic equipment that consume large amounts of electricity.
3. Locate the EMI hazard sign at ingress/egress points on the heliport for maximum visibility.
4. Ensure the EMI hazard sign is located outside the safety area and does not penetration the approach/departure surface, transitional surface, or lateral extension surface.
5. Design EMI hazard marking as follows:
 - a. Align the compass with magnetic north.
 - b. Use arrows to indicate the four cardinal headings (N, S, E, W) and four intercardinal headings (NE, SE, SW, and NW).
 - c. Use a minimum dimension of a 6-foot (1.8 m) outer diameter and a 4-foot (1.2 m) inner diameter for the compass circle.
 - d. Use blue paint for the compass circle and white paint for the inner portion of the compass.

- e. If necessary for visual contrast, use a one foot (0.3 m) white outline along the outer edge of the compass and arrows.

Figure 4-26. EMI Hazard Marking

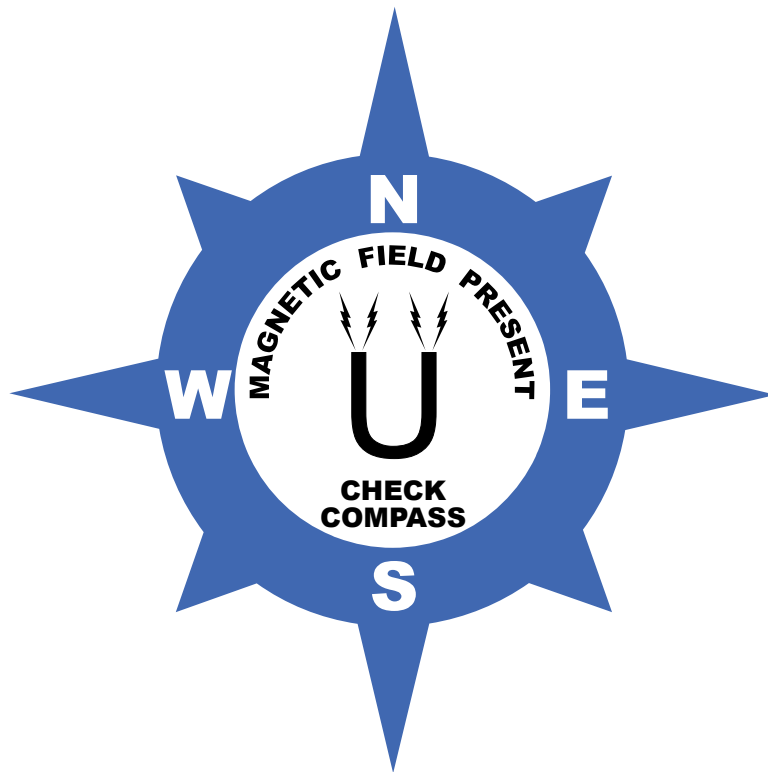
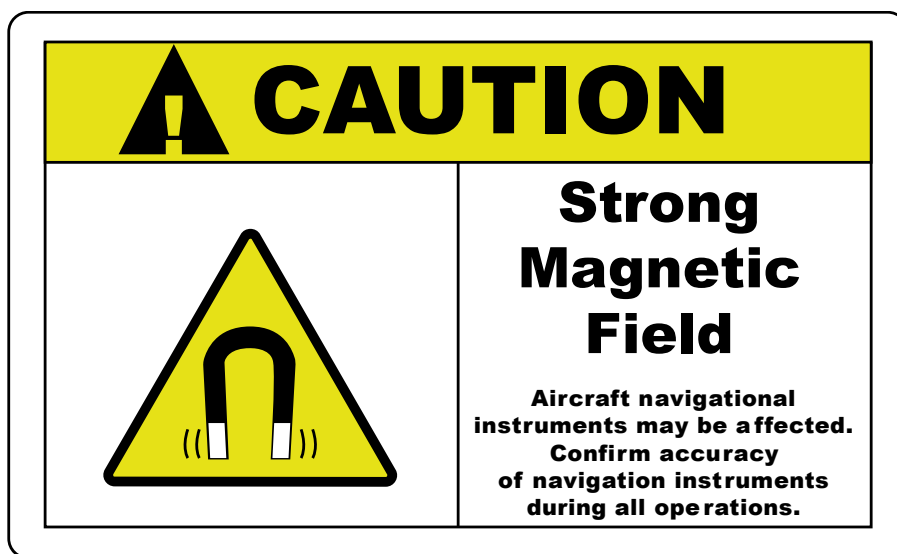


Figure 4-27. EMI Hazard Sign



CHAPTER 5. Heliport Taxiways

5.1 Taxiways.

Taxiways provide for the movement of aircraft from one part of the heliport to another via either ground taxi or hover taxi operation. They connect the TLOF and FATO to the parking positions and allow for maneuvering when needed. When the TLOF is separate from the FATO, taxiways connect the TLOF and the FATO via hover taxi operations. The taxiway does not require a prepared surface if it is designed solely for hover operations. Taxiways are not needed at heliports with no parking spots, refueling, or recharging areas outside a TLOF unless the TLOF is separate from a FATO.

For a taxiway with a prepared ground surface, the taxiway consists of two components:

1. Taxiway surface – The width of the pavement or other prepared surface where the aircraft wheels touch.
2. TOFA – The area free of objects either side of the taxiway centerline.

5.1.1 Standards.

1. Design taxiways to the dimensions in Table 5-1.
2. No objects are permitted in the taxiway or TOFA except those fixed-by-function.
3. Site fixed-by-function objects, like taxiway lights, at the edge of the minimum taxiway surface width and on frangible mounts when elevated.
4. Design the hover taxiway to consist of only the TOFA.
5. Design hover taxiways so that aircraft do not fly over other operating areas (e.g., parking areas, taxiways, TLOF, FATO, etc.).
6. For ground taxiways, provide a Portland cement concrete, asphalt, or stabilized surface, such as turf, under the standards of AC 150/5370-10.
7. For unpaved portions of taxiways, provide a turf cover or treat the surface in a way to prevent dirt and debris from being dispersed by a taxiing aircraft's DWOW.
8. Design taxiway longitudinal gradients to not exceed 2 percent.
9. Design transverse gradients to be between 0.5 percent and 2 percent.

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Table 5-1. Heliport Taxiway Dimensions

Aircraft Type	Helicopter	Powered Lift
Ground Taxiway		
Taxiway surface width	$2 \times \text{UCW}$	$2 \times \text{UCW}$ but no less than 25 feet (7.6 m) ⁶
TOFA width	$1.25 D$	$(\frac{1}{2} \text{ overall aircraft width} + 20 \text{ feet (6.1 m)}) \times 2$
Hover Taxiway		
TOFA width	$1.67 D$	$((\frac{1}{2} \text{ overall aircraft width} + 20 \text{ feet (6.1 m)}) \times 2) \times 1.336$

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Note: UCW: Undercarriage width. Distances are from edge to edge.

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5.1.2 Design Considerations.

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1. Pilots need ample rotor, propeller, and/or wingtip clearance due to the pilots' limited ability to see these parts of the aircraft from the cockpit and to ensure an acceptable level of safety if the aircraft on a taxiway deviates from the taxiway centerline.

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2. Consider the DCA guidance when designing taxiways to avoid impacting people and property on the ground.

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3. Ground taxi turns of wheeled aircraft are significantly larger than a hover turn.

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4. Consider the turn radius of aircraft when designing taxi intersections and parking positions for wheeled aircraft.

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5.2 Marking.

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5.2.1 Standards.

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1. Use paint or preformed materials for surface markings (see AC 150/5370-10, Item P-620, Runway and Taxiway Marking, for specifications for paint and preformed material).

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2. Place markings along the edge of the taxiway with the outer edge of each stripe approximately on the edge of the paved usable taxiway.

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3. Mark the centerline of a paved taxiway with a continuous 6-inch (152 mm) yellow line (Figure 5-1).

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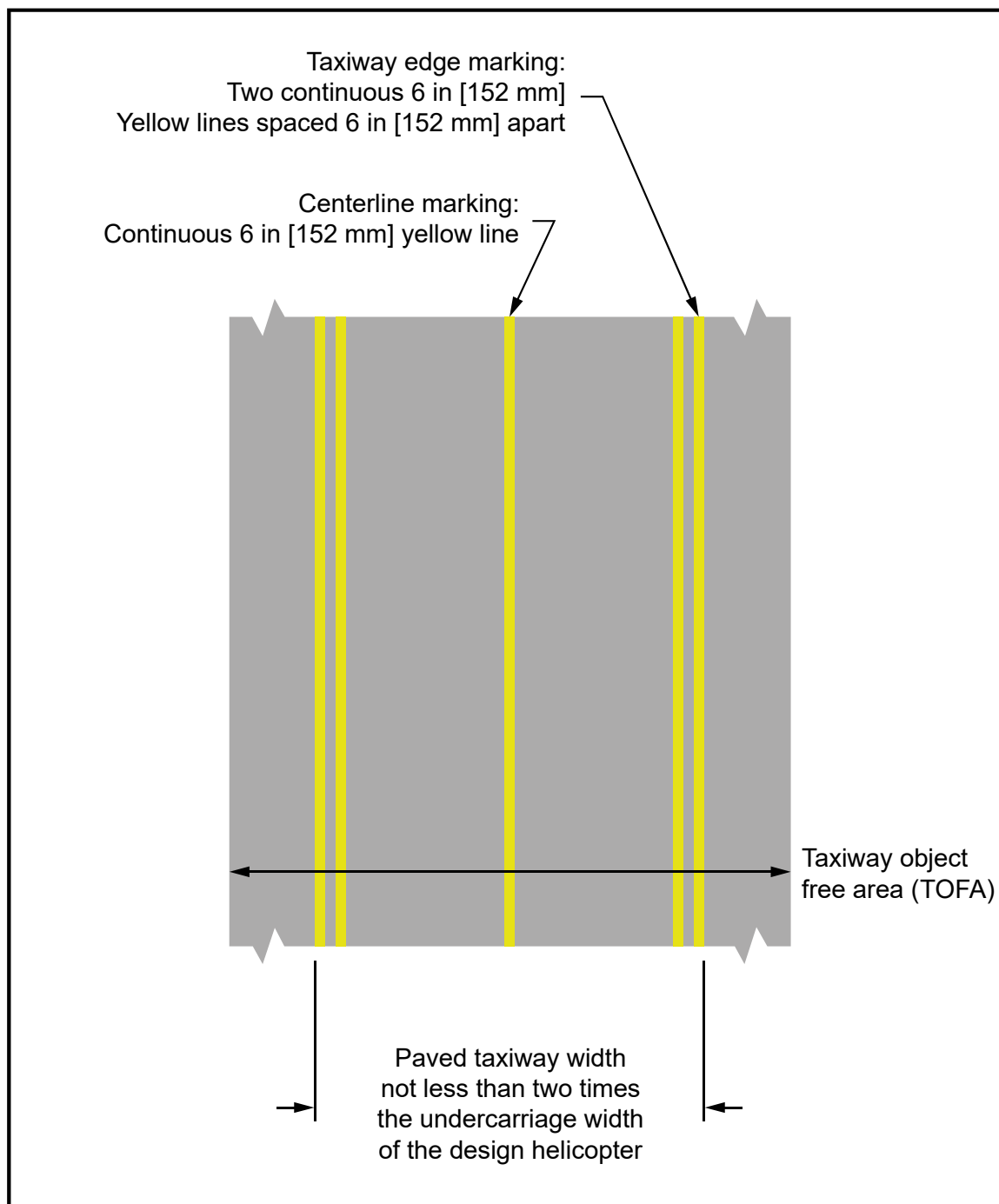
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4. Design taxiway centerline markings to continue into parking positions and become the parking position centerlines.

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⁶ AC 150/5300-13 specifies 25 feet (7.6 m) for taxiway width for fixed wing aircraft for TDG Groups 1A and 1B.

Figure 5-1. Taxiway/Taxiway Object Free Area (TOFA) Relationship – Paved Taxiway



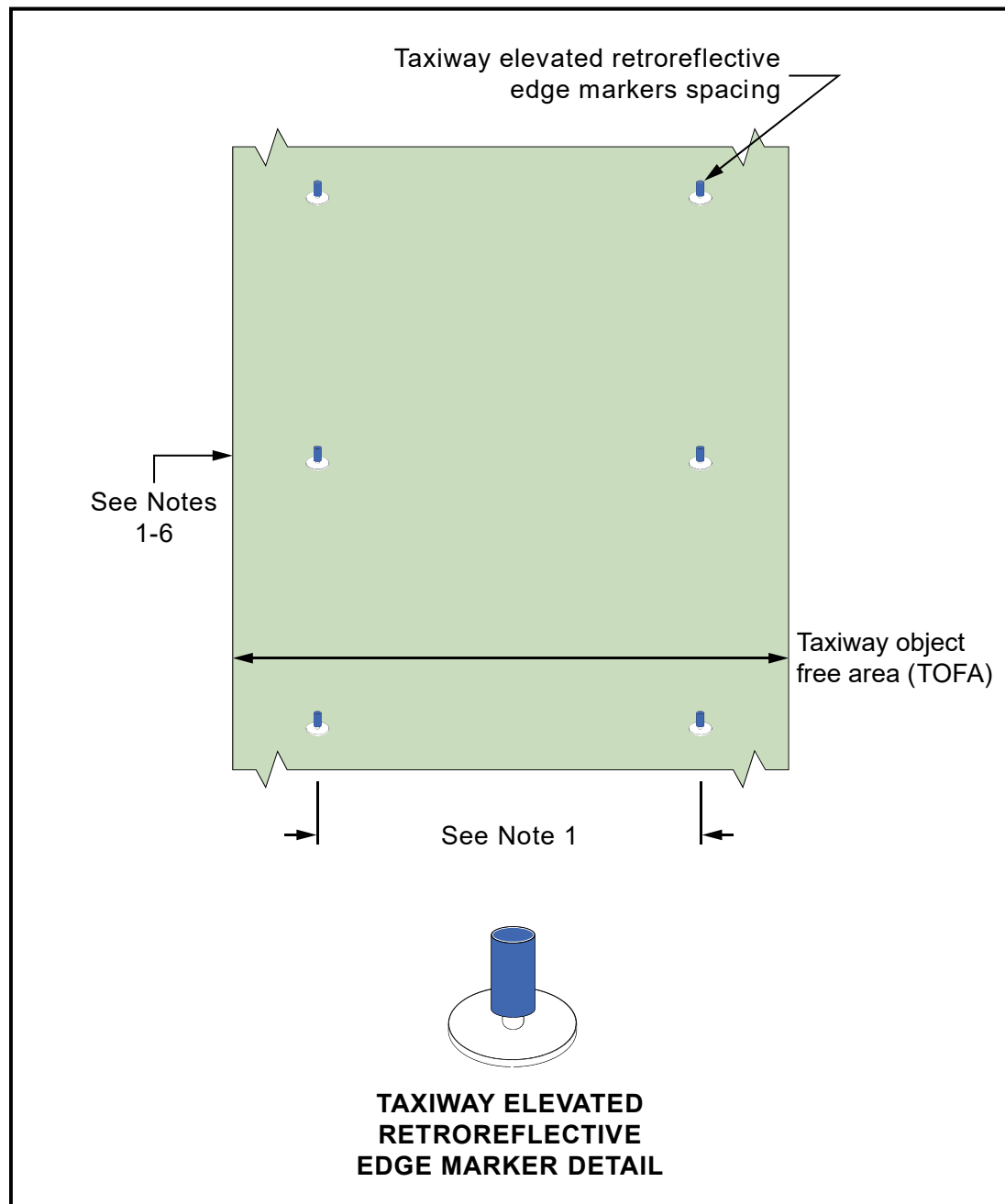
Note 1: See [Table 5-1](#) for taxiway width.

Note 2: TOFA outside of minimum taxiway width does not need to be paved.

5.2.2 Recommended Practices.

1. Mark both edges of the taxiway with two continuous 6-inch (152 mm) wide yellow lines spaced 6 inches (152 mm) apart to increase conspicuity (Figure 5-1).
2. Where taxiways are unpaved, use retroreflective edge markers at the edge of the limits of the taxiway to provide strong visual cues (Figure 5-2, and Figure 5-3).
 - a. Retroreflective edge markers are yellow, 12 inches (0.3 m) wide, and approximately 5 feet (1.5 m) long.
 - b. Space retroreflective markers longitudinally at approximately 15-foot (4.6 m) intervals on straight segments and at approximately 10-foot (3 m) intervals on curved segments.
 - c. Install elevated retroreflective markers on the outside edge of the limits of the minimum taxiway width.
 - d. Elevated retroreflective edge markers are blue, 4 inches (102 mm) diameter × 8 inches (203 mm) high maximum cylinder on a 2-inch (51 mm) support.
 - e. Install 12-inch (0.3 m) diameter solid-material disks around the poles supporting the elevated retroreflective markers where necessary to prevent grass from obscuring the markers.

Figure 5-2. Taxiway/ Taxiway Object Free Area (TOFA) Relationship – Unpaved Taxiway with Elevated Retroreflective Edge Markers



Note 1: See [Table 5-1](#) for taxiway width.

Note 2: Taxiway marker spacing: 15 feet (4.6 m) on straight segments.

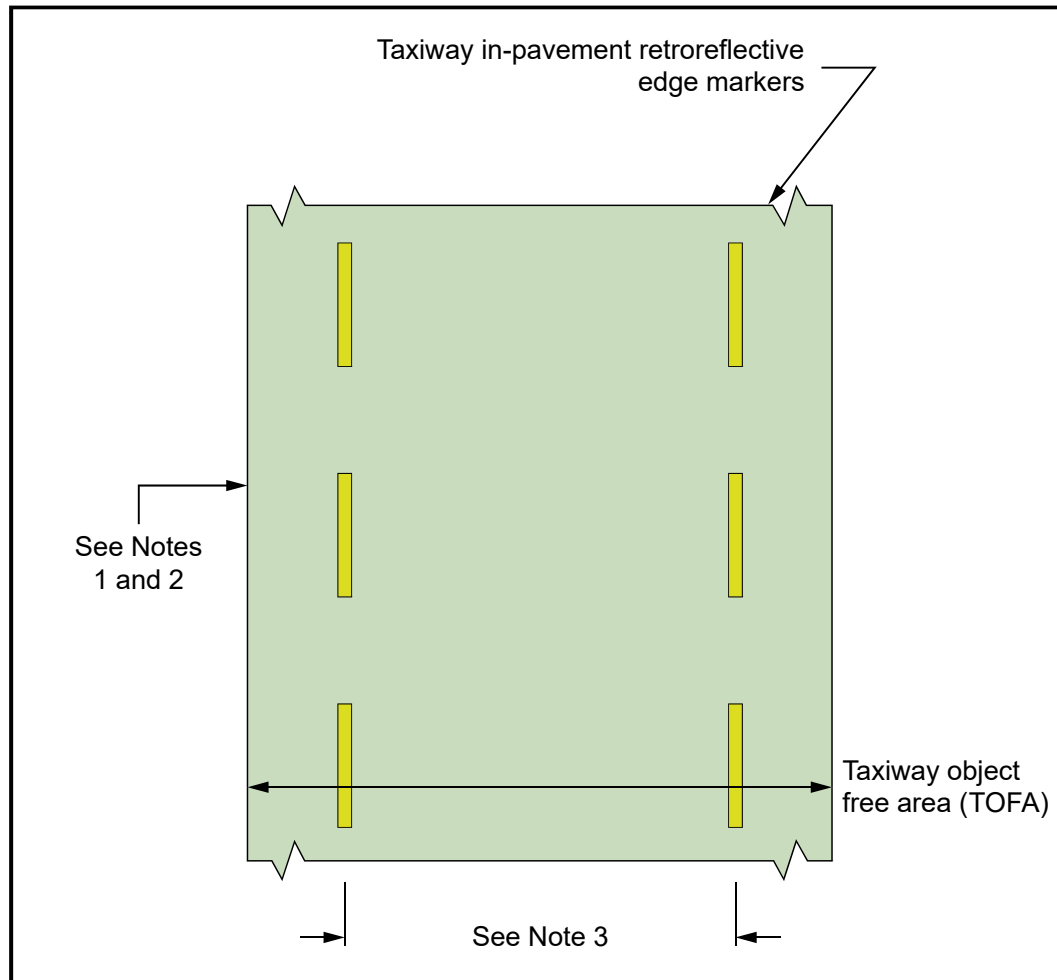
Note 3: Taxiway marker spacing: 10 feet (3 m) on curved segments.

Note 4: Taxiway marker detail: 12-inch (0.3 m) minimum diameter disc at grade or not to exceed 3 inches (76 mm).

Note 5: Taxiway marker detail: 4-inch (102 mm) diameter × 8-inch (203 mm) high maximum cylinder on a 2-inch (51 mm) support.

Note 6: See [AC 150/5345-39](#) for L-853 elevated retroreflective edge markers.

Figure 5-3. Taxiway/Taxiway Object Free Area (TOFA) Relationship – Unpaved Taxiway with In-Pavement Retroreflective Edge Markers



- Note 1:** Taxiway in-pavement retroreflective edge markers are 5 feet $\times$ 1 feet (1.5 m $\times$ 0.3 m).
Note 2: Retroreflective edge marker spacing: 15 feet (4.6 m) on straight segments, 10 feet (3 m) on curved segments.
Note 3: See [Table 5-1](#) for taxiway width.

5.3 Lighting.

Taxiway lighting provides enhanced safety at night and may be used.

5.3.1 Standards.

5.3.1.1 Taxiway Centerline Lights.

1. Install in-pavement bidirectional green taxiway centerline lights meeting the standards of [AC 150/5345-46](#) for type L-852A (straight segments) or L-852B (curved segments).
2. Space taxiway centerline lights at maximum 50-foot (15.2 m) longitudinal intervals on straight segments and at maximum 25-foot

1933 (7.6 m) intervals on curved segments, using a minimum of four lights
1934 to define the curve.

1935 3. Uniformly offset the taxiway centerline lights no more than two feet
1936 (0.6 m) to facilitate painting of the taxiway centerline.

1937 5.3.1.2 Taxiway Edge Lights.

1938 1. Install taxiway edge lights per AC 150/5340-30.

1939 2. For paved taxiways, use type L-852T in-pavement omnidirectional
1940 blue lights meeting the standards of AC 150/5345-46.

1941 3. The lateral spacing is equal to 1 D of the critical aircraft, but not more
1942 than 35 feet (10.7 m).

1943 5.3.2 Design Considerations.

1944 5.3.2.1 Taxiway Centerline Lights.

1945 1. Green retroreflective markers may be used instead of taxiway
1946 centerline lights.

1947 2. Use Type I retroreflective markers, as described in AC 150/5345-39,
1948 *Specification for L-853, Runway and Taxiway Retroreflective Markers*.

1949 5.3.2.2 Taxiway Edge Lights.

1950 1. L-861T elevated lights meeting the standards of AC 150/5345-46 may
1951 also be used for taxiway edge lights.

1952 2. For unpaved taxiways only, blue retroreflective markers may be used
1953 in lieu of taxiway edge lights.

1954 3. Ensure retroreflective markers are no more than 8 inches (203 mm)
1955 tall.

1956 4. For straight segments, space taxiway edge lights at 50-foot (15.2 m)
1957 longitudinal intervals on straight segments.

1958 5. Curved taxiway segments require smaller spacing of edge lights.

1959 a. The light spacing is based on the radius of the curve, as described
1960 in AC 150/5340-30.

1961 b. Space taxiway edge lights uniformly.

1962 c. On curved edges of more than 30 degrees from point of tangency
1963 (PT) of the taxiway section to PT of the intersecting surface, install
1964 at least three edge lights.

1965 d. For radii not listed, determine spacing by linear interpolation.

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1966

CHAPTER 6. Heliport Parking

1967

6.1 Parking.

1968

The design of a parking position is based on the size and weight of the aircraft intended to use it.

1969

1970

6.1.1 Standards.

1971

6.1.1.1 Location.

1972

Do not locate aircraft parking areas underneath approach/departure surfaces.

1973

1974

6.1.1.2 Size.

1975

1. Design the individual parking positions to accommodate the aircraft sizes and weights expected to use the positions, and size at least one parking position to accommodate the critical aircraft.

1976

1977

1978

2. Design parking to 1 D.

1979

3. For parking positions that will allow hover and/or air taxi operations, design the parking position no smaller than the FATO size and meet dynamic FATO load-bearing requirements.

1980

1981

1982

4. Account for the additional space needed if turning the aircraft while in the parking position.

1983

1984

5. Design parking to have rotors and propellers away from the direction of passenger walking paths.

1985

1986

6.1.1.3 Shape.

1987

Design parking positions to be round, rectangular, or polygons shaped and designed as taxi-through, turnaround, or back-out (Figure 6-1 and Figure 6-2).

1988

1989

1990

6.1.1.4 Separation.

1991

1. Provide a minimum of 0.28 D, no less than 10 feet (3 m) separation between the parking position and any object, building, safety area, or other parking position.

1992

1993

1994

2. Increase the minimum separation from 0.28 D to 0.42 D for back out parking.

1995

1996

3. Use the largest aircraft expected to occupy a parking position to determine the separation between parking positions intended for aircraft of different sizes.

1997

1998

1999

4. Use the critical aircraft to determine the separation between parking positions and taxiways.

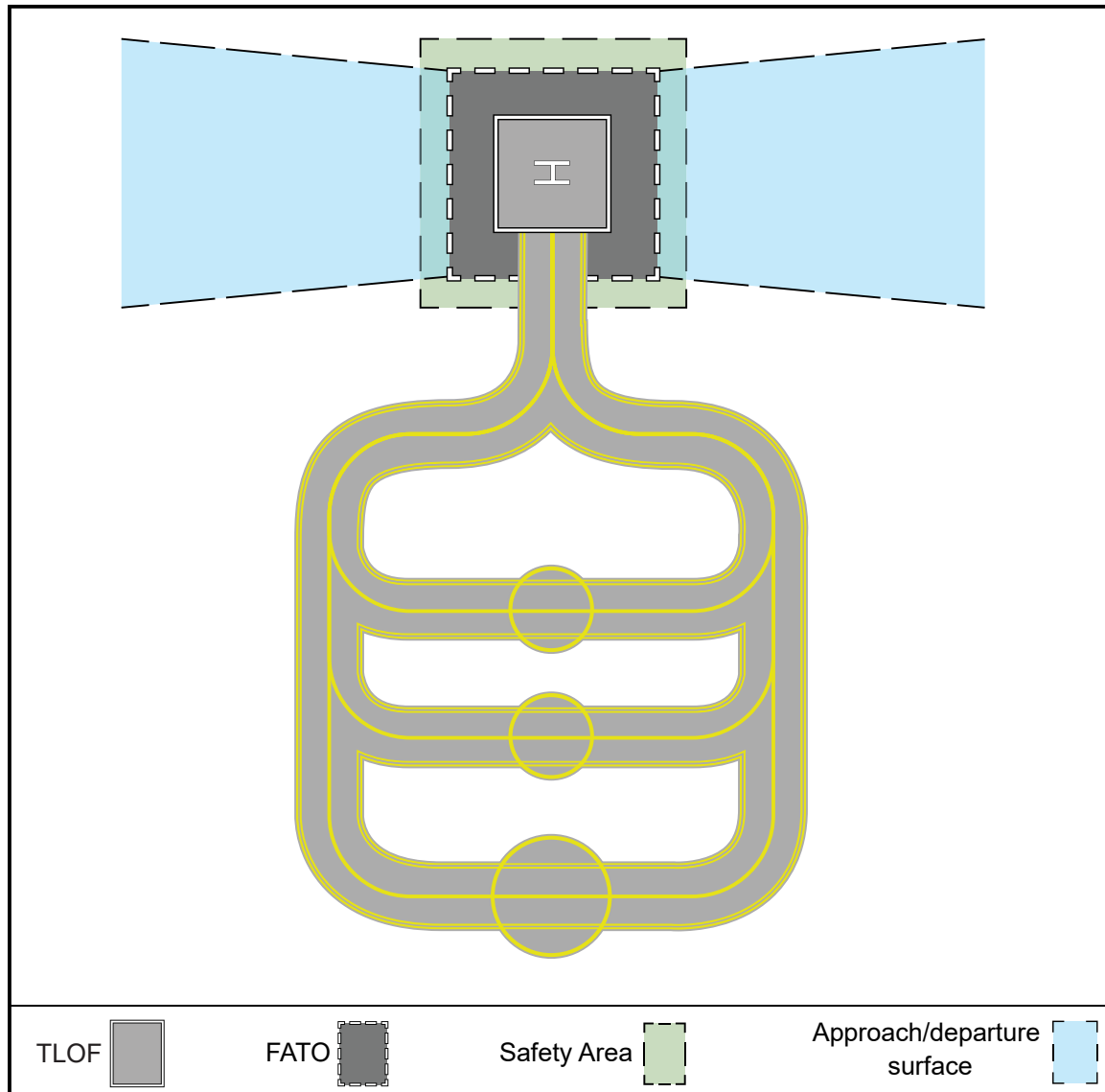
2000

5. If the parking area is designed as one large apron, use the nearest parking position to determine separation distance.

6.1.1.5 Design Load.

Design the parking positions to support the static loads of the aircraft intended to use them.

Figure 6-1. Typical Parking Area Design – “Taxi-through” Parking Positions

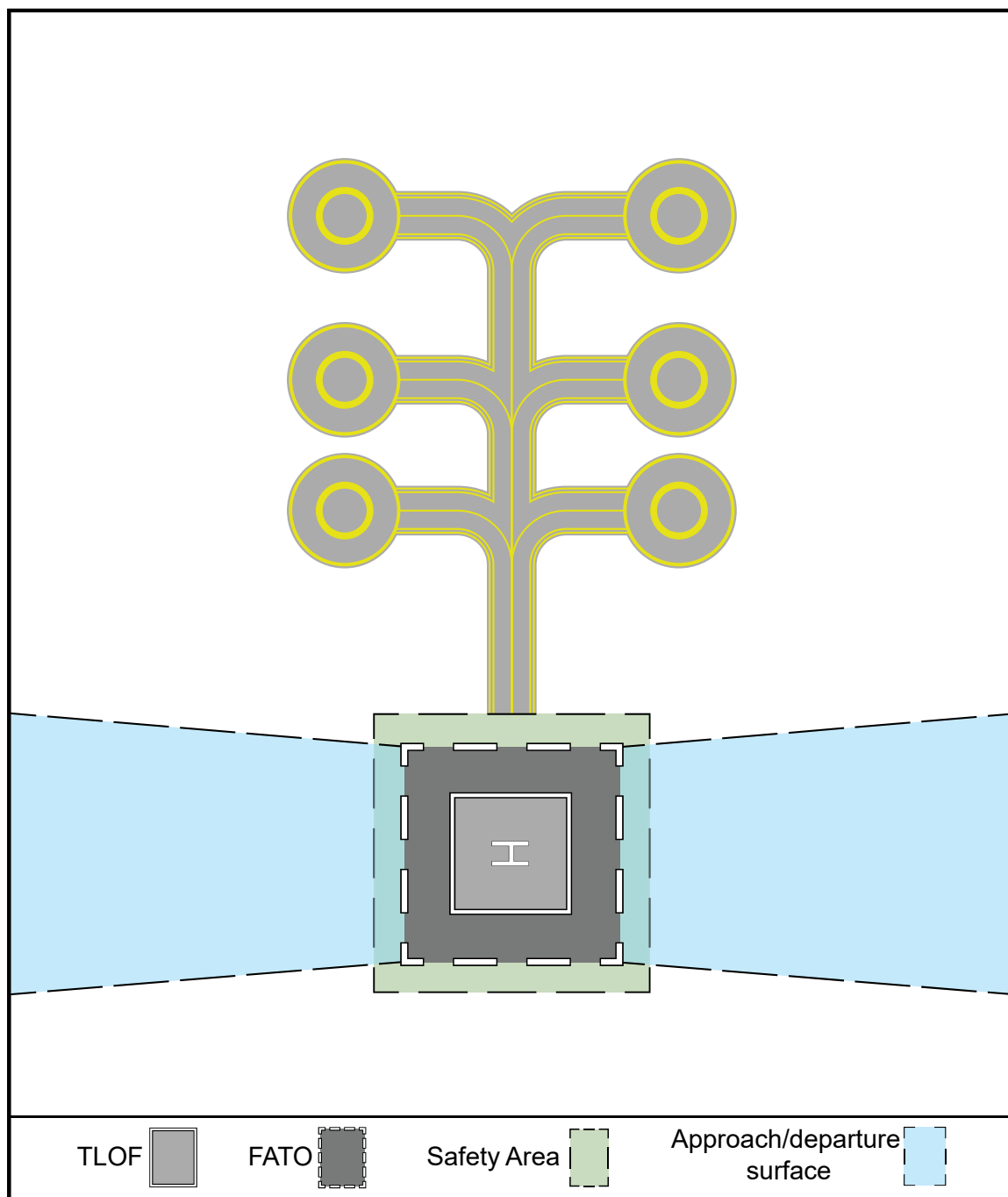


Note 1: For paved taxiways and parking positions, the taxiway centerline leads directly into the parking position centerline.

Note 2: See [Table 5-1](#) for taxiway width.

2011
2012

Figure 6-2. Typical Parking Area Design – “Back-out” and “Turn-around” Parking Positions



2013
2014
2015
2016

Note 1: For paved taxiways and parking positions, the taxiway centerline leads directly into the parking position centerline.

Note 2: See [Table 5-1](#) for taxiway width.

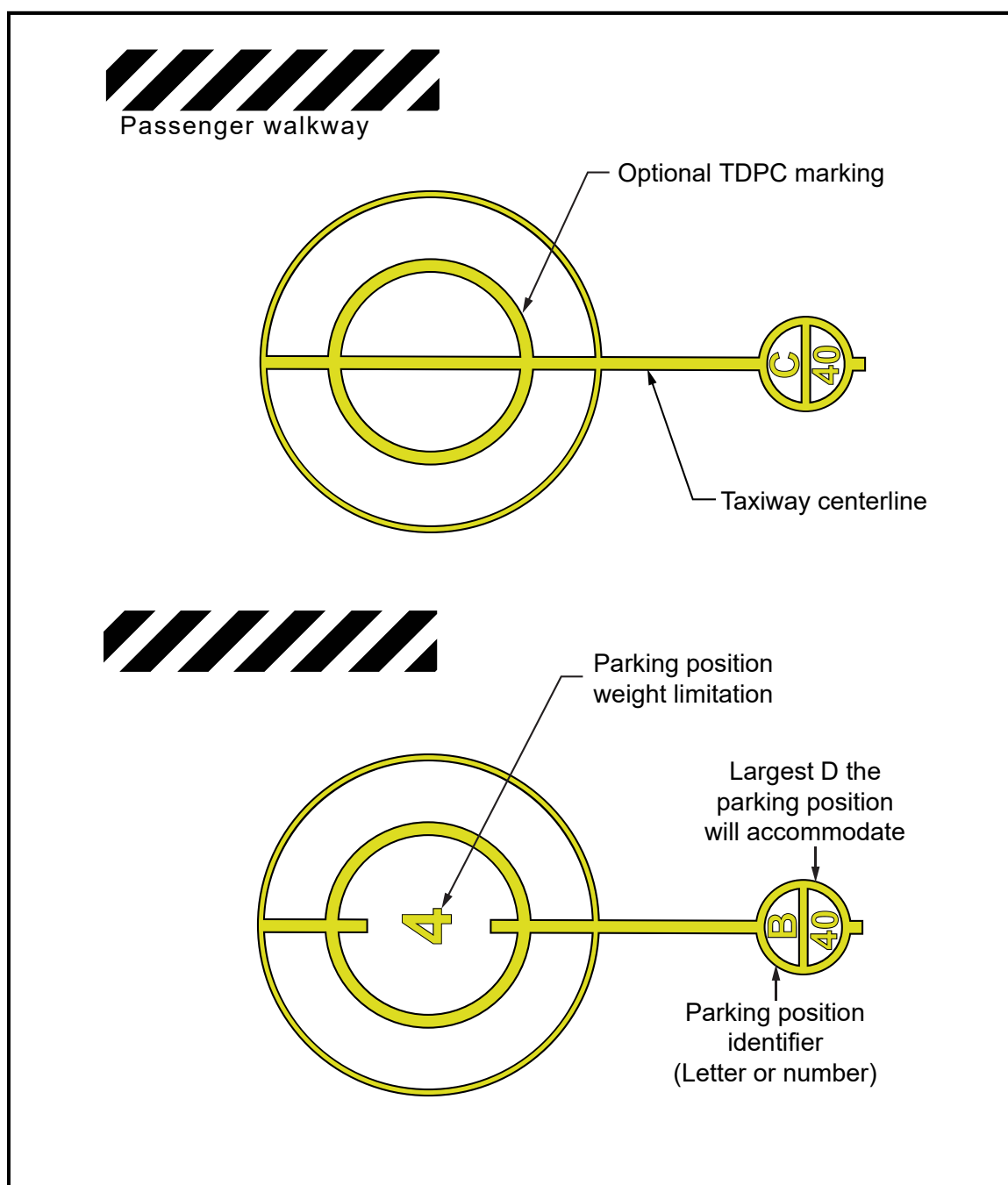
- 2017 6.1.1.6 **Tiedowns.**
- 2018 1. Install recessed tiedowns at parking positions to protect aircraft from
- 2019 DWOV and to accommodate extended or overnight parking.
- 2020 2. Ensure any surface depression associated with a tiedown is narrower
- 2021 than half the width of the smallest aircraft wheel anticipated to use the
- 2022 parking position.
- 2023 3. Provide storage for tiedown chocks, chains, cables, and ropes off the
- 2024 parking position.
- 2025 6.1.1.7 **Walkways.**
- 2026 1. Provide marked ingress/egress walkways identified with black and
- 2027 white paint (Figure 6-3).
- 2028 2. Locate passenger walkways to minimize passenger exposure to various
- 2029 risks, including DWOV, during passenger loading and unloading.
- 2030 3. Design the pavement to drain away from walkways so spilled fuel
- 2031 does not drain onto walkways or toward parked aircraft.
- 2032 6.1.2 Recommended Practices.
- 2033 1. Highlighting each tiedown point with a bright contrasting color increases
- 2034 conspicuity.
- 2035 2. Orient markings such that a pilot would be able to see incoming traffic from the
- 2036 parking position.
- 2037 6.1.3 Design Considerations.
- 2038 1. Parking may occur under the transitional surfaces.
- 2039 2. Consider the turn radius of the aircraft when designing taxi intersections and
- 2040 parking positions for wheeled aircraft.
- 2041 3. Consider ground vehicle loads in the design.
- 2042 6.2 **Marking.**
- 2043 6.2.1 Standards.
- 2044 1. Outline the circle, rectangle, or polygon of a paved parking position with a 6-inch
- 2045 (152 mm) wide, solid yellow line (Figure 6-3 and Figure 6-4).
- 2046 2. Place markings along the edge of the parking area with the outer edge of each stripe
- 2047 approximately on the edge of the usable parking area.
- 2048 3. Mark paved parking position identifications (numbers or letters), if there is more
- 2049 than one parking position, using yellow characters 36 inches (0.9 m) high (Figure
- 2050 6-3, and Figure 6-4, and Figure F-1).

4. On paved parking positions, mark the D of the largest aircraft that the position is designed to accommodate using yellow characters 36 inches (0.9 m) high (Figure 6-3, and Figure 6-4, and Figure F-1).
5. For paved parking positions with a weight limitation, mark the weight limitation in units of 1,000 lbs in the center of the parking position (Figure 6-3, and Figure 6-4, and Figure F-1).
 - a. Mark with yellow characters 36 inches (0.9 m) high.
 - b. When necessary, place a bar under the number to minimize the possibility of being misread.
 - c. Do not use metric equivalent.
6. For unpaved parking positions, outline the position with a series of retroreflective markers, 6 inches (152 mm) 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).
 - a. Place markers along the edge of the parking area with the outer edge of each stripe approximately on the edge of the usable parking area.
 - b. Ensure the markers are affixed to the ground and do not move from DWOW or create tripping hazards.

6.2.2 Recommended Practices.

1. Use a TDPC marking for “turn-around” parking areas.
2. Design the TDPC marking to be a yellow circle with an inner diameter of 1/2 RD and a line width of 18 inches (0.5 m) (Figure 4-18).
3. Locate the TDPC marking in the center of a parking position (Figure 6-3).
4. For paved circular parking positions, locate a 6 inch (152 mm) wide solid yellow shoulder line 1/4 D from the center of the parking position and perpendicular to the centerline (Figure 6-4).

2076

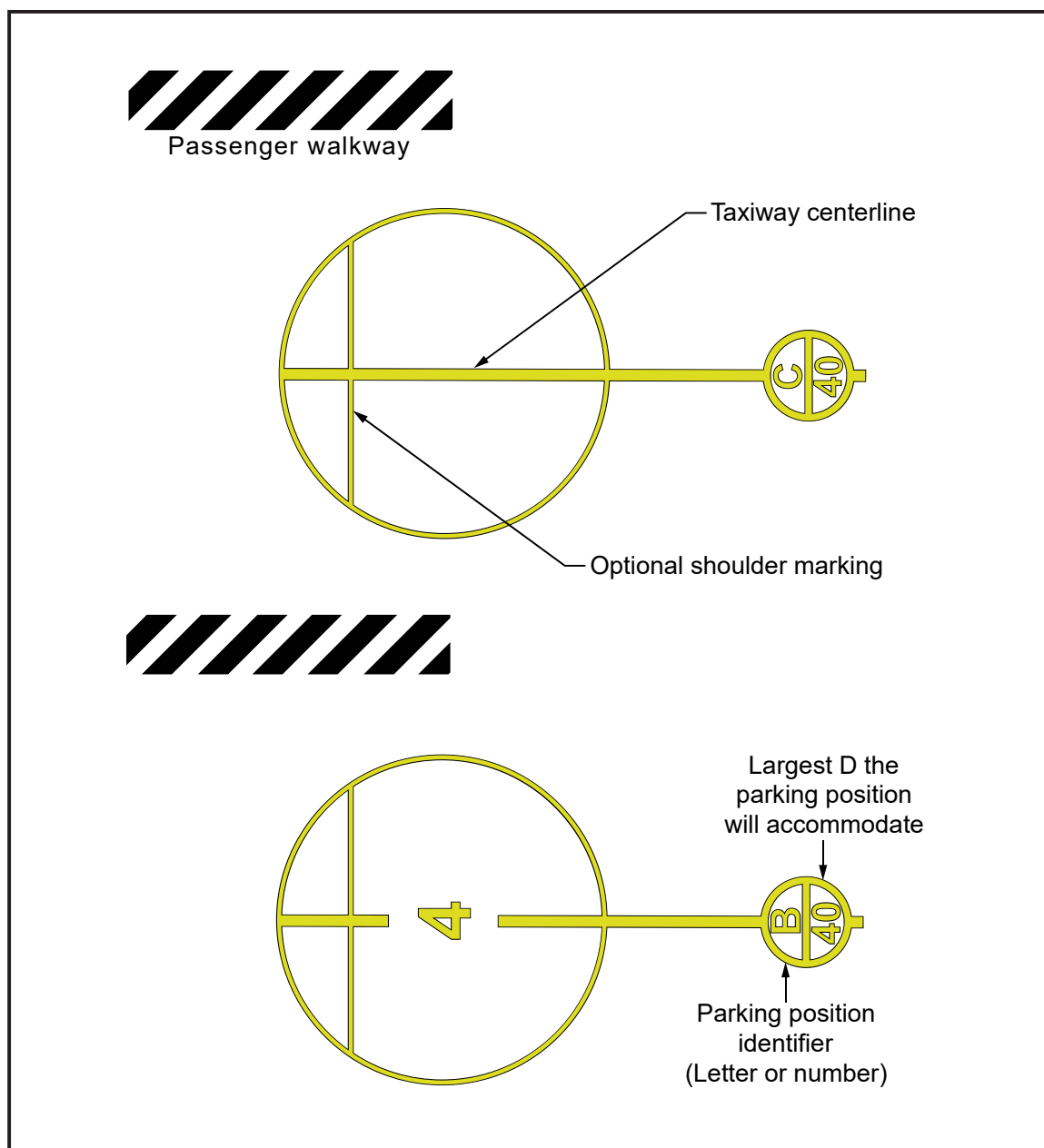
Figure 6-3. “Turn-around” Parking Position Marking

Note 1: Base the design of these parking positions on the understanding that the aircraft may pivot about a point to exit the parking position.

Note 2: This marking scheme is for paved areas only.

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2079
2080

2081

Figure 6-4. “Taxi-through” and “Back-out” Parking Position Marking2082
2083**Note:** This marking scheme is for paved areas only.

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2084

CHAPTER 7. Soil Stabilization

2085

Stabilize soil to meet different site requirements. Find guidance on soil stabilization in

2086

AC 150/5320-6 and AC 150/5370-10, at the FAA Airports website

2087

<https://www.faa.gov/airports>.

2088

7.1**Design Considerations.**

2089

1. Consider aircraft weight, ground support vehicle weight, operational frequency, soil analysis, and climatic conditions in selecting the method(s) and extent of surface stabilization. A well-drained and well-established turf that presents a smooth, dense surface is usually the most cost-effective surface stabilization available.

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2091

2092

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2. Thicker pavements may be needed where the quality of the subsurface soil is poor or questionable.

2094

2095

3. Climatic and soil conditions dictate the appropriate grass species to use at the site.

2096

4. Where heliports are located on soils that have poor load-carrying capabilities when wet, consider overcoming this deficiency by mixing selected granular materials into the upper 12 inches (0.3 m) of the soil (see Item P-217 of AC 150/5370-10).

2097

2098

2099

a. Suitable granular materials for this purpose are crushed stone, pit-run gravel, coarse sand, or oyster shells.

2100

2101

b. Use a sufficient ratio of aggregate to soil to improve the stability of the soil yet retain the soil's ability to support grass.

2102

2103

5. Precast masonry shapes or metal panels/grates may be used to support soil and loads.

2104

2105

a. Use them on a prepared foundation to present a semi-solid surface that allows grass to grow in the natural openings.

2106

2107

b. Other materials such as pre-manufactured concrete or other suitable materials may be used where applicable.

2108

2109

6. Ensure any materials used do not become a flying hazard due to DWOW.

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2110 CHAPTER 8. Aircraft Fueling and Charging

2111 8.1 Fueling.

2112 Various federal, state, and local requirements for petroleum handling facilities apply to
2113 systems for storing and dispensing fuel. Guidance is provided in AC 150/5230-4,
2114 *Aircraft Fuel Storage, Handling, and Dispensing on Airports*.

2115 8.1.1 Standards.

- 2116 1. Design the heliport facility to allow fueling with the use of a fuel truck (this
2117 includes hot refueling) or a specific fueling area with stationary fuel tanks.
- 2118 2. Do not locate fueling equipment in the TLOF or FATO.
- 2119 3. Do not locate fueling equipment directly under the approach/departure surfaces.
- 2120 4. Design and mark fueling facilities to minimize the potential for aircraft to collide
2121 with the dispensing equipment.
- 2122 5. Design fueling areas so there is no object tall enough to be hit by any part of the
2123 critical aircraft.
 - 2124 a. Provide a minimum of 0.42 D clearance from any part of the aircraft and fueling
2125 equipment.
 - 2126 b. Provide area lighting for the fueling area if night fueling operations are offered.
 - 2127 c. Ensure any light poles do not constitute an obstruction hazard.

2128 8.1.2 Design Consideration.

2129 Low-profile fuel dispensing cabinets can be in one quadrant of a safety area if there is
2130 no available room outside the safety area, provided they are marked and lighted, and the
2131 other three quadrants of the safety area are clear.

2132 8.2 Charging and Electric Infrastructure.

2133 Many emerging vertical flight aircraft are being developed to use electric propulsion.
2134 The electrical needs for these aircraft vary based on design and manufacturer. This AC
2135 addresses battery driven technologies. Future guidance will be provided on other
2136 emerging energy concepts (e.g., hydrogen).

2137 Electrification of aviation propulsion systems is an evolving area with few industry-
2138 specific standards. In addition to relevant national, state, and local building codes,
2139 Appendix J provides a partial list of relevant standards that may assist when specifying
2140 charging systems and facility layout for this emerging industry.

2141 At the time of this publication, consensus has not been achieved regarding classes of
2142 charging or connection standards and could vary based on the aircraft duty cycle,
2143 charging speed, battery chemistry, charging system, and battery cooling system, etc.

8.2.1 Standards.

1. Site aircraft batteries storage outside the TLOF, FATO, and safety areas and not penetrating the approach/departure surfaces.
2. Ensure charging equipment meets all applicable building codes, fire codes, and NFPA Standards.

8.2.2 Recommended Practices.

Electric charging infrastructure often exists within the airport environment where other types of legacy based fueling and aircraft operations exist. Plan this mixed-use environment to ensure a safe, efficient, and successful airport operation. The following non-exhaustive list may help with this goal:

1. Ensure the location of charging equipment does not flood. Install equipment on raised concrete pad to limit exposure.
2. Install collision barriers and signage to limit the potential for impact to equipment by aircraft, fuel trucks, etc.
3. Provide for proper set back of equipment based on aircraft wingspans, rotor spans, and propulsion unit spans. Ensure there is no object tall enough to be hit by any part of the critical aircraft. Provide a minimum of 0.42 D clearance from any part of the aircraft.
4. Take precautions to ensure snow does not accumulate on and around equipment. Locate charging equipment so it is clearly visible to snow removal equipment operators.
5. Do not locate charging equipment in areas where deicing will take place as deicers contain chemicals that can damage and corrode it.
6. Place charging equipment inside the security fence to limit potential for tampering.
7. Provide for cord storage on the dispensers or use cord retractors to increase safety and reduce tripping hazards
8. Consider adding options for ground power unit auxiliary needs.
9. Ensure the charging station is located outside the safety area and does not penetrate the approach/departure surface, transitional surface, or lateral extension surface.

8.2.3 Design Considerations.

1. Consider adapting charging infrastructure design for heliports to multiple aircraft specific systems.
2. When siting charging stations and equipment, consider all potential safety hazards and guidance in this AC.

2178

CHAPTER 9. Site Safety

2179

9.1 Fire Fighting Considerations.

2180

2181

Heliports are subject to state and local rescue and fire fighting regulations. See NFPA 418 and NFPA 855 for the most current guidance on fire protection.

2182

9.1.1 Standards.

2183

2184

1. Provide a fire hose cabinet or extinguisher at each access gate/door and each fueling location.

2185

2186

2. Locate fire hose cabinets, fire extinguishers, and other fire fighting equipment adjacent to, but below the level of, the TLOF.

2187

9.2 Security and Safety.

2188

2189

Controlling heliport access and keeping operational areas clear of people, animals, equipment, debris, and vehicles is important for safety and security.

2190

9.2.1 Standards.

2191

2192

2193

1. For ground-level heliports, erect a safety barrier fence around the aircraft operational areas outside of the safety area and below the applicable elevation of the approach/departure and transitional surfaces.

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2195

2196

2. Design safety fences to be high enough to present a positive deterrent to people inadvertently or maliciously entering an operational area, but at a low enough elevation to be non-hazardous to all aircraft operations.

2197

2198

3. Control access to airside areas with adequate security measures as required or recommended by the Transportation Security Administration.

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2201

4. Locate a heliport caution sign at all heliport access points, ensuring it is outside the safety area and does not penetrate the approach/departure surface or transitional surface (Figure 9-1).

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2203

5. Ensure all people are outside of the DCA when aircraft are operating, as described in paragraph 4.6.

2204

9.2.2 Design Considerations.

2205

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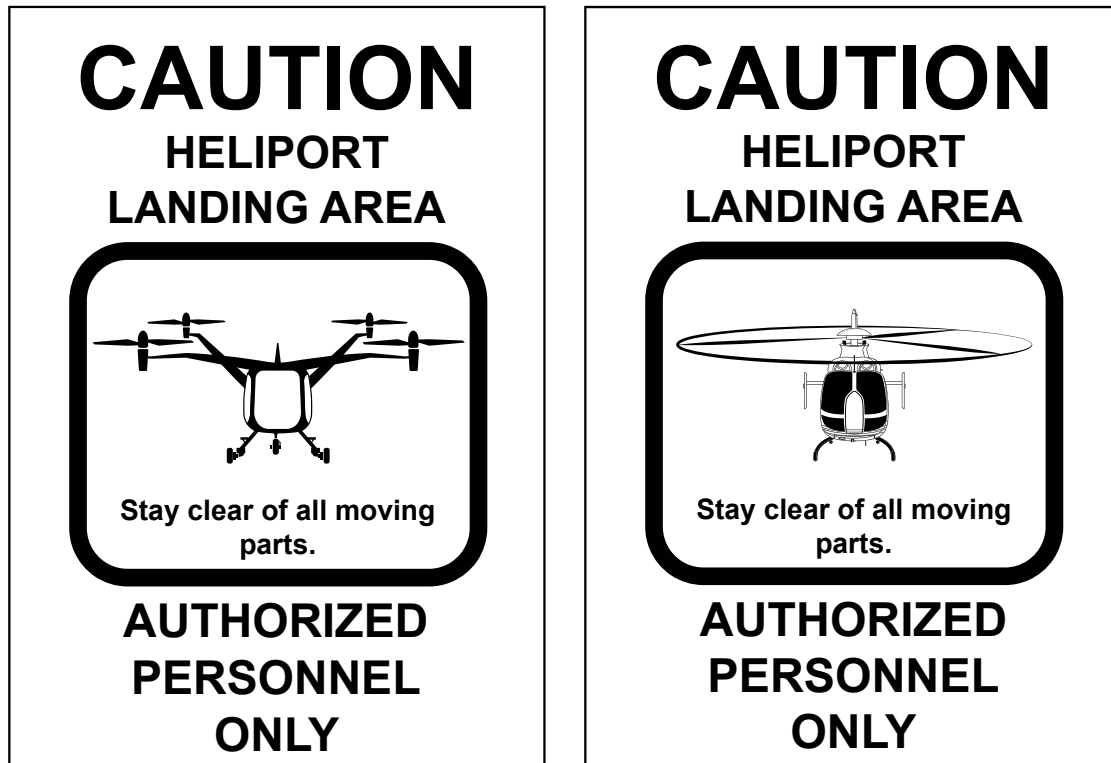
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Other types of safety barriers may be used if they provide adequate positive deterrent to people inadvertently entering an operational area, do not create turbulence during aircraft operations, and do not attract wildlife or negatively impact safety following the same precautions for fences.

2209

Figure 9-1. Heliport Caution Sign Examples



2210

2211 9.3 Weather Information.

2212 When installed, an automated weather observing system (AWOS) measures and
 2213 automatically broadcasts current weather conditions at the heliport site. Further research
 2214 is being conducted as other systems may be able to provide weather data similar to an
 2215 AWOS. Other weather sources approved by the FAA Administrator may also be used.
 2216 These weather systems will have different siting criteria.

2217 9.3.1 Standard.

- 2218 1. When installing an AWOS, locate it at least 100 feet (30.5 m) and not more than
 2219 700 feet (213 m) from the TLOF and such that its instruments will not be affected
 2220 by DWOW from aircraft operations.
- 2221 2. Follow guidance on AWOS systems in AC 150/5220-16, Automated Weather
 2222 Observing Systems (AWOS) for Non-Federal Applications, and FAA Order 6560.20,
 2223 Siting Criteria for Automated Weather Observing Systems (AWOS).

2224 9.4 Winter Operations.

2225 Swirling snow dispersed by an aircraft's rotor/propeller DWOW can cause the pilot to
 2226 lose sight of the intended landing point and/or obscure objects that need to be avoided.
 2227 Find guidance on winter operations in AC 150/5200-30, Airport Field Condition
 2228 Assessments and Winter Operations Safety.

2229 9.4.1 Standards.

- 2230 1. Design the heliport to accommodate the methods and equipment to be used for snow
2231 removal.
- 2232 2. Design the heliport to allow the snow to be removed sufficiently so it will not
2233 present white-out conditions for pilots, an obstruction hazard, or a flying debris
2234 hazard to people and vehicles.

2235 9.4.2 Recommended Practices.

- 2236 1. For heliports located in climates with winter weather, a dark TLOF surface can be
2237 used to absorb more heat from the sun and melt residual ice and snow.
- 2238 2. Elevated heliports may benefit from the incorporation of in-surface snow and ice
2239 melt systems.

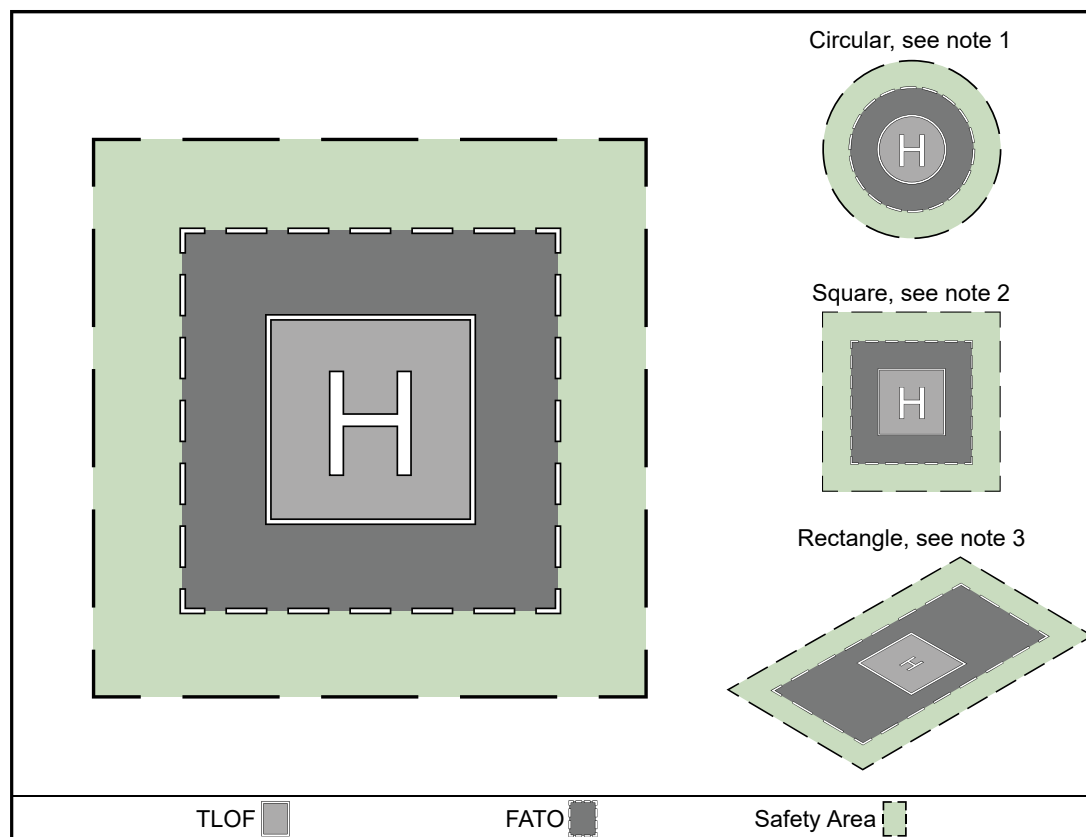
2240 9.5 **Access to Heliports by Individuals with Disabilities.**

2241 Congress has passed various laws concerning access to airports. Since heliports are a
2242 type of airport, these laws are similarly applicable. Follow guidance in AC 150/5360-
2243 14, Access to Airports by Individuals with Disabilities.

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APPENDIX A. TLOF/FATO/Safety Area Relationships and Minimum Dimensions

Figure A-1. TLOF/FATO/Safety Area Relationships and Minimum Dimensions



	Minimum Dimension	LBA
TLOF	1 RD +10 feet (3 m)	Dynamic
FATO	1.5 D	Depends on critical aircraft
Minimum separation between TLOF and FATO perimeters	0.34 D on all side	Depends on critical aircraft
Safety area	0.28 D on all sides (but not less than 20 feet (6.1 m))	N/A

Note 1: For a circular TLOF and FATO, dimensions refer to diameters.

Note 2: For a square TLOF and FATO, all sides of the TLOF and FATO have equal length.

Note 3: For a square TLOF with a rectangular FATO, dimensions refer to sides.

Note 4: Increase sizes if the heliport elevation is above 1,000 feet (305 m) MSL.

Note 5: Pay attention to whether the dimension is expressed in RD vs. D.

Note 6: For hospital heliports only, the minimum safety area is 10 feet (3 m) if it is not practicable to meet the standard size.

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APPENDIX B. Instrument Flight Procedures (IFP)

This appendix provides guidance for instrument operations on heliports. Title 14 CFR Part 97, *Standard Instrument Procedures*, prescribes the criteria for instrument flight procedure development through incorporation of FAA Order 8260.3, *United States Standard for Terminal Instrument Procedures (TERPS)*. Instrument flight procedures permit aircraft operations to continue during periods of low ceilings and reduced visibility. Instrument flight procedures include approach procedures, departure procedures, and missed approach procedures.

The FAA establishes instrument flight procedures under FAA 8260-series Orders overseen by the FAA Flight Technologies and Procedures Division. When a procedure applies to a private (non-public) heliport, is developed for one specific user, or is developed by a non-FAA service provider using unique FAA-approved instrument criteria, the instrument procedure is a “special” instrument procedure. After approval by the FAA, the special instrument procedure is issued to the operator approved to fly the procedure.

Those who design instrument flight procedures have some flexibility in the design of such procedures. See the latest revision of FAA 8260-series Orders for more detailed information on criteria for developing instrument flight procedures. The standards and recommendations in this AC are not intended to be sufficient to design an instrument flight procedure. Initiate early contact with the Flight Technologies and Procedures Division | Federal Aviation Administration to plan for and establish instrument flight procedures.

B.1 Criteria to Support Instrument Flight Procedure Development.

For planning purposes, use Table B-1 to determine the lowest obtainable minimums. Consideration of all pertinent factors ultimately determines the lowest minimums obtainable.

Table B-1. Criteria to Support Instrument Flight Procedure Development at Heliports

	Precision approach/ Approach with Vertical Guidance ⁷		Non-precision approach	Approach to point-in-space, proceed visually	Approach to point-in- space, proceed VFR
Visibility minimums	1/4 statute mile (0.4 km)	1/2 statute mile (0.8 km) ¹	HAL=250-600: 1/2 statute mile (0.8 km) HAL=601-800: 3/4 statute mile (1.2 km) HAL>800: 1 statute mile (1.5 km)	3/4 statute mile (1.2 km) day ⁵	3/4 statute mile (1.2 km) day, 1 statute mile (1.5 km) night ⁶
Authorized minima	≥200 feet (61 m) AGL	≥200 feet (61 m) AGL	≥250 feet (76 m) AGL	≥250 feet (76 m) AGL	≥250 feet (76 m) AGL

	Precision approach/ Approach with Vertical Guidance ⁷		Non-precision approach	Approach to point-in-space, proceed visually	Approach to point-in- space, proceed VFR
Obstacle Clearance Surface (OCS)	34:1 Clear ROC ²	34:1 Clear ROC ²	Standard Non- precision ROC ²	8:1 clear	NA
Heliport lights ³	Required	Required	Required	Required	NA
Survey required ⁹	Yes	Yes	Yes	No	No
Approach lights (HALS)	Yes	Yes ⁴	Yes ⁴	No	No
HPZ protection	Yes	Yes	Yes	Yes	Yes
Elongated FATO	150 feet (46 m) × 150 feet (46 m)	150 feet (46 m) × 150 feet (46 m)	150 feet (46 m) × 150 feet (46 m)	No	No

Note 1: 1/4 statute mile (0.4 km) reduction is authorized with height above landing (HAL) aligned to approach angle and course.

Note 2: Required obstacle clearance (ROC). See FAA Order 8260.3. A standard glidepath angle of 3 degrees requires a 34:1 OCS for the entire approach surface.

Note 3: Either the TLOF or the FATO (if the FATO is load-bearing), must be lit at night.

Note 4: For any approach with ½ mile visibility or less.

Note 5: Proceed visually minimum visibility is 3/4 miles (1.2 km) maximum visibility based on distance from missed approach point/descent altitude (MAP/DA) to landing location.

Note 6: If HAL is greater than 800 feet (244 m) MSL, visibility for day and night is 1 statute mile (1.6 km).

Note 7: A precision approach is any type of approach that has vertical guidance.

Note 8: A heliport with an instrument approach procedure must use standard symbology (not distinctive markings like a company logo) to identify the facility. See paragraph 4.8.

Note 9: Aeronautical surveys are required to obtain certain visibility minimums. See AC 150/5300-16, *General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey*, AC 150/5300-17, *Standards for Using Remote Sensing Technologies in Airport Surveys*, and AC 150/5300-18, *General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards*.

B.2 Visual References.

One of the following items must be available and visible to a pilot approaching a heliport on an instrument approach procedure where necessary visual requirements are specified by the FAA. (See FAA AIM 10-1-3, *Helicopter Approach Procedures to VFR Heliports*, and FAA Order 8260.3, *United States Standard for Terminal Instrument Procedures (TERPS)*, Appendix G)

1. FATO lights.
2. TLOF lights.
3. Heliport Instrument Lighting System (HILS).
4. Heliport Approach Lighting System (HALS) or lead-in lights.

- 2310 5. Visual Glideslope Indicator (VGSI).
2311 6. Windsock or windsock light(s). See note below.
2312 7. Heliport beacon.
2313 8. Other facilities or systems approved by the Flight Technologies and Procedures
2314 Division (AFS-400).

2315 **Note:** Locate windsock lights within 500 feet (152 m) of the TLOF.

2316 B.2.1 Heliport Instrument Lighting System (HILS).

2317 The HILS can be used with non-precision instrument approach procedures to heliports.
2318 It consists of 24 unidirectional PAR 56, 200-watt white lights that extend the FATO
2319 perimeter lights. The system extends both the right and left edge lights as edge bars and
2320 both the front and rear edge lights as wing bars, as shown in Figure B-1.

2321 B.2.1.1 **Standards.**

- 2322 1. Place edge bar lights at 50-foot (15.2 m) intervals, measured from the
2323 front and rear row of the FATO perimeter lights (Figure B-1).
2324 2. Space FATO wing bar lights at 15-foot (4.6 m) intervals, measured
2325 from the line of FATO perimeter (side) lights (Figure B-1).

2326 B.2.2 Heliport Approach Lighting System (HALS).

2327 The HALS depicted in Figure B-2 is a distinctive approach lighting configuration
2328 designed to prevent it from being mistaken for an airport runway approach lighting
2329 system. This system is required for precision approaches with visibility minimums
2330 below ½ mile (Table B-1).

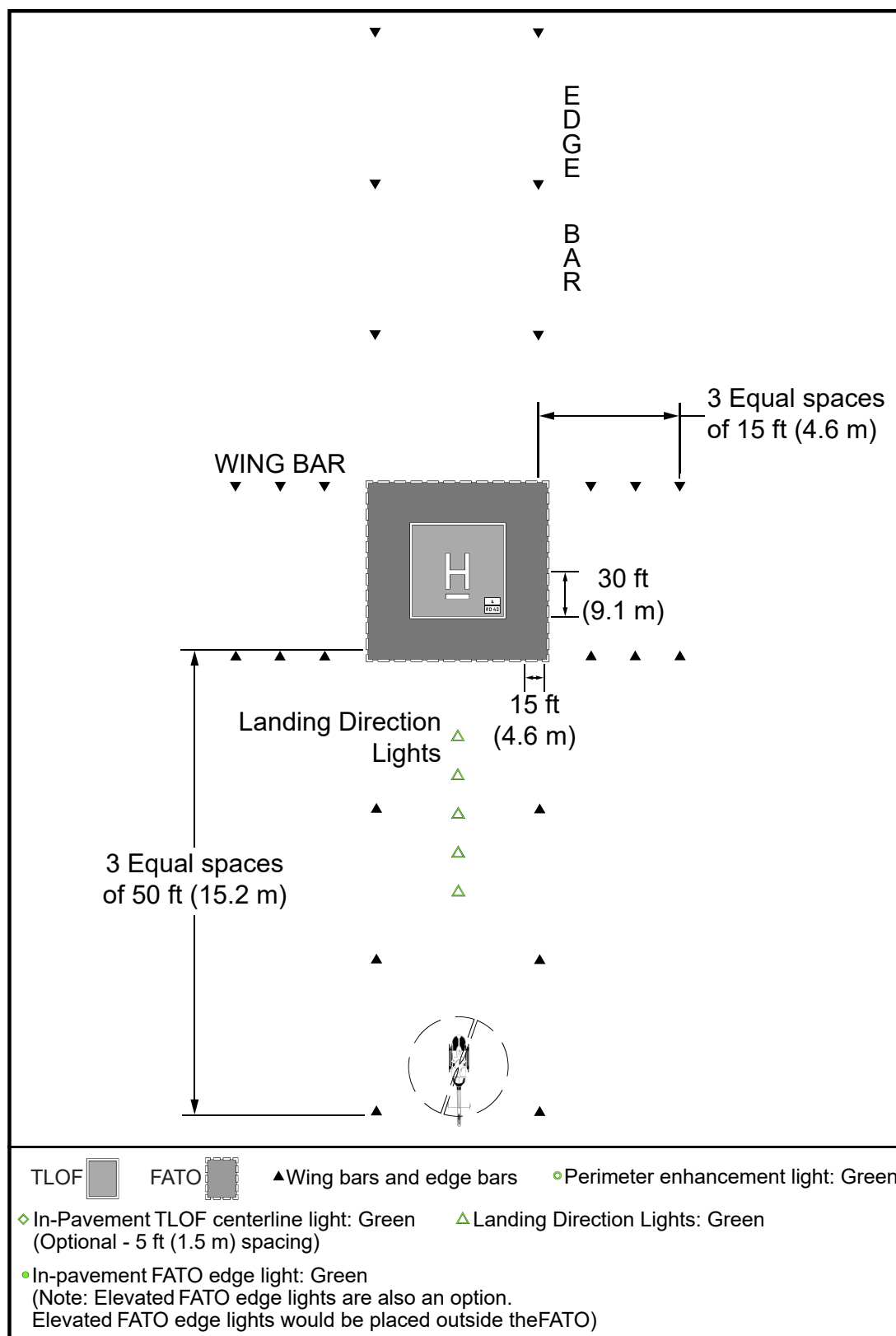
2331 B.3 **Visual Glideslope Indicators (VGSI).**

2332 See paragraph 4.9.8.

2333 B.4 **Obstacle Evaluation Surfaces.**

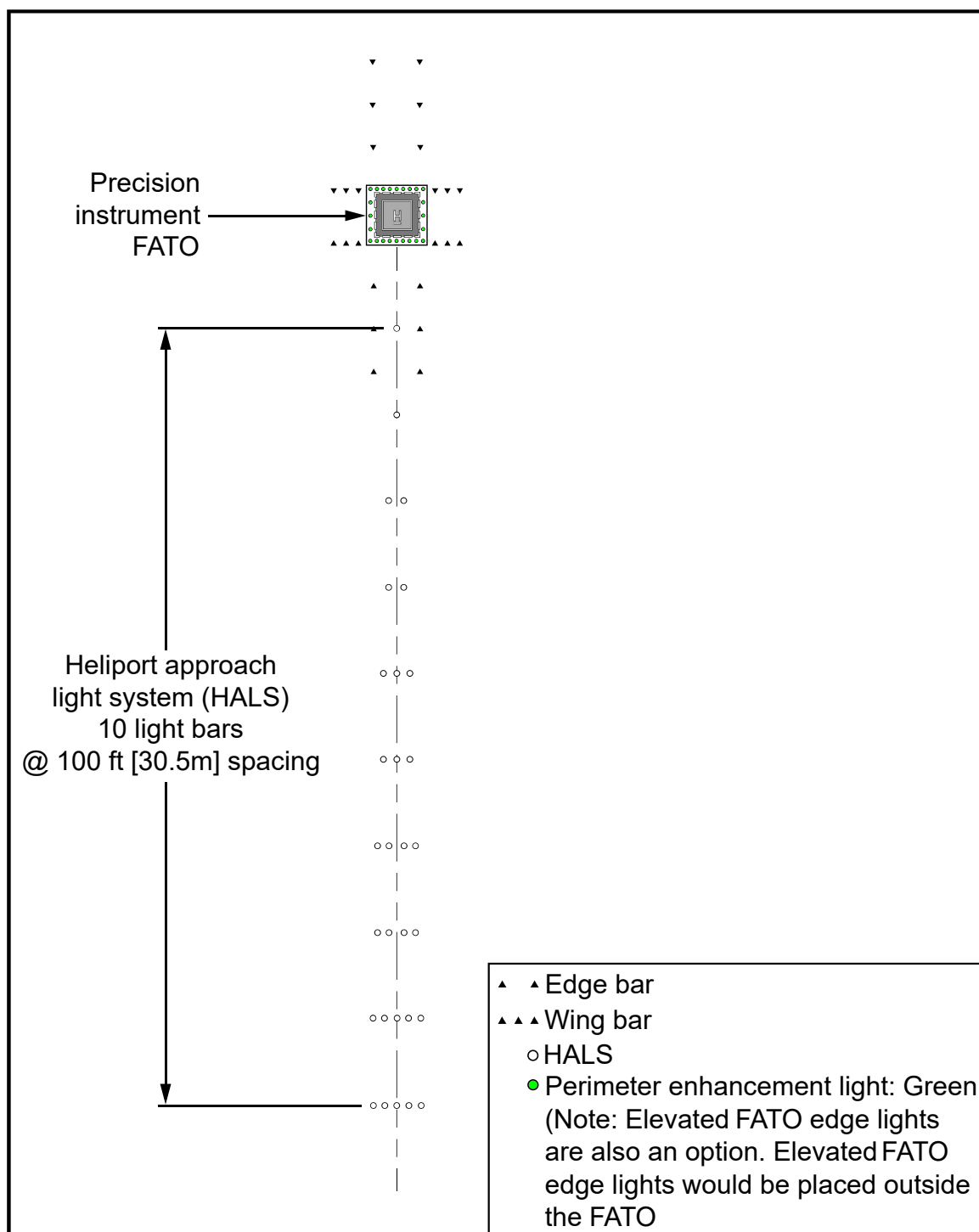
2334 The instrument procedure developer considers the specific heliport location, its physical
2335 characteristics, the terrain, surrounding obstructions, etc., in designing the instrument
2336 approach procedure. Upon development of the instrument procedure, protect the
2337 obstacle evaluation surfaces from penetrations. See Table B-1 for additional guidance.

2338

Figure B-1. Heliport Instrument Lighting System (HILS): Non-precision

2339

2340

Figure B-2. Heliport Approach Lighting System2341
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Note: The illustrated HILS has elevated FATO edge lights. In-pavement FATO edge lights may be placed just inside the FATO.

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2344 APPENDIX C. Emergency Helicopter /VTOL Landing Facilities (EHLF)

2345 C.1 General.

2346 Preplanning emergency landing areas will result in safer and more effective air-support
2347 operations. These facilities comprise rooftop emergency facilities and medical
2348 emergency sites and are not for routine aircraft operations. For additional reference
2349 material, see paragraph 1.5.

2350 C.2 Notification and Coordination.

2351 In addition to the sponsor's requirements to provide notice under 14 CFR Part 157,
2352 advise the local Terminal Approach Radar Control or the local ATC facility manager in
2353 writing of the EHLF. State and local building code requirements may apply to rooftop
2354 EHLF facilities.

2355 C.3 Rooftop Emergency Facilities.

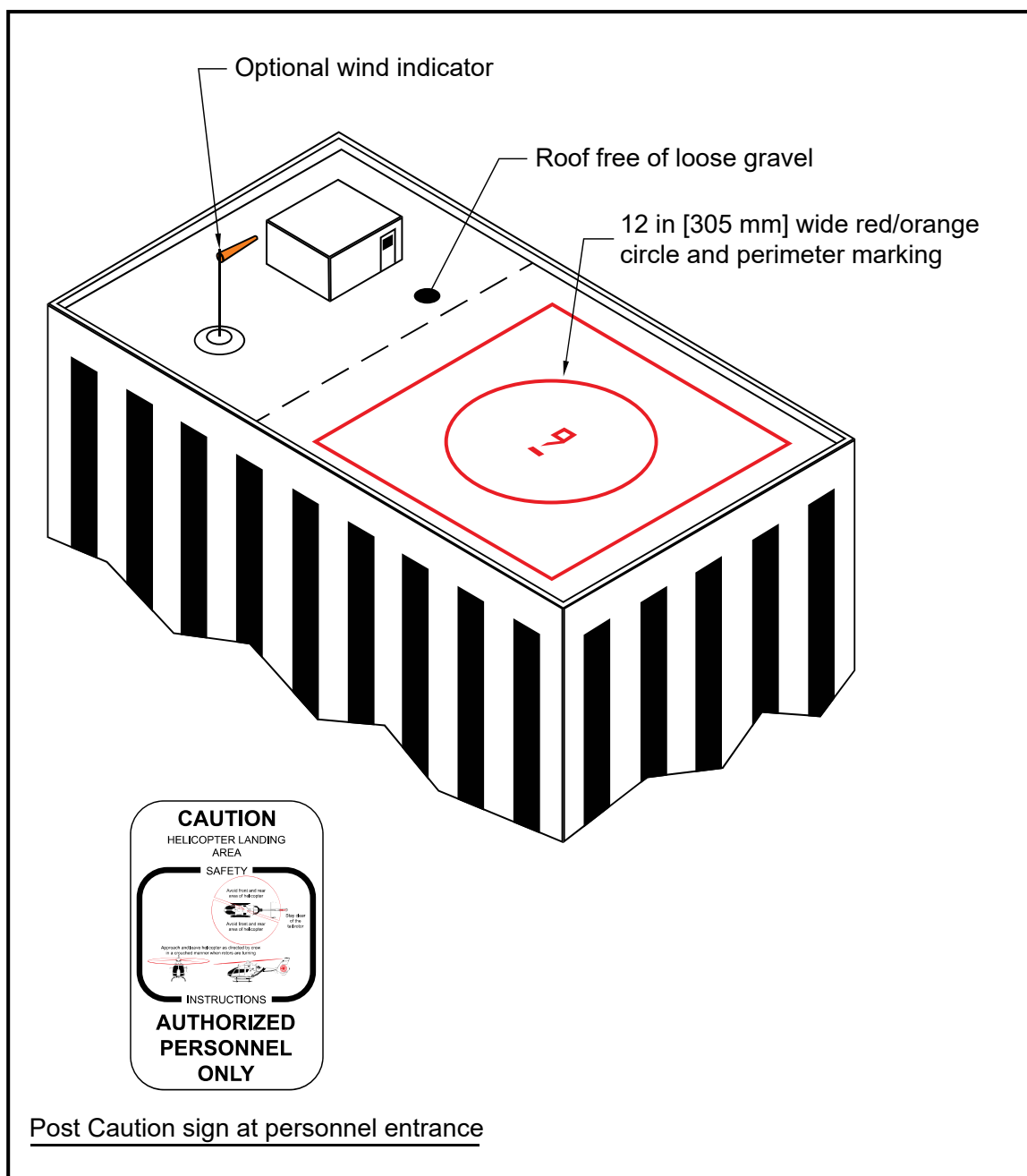
2356 Review local building codes to determine if they require structures over a specified
2357 height to provide a clear area on the roof capable of accommodating an aircraft to
2358 facilitate firefighting or emergency evacuation operations.

2359 C.3.1 Standards.

2360 C.3.1.1 TLOF.

- 2361 1. Design the landing surface to the local fire department requirements
2362 based on the size and weight of the aircraft expected to engage in fire
2363 or rescue operations (Figure C-1).
- 2364 2. Design the TLOF to be square, rectangular, or circular in configuration
2365 and centered within the EHLF.
- 2366 3. Design the length and width or diameter to be at least the controlling
2367 dimension D of the largest aircraft expected to use the EHLF.
- 2368 4. Design the TLOF to accommodate the maximum takeoff weight of the
2369 critical aircraft expected to use the EHLF.
- 2370 5. Provide two pedestrian access points to the TLOF at least 90 degrees
2371 apart with a minimum of 60 feet (18.3 m) TLOF perimeter separation.
- 2372 6. Design the surface so drainage flows away from pedestrian access
2373 points, with a maximum slope of 1.5 to 2.0 percent.

2374

Figure C-1. Rooftop Emergency Landing Facility2375
2376
2377

Note: The example shown in the illustration indicates a 9,000 lbs (4,082 kg) weight limitation in the center of circle.

- 2378 C.3.1.2 **FATO.**
- 2379 1. Design the FATO to extend a distance of at least 45 feet (13.7 m) in all
- 2380 directions from the center of the EHLF.
- 2381 2. Provide clearance of 0.28 D of the largest aircraft expected but not less
- 2382 than 20 feet (6.1 m) between any part of the aircraft and any object
- 2383 that could be struck.
- 2384 3. Design the FATO to be unobstructed and without penetration of
- 2385 obstacles such as parapets, window washing equipment, penthouses,
- 2386 handrails, antennas, vents, etc.
- 2387 4. Design the FATO to be at the same level as the TLOF.
- 2388 C.3.1.3 **Safety Area.**
- 2389 Provide a clear, unobstructed area, a minimum of 12 feet (3.7 m) wide, on
- 2390 all sides, outside and adjacent to the FATO.
- 2391 C.3.1.4 **Fall Protection.**
- 2392 1. Provide fall protection if the TLOF or load-bearing FATO is elevated
- 2393 4 feet (1.2 m) or more above its surroundings, per 29 CFR Section
- 2394 1910.23, *Duty to Have Fall Protection and Falling Object Protection.*
- 2395 If using a net:
- 2396 a. Ensure the net has a load carrying capability of 25 lbs/sq foot (122
- 2397 kg/sq m).
- 2398 b. Ensure the net does not project above the level of the TLOF.
- 2399 c. Fasten both the inside and outside edges of the safety net to a solid
- 2400 structure.
- 2401 d. Ensure the net is constructed of materials that are resistant to
- 2402 environmental effects.
- 2403 2. Do not use permanent railings or fences since they would be safety
- 2404 hazards during aircraft operations.
- 2405 C.3.1.5 **Markings.**
- 2406 1. Define the limits of the TLOF with a solid 12-inch (0.3 m) wide red or
- 2407 orange line, as illustrated in Figure C-1.
- 2408 2. Center a 12-inch (0.3 m) wide red or orange touchdown/positioning
- 2409 circular marking, 30 feet (9.1 m) in diameter, within the TLOF using a
- 2410 contrasting color for the background within the circle.
- 2411 3. Mark the TLOF with the maximum takeoff weight of the critical
- 2412 aircraft, in units of thousands of pounds (for example, a number “9”
- 2413 indicating 9,000 lbs (4,082 kg) gross weight), with each numeral ten
- 2414 feet (3 m) in height, centered within the TLOF.

- 2415 4. Clearly mark rooftop access paths, EHLF access paths, and assembly
2416 zone(s) with surface paint and instructional signage.
- 2417 C.3.1.6 **Access.**
2418 Provide a minimum of two rooftop access stairs, with no less than 150
2419 degrees separation, connecting to the top floor of the structure, with at
2420 least one providing access to the structure's emergency staircase.
- 2421 C.3.1.7 **Wind Indicator.**
2422 Install an orange wind indicator assembly within the line-of-sight from the
2423 EHLF and outside the approach/departure path(s) conforming to AC
2424 150/5345-27.
- 2425 C.3.1.8 **Lighting.**
2426 Shield ambient rooftop lighting to avoid affecting the pilot's vision.
- 2427 C.3.2 **Recommended Practices.**
2428 1. Add fall protection for all platforms elevated 30 inches (0.8 m) or more.
2429 2. Equip access doors with "panic bar" hardware and/or alarm them.
2430 3. Always keep the penthouse and stairwell rooftop access doors unlocked to provide
2431 access to the EHLF.
2432

2433

APPENDIX D. Pre-Designated Emergency Landing Areas (PELAs)2434
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PELAs are clear and level areas near the scene of an accident or incident that the local emergency response team designates as the place where the air ambulance is directed to land to transport an injured person to a hospital. Provide such sites in various locations within a jurisdiction to support fast response to medical emergencies and accidents. Pre-designating these areas 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. See the AIM, Chapter 10, for guidance on setting up offsite scene or PELA landing sites.

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APPENDIX E. Helicopter Data

2443

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 features, carry fewer passengers, etc.

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2445

2446

2447

Various helicopter manufacturers have provided this information. Confirm data by contacting the manufacturer(s) of the specific helicopter(s) of interest.

2448

2449

Legend for Figure E-1 and Table E-1: Helicopter Dimensions and Data

2450

A Manufacturer name and helicopter model

2451

B Maximum takeoff weight in pounds

2452

D Controlling dimension

2453

E Number of blades

2454

F Rotor plane clearance in feet

2455

H Overall height in feet (usually at tail rotor)

2456

I Tail rotor diameter (in feet)

2457

J Number of tail rotor blades

2458

K Tail rotor ground clearance in feet

2459

L Type of undercarriage

2460

M Number and type of engines

2461

N Number of crew and passengers

2462

OL Overall helicopter length in feet (rotors at their maximum extension)

2463

2464

OW Overall aircraft width in feet

2465

RD Rotor diameter in feet

2466

TR Distance from rotor hub to tip of tail rotor in feet

2467

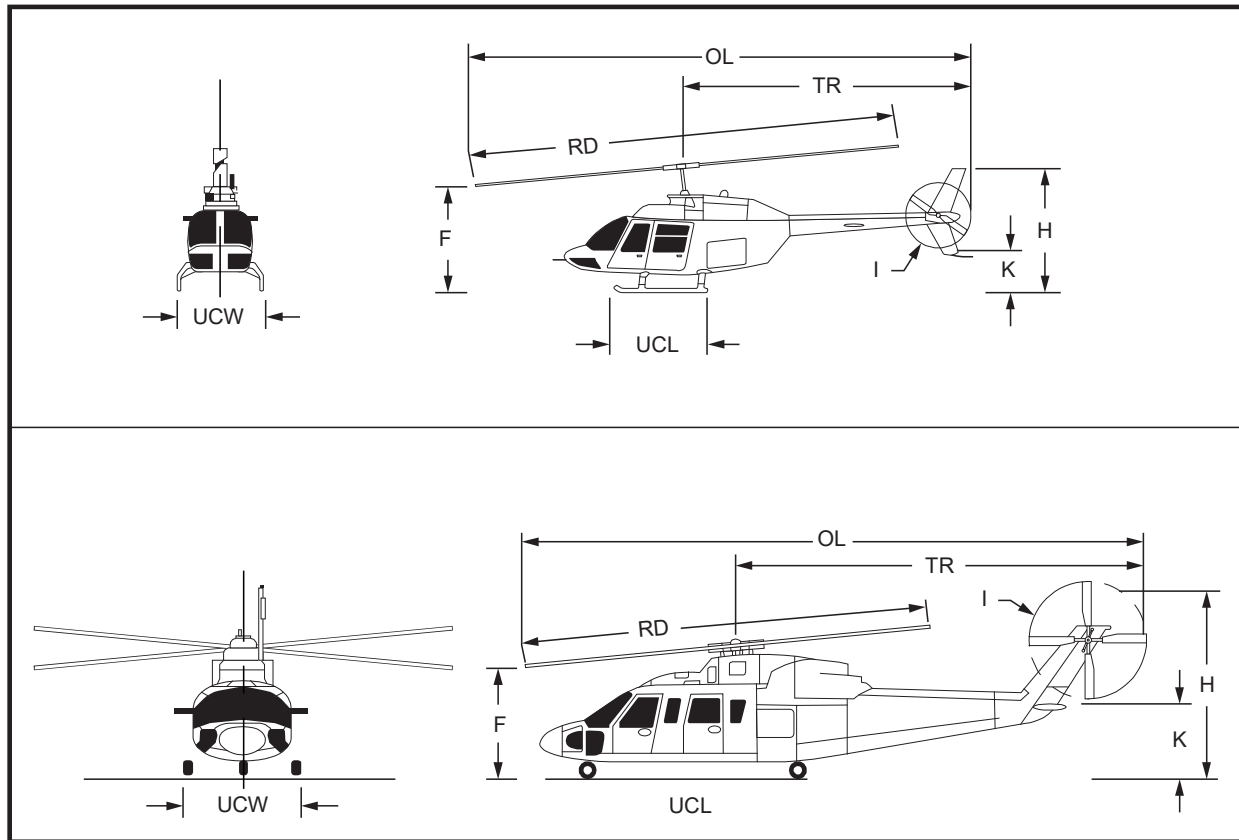
UCL Undercarriage length in feet

2468

UCW Undercarriage width in feet (the distance between the outside edges of the tires or the skids)

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2470

Figure E-1. Helicopter Dimensions

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Table E-1. Helicopter Data

Manufacturer / Model	Maximum Takeoff Weight	Controlling Dimension (ft)	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 Rotor Circle Radius (ft)	Diameter (ft)	Number of Blades	Ground Clearance (ft)	Type	Length (ft)	Width (ft)		
A	B	D	OL	H	RD	E	F	TR	I	J	K	L	UCL	UCW	M	N
AgustaWestland																
A-109A	5,732	42.8	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	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	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	42.5	11.2	35.5	4	8		6.4	2	3.3	wheel	12.3	7.1	2-T	1-2&6-7

Manufacturer / Model	Maximum Takeoff Weight	Controlling Dimension (ft)	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 Rotor Circle Radius (ft)	Diameter (ft)	Number of Blades	Ground Clearance (ft)	Type	Length (ft)	Width (ft)		
A	B	D	OL	H	RD	E	F	TR	I	J	K	L	UCL	UCW	M	N
AW-119 Ke	6,283	42.4	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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
Boeing																
107/CH-46E	24,300	84.3	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	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	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	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	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	30.1	9.7	32	3	6.5	21.2	5	2	3.6	skid	9.2	8	1-T	1&4

Manufacturer / Model	Maximum Takeoff Weight	Controlling Dimension (ft)	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 Rotor Circle Radius (ft)	Diameter (ft)	Number of Blades	Ground Clearance (ft)	Type	Length (ft)	Width (ft)		
A	B	D	OL	H	RD	E	F	TR	I	J	K	L	UCL	UCW	M	N
Erickson																
S-64E/F Air Crane	42,000 - 47,000	88.5	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	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	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	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	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	39.3	10.2	34.5	3	8.9	23	Fenestron		2.4	skid	6.4	6.6	1-T	1&4
AS-350 A Star	4,960	42.5	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	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	43.3	11.5	37.7	4	10.7	25	Fenestron		2.6	wheel	23.7	6.4	1-T	1&13
AS-365 Dauphin/H-65 Dolphin	9,480	45.1	45.1	13.3	39.2	4	11.4	24	Fenestron		2.6	wheel	11.9	6.2	2-T	1&11
BO-105	5,732	38.9	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	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	37.8	11.2	32.8	3	10.1	24.6	Fenestron		2.1	skid	9.4	6.8	1-T	1&4
EC-130	5,291	41.5	41.5	11.8	35.1	3	11	23.7	Fenestron		5.3	skid	10.5	7.9	1-T	1&7
EC-135	6,250	40	40	11.5	33.5	4	11	22.8	Fenestron		5.6	skid	10.5	6.6	2-T	1&6
EC-145/ UH-72A	7,904	42.7	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	46.9	14.27	41.3	5	12	23	Fenestron		3.1	wheel	12.8	6.2	2-T	2&12
EC-225	24,332	64	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	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	52.5	15.1	44	4			8.1	4		wheel			2-T	3&8
MD Helicopters																
500E	3,000	30.8	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	32.1	8.1	27.4	5	8	19	4.8	2	1.3	skid	8.1	6.4	1-T	1&4

Manufacturer / Model	Maximum Takeoff Weight	Controlling Dimension (ft)	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 Rotor Circle Radius (ft)	Diameter (ft)	Number of Blades	Ground Clearance (ft)	Type	Length (ft)	Width (ft)		
A	B	D	OL	H	RD	E	F	TR	I	J	K	L	UCL	UCW	M	N
520N	3,350	32.1	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	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	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	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	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	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	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	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	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	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
300CB/CBi	1,750	30.8	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	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	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	62.6	13.1	53	3			8.2	2		wheel			1-T	2&12
S-58/H34	14,600	65.8	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	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	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	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	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	99.5	27.8	79	7	17	59.6	20	4	9.5	wheel	27.3	13	3-T	3&55

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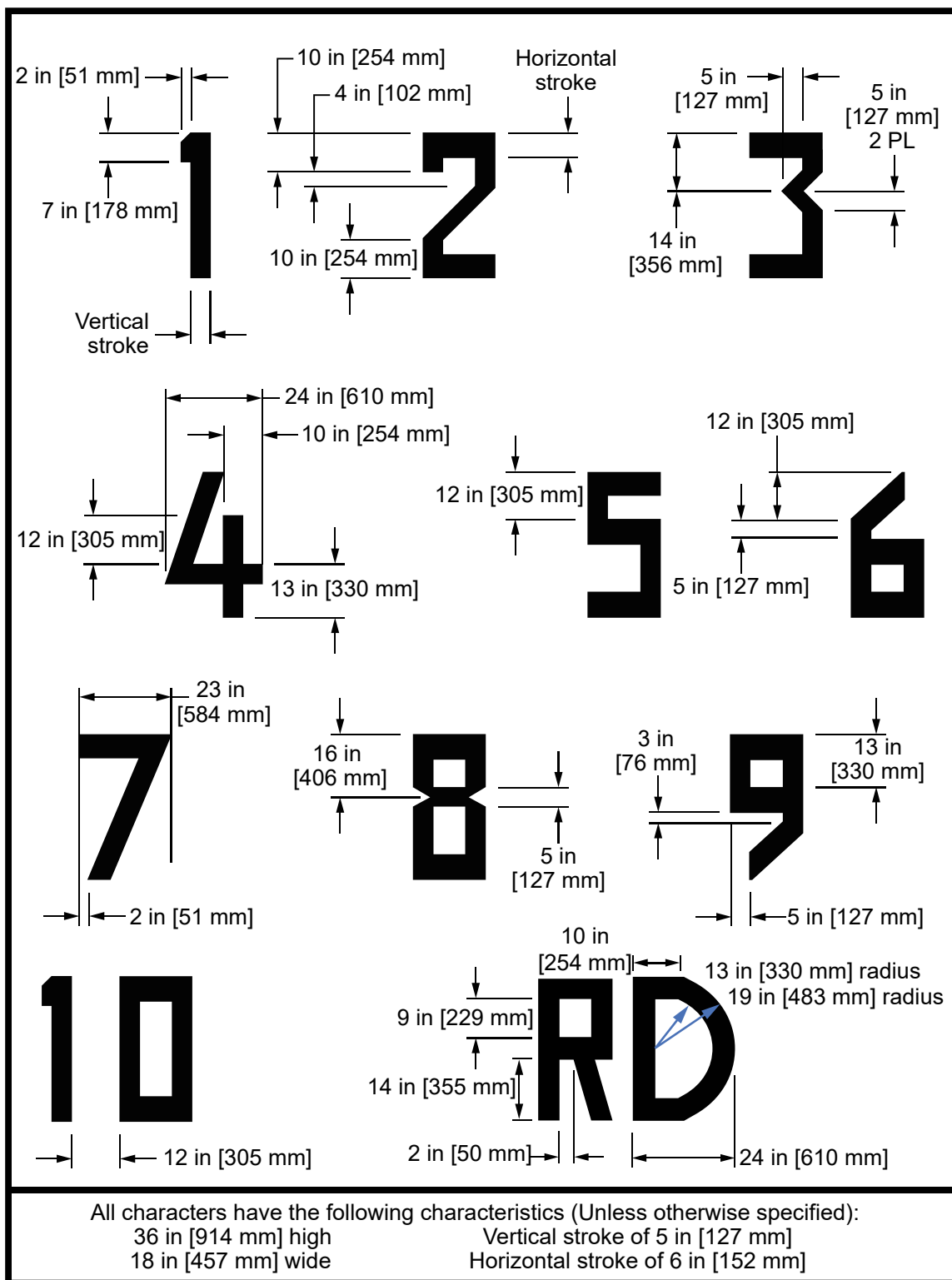
APPENDIX F. Dimensions for Marking Size and Weight Limitations

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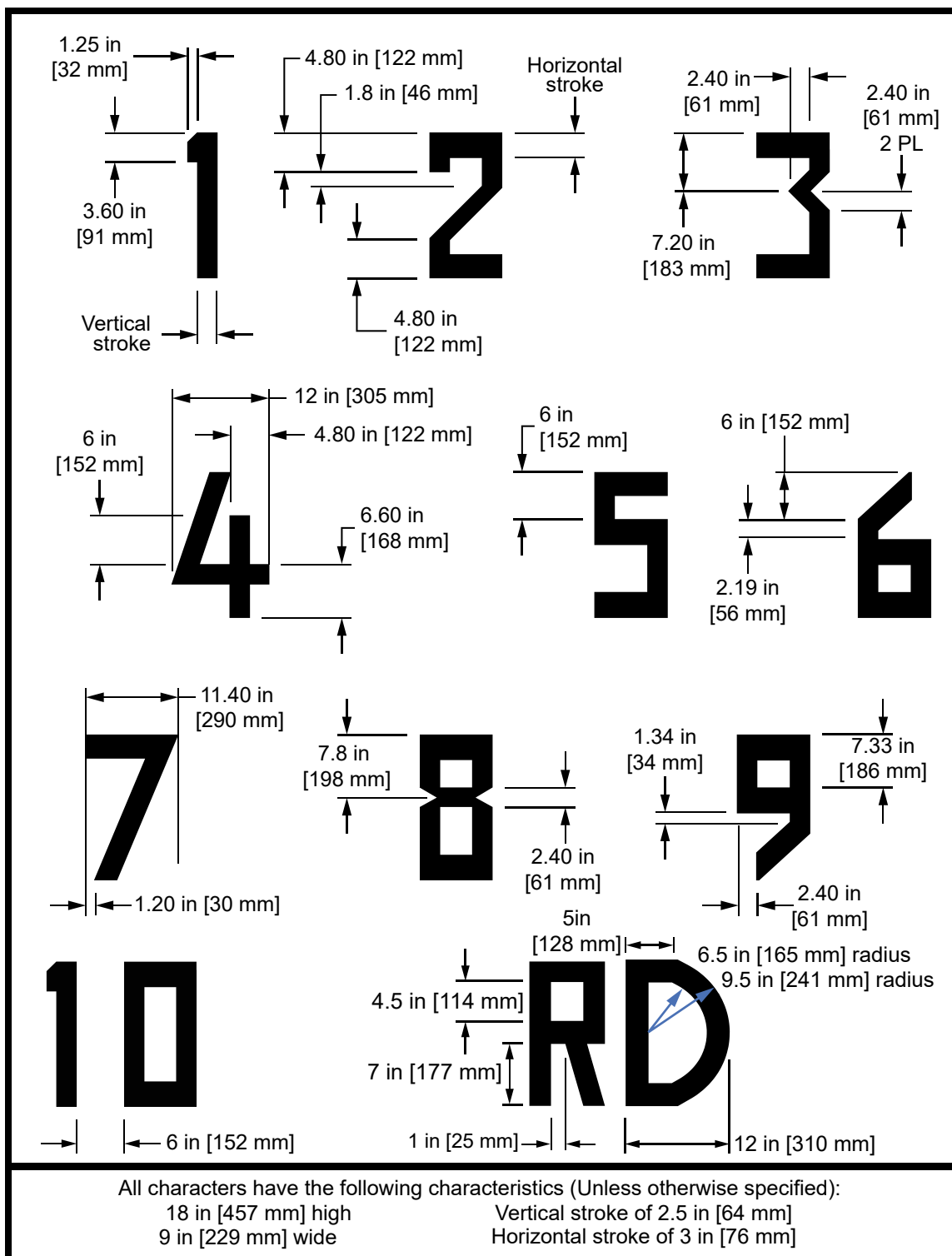
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The form and proportion of numbers and letters for marking TLOF and parking area size and weight limitations are shown in the two figures below for both 36-inch (914 mm) and 18-inch (457 mm) numbers (Figure F-1 and Figure F-2, respectively).

2477
2478**Figure F-1. Form and Proportions of 36-inch (914 mm) Numbers for Marking Size and Weight Limitations**

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Figure F-2. Form and Proportions of 18-inch (457 mm) Numbers for Marking Size and Weight Limitations

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APPENDIX G. Design Standards for Heliport Perimeter Lighting

G.1 Elevated and In-pavement Omnidirectional Helipad Perimeter Light.

Approaches to heliports are typically performed into the prevailing wind direction. Aircraft can approach the heliport from any direction. The approach paths flown by the pilot dictate the required vertical intensity coverage of the light fixture.

G.1.1 Standards.

G.1.1.1 **Horizontal Beam Coverage.**

Ensure the intensity for heliport perimeter lighting is maintained for all possible directions of approach, requiring an omnidirectional horizontal light geometry.

G.1.1.2 **Vertical Beam Coverage.**

1. Control the vertical intensity distribution of the heliport perimeter lights as a function of elevation (Table G-1).
 - a. The approach path data were converted to the corresponding angle of elevation from the heliport perimeter lighting as a function of range.
 - b. The mean angle of elevation and the upper and lower limits of the vertical beam spread will increase as the range from the heliport decreases.

Table G-1. Approach Angles Assuming VMC

Approach	Typical Descent Angle
Shallow	3 degrees to 5 degrees
Normal	7 degrees to 12 degrees
Steep	12 degrees to 15 degrees

G.1.1.3 **Helipad Perimeter Lighting Intensity.**

The intensity requirements were developed into a specification that can be used by industry to produce and install optimized perimeter lighting. The intensity specification is based on a currently available light fixture FAA type L-860E that was determined to be the most effective in meeting the need for the pilot to be able to clearly see the perimeter lighting.

G.1.1.4 **Helipad Perimeter Lighting Chromaticity.**

Ensure helipad perimeter light fixtures meet chromaticity requirements for aviation green per AC 150/5345-46 and SAE AS25050 when using

2512 incandescent lights. For light fixtures that use light emitting diodes
2513 (LEDs) see the requirements in EB 67.

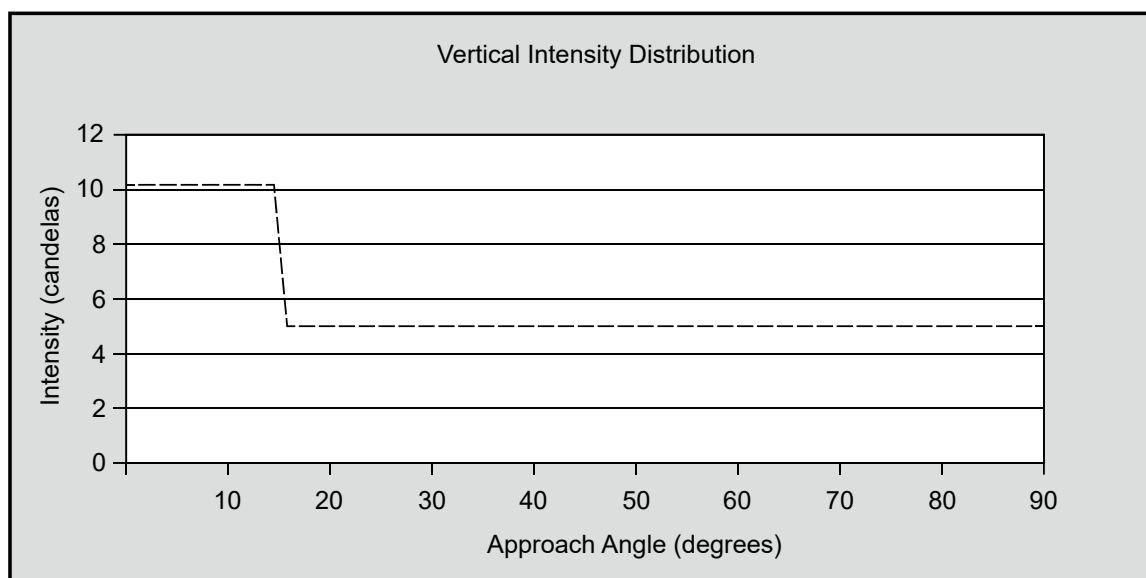
2514 G.2 Photometric Requirements.

2515 See Table G-2 for the heliport perimeter light fixture photometric requirements. Figure
2516 G-1 illustrates the proposed light fixture intensity distribution.

2517 **Table G-2. Perimeter Lighting Intensity Recommendations in Candelas**

0 to 15 degrees		16 to 90 degrees	
Color	Minimum	Minimum average intensity	Minimum
Green	10	15	5

2518 **Figure G-1. Perimeter Light Intensity Distribution**



2520 G.3 Additional Heliport Perimeter Light Requirements.

2521 The construction, materials, environmental requirements, and production testing for the
2522 qualification and acceptance of elevated perimeter light fixtures, per AC 150/5345-46.

2523 G.3.1 LED Light Fixtures.

2524 The additional requirements in EB 67 are applicable for light fixtures that use LEDs.

2525 **Note:** Some night vision goggle systems may not detect specific LED colors.

2526 G.3.2 Light Fixture Type Number.

2527 The light fixtures will be listed in AC 150/5345-46 as FAA type L-860H, elevated
2528 heliport perimeter light and Type L-852H, in-pavement heliport perimeter light.

2529 G.3.3 Light Base Requirements.

2530 Elevated heliport perimeter light fixtures will be installed in a load-bearing light base
2531 (L-868, Size B) or non-load-bearing light base (L-867, Size B), per AC 150/5345-42.
2532 Shallow base type light bases will not be used.

2533 G.4 **L-860H and L-852H Light Fixture Testing.**

2534 G.4.1 Laboratory Testing.

2535 The prototype L-860H and L-852H light fixture will be fully characterized in the
2536 laboratory using a goniometer and calibrated photodetector for spatial light intensity
2537 distribution. For vertical angles of 0 to 10 degrees, the light intensity will be measured
2538 for each 1 degree vertically over 360 degrees horizontally (5-degree intervals). For
2539 vertical angles of 10 to 90 degrees, visually verify the projected light intensity.

2540 All testing requirements specified in AC 150/5345-46 will be observed except for
2541 photometric requirements.

2542 G.4.2 Reports.

2543 At the conclusion of all testing, the manufacturer will generate a report that details the
2544 photometric testing results in the laboratory per paragraph G.4.1.

2545 G.4.3 Production.

2546 All subsequent L-860H and L-852H light fixture production will be based upon the
2547 documented results of testing per paragraph G.4.1.

2548 G.5 **Installation Criteria.**

2549 Heliport light fixtures will be installed in accordance with the requirements of AC
2550 150/5340-30.

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APPENDIX H. Autonomy

2552 As technology evolves to support autonomous operations, there may be the desire to
2553 utilize heliports by vertical flight aircraft without a pilot on board. The FAA is actively
2554 researching non-traditional air traffic control technology. Future research will evaluate
2555 how autonomous technologies interact with ground infrastructure to determine
2556 performance-based guidelines, and guidance will follow that addresses infrastructure
2557 design standards for aircraft operating without a pilot on board. If a facility sponsor
2558 expects a pilotless aircraft to utilize their heliport facility, coordinate with the applicable
2559 FAA Airports District Office (ADO) and Flight Standards District Office (FSDO)
2560 office.

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APPENDIX I. Short Takeoff and Landing (STOL)2562
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As short takeoff and landing (STOL) aircraft are developed with new technologies such as distributed electrical propulsion (DEP) and blown lift, there may be the desire and ability for these aircraft to utilize heliport facilities. Blown lift using DEP accelerates air over the wing, which generates lift at a much slower forward air speed than conventional airplanes. This makes a heliport a potential takeoff and landing area for these types of aircraft. In these instances, elongated load-bearing TLOFs and an elongated FATO would likely be standard to account for the distance needed to take off and land. Other standards may be needed to account for the stopping distance required in all weather conditions, including load-bearing safety areas and other surfaces typically associated with runways. Additionally, consider potential prop wash or jet blast. The FAA will release more guidance for these novel distributed propulsion blown lift systems as data becomes available. If a facility sponsor expects a STOL aircraft to utilize their heliport facility, coordinate with the applicable FAA ADO and FSDO office.

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APPENDIX J. Electric Charging Infrastructure Best Practices and Standards**J.1 Reference Standards.****J.1.1 Airport/Heliport Fire Fighting and Safety Considerations.**

- 2021 International Fire Code (IFC): To implement alternative energy vectors, there is the need for general precautions, emergency planning and preparedness, and storage of hazardous materials.
- NFPA 110, *Standard for Emergency and Standby Power Systems*: To ensure the continuity of electric aircraft operations, uninterrupted power supply is needed thus creating a need for guidelines on emergency and backup power supply systems.
- NFPA 70, *NEC Article 625 - Electric Vehicle Charging System*: Covers the electrical conductors and equipment external to an electric vehicle that connect an electric vehicle to a supply of electricity by conductive or inductive means, and the installation of equipment and devices related to electric vehicle charging. It also addresses scenarios that would allow the use of load balancing functions on electrical supply systems.
- NFPA 70, *Article 706 - Energy Storage Systems*: This article applies to all energy storage systems (ESS) having a capacity greater than 3.6 MJ (1 kWh) that may be standalone or interactive with other electric power production sources. These systems are primarily intended to store and provide energy during normal operating conditions.
- NFPA 400, *Hazardous Materials Code*: Covers the minimum NFPA standards for the storage and handling of hazardous materials such as lithium batteries.
- NFPA 407, *Standard for Aircraft Fuel Servicing*: This standard establishes the minimum, internationally recognized fire safety requirements for ground fuel servicing of aircraft using liquid petroleum fuels. The 2022 edition covers procedures, equipment (hoses, vehicles), and installations, featuring updated requirements for grounding straps, extinguishers, and refueling cabinets.
- NFPA 415, *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*: The purpose of this standard is to protect life and property from fire at airport terminal complexes.
- NFPA 418, *Standard for Heliports and Vertiports*: This standard establishes fire safety standards for operations of heliports and rooftop hangars for the protection of people, aircraft, and other property. Future editions of this standard will include electric mobility asset considerations.
- NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems*: Covers the minimum NFPA standards established for design, installation, and maintenance of a stationary energy storage system including battery storage systems.

2614 J.1.2 Occupational Safety and Health Administration Considerations.

- 2615 • 29 CFR § 1910.176, *Handling Materials – General*: This standard provides the
2616 minimum requirements for the storage and handling of hazardous materials such as
2617 lithium batteries.

2618 J.1.3 Power Quality Considerations.

- 2619 • IEEE 519-2014, *IEEE Recommended Practice and Requirements for Harmonic*
2620 *Control in Electric Power Systems*: The grid impact of high wattage charging
2621 stations needs to be considered when designing and adopting charging stations. This
2622 standard provides guidance in the design and compliance of power systems with
2623 nonlinear loads.
- 2624 • IEEE 1826-2020, *IEEE Standard for Power Electronics Open System Interfaces in*
2625 *Zonal Electrical Distribution Systems Rated Above 100 kW*: Airports require power,
2626 monitoring, information exchange, control, and protection of interfaces that are
2627 based on technological maturity, accepted practices, and allowances for future
2628 technology insertions such as the integration of electric aircraft.

2629 J.1.4 Certifications Considerations.

2630 The following standards focus on certifying the components and safety of the systems.

- 2631 • UL 2202, *Standard for Safety of Electric Vehicle (EV) Charging System Equipment*:
2632 Covers conducting charging system equipment (600 volts or less) for recharging
2633 batteries in surface electric vehicles.
- 2634 • UL 2251, *Standard Testing for Charging Inlets and Plugs*: Covers plugs,
2635 receptacles, vehicle inlets, and connectors rated up to 800 amperes and up to 600
2636 volts AC or DC, and intended for conductive connection systems, for use with
2637 electric vehicles.
- 2638 • UL 2580, *Batteries for Use in Electric Vehicles*: Covers electric equipment storage
2639 assemblies in electric powered vehicles.
- 2640 • UL 9540, *Energy Storage System (ESS) Requirements - Evolving to Meet Industry*
2641 *and Regulatory Needs*: This key standard encompasses the design, commissioning,
2642 operation, decommissioning, and emergency operations for all energy storage
2643 systems.
- 2644 • UL 9540a, *Test Method*: Vehicle to Infrastructure Considerations.
- 2645 • SAE J1772, *SAE Electric Vehicle and Plugin Hybrid Electric Vehicle Conductive*
2646 *Charge Coupler*: This standard was developed to define the fit and function of a
2647 conductive coupler for use in charging electric vehicles. It was later expanded to
2648 include direct current (DC) charging through combined alternating current/direct
2649 current (AC/DC) physical connector referred to as the Combined Charging Standard
2650 (CCS).
- 2651 • SAE AIR7357, *Megawatt and Extreme Fast Charging for Aircraft (under*
2652 *development)*: This standard is a work in progress under SAE leadership and

intended to provide a charging interface for battery packs from 150kWh-1MWh within aircraft.

- Megawatt Charging System (MCS)ISO/IEC 15118-1:2019 UL 2251: The MCS is intended to extend the capabilities of the CCS to accommodate the charge rate demands of larger vehicles and thus serve the trucking and aviation sectors. Ratings should exceed 1MW (maximum 1,250 volt and 3,000 ampere (DC)) while also addressing communication and controls using and meeting touch safe standards.
- ISO/IEC 15118-1:2019, *Road Vehicles Vehicle to Grid Communication Interface*: This standard defines the digital communications protocol to be used for the charging of high voltage electric vehicle batteries from a charging station. Beyond the basic handshakes and charge control between a vehicle and a charging station, this standard also includes convenience and security layers that support the “plug and charge” experience. Additionally, it offers the potential to schedule and coordinate the charging demands with the grid conditions.

J.2 Other Information.

J.2.1 National Laboratory of the Rockies⁷ (NLR) Federal Aviation Administration Vertiport Electrical Infrastructure Study.

With the introduction of eVTOL aircraft, electrical charging loads will be added at the vertiports along with building loads and distributed energy resources (DERs). The key research challenge is the optimization of megawatt-scale building loads, charging loads, energy storage, and renewables production. To better understand vertiport infrastructure requirements, the FAA identified multiple stakeholders in the Report including aircraft manufacturers, electric utilities, potential site property owners, and local communities to evaluate their unique operational needs.

<https://docs.nlr.gov/docs/fy24osti/86245.pdf>

J.2.2 NLR Overview of Potential Hazards in Electric Aircraft Charging Infrastructure.

The objective of this Report is to document and help familiarize the FAA and airport authorities with the potential hazards associated with the deployment of electric aircraft and the associated charging infrastructure. The list and examples of these hazards are non-exhaustive, and multiple hazards can occur simultaneously. This discusses natural, human, and technological causes that can lead to fire (thermal), physical, or chemical hazards. Applicable standards and guidelines associated with electric vehicle supply equipment (EVSE) infrastructure are available for reference in the appendix. These sources, which address diverse geographic location and climate considerations, can help operators in site selection for EVSE, mitigation planning, deployment considerations, and training of staff to handle these situations.

⁷ As of December 2025, the National Renewable Energy Laboratory (NREL) was renamed the National Laboratory of the Rockies (NLR).

2689 <https://docs.nlr.gov/docs/fy24osti/83429.pdf>

2690 J.2.3 [NLR Addressing Electric Aviation Infrastructure Cybersecurity Implementation.](#)

2691 This Technical Report evaluates key considerations of cybersecurity systems in
2692 preparation for the electrification of both legacy and new aviation services. The
2693 objectives are to consider the landscape of components and interconnections, review
2694 sensitivities and the criticality of operational data, consider applicability of existing best
2695 practices, and identify gaps associated with the cybersecurity of electric charging
2696 systems for the aviation sector. It is noted that cybersecurity analysis is a key
2697 component of the overall hazard analysis for aviation electrical infrastructure necessary
2698 for safely providing energy to aircraft.

2699 <https://docs.nlr.gov/docs/fy23osti/82856.pdf>

2700

APPENDIX K. Acronyms

2701	AAS	FAA Office of Airport Safety and Standards
2702	AAS-1	FAA Office of Airport Safety and Standards Directorate
2703	AAS-100	FAA Office of Airport Safety and Standards, Airport Engineering Division
2704	AC	Advisory Circular
2705	AC/DC	Alternating Current/Direct Current
2706	ADIP	Airport Data and Information Portal
2707	ADO	Airports District Office
2708	AFS-400	FAA Flight Technologies and Procedures Division
2709	AGL	Above Ground Level
2710	AIM	Aeronautical Information Manual
2711	AIP	Airport Improvement Program
2712	ALP	Airport Layout Plan
2713	ATC	Air Traffic Control
2714	AWOS	Automated Weather Observing Systems
2715	CCS	Combined Charging Standard
2716	CFR	Code of Federal Regulations
2717	D	Controlling Dimension
2718	DC	Direct Current
2719	DCA	Downwash/Outwash Caution Area
2720	DEP	Distributed Electrical Propulsion
2721	DoD	Department of Defense
2722	DWOW	Downwash/Outwash
2723	EB	Engineering Brief
2724	EFVS	Enhanced Flight Vision System
2725	EHLF	Emergency Helicopter Landing Facility
2726	EMC	Electromagnetic Compatibility
2727	EMI	Electromagnetic Interference
2728	ESS	Energy Storage System
2729	ETL	Effective Translational Lift
2730	EV	Electric Vehicle
2731	EVSE	electric vehicle supply equipment

2732	eVTOL	Electric Vertical Takeoff and Landing
2733	FAA	Federal Aviation Administration
2734	FATO	Final Approach and Takeoff Area
2735	FOD	Foreign Object Debris
2736	FPAL	Flight Path Alignment Lights
2737	FSDO	Flight Standards District Office
2738	GVGI	Generic Visual Glideslope Indicator
2739	H	Heliport
2740	HAL	Height Above Landing
2741	HALS	Heliport Approach Lighting System
2742	HAPI	Helicopter Approach Path Indicator
2743	HIGE	Hover in Ground Effect
2744	HILS	Heliport Instrument Lighting System
2745	HOGGE	Hover Out of Ground Effect
2746	HPZ	Heliport Protection Zone
2747	HRP	Heliport Reference Point
2748	HTTPS	Hypertext Transfer Protocol Secure
2749	ICAO	International Civil Aviation Organization
2750	IEC	International Electrotechnical Commission
2751	IEEE	Institute of Electrical and Electronics Engineers
2752	IFC	International Fire Code
2753	IFP	Instrument Flight Procedure
2754	IFR	Instrument Flight Rules
2755	ISO	Location Identifier
2756	JO	Joint Order
2757	LBA	Load-Bearing Area
2758	LDL	Landing Direction Lights
2759	LED	Light Emitting Diode
2760	LOA	Letter of Agreement
2761	Loc ID	Location Identifier
2762	MCS	Megawatt Charging System
2763	MRI	Magnetic Resonance Imaging Machine

2764	MSL	Mean Sea Level
2765	NA	Not Applicable
2766	NEC	National Electrical Code
2767	NEPA	National Environmental Policy Act
2768	NFPA	National Fire Protection Association
2769	NLR	National Laboratory of the Rockies
2770	NTIS	National Technical Information Service
2771	NVG	Night Vision Goggles
2772	NVIS	Night Vision Imaging System
2773	OCS	Obstacle Clearance Surface
2774	OFZ	Obstacle Free Zone
2775	OL	Overall Aircraft Length
2776	OW	Overall Aircraft Width
2777	PAPI	Precision Approach Path Indicator
2778	PAR	Precision Approach Radar
2779	PCC	Portland Cement Concrete
2780	PELA	Pre-designated Emergency Landing Area
2781	PFC	Passenger Facility Charge
2782	PPR	Prior Permission Required
2783	PT	Point of Tangency
2784	PVT	Private
2785	RD	Rotor Diameter
2786	RNAV	Area Navigation
2787	ROC	Required Obstacle Clearance
2788	RPZ	Runway Protection Zone
2789	SAE	Society of Automotive Engineers
2790	SARPs	Standards and Recommended Practices
2791	STOL	Short Takeoff and Landing
2792	TDPC	Touchdown Position Circle
2793	TLOF	Touchdown and Liftoff Area
2794	TOFA	Taxiway Object Free Area
2795	TR	Distance from rotor hub to tip of tail rotor

2796	U.S.C.	United States Code
2797	UCL	Undercarriage Length
2798	UCW	Undercarriage Width
2799	UL	Underwriters Laboratories
2800	USDA	U.S. Department of Agriculture
2801	VASI	Visual Approach Slope Indicator
2802	VFR	Visual Flight Rules
2803	VGSI	Visual Guidance Slope Indicator
2804	VMC	Visual Meteorological Conditions
2805	VTL	Vertiport Identification Marking
2806	VTOL	Vertical Takeoff and Landing