

**BY ORDER OF THE COMMANDER  
UNITED STATES AIR FORCES IN  
EUROPE-AIR FORCES AFRICA**

**UNITED STATES AIR FORCES IN  
EUROPE-AIR FORCES AFRICA  
INSTRUCTION 32-1007**



**6 OCTOBER 2021**

**Civil Engineering**

**AIRFIELD AND HELIPORT PLANNING  
AND DESIGN**

**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**

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This publication implements Air Force Policy Directive (AFPD) 32-10, *Installations and Facilities*. This instruction provides standardized airfield, heliport and airspace criteria for the geometric layout, design, and construction of runways, helipads, taxiways, aprons, and related permanent facilities to meet sustained operations in the European and Africa theaters. It applies to United States Air Forces in Europe and United States Air Forces Africa (USAFE-AFAFRICA) Regular Air Force. Applicable host nation, International Civil Aviation Organization (ICAO), North Atlantic Treaty Organization (NATO), and Standardization Agreements (STANAGS) criteria are consolidated in this document. This publication does not apply to United States Space Force, Air Force Reserve, or Air National Guard units. Ensure that all records generated as a result of processes prescribed in this publication adhere to Air Force Instruction (AFI) 33-322, *Records Management and Information Governance Program*, and are disposed of in accordance with the Air Force Records Disposition Schedule which is located in the Air Force Records Information Management System. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*. The authorities to waive wing/Space Force equivalent/unit level requirements in this publication are identified with a Tier (“T-0, T-1, T-2, T-3”) number following the compliance statement. See Department of the Air Force (DAFI) 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the requestor’s commander for non-tiered compliance items. Submit requests for waivers through

the chain of command to the appropriate Tier waiver approval authority, or alternately, to the Publication OPR for non-tiered compliance items, utilizing guidance identified in DAFI 33-360. This publication may be supplemented at any level, but all supplements must be routed to the OPR of this publication for coordination prior to certification and approval. Compliance with the attachments in this publication is not mandatory.

## **SUMMARY OF CHANGES**

This publication has been substantially revised and must be completely reviewed. With this update, all relevant United States Air Force (USAF) airfield criteria, found in Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design, with Change 1*; ICAO Standards Annex 14, *Aerodrome Design and Operations*; STANAG 7174, Edition 1, *Airfield Clearance Planes*; NATO Bi-SC Directive 85-5, *NATO Approved Criteria and Standards for Airfields*; NATO Allied Air Traffic Management Publication (AATMP) 38 Edition A, *Airfield and Heliport/Helipad Clearance Planes*; and applicable host nation (HN) criteria have been combined into a common document for USAFE-AFAFRICA. The main body of this document now contains the baseline USAFE-AFAFRICA airfield provisions comprising criteria from USAF, NATO, and ICAO standards. Where relevant, requisite or additional HN airfield criteria have been added to country specific appendices. Additional changes include the following revisions: Both **Chapter 1**, “General Requirements,” and **Chapter 2**, “Aviation Facilities Planning” received minor update to references and points of contact for implementation of this instruction. **Chapter 3**, “Runways (fixed-wing) and Imaginary Surfaces,” received the following updates: Runway criteria in **Table 3.2** were heavily updated to reflect changes in applicable NATO policies. Airfield imaginary surface criteria were completely updated within **Table 3.6** Graphics depicting the airfield and airfield imaginary surfaces have been updated to reflect the changes to criteria presented in **Table 3.2** and **Table 3.6**, accordingly. The rest of the chapter received only minor update to references and to homogenize numeric rounding throughout the tables. **Chapter 4**, “Criteria for Rotary Wing Runways, Helipads, and Hoverpoints in USAFE-AFAFRICA,” received minor update to references. **Chapter 5**, “Taxiways,” received the following updates: Rotary wing runway criteria found in **Table 5.2**, taxitrak criteria found in **Table 5.8**, and parallel taxiway/emergency runway criteria found in **Table 5.9** were heavily updated to reflect changing NATO standards. All other criteria and tables received only minor update to references and to homogenize numeric rounding throughout the tables. **Chapter 6**, “Aprons and Pavements,” received the following updates: Fixed-wing Apron criteria in **Table 6.1** were heavily updated to reflect changing NATO standards. All other criteria and tables received only minor update to references and to homogenize numeric rounding throughout the tables. **Chapter 8**, “Aircraft Hangar Pavements,” was modified to include proper NATO clearances for NATO hangars. **Attachment 2**, “USAFE-AFAFRICA Airfield Waiver Program,” was overhauled to update and streamline the USAFE-AFAFRICA waiver program and includes new processes and forms. **Attachment 3**, “Risk Management (RM) for Airfield Obstructions and Waiver Requests,” was streamlined to better align the USAFE-AFAFRICA RM process with the recently updated AFI 90-802. **Attachment 4**, “Land Use Compatibility Guidelines for Clear Zones,” was replaced with references to proper AFI, AFH, and host nation criteria. **Attachment 5**, “Civil Engineer’s Role in the Air Traffic System Evaluation Program (ATSEP)” was deleted. **Attachment 6**, “Airfield Criteria and Waiver Processing Procedures for German Installations,” was renumbered as **Attachment 5** and received major update to account for recent structural and procedural changes to airfield waiver processing by

German authorities. New chapters and appendices include the following: **Chapter 9**, “Unmanned Aircraft Systems (UAS).” **Attachment 6**, “Airfield Criteria and Waiver Processing Procedures for Spanish Installations.” **Attachment 7**, “Airfield Criteria and Waiver Processing Procedures for Installations in the United Kingdom (UK).” **Attachment 8**, “Airfield Criteria and Waiver Processing Procedures for Turkish Installations.” **Attachment 9**, “Airfield Criteria and Waiver Processing Procedures for Portuguese Installations.” **Attachment 10**, “Airfield Criteria and Waiver Processing Procedures for Italian Installations.” **Attachment 11**, “Airfield Criteria and Waiver Processing Procedures for Belgian Installations.” **Attachment 12**, “Installation Complex Encroachment Management Action Plan (ICEMAP) Requirements.” All other chapters remain unchanged or have been replaced with specific references to other appropriate guidance documents.

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## Chapter 1

### GENERAL REQUIREMENTS

**1.1. Purpose.** This instruction provides standardized airfield, heliport, and airspace criteria for the geometric layout, design, and construction of runways, helipads, taxiways, aprons, and related permanent facilities to meet sustained operations.

**1.2. Scope.** This instruction prescribes dimensional and geometric layout criteria for safe standards for airfields, landing zones (LZ), heliports and helipads, related permanent facilities, as well as the navigational airspace surrounding these facilities. Criteria in this instruction are a compilation of criteria derived from host nation, North Atlantic Treaty Organization (NATO), International Civil Aviation Organization (ICAO), and Department of Defense (DoD) Unified Facility Code (UFC) 3-260-01 with Change 1, *Airfield and Heliport Planning and Design*. This instruction pertains to United States Air Forces in Europe and United States Air Forces Africa (USAFE-AFAFRICA) airfields within the HQ USAFE-AFAFRICA Area of Responsibility (AOR). Criteria within this instruction should be applied to the maximum extent practicable. If a written agreement exists between a host nation and DoD that requires application of other standards, those standards shall apply. Procedures for pavement structural design and pavement marking and lighting are beyond the scope of this instruction.

**1.2.1. USAFE-AFAFRICA Host Nation Agreement Policy.** If a USAFE-AFAFRICA airfield follows a host nation agreement that stipulates standards other than standards in this instruction, the installation shall maintain official and written documentation of that agreement. Written agreements shall be furnished to AFIMSC Det 4/CE upon request. Failure to produce written documented proof of criteria in violation of these standards shall result in non-compliance of that airfield for each standard within this instruction that is not met. **(T-3)**

**1.2.2. Terminal Instrument Procedures (TERPS or PANSOPS).** In addition to a local Terminal Instrument Procedures (TERPS) review, modifications to existing facilities, temporary construction, airfield surface modifications, maintenance or construction requiring equipment on or near the airfield flying environment, and construction of new facilities must be closely coordinated with Air Operations Command and Control (MAJCOM TERPS) to determine the impact to existing and planned instrument approach and departure procedures. The criteria in this instruction do not address instrument flight procedures. TERPS evaluations and processes are described in Air Force Manual (AFMAN) 11-230, *Instrument Procedures*, and Federal Aviation Administration (FAA) Order 8260.3, *United States Standard for Terminal Instrument Procedures (TERPS)*, and ICAO Document 8168-OPS/611, *Procedures for Air Navigation Services – Volume II Construction of Visual and Instrument Flight Procedures (PANS-OPS)* as supplemented by NATO Supplement Allied Air Traffic Control Publication (AATCP-1). TERPS criteria shall be considered when designing or modifying airfields and facilities on airfields that are used under Instrument Flight Rules (IFR).

**1.2.3. Objects Affecting Navigable Airspace.** Modifications to existing facilities and construction of new facilities must consider navigable airspace and may require coordination with host nation civil, military or construction authorities. The criteria for determining obstructions to navigable airspace have been identified in this instruction. The designer must consult this instruction during the design process to identify obstructions to airspace. Designers will coordinate with the airfield manager (AFM) and safety officer, and then host nation civil,

military or construction authorities, as required. If the criteria in this instruction are more stringent than host nation criteria, this instruction should be used to the maximum extent practical.

**1.2.4. Navigational Aids (NAVAIDS) and Lighting.** Navigational Aids (NAVAIDS) and airfield lighting are integral parts of an airfield and must be considered in the planning and design of airfields and heliports. NAVAID location, airfield lighting, and the grading requirements of a NAVAID must be considered when locating and designing runways, taxiways, aprons and other airfield facilities.

**1.2.5. Special Tilt Rotor Aircraft Considerations (V-22).** The V-22 is a tilt-rotor aircraft that can operate both as a fixed-wing aircraft or a rotary-wing aircraft. At permanent shore establishments, the V-22 will be considered a fixed-wing aircraft for the purposes of determining facilities requirements. The runway will be planned according to critical field length. **Chapter 3** contains V-22 fixed-wing criteria with noted exceptions. Additionally, rotary-wing facilities such as helipads may be utilized for V-22 operations. **Chapter 4** contains V-22 rotary-wing criteria with noted exceptions. V-22 facilities require upgraded high temperature materials where stationary operations are expected for extended periods of times. V-22 apron requirements are provided in **Chapter 6**.

**1.3. References.** **Attachment 1** *Glossary of References and Supporting Information* contains a list of documents referenced in this instruction.

#### **1.4. Application of Criteria.**

**1.4.1. Existing Facilities.** Existing airfield facilities built under a previous standard need not be immediately modified nor upgraded to conform to the criteria in this instruction if these facilities meet current mission requirements. This includes cases where runways may lack paved shoulders or other physical features because they were not previously required or authorized. However, when a change in the facility mission occurs, new features are added, or the facility is repaired (when repair is accomplished by replacement), the airfield facilities must be re-evaluated and upgraded where deficient using current criteria and the new mission requirements to eliminate the deficiency. A change in the facility mission can be a new aircraft or weapons platform, revised facility use, facility re-purposing, or other change that may present a new risk, assumption, or loading not previously considered or evaluated for the existing facility. Upgraded facilities must be maintained at a level that will sustain compliance with current standards.

**1.4.1.1.** Once upgraded, facilities must be maintained at a level that will sustain compliance with current standards defined within this publication. DoD personnel must identify the status of features and facilities on airfield maps as exempt (because they were constructed under a previous, less stringent standard), as a permissible deviation (authorized as a deviation to airfield criteria and sited appropriately), or as a violation, with or without approved waiver. Building Restriction Lines (BRLs) encompass vertical facilities along the flight line that are exempt because they were constructed under previous standards. For other items or features, annotate the airfield map to identify the status of the facility or feature and the date of construction or waiver number.

**1.4.2. Modification of Existing Facilities.** When existing airfield facilities are modified, construction must conform to the criteria established in this instruction unless waived in

accordance with [paragraph 1.6](#) Modified portions of facilities must be maintained at a level that will sustain compliance with current standards. Modification of an existing facility, which alters the exterior dimensions of a facility, must be coordinated with AFIMSC Det 4/CE to determine if an airfield waiver is required. For additional requirements, see [Attachment 2](#), *USAFE-AFAFRICA Airfield Waiver Program*.

1.4.3. **New Construction.** The criteria established within this instruction apply to all new facility construction unless the appropriate waivers are obtained, as outlined in [Attachment 2](#). New facilities must be maintained at a level that will sustain compliance with current standards.

1.4.4. **Metric Application.** Geometric design criteria established in this instruction are expressed in the International System of Units (SI) units. These metric values are based upon aircraft specific requirements rather than direct conversion and rounding. This results in apparent inconsistencies between metric and inch-pound (English) dimensions. For example, 150-foot-wide runways are shown as 46 meters (m), 150-foot-wide aircraft wash racks are shown as 45 m. Runways need the extra meter in width for aircraft operational purposes; wash racks do not. SI dimensions apply to new airfield facilities, and where practical, to modification of existing airfield facilities, unless waived in accordance with [paragraph 1.6](#) Inch-pound measurements are included in the tables and figures in this instruction only to permit reference to the previous standards. To avoid changes to existing airfield obstruction maps and compromises to flight safety, airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from inch-pound to SI units.

**1.5. General Building Requirements.** Comply with UFC 1-200-01, *General Building Requirements*, and applicable Host Nation building requirements. UFC 1-200-01 provides applicability of model building codes and government unique criteria for typical design disciplines and building systems, as well as for accessibility, antiterrorism, security, high performance and sustainability requirements, explosive and other safety. Use this instruction in addition to UFC 1-200-01 and government criteria referenced therein.

1.5.1. **Explosives Safety.** This instruction does not contain requirements for explosives safety. Facilities that involve DoD Ammunition and Explosives (AE) storage, handling, maintenance, manufacture or disposal, as well as facilities within the explosives safety quantity distance (ESQD) arcs of AE facilities, must comply with the requirements found in DoD 6055.09-M, as well as implementing Service criteria found in DESR 6055.09\_AFMAN 91-201. DoD facilities exposed to potential explosion effects from AE belonging to other nations are also required to meet DoD and Service explosives safety criteria. See Appendix B Section 9 of UFC 3-260-01.

1.5.2. **Physical Security.** That part of security concerned with physical measures designed to safeguard personnel; to prevent or delay unauthorized access to equipment, installations, material, and documents; and to safeguard them against espionage, sabotage, damage, and theft.

1.5.2.1. Regulatory requirements for security of assets can have a significant impact on the planning and design of airfields and heliports. The arms, ammunition, explosives, and electronic devices associated with aircraft, as well as the aircraft themselves, require varying types and levels of protection. Operational security of the airfield is also a consideration.

1.5.2.2. Protective features such as barriers, fences, lighting, access control, intrusion detection, and assessment must be integrated into the airfield planning and design process to minimize problems with aircraft operations and safety requirements. This is discussed further in [Chapter 2](#) and in unified facilities criteria UFC 4-020-01, *DoD Security Engineering Facilities Planning Manual*. The protective measures will be included in the design based on risk and threat analyses with an appropriate level of protection, or will comply with security-related requirements.

**1.6. Waivers to Criteria.** Waivers to the criteria contained in this instruction will be processed in accordance with [Attachment 2](#). If a waiver affects instrument approach and departure procedures as defined in TERPS (FAA Order 8260.3) or PANSOPS, the DoD Service component processing the waiver must also coordinate its action with the applicable TERPS/PANSOPS approving authority. See [Attachment 5](#) through [Attachment 11](#) for host nation authority coordination. Certain existing facilities may require the supported aircraft activity to have an operational waiver to continue to operate, such as to land/take-off on a shorter runway, operate on a taxiway that is not wide enough, or operate with reduced wingtip clearances for interior hangars or sunshades. These are operational/ safety waivers and not design criteria waivers for new construction. Design criteria waivers address design considerations of new facilities while operational/safety waivers address airfield safety/risk considerations and operational mitigations. The authority owning the airfield and/or the mission aircraft will determine the requirements needed to safely operate on the existing facilities. **(T-3)**

1.6.1. **Waiver Authority.** The authorities to waive wing/unit level requirements in this publication are identified with a Tier number (T-3) number following the compliance statement. See DAFI 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. IAW DAFI33-360, Table 1.1. Note 2, USAFE-AFAFRICA/DCOM is the waiver authority for un-tiered requirements in this instruction unless stated otherwise. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority.

**1.7. Work Order Coordination and Authorization.** All work orders processed for work in the airfield environment must first be coordinated with communications, civil engineering, safety, security forces, and TERPS, and then signed by the airfield manager before work may proceed. **(T-3)** The airfield manager (AM) and flight safety must be notified no less than five working days prior to beginning construction/work on the airfield. This does not apply to emergency repairs. Additionally, coordination shall include host nation authorities, as identified in the country-specific attachments to this instruction, so an assessment of impact to civil aviation may be performed. See [Attachment 5](#) through [Attachment 11](#) for host nation authority coordination.

**1.8. Zoning.** Existing facilities should be modified, and new facilities should be sited and constructed in a manner that is compatible with flight operations as defined in Department of Defense Instruction (DoDI) 4165.57, *Air Installation Compatible Use Zone (AICUZ) Program*.

**1.9. Construction Phasing Plan.** A construction phasing plan, as discussed in UFC 3-260-01, Appendix B, Section 14, *Construction Phasing Plan and Operational Safety on Airfields During Construction*, shall be included in the contract documents. This is a mandatory requirement (Section 14). Also see the procedures for obtaining temporary waivers for construction in [Attachment 2](#).

**1.10. References and Glossary.** Attachment 1 contains a list of documents referenced in this instruction as well as a glossary of abbreviations and terms.

**1.11. Use of Terms.** The following terms, when used in this instruction, indicate the specific requirements:

- 1.11.1. *Will, Shall or Must* – A mandatory and required action.
- 1.11.2. *Should* – A recommended, advisory or desirable action.
- 1.11.3. *May or Can* – A permissible action

## Chapter 2

### AVIATION FACILITIES PLANNING

**2.1. Applicability.** Aviation facilities planning in United States Air Forces in Europe and United States Air Forces Africa (USAFE-AFAFRICA) shall follow the criteria of Chapter 2 of the UFC 3-260-01, *Airfield and Heliport Planning and Design*, with the following variations:

2.1.1. **Air Installation Compatible Use Zone (AICUZ) Programs.** AICUZ programs are only required within base boundaries of USAFE-AFAFRICA installations. Lands outside of the installation boundary are exempt from AICUZ.

2.1.2. **Accident Potential Zones (APZ).** APZ do not apply in USAFE-AFAFRICA when they extend outside of the installation boundary.

2.1.3. **Environmental Studies.** Section 2-4.3 of the UFC 3-260-01 does not apply. At USAFE- AFAFRICA installations, environmental studies are conducted in accordance with 32 Code of Federal Regulations (CFR) Part 187, *Environmental Effects Abroad of Major Department of Defense Actions*.

## Chapter 3

### RUNWAYS (FIXED-WING) AND IMAGINARY SURFACES

**3.1. Contents.** This chapter presents design standards and considerations for fixed-wing runways and associated imaginary surfaces.

**3.2. Requirements.** The landing and take-off design considerations for an airfield include mission requirements, expected type and volume of air traffic, traffic patterns such as the arrangement of multidirectional approaches and take-offs, ultimate runway length, runway orientation required by local wind conditions, local terrain, restrictions due to airspace obstacles or surrounding community, noise impact and aircraft accident potential.

**3.3. Runway Classification.** Runways are classified as either Class A or Class B, based on aircraft type as shown in [Table 3.1](#). This table uses the same runway classification system established by the office of the Secretary of Defense as a means of defining accident potential zones (APZ) for the Air Installation Compatible Use Zone (AICUZ) program. These runway classes are not to be confused with aircraft approach categories and aircraft wingspan in other Department of Defense (DoD), International Civil Aviation Organization (ICAO), North Atlantic Treaty Organization (NATO), or Federal Aviation Administration (FAA) documents, aircraft weight classifications or pavement traffic areas. The aircraft listed provide examples of aircraft that fall into these classifications and may not be all-inclusive.

**3.3.1. Class A Runways.** Class A runways are primarily intended for small light aircraft. These runways do not have the potential or foreseeable requirement for development use by high-performance and large heavy aircraft. Ordinarily, these runways are less than 2,440 meter (m) (8,000 ft) long and have less than 10 percent of their operations that involve aircraft in the Class B category. However, this is not intended to limit the number of C-130 and C-17 operations conducted on any Class A airfield.

**3.3.2. Class B Runways.** Class B runways are primarily intended for high performance and large heavy aircraft, as shown in [Table 3.1](#).

**3.3.3. Special Tilt Rotor Aircraft Considerations (V-22).** The V-22 is a tilt-rotor aircraft that can operate both as a fixed-wing aircraft or a rotary-wing aircraft. When the V-22 operates on a fixed-wing airfield, this chapter applies with noted V-22 exceptions. See [Paragraph 1.2.5](#) for general V-22 planning considerations.

**3.3.4. Landing Zones (Formerly called Short Fields and Training Assault Landing Zones (LZ)).** LZs are special use fields. Design criteria are found in Chapter 7 of the UFC 3-260-01.

**Table 3.1. Runway Classification by Aircraft Type.**

Class A Runway		Class B Runway		
C-1	OV-10	A-4	E-3	P-3
C-2	T-3	A-6	E-4	P-8
C-12	T-6 (Navy)	EA-6B	E-6	RQ-4
C-20	T-28	A-10	E-8	RQ-9
C-21	T-34	AV-8	EA-18	MQ-4
C-22	T-41	B-1	R/F-4	S-3

C-23	T-44	B-2	F-5	T-1
C-26	U-21	B-52	F-15	T-2
C-37	UC-35	C-5	F-16	T-6 (AF)
C-38	UV-18	C-9	E/F/A-18	T-38
E-1	V-22	KC-10	F-22	T-43
E-2	DASH-7	KC-46	F-35	T-45
MQ-1	DASH-8	KC-135		TR-1
		C-17		U-2
		C-27J		VC-25
		C-32		
		C-40		
		C-130		
		C-135		
		C-137		

**Notes:**

1. Only symbols for basic-mission aircraft or basic mission aircraft plus type are used. Designations represent entire series. Runway classes in this table are not related to aircraft approach categories, aircraft weight, aircraft wingspan or to pavement design classes or types.
2. These are examples of aircraft, which fall into these classifications and may not be all-inclusive.
3. Rotary aircraft are not addressed in this table.
4. For F-35B aircraft operating as STOVL, see **Chapter 8**.

**3.4. Runway Systems.** Runway systems are selected based on local wind patterns and mission needs.

**3.4.1. Single Runway.** A single runway is the least flexible and lowest-capacity system. The capacity of a single runway system will vary from approximately 40 to 50 operations per hour under Instrument Flight Rules (IFR) conditions, up to 75 operations per hour under Visual Flight Rules (VFR) conditions.

**3.4.2. Parallel Runways.** Parallel runways are the most commonly used system for increased capacity. In some cases, parallel runways may be staggered with the runway ends offset from each other and with terminal or service facilities located between the runways. When parallel runways are separated by less than the distance shown in Item 15 of **Table 3.2**, the second runway will increase capacity at the airfield under VFR conditions, but due to the close distance, capacity at the airfield will not be increased under IFR conditions.

**3.4.3. Crosswind Runways.** Crosswind runways may be either the open-V or the intersecting type of runway. The crosswind system is adaptable to a wider variety of wind conditions than the parallel system. When winds are calm, both runways may be used simultaneously. An open-V system has a greater capacity than the intersecting system.

**3.5. Runway Orientation and Wind Data.** Runway orientation is the key to a safe, efficient and usable aviation facility. Orientation shall be based on an analysis of wind data, terrain, local development, operational procedures and other pertinent data. Procedures for analysis of wind data to determine runway orientation are further discussed in UFC 3-260-01, Appendix B, Section 4, Wind Coverage Studies.

**Table 3.2. Runways.**

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
1	Length	See Remarks	See Remarks	New or substantially modified runway length will be determined by the HQ USAFE-AFAFRICA/A3 for the most critical aircraft in support of the mission.
2	Width	30.5 m (100 ft)	45.7 m (150 ft)	USAFE-AFAFRICA Airfields, not otherwise specified. NATO projects may require up to 61 m (200 ft) for airfields regularly used by strategic bombers (e.g., B1-B and B-52).
		Not applicable	91.4 m (300 ft)	B-52 aircraft. Air Force Instruction (AFI) 11-202 V3, General Flight Rules, allows B-52 aircraft to routinely operate on 61 m (200 ft) wide runways.
3	Total width of shoulders (paved and unpaved)	30.5 m (100 ft)	61.0 m (200 ft)	Pave shoulders to provide a combined hard surface width (runway and paved shoulders) of not less than 61 m (200 feet) with at least 0.61 m (2 ft) of paved surface beyond the edge lights. For AF funded projects. NATO funded projects require a 30 m (98.4 ft) wide shoulder (paved and unpaved). Use the USAFE-AFAFRICA shoulders to the extent possible.
4	Paved shoulder width	7.6 m (25 ft)	7.6 m (25 ft)	For AF funded projects. NATO funded projects require a 3 m (9.8 ft) wide load bearing shoulder. Use the USAFE-AFAFRICA shoulders to the greatest extent possible.
		Not applicable	3.1 m (10 ft)	Airfields designed for Trainer, Fighter and B-52 aircraft. (Pave shoulders to provide a combined hard surface width (runway and paved shoulders) of 51.8 m (170 ft) for fighters and trainers and 97.5 m (320 ft) for B-52 mission runways, with at least 0.6 m (2 ft) of paved surface beyond the edge lights.
5	Longitudinal grades of runway and shoulders	Max. 1.0%		Grades may be both positive and negative but must not exceed the limit specified. Grade restrictions are exclusive of other pavements and shoulders. Where other pavements tie into runways, comply with

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
				grading requirements for tow ways, taxiways, or aprons as applicable, but hold grade changes to the minimum practicable to facilitate drainage. Exception for shoulders (paved and unpaved): a 3.33% maximum is permitted where arresting systems and visual glide slope indicators (VGSIs) are installed relative to the longitudinal slope of the runway and shoulders. Grade deviations must be held to a minimum for VGSI installations but may be used when necessary to limit the overall height of the light housings above grade.
6	Longitudinal runway grade changes	No grade change is to occur less than 305 m (1,000 ft) from the runway end	No grade change is to occur less than 914 m (3,000 ft) from the runway end	Where economically feasible, the runway will have a constant centerline gradient from end to end. Where terrain dictates the need for centerline grade changes, the distance between two successive points of intersection (PI) will be not less than 305 m (1,000 ft) and two successive distances between PIs will not be the same.
7	Rate of longitudinal runway grade changes	Max 0.167% per 30 linear meters (98.4 linear ft) of runway		Maximum rate of longitudinal grade change is produced by vertical curves having 180 m (591 ft) lengths for each percent of algebraic difference between the two grades.
8	Longitudinal sight distance	Min. 1,524 m (5,000 ft)		Any two points 2.4 m (8 ft) above the pavement must be mutually visible (visible by each other) for the distance indicated. For runways shorter than 1,524 m (5,000 ft), height above runway will be reduced proportionally.
9	Transverse grade of runway	Min. 1.0% Max. 1.5%		New runway pavements will be centerline crowned. Existing runway pavements with insufficient transverse gradients for rapid drainage should provide increasing gradients when overlaid or reconstructed. Slope pavement downwards from centerline of runway. 1.5% slope is optimum transverse grade of runway.

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
				Selected transverse grade is to remain constant for length and width of runway, except at or adjacent to runway intersections where pavement surfaces must be warped to match abutting pavements.
10	Transverse grade of paved shoulder	Min. 2.0% Max. 3.0%		Paved portion of shoulder. Slope downward from runway pavement. Reversals are not allowed. Exception allowed in the tape sweep area for USAF aircraft arresting systems. At runway edge sheaves, paved shoulder slope should match runway cross slope on centerline crowned runways. Designers shall warp the adjacent tape sweep area pavement surfaces to direct drainage away from the aircraft arresting system components as much as possible. Pavement within the tape sweep area of arresting systems shall meet the design and grade criteria in USAF Typical Installation Drawing 67F2011 A.
11	Transverse grade of unpaved shoulder	(a) 40-mm (1.5-in) drop-off at edge of paved shoulder, ± 13 mm (0.5 in) (b) Min. 2.0% , Max. 4.0%		Unpaved Portion of Shoulder. Slope downward from shoulder pavement. For additional information, see <b>Figure 3.2.</b>
12	Runway lateral clearance zone	140 m (459 ft)		On each side of runway centerline. The runway lateral clearance zone’s lateral limits coincide with the limits of the primary surface (See <b>Figure 3.1.</b> ). The ends of the lateral clearance zone coincide with the runway ends. The ground surface within this area must be clear of fixed or mobile objects and graded to the requirements of <b>Table 3.2.</b> , Items 13 and 14. Measure the zone width perpendicularly from the centerline of the runway. Fixed obstacles include manmade or natural features such as buildings, trees, rocks, terrain irregularities and any other

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
				<p>features constituting possible hazards to moving aircraft. Navigational aids (NAVAIDS) and meteorological equipment will be sited within these clearances where essential for their proper functioning. This area needs to be clear of all obstacles except for the permissible deviations noted in UFC 3-260-01, Appendix B, Section 13, <i>Deviation from Criteria for Air Force Airfield Support Facilities</i>, provided they are correctly sited.</p> <p>Mobile obstacles include parked aircraft, parked and moving vehicles, railroad cars and similar equipment. Taxiing aircraft, emergency vehicles and authorized maintenance vehicles are exempt from this restriction.</p> <p>For Class A runways above ground drainage structures, including head walls, are not permitted within 91 m (300 ft) of the runway edge. For Class B runways above ground drainage structures, including head walls are not permitted within 114 m (375 ft) of the runway centerline. Drainage slopes of up to a 10 to 1 ratio are permitted for all runway classes, but swales with more gentle slopes are preferred.</p> <p>Distance from runway centerline to helipads is discussed in <b>Table 3.2</b>, Item 15. Additional reference can be found in Chapter 4 of UFC 3-260-01.</p>
13	Longitudinal grades within runway lateral clearance zone	Max. 10.0%		<p>Exclusive of pavement, shoulders, and cover over drainage structures. Slopes are to be as gradual as practicable. Avoid abrupt changes or sudden reversals. Rough grade to the extent necessary to minimize damage to aircraft.</p>
14	Transverse grades within runway lateral	Min. 2.0%, Max. 10.0% Grades may be upwards or downwards		<p>Exclusive of pavement, shoulders, and cover over drainage structures.</p>

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
	clearance zone (in direction of surface drainage)			Slopes are to be as gradual as practicable. Avoid abrupt changes or sudden reversals. Rough grade to the extent necessary to minimize damage to aircraft.
15	Distance between centerlines of parallel runways	213 m (700 ft)	305 m (1,000 ft)	VFR without intervening parallel taxiway between the parallel runways. One of the parallel runways must be a VFR only runway.
		632 m (2,075 ft)		VFR with intervening parallel taxiway.
		762 m (2,500 ft)		IFR using simultaneous operation (Depart-Depart) (Depart-Arrival).
		1,311 m (4,300 ft)		IFR using simultaneous approaches.
16	Distance between centerlines of runway and parallel taxiway / emergency runway	150 m (492 ft)		NATO Alternate Launch Recovery Surface (ALRS) clearances. USAFE-AFAFRICA Parallel Taxiway/ Emergency Runway
17	Width of USAF Mandatory Zone of Frangibility	280 m (919 ft)		Centered on the runway centerline. 140 m (459 ft) on each side of centerline. Items sited within this area must be frangible except those noted in UFC 3-260-01, Appendix B, Section 13.
18	Length of USAF Mandatory Zone of Frangibility	Length extends from the edge of the runway to the lesser of 914 m (3,000 ft) or the installation boundary.		Extending outward from the runway threshold. All items sited within this area to the end of the installation must be frangible, see UFC 3-260-01, Appendix B, Section 13.

**Notes:**

1. For separation distance between fixed wing runways and rotary wing runways, see Table 4.1 of UFC 3-260-01.
2. Geometric design criteria in this instruction are based on aircraft-specific requirements and are not direct conversions from inch-pound (English) dimensions. Inch-pound units are included only to permit reference to the previous standard.
3. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are direct conversions from inch-pound to SI units.

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
4. Metric units apply to new airfield construction and where practical, to modifications to existing airfields and heliports, as discussed in <b>paragraph 1.4.4</b> .				

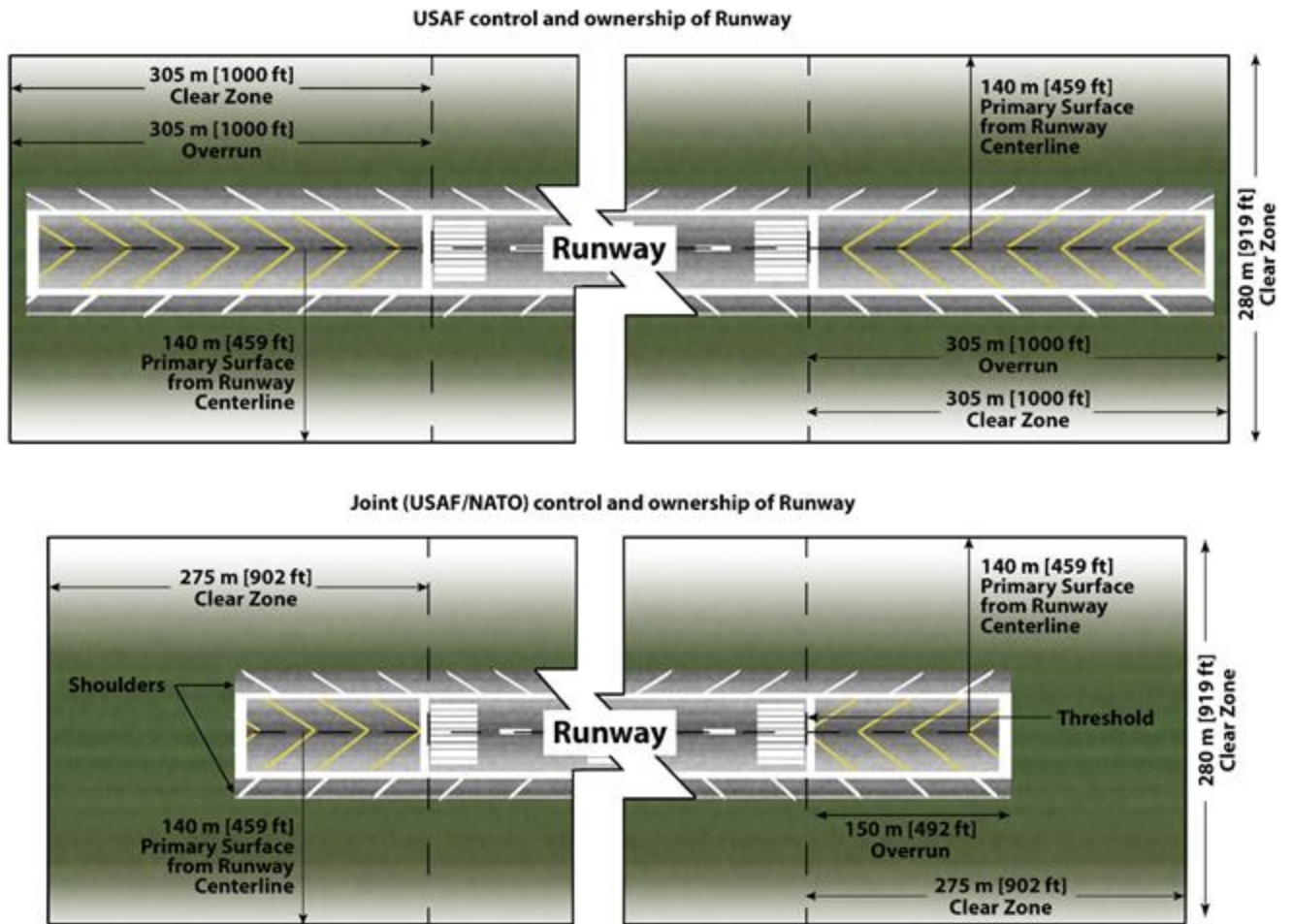
**3.6. Additional Considerations for Runway Orientation.** In addition to meteorological and wind conditions, the following factors must be considered:

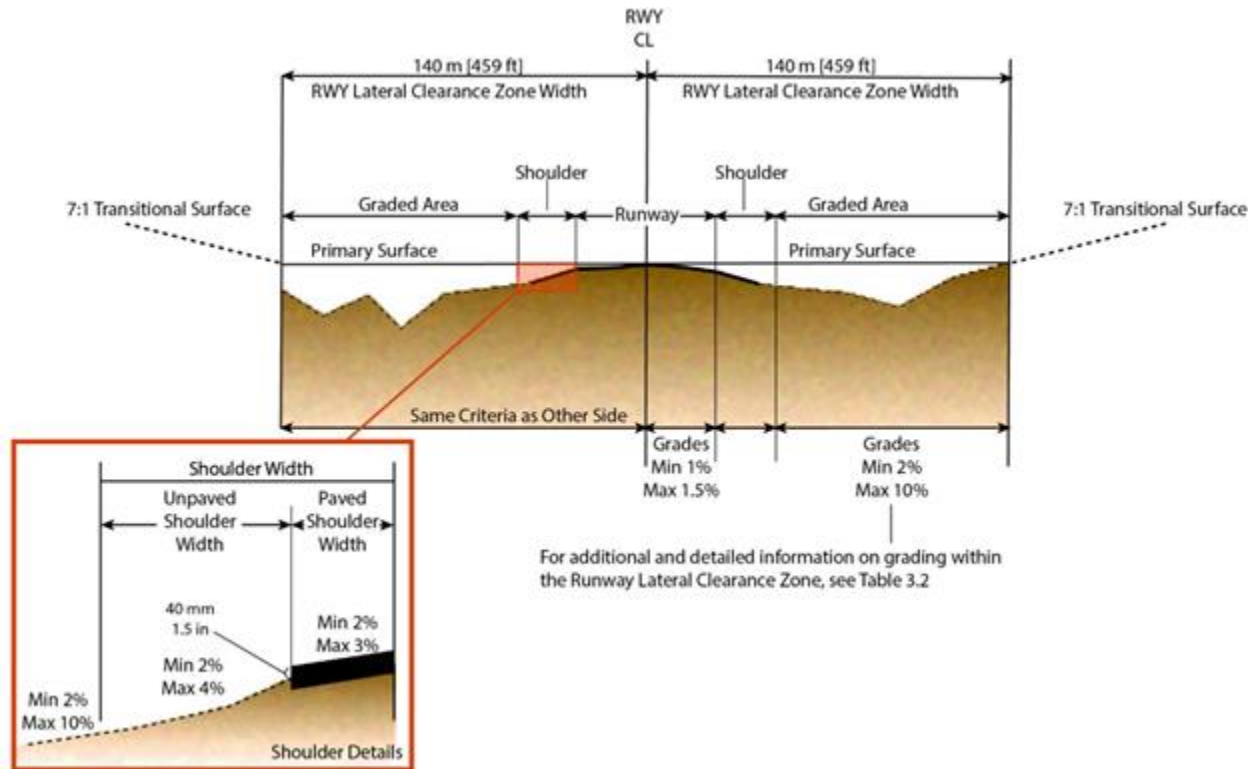
3.6.1. **Obstructions.** A specific airfield site and the proposed runway orientation must be known before a detailed survey can be made of obstructions, which affect aircraft operations. Runways should be so oriented that approaches necessary for the ultimate development of the airfield are free of all obstructions.

3.6.2. **Restricted Airspace.** Airspace through which aircraft operations are restricted, and possibly prohibited, are shown on sectional and local aeronautical charts. Runways should be so oriented that their approach and departure patterns do not encroach on the restricted areas.

3.6.3. **Built-Up Areas.** Airfield sites and runway alignment will be selected and the operational procedures adopted which will least impact local inhabitants. Additional guidance for facilities is found in DoD Instruction 4165.57, *Air Installation Compatible Use Zone (AICUZ)*.

Figure 3.1. Runway and Primary Surface Boundaries.



**Figure 3.2. Runway and Primary Surface Transverse Sections.**

3.6.4. **Neighboring Airports.** Existing aircraft traffic patterns of airfields in the area may affect runway alignment.

3.6.5. **Topography.** Avoid sites which require excessive cuts and fills. Evaluate the effects of topographical features on: airspace zones, grading, drainage and possible future runway extensions.

3.6.6. **Soil Conditions.** Evaluate soil conditions at potential sites to minimize settlement problems, heaving from highly expansive soils, high groundwater problems and construction costs. Evaluate the project area for wetlands and potential historical/archaeological sites. Analyze the soil for contaminants and plan for remediation or protection, as necessary.

3.6.7. **Noise Analysis.** Noise analyses should be conducted to determine noise impacts to local communities and identify noise sensitive areas.

**3.7. Runway Designation.** Runways are identified by the whole number nearest one-tenth (1/10) the magnetic azimuth of the runway centerline.

3.7.1. **Determining Runway Designation.** The magnetic azimuth of the runway centerline is measured clockwise from magnetic north when viewed from the direction of approach. For example, where the magnetic azimuth is 183 degrees, the runway designation marking would be 18; and for a magnetic azimuth of 117 degrees, the runway designation marking would be 12. For a magnetic azimuth ending in the number 5, such as 185 degrees, the runway designation marking can be either 18 or 19. Supplemental letters, where required for differentiation of parallel runways, are placed between the designation numbers and the threshold or threshold marking. For parallel runways, the supplemental letter is based on the

runway location, left-to-right, when viewed from the direction of approach: for two parallel runways - “L”, “R”; for three parallel runways – “L,” “C,” and “R.” A zero (0) is marked to precede single-digit numbers on Class B runways.

**3.7.2. Runway Designation Magnetic Variation.** The TERPS specialist will coordinate the Epoch year magnetic variation values on AF owned and operated airports and NAVAIDs with HQ AFFSA in accordance with AFMAN 11-230, paragraph 7.3. Implementing Epoch Year Magnetic Variation (MV). Guidance for the application of magnetic variation is from FAA Order 8260.19H, Section 2-5.

**3.8. Runway Dimensions.** The following paragraphs and tables present the design criteria for runway dimensions at all aviation facilities except LZs.

**3.8.1. Runway Dimension Criteria, Except Runway Length.** In [Table 3.2](#) presents all dimensional criteria, except runway length, for the layout and design of runways used primarily to support fixed-wing aircraft operations.

**3.8.2. Runway Length Criteria.** HQ USAFE-AFAFRICA/A3 will determine the length of new or substantially modified Class A and Class B runways.

**3.8.3. Layout.** Typical sections and profiles for runways and the associated airspace surfaces are in [Figure 3.1](#) through [Figure 3.11](#).

**3.9. Runway End Siting Requirements.** This paragraph provides guidance on the preliminary design for the establishment of runway thresholds and departure ends. Final design must be based on a detailed analysis, coordinated with the MAJCOM TERPS office, and verified by the Air Force Flight Standards Agency.

**3.9.1. Runway Ends.** The runway ends are the physical ends of the rectangular surface that constitutes a runway. The end of the runway is normally the beginning of the take-off roll and the end of the landing roll out.

**3.9.2. Threshold.** The threshold is ideally located at the beginning of the runway. The threshold is located to provide proper clearance for landing aircraft over existing obstacles while on approach to landing. When an object is beyond the DoD’s ability to remove, relocate, or reduce the height and the object obstructs the airspace required for aircraft to land at the beginning of the runway for takeoff, the threshold may be located farther down the runway. Such a threshold is called a “displaced threshold”.

**3.9.2.1. Displaced Threshold.** A displaced threshold may be designated on certain runways in order to avoid obstacles in the imaginary or TERPS/PANS-OPS surfaces. When it is determined that a runway requires a displaced threshold, the responsible airfield authority will evaluate each individual situation and set the displaced threshold and airspace imaginary surfaces.

**3.9.2.2. Impacts to Runway Length.** Displacement of a threshold reduces the length of runway available for landings. The portion of the runway behind a displaced threshold may be available for take-offs and, depending on the reason for displacement, may be available for take-offs and landings from the opposite direction.

**3.9.2.3. Other Impacts.** Displacement of the threshold often introduces disruptions to an otherwise orderly airport design. Approach lighting systems and NAVAIDs used for landing may need to be moved. Taxiways that remain in the new approach area (prior to

the threshold) can create situations where taxiing aircraft penetrate the approach surface or the Clear Zone. Hold lines may also need to be moved to keep aircraft clear of these areas and runway capacity may be affected. While threshold displacement is often used to as a solution for constrained airspace, airfield designers need to carefully weigh the trade-offs of a displaced threshold. Displacing a threshold may also create a situation where the holdline must be placed on the parallel taxiway. This is undesirable as pilots do not normally expect to encounter a holdline on the parallel taxiway.

3.9.2.4. **Cautions.** Threshold displacement should be undertaken only after full evaluation reveals that displacement is the best alternative.

**3.10. Shoulders.** Unprotected areas adjacent to runways and overruns are susceptible to erosion caused by jet blast. Shoulders reduce the probability of serious damage to an aircraft to a minimum in the event that the aircraft runs off the runway pavement. The shoulder width, shown in Item 3 of **Table 3.2**, includes both paved and unpaved shoulders. Paved shoulders are required adjacent to all runways. The minimum paved shoulder width, shown in **Table 3.2**, allows the runway edge lights to be placed within the paved portion of the shoulder and to reduce foreign object damage (FOD) to aircraft. The unpaved shoulder should be graded to prevent water from ponding on the adjacent paved area (shoulder and runway). The drop-off next to the paved area prevents turf (which may build up over the years) from ponding water. Manholes, hand holes, and drainage structures constructed within these areas should, at a minimum, be designed as provided in this section. See Paragraph 2-12 of UFC 3-260-01 for requirements for designing buried utility structures in overruns.

**3.11. Runway Overruns.** Runway overruns keep the probability of serious damage to an aircraft to a minimum in the event that the aircraft runs off the runway end during a take-off or landing, or lands short during a landing. Overruns are required for the landing and take-off areas. **Table 3.3** shows the dimensional requirements for overruns. Design and construction requirements are covered in UFC 3-260-02 (Chapter 10, under “Special Areas”). See Paragraph 2-12 of UFC 3-260-01 for requirements for designing buried utility structures in overruns.

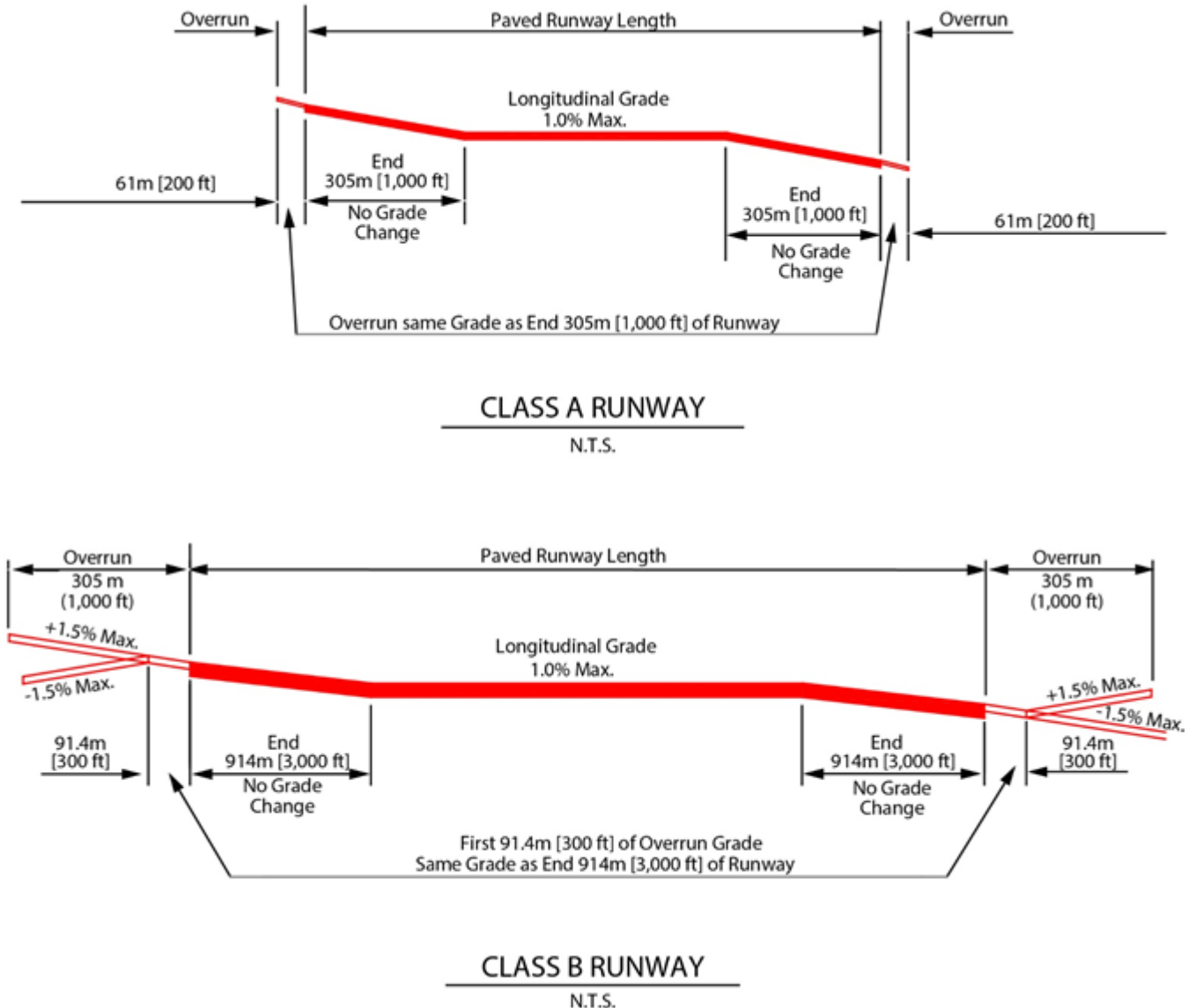
3.11.1. In certain situations, mission capability may be improved by increased runway length for takeoff. With responsible airfield authority approval, this can sometimes be accomplished by strengthening the paved overrun to support full aircraft traffic, thereby extending the allowable take-off length, but not changing the approach or departure surfaces or runway thresholds. This situation will require displaced threshold markings to indicate the landing threshold and may require changes to lighting systems. (T-3) See **paragraph 3.9.2** for displaced threshold guidance.

**Table 3.3. Overruns.**

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
1	Length	61.0 m (200 ft)	305 m (1,000 ft)	The USAFE-AFAFRICA overrun dimensions must be applied whenever land is available, and the USAF controls/ owns the entire clear zone.

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
		61.0 m (200 ft)	150 m (492 ft)	For installations with clear zones containing land not under USAF control, the NATO overrun can be applied. Although, the USAFE-AFAFRICA overrun shall be applied whenever possible.
2	Total Width of Overrun (Paved and Unpaved)	Sum of runway and shoulder widths		
3	Paved Overrun Width	Same as width of runway and paved shoulders		Center overrun pavement along the extended runway centerline.
4	Unpaved Width of Overrun	Same width as runway shoulder		The outside edges of the overrun equal in width to the runway shoulder, is graded as overrun, but not paved.
5	Longitudinal Centerline Grade	Same as last 305 m (1,000 ft) of runway	First 91.4 m (300 ft) same as last 914 m (3,000 ft) of runway. Remainder: Max 1.5%	To avoid abrupt changes in grade between the first 91.4 m (300 ft) and remainder of overrun of a Class B runway, the maximum change of grade is 2% per 30.5 linear meters (100 linear feet). See <b>Figure 3.3</b> .
6	Transverse Grade	Min. 2.0% Max. 3.0% 40 mm (1.5 in) drop-off at edge of paved overrun ± 13 mm (0.5 in)		From centerline of overrun. Transition from the runway and runway shoulder grades to the overrun grades to be made within the first 45.7 m (150 ft) of overrun.
<p><b>Note:</b> Geometric design criteria in this instruction are based on aircraft-specific requirements and are not direct conversions from inch-pound (English) dimensions. Inch-pound units are included only to permit reference to the previous standard.</p>				

Figure 3.3. Runway and Overrun Longitudinal Profile.



**3.12. Runway Clear Zones.** Runway Clear Zones are areas on the ground, located at the ends of each runway. They possess a high potential for accidents and their use is restricted to be compatible with aircraft operations. In USAFE-AFAFRICA, Clear Zones are only delineated and protected when they lie within the installation perimeter. [Table 3.4](#) shows the dimensional requirements for runway clear zones. Layout of the clear zones is shown in [Figure 3.3](#) through [Figure 3.6](#).

**3.12.1. Land Use in Clear Zones.** The purpose of the clear zone is to protect the safety of flight and safety of people on the ground. The entire clear zone area is a land use control area intended to protect people both flight safety and property on the ground. DoDI 4165.57, AFI 32-1015 and AFH 32-7084 govern land use in this area. USAFE-AFAFRICA airfields shall also consider any host nation requirements or national standards, where applicable and as stipulated in a written host nation agreement.

3.12.2. **The Mandatory Frangibility Zone (MFZ).** The MFZ includes the Clear Zone and Primary surface and extends through the land use control area to the end of the clear zone if on property owned or controlled by the USAF, or to the base boundary if a navigation easement does not exist. Items that must be sited in the clear zone or primary surface within the base boundary due to their function must be made frangible, see UFC 3-260-01, Appendix B, Section 13. Items that cannot be made frangible (such as highway guard rails), but which must be located within this area for urgent and compelling reasons, must be waived by HQ USAFE-AFAFRICA before they are constructed. This is to ensure all alternatives are considered before non-frangible structures are sited within this area, see [Figure 3.1](#) and [Figure 3.13](#) See AFI 32-1015 for additional information.

**Table 3.4. Clear Zone.**

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
1A	Length	305 m (1,000 ft)	305 m (1,000 ft)	This USAFE-AFAFRICA-defined Clear Zone length is to be applied whenever land is available and controlled by USAFE-AFAFRICA. Measured along the extended runway centerline beginning at the runway end. Clearing and grading of the entire area is required. For grading requirements, see <b>Table 3.4.</b> , Items 3 and 4.
1B		275 m (902 ft)	275 m (902 ft)	For installations with clear zones containing land not under USAF control, the NATO clear zone can be applied. However, the USAFE-AFAFRICA Clear Zone shall be applied whenever practical. Measured along the extended runway centerline beginning at the runway end. Clearing and grading of the entire area is required. For grading requirements, see <b>Table 3.4.</b> , Items 3 and 4.
2	Width of Clear Zone (adjacent to the runway)	280 m (919 ft)	280 m (919 ft)	Clearing and grading of the entire area is required. For grading requirements, see <b>Table 3.4.</b> , Items 3 and 4.

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
3	Longitudinal grade of area to be graded	Max 10.0%		<p>The area to be graded is 305 m (1,000 ft) in length by the established width of the primary surface. Grades are exclusive of the overrun, but are to be shaped into the overrun grade. The maximum longitudinal grade change cannot exceed <math>\pm 2.0\%</math> per 30.5 m (100 ft). Grade restrictions are also exclusive of other pavements and shoulders. Where other pavements cross the graded area, comply with grading requirements for the specific pavement design (tow ways, taxiways, or aprons as applicable), but hold grade changes to the minimum practicable to facilitate drainage. The graded area is to be cleared and grubbed of stumps and free of abrupt surface irregularities, ditches and ponding areas. No aboveground structures objects or roadways are permitted in the area to be graded (except air traffic control (ATC)) controlled service roads to arresting gear or NAVAIDs), but gentle swales, subsurface drainage, covered culverts and underground structures are permissible. No part of either area must penetrate the approach or departure clearance surfaces. For policy regarding permissible facilities, geographical features and land use in the remainder of the clear zone, refer to guidance furnished by HQ USAFE-AFAFRICA, and DoD Air Installations Compatible Use Zone (AICUZ) guidelines for Clear Zones, see Attachment 4, <i>Land Use Compatibility Guidelines for Clear Zones</i>.</p>
4	Transverse grade of area to be graded (in direction of surface)	Min. 2.0% Max. 10.0%		See Remarks for Item No. 3 above.

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
	drainage prior to channelization)			
5	Width of USAF Mandatory Zone of Frangibility	280 m (919 ft)		140 m on each side of the extended center line. All items sited within this area must be frangible, see UFC 3-260- 01, Appendix B, Section 13.
6	Length of USAF Mandatory Zone of Frangibility	Length extends from the edge of the runway to the lesser of 914.4 m (3,000 ft) or the installation boundary.		Centered on the extended runway centerline. All items sited within this area must be frangible, see UFC 3-260- 01, Appendix B, Section 13 for exceptions such as fencing.

**Notes:**

1. For the definition of runway end, refer to the glossary of UFC 3-260-01.
2. Essential NAVAID structure exceptions are discussed in UFC 3-260-01, Appendix B, Section 13.
3. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are direct conversions from inch-pound to SI units.
4. Metric units apply to new airfield construction, and where practical, to modifications to existing airfields and heliports, as discussed in **paragraph 1.4.4.**

**Figure 3.4. Clear Zone and Transverse Section Detail.**

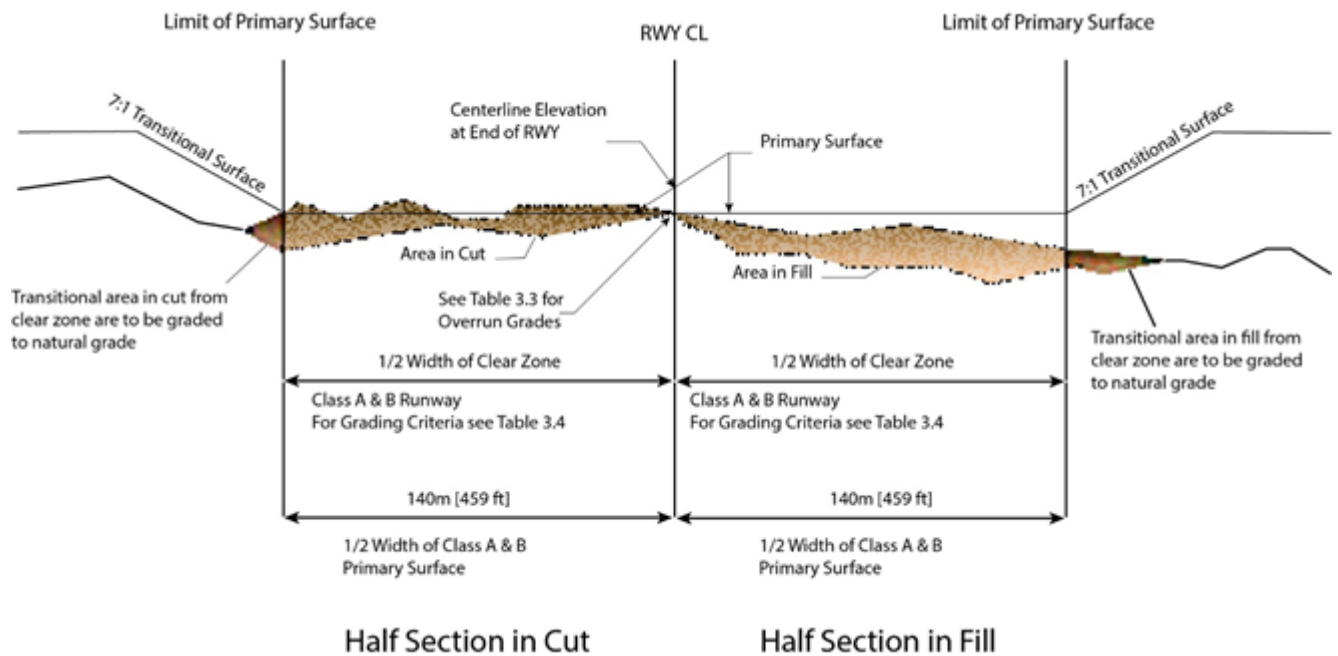


Figure 3.5. Class B Runway Approach Surface End and Clear Zone Details.

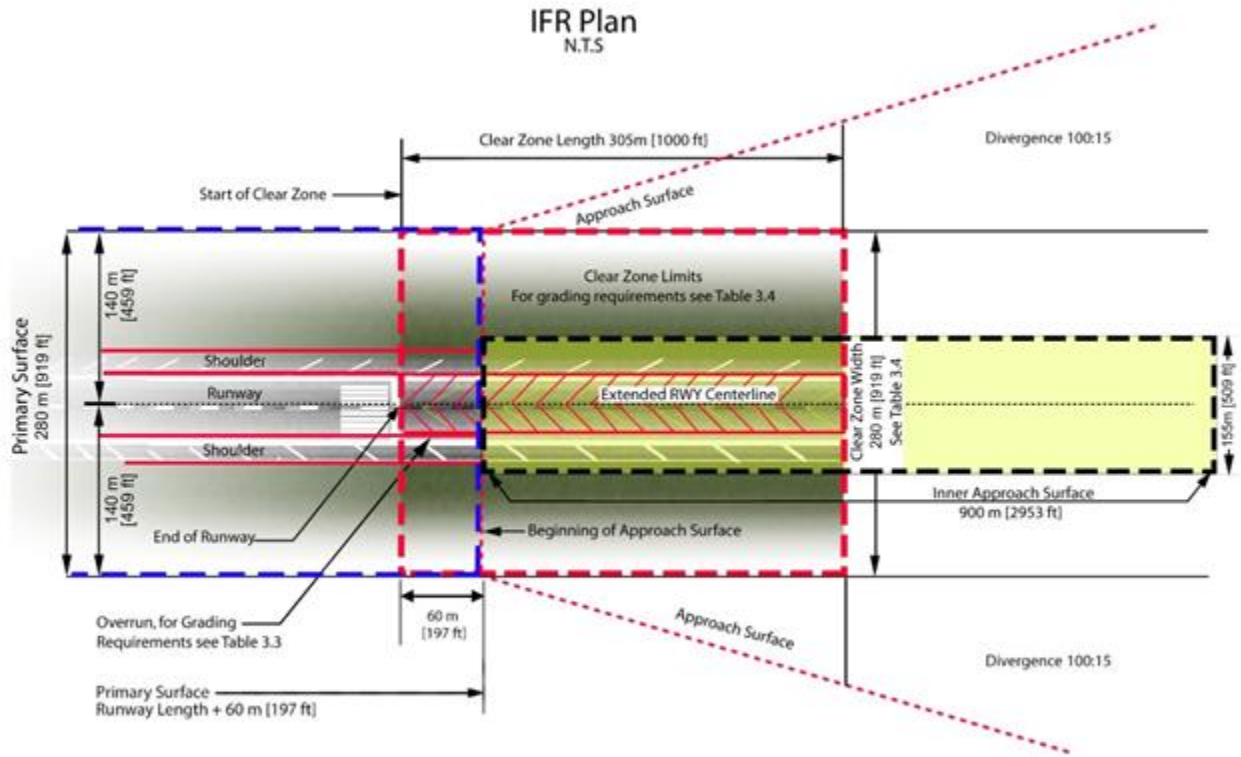
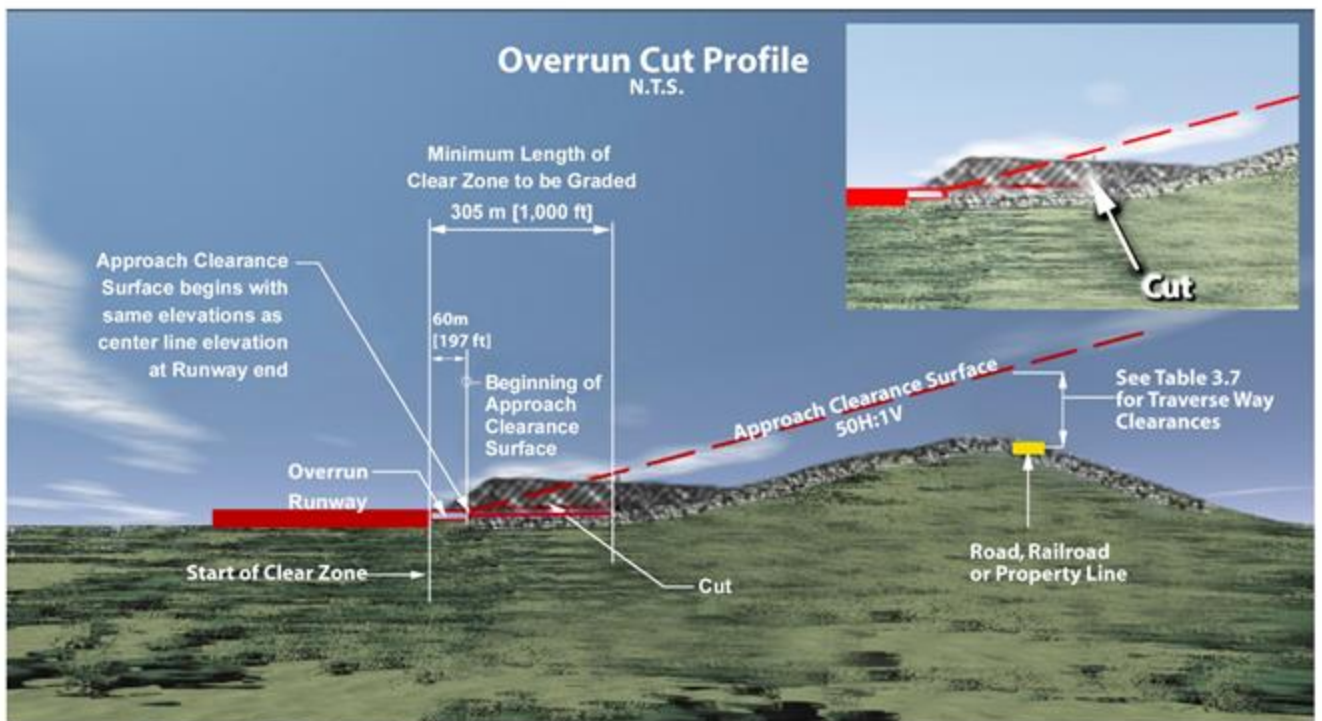
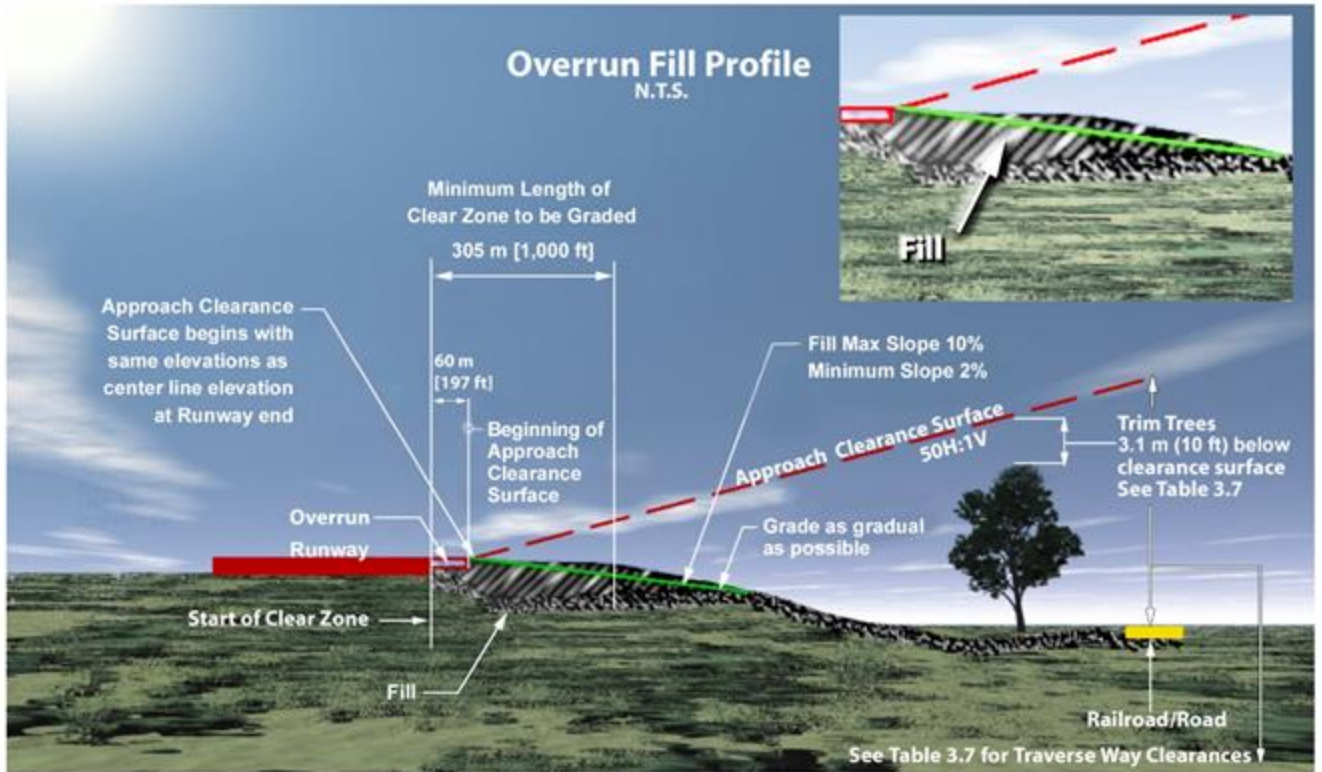


Figure 3.6. Class B Runway Primary Surface End and Clear Zone Details.



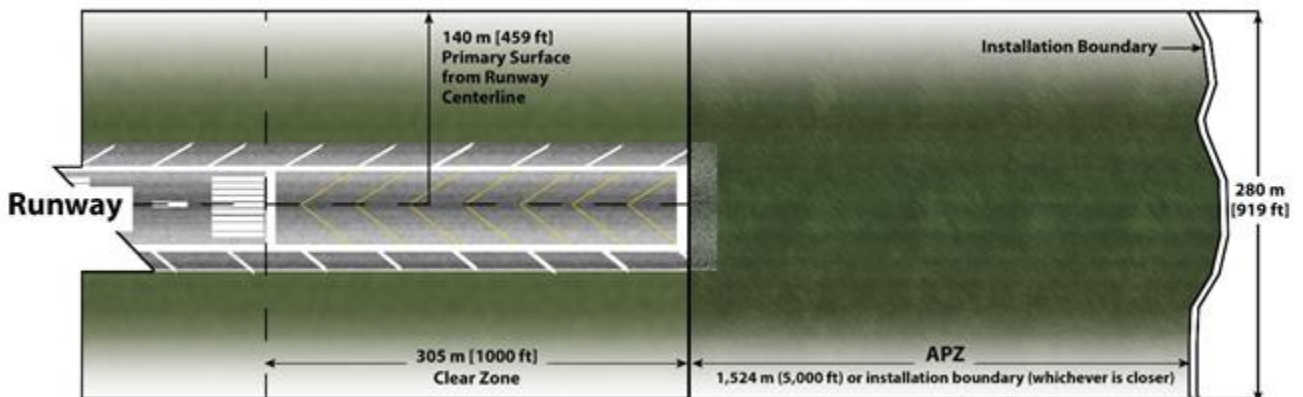
**3.13. Accident Potential Zones (APZs).** APZs are areas on the ground located beyond the clear zone of each runway. They possess a potential for accidents, and their use is restricted in accordance with DoDI 4165.57. **Table 3.5.** shows the dimensional requirements for runway APZs. Land use guidelines within the clear zone and APZs are provided in AFI 32-1015, *Integrated Installation Planning*, and AFH 32-7084, *AICUZ Program Manager’s Guide*. However, APZs in USAFE-AFAFRICA are not applicable outside of the installation boundary and only need to be managed within the fenceline.

**Table 3.5. Accident Potential Zone (APZ).**

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
1	APZ Length	762 m (2,500 ft) or to the installation boundary, whichever is closer to the end of the clear zone.	1,524 m (5,000 ft) or to the installation boundary, whichever is closer to the end of the clear zone.	APZ starts at the end of the Clear Zone and is centered and measured on the extended centerline. Modifications will be considered if: The runway is infrequently used. Prevailing wind conditions are such that a large percentage (that is, over 80%) of the operations are in one direction. Local accident history indicates consideration of different areas. Other unusual conditions exist.
2	APZ Width	280 m (919 ft)	280 m (919 ft)	

**Note:** See AFI 32-1015 and AFH 32-7084, as they apply to APZ. Due to land use restrictions within USAFE- AFAFRICA, no APZ equivalents to APZ II exist.

**Figure 3.7. USAFE-AFAFRICA APZ.**



**3.14. Airspace Imaginary Surfaces.** The area surrounding a runway that must be kept clear of objects that might damage an aircraft is bounded by imaginary surfaces that are defined in this instruction. An object, either man-made or natural, which projects above an imaginary surface, is

an obstruction. Imaginary surfaces for fixed-wing airfields are shown in **Figure 3.5** through **Figure 3.13**, and are defined in **Attachment 1, Glossary of References and Supporting Information**. The applicable dimensions and slopes are provided in **Table 3.6**. These imaginary surfaces include:

- 3.14.1. Primary Surface (Runway Strip).
- 3.14.2. Clear Zone.
- 3.14.3. Inner Approach Surface.
- 3.14.4. Approach Surface.
- 3.14.5. Transitional Surface.
- 3.14.6. Inner Horizontal Surface.
- 3.14.7. Outer Horizontal Surface.
- 3.14.8. Conical Surface.
- 3.14.9. Departure Surface.
- 3.14.10. Inner Transitional Surface.
- 3.14.11. Balked Landing Surface.

**Table 3.6. Air Space Imaginary Surfaces.**

Item No.	Item Description	Legend	All Runway Requirements	Remarks
1	Primary Surface Width	A	280 m (919 ft)	Centered on the runway centerline.
2	Primary Surface Length	A	Runway Length + 60 m (197 ft) at each end	Primary surface extends 60 m (197 ft) beyond the threshold of the runway.
3	Primary Surface Elevation	A	The elevation of any point on the primary surface is the same as the elevation of the nearest perpendicular point on the runway centerline.	
4	Clear Zone Surface	B	See <b>Table 3.4</b> .	All of the USAFE-AFAFRICA Clear Zone is treated as a graded area. For grading requirements, see <b>Table 3.4</b> , Items 3 and 4.
5	Start of Approach Surface	C	60 m (197 ft)	Measured from the threshold of the runway.

Item No.	Item Description	Legend	All Runway Requirements	Remarks
6	Approach Surface Beginning Width	C	280 m (919 ft)	The Approach Clearance Surface starting width is equal to the Primary Surface width at 60 m (197 ft) from the threshold.
7	Approach Surface Divergence	C	100:15	The Approach surface flares outward from the extended runway centerline. See <b>Figure 3.8.</b> through <b>Figure 3.11.</b>
8	Length of Approach Surface First Section	C	3,000 m (9,842 ft)	Measured Horizontally.
9	Slope of Approach Surface First Section	C	50:1	Slope ratio is horizontal: vertical. Example: 50:1 is 50 m (164 ft) horizontal to 1 m (3.2 ft) vertical. For clearances over highway and railroads, see <b>Table 3.7.</b>
10	Length of Approach Surface Second Section	C	3,600 m (11,811 ft)	Measured Horizontally.
11	Slope of Approach Surface Second Section	C	40:1	Slope ratio is horizontal: vertical. Example: 40:1 is 40 m (131.2 ft) horizontal to 1 m (3.2 ft) vertical.
12	Length of Approach Surface Horizontal Section	D	8,400 m (27,559 ft)	Measured Horizontally.
13	Total Length of the Approach Surface	D	15,000 m (49,212 ft)	Measured Horizontally.
14	Inner Horizontal Surface Height	E	45 m (148 ft)	Above the established airfield elevation.

Item No.	Item Description	Legend	All Runway Requirements	Remarks
15	Inner Horizontal Surface Radius	E	4,000 m (13,123 ft)	An imaginary surface constructed by scribing an arc with a radius of 4,000 m (13,123 ft) about the centerline at the midpoint of the runway.
16	Conical Surface Slope	F	20:1	Slope ratio is horizontal: vertical. Example: 20:1 is 20 m (65.6 ft) horizontal to 1 m (3.2 ft) vertical starting at the outer edge of the inner horizontal surface terminating at a height of 100 m (328 ft).
17	Conical Surface Height	F	145 m (476 ft)	Above the established airfield elevation.
18	Start of Inner Approach Surface	G	60 m (197 ft)	Measured from the threshold of the runway.
19	Width of Inner Approach Surface	G	155 m (509 ft)	Centered on the runway centerline. For runways supporting only those aircraft with wingspans less than 65 m (213 ft), the width for IFR inner approach surfaces may be reduced to 120 m (394 ft).
20	Length of Inner Approach Surface	G	900 m (2,953 ft)	Measured Horizontally.
21	Slope of Inner Approach Surface	G	50:1	Slope ratio is horizontal: vertical. EXAMPLE: 50:1 is 50 m (164 ft) horizontal to 1 m (3.2 ft) vertical. For clearances over highway and railroads, see <b>Table 3.7</b> .
22	Start of Transitional Surface	H	140 m (459 ft)	The beginning of the Transitional Surface corresponds with the outer edge of the Primary Surface.
23	End of Transitional Surface	H	320 m (1,050 ft) parallel to edge of primary surface. See Remarks	The Transitional Surface ends at the Inner Horizontal Surface, Conical Surface or at an elevation of 45 m (148 ft).

Item No.	Item Description	Legend	All Runway Requirements	Remarks
24	Slope of Transitional Surfaces	H	7:1	Slope ratio is horizontal: vertical. 7:1 is 7 m (23 ft) horizontal to 1 m (3.2 ft) vertical. Vertical height of vegetation and other fixed or mobile obstacles and/or structures will not penetrate the transitional surface. Taxiing aircraft are exempt from this requirement. The air traffic control tower is exempt from this requirement if the height will not affect Terminal Instrument Procedures (TERPS) criteria.
25	Slope of Inner Transitional Surfaces <sup>4</sup>	I	3:1	
26	Length of Inner Edge of Balked Landing Surface <sup>4</sup>	J	155 m (509 ft)	Centered on the runway centerline. For runways supporting only those aircraft with wingspans less than 65 m (213 ft), the width for IFR inner approach surfaces may be reduced to 120 m (394 ft).
27	Balked Landing Surface Distance from Threshold <sup>4</sup>	J	1,800 m (5,906 ft)	The distance from the threshold is the lesser of 1,800 m (5,905 ft) or the end of the runway.
28	Balked Landing Surface Divergence <sup>4</sup>	J	10%	
29	Balked Landing Surface Slope <sup>4</sup>	J	30:1	
30	Start of Departure Surface <sup>4</sup>	K	60 m (197 ft)	Measured from the threshold of the runway.
31	Departure Surface	K	180 m (590 ft)	

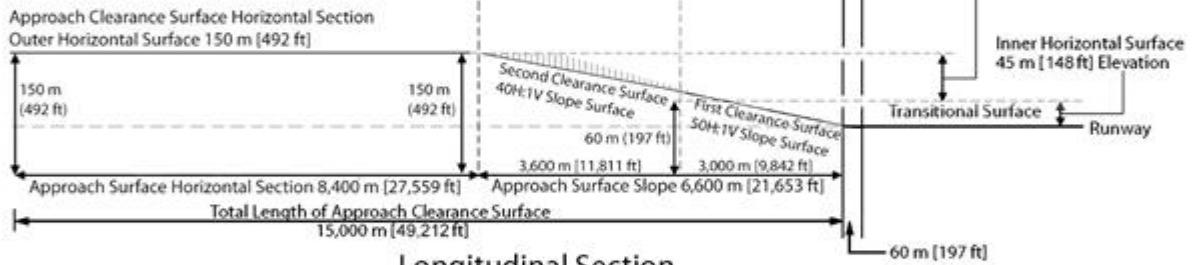
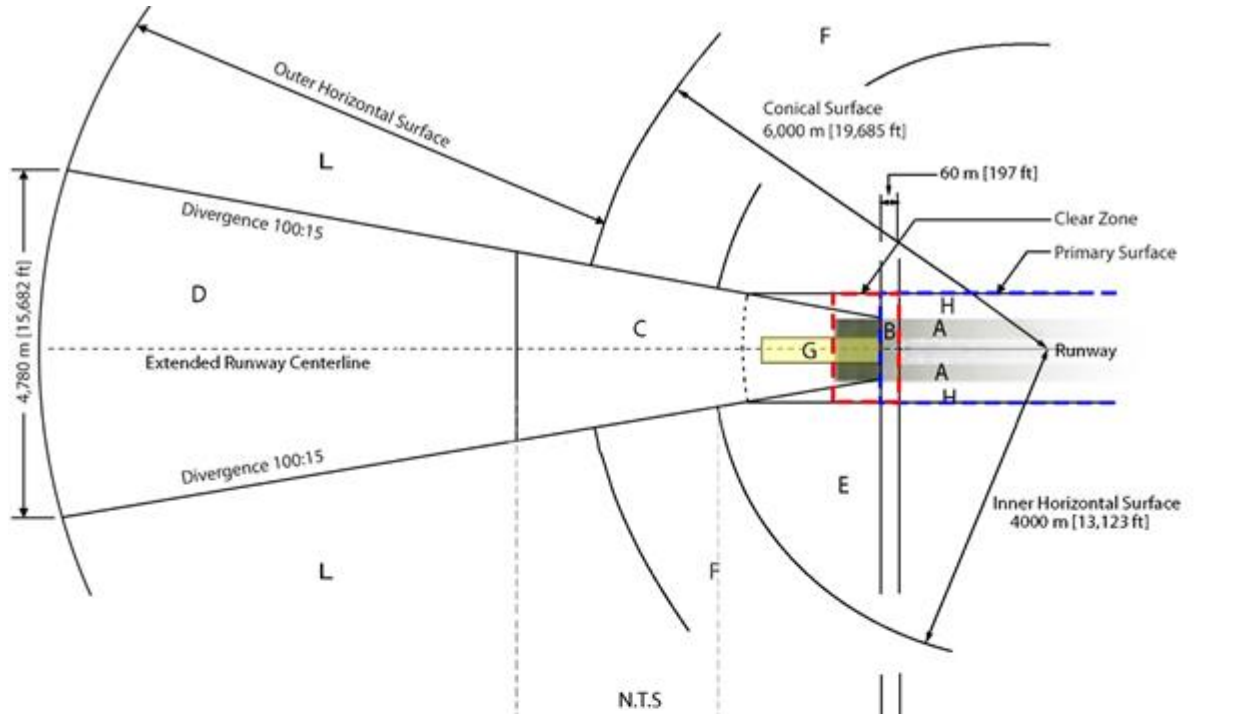
Item No.	Item Description	Legend	All Runway Requirements	Remarks
	Beginning Width <sup>4</sup>			
32	Departure Surface Divergence <sup>4</sup>	K	8:1	The Departure surface flares outward from the extended runway centerline.
33	Start of Transitional Surface <sup>4</sup>	K	15,000 m (49,212 ft)	Measured Horizontally.
34	Departure Surface Final Width <sup>4</sup>	K	1,200 m (3,937 ft)	
35	Slope of Departure Surface <sup>4</sup>	K	50:1	Slope ratio is horizontal: vertical. EXAMPLE: 50:1 is 50 m (164 ft) horizontal to 1 m (3.2 ft) vertical.
36	Outer Horizontal Surface Height	L	145 m (476 ft)	Above the established airfield elevation. Surface starts at outer edge of Conical Surface at an elevation of 145 m (476 ft). See <b>Figure 3.8.</b> and <b>Figure 3.9.</b>
37	Distance to the Outer Edge of the Outer Horizontal Surface	L	15,000 m (49,212 ft)	An imaginary surface constructed by scribing an arc with a radius of 15,000 m (49,212 ft) about the centerline at the midpoint of the runway.

**Notes:**

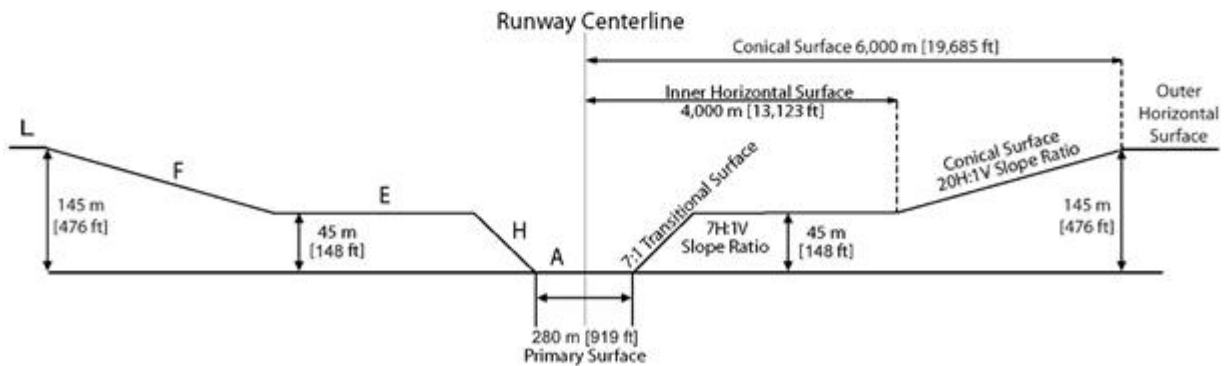
1. Approach Surfaces are based on Instrument Approach-Departure procedures. Verify Instrument Approach procedures with AF Flight Standard Agency or Host Nation Civil or Military Aviation Authority, as appropriate, prior to using this table.
2. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from inch-pound to SI units.
3. All USAFE-AFAFRICA installations must, as a minimum, follow the NATO and ICAO imaginary surface criteria presented in this table. Additional or more protective criteria may be present in the country-specific appendices to this instruction.
4. These criteria apply in USAFE-AFAFRICA by implementation of NATO Standardization Agreement (STANAG) 7174, Edition 1, Airfield Clearance Planes. However, these surfaces will not appear in USAFE-AFAFRICA airfield imaginary surface maps. USAFE-AFAFRICA airfields must establish their airfield maps using dual-approach, Class B IFR runway imaginary surfaces and also implement the USAFE-AFAFRICA Mandatory Frangibility Zone (MFZ) throughout the primary surface (see **paragraph 3.12.2.**). Following this approach, USAFE-

Item No.	Item Description	Legend	All Runway Requirements	Remarks
<p>AFAFRICA installations establish more protective obstacle limitation surfaces by implementing the imaginary surfaces listed in <b>paragraph 3.14.1.</b> through <b>paragraph 3.14.8.</b> above and the USAFE-AFAFRICA MFZ. Departure, inner transitional, and balked landing surfaces are not present in UFC 3-260-01, and many USAF users find their presence in this document confusing. The UFC includes only an approach/ departure surface and no separate surfaces for departures or balked landings (a balked landing is a very low altitude go-around).</p>				

**Figure 3.8. Class B Runway Airspace Plan and Profile Runway Imaginary Surfaces.**



Longitudinal Section  
N.T.S



Transverse Section  
N.T.S

Legend:

- |   |                                |
|---|--------------------------------|
| A - Primary Surface                         | E - Inner Horizontal Surface   |
| B - Clear Zone                              | F - Conical Surface            |
| C - Approach Clearance Surface (Sloped)     | G - Inner Approach Surface     |
| D - Approach Clearance Surface (Horizontal) | H - Transitional Slope (7H:1V) |
|   | L - Outer Horizontal Surface   |

Figure 3.9. Class B Runway Airspace Imaginary Surfaces.

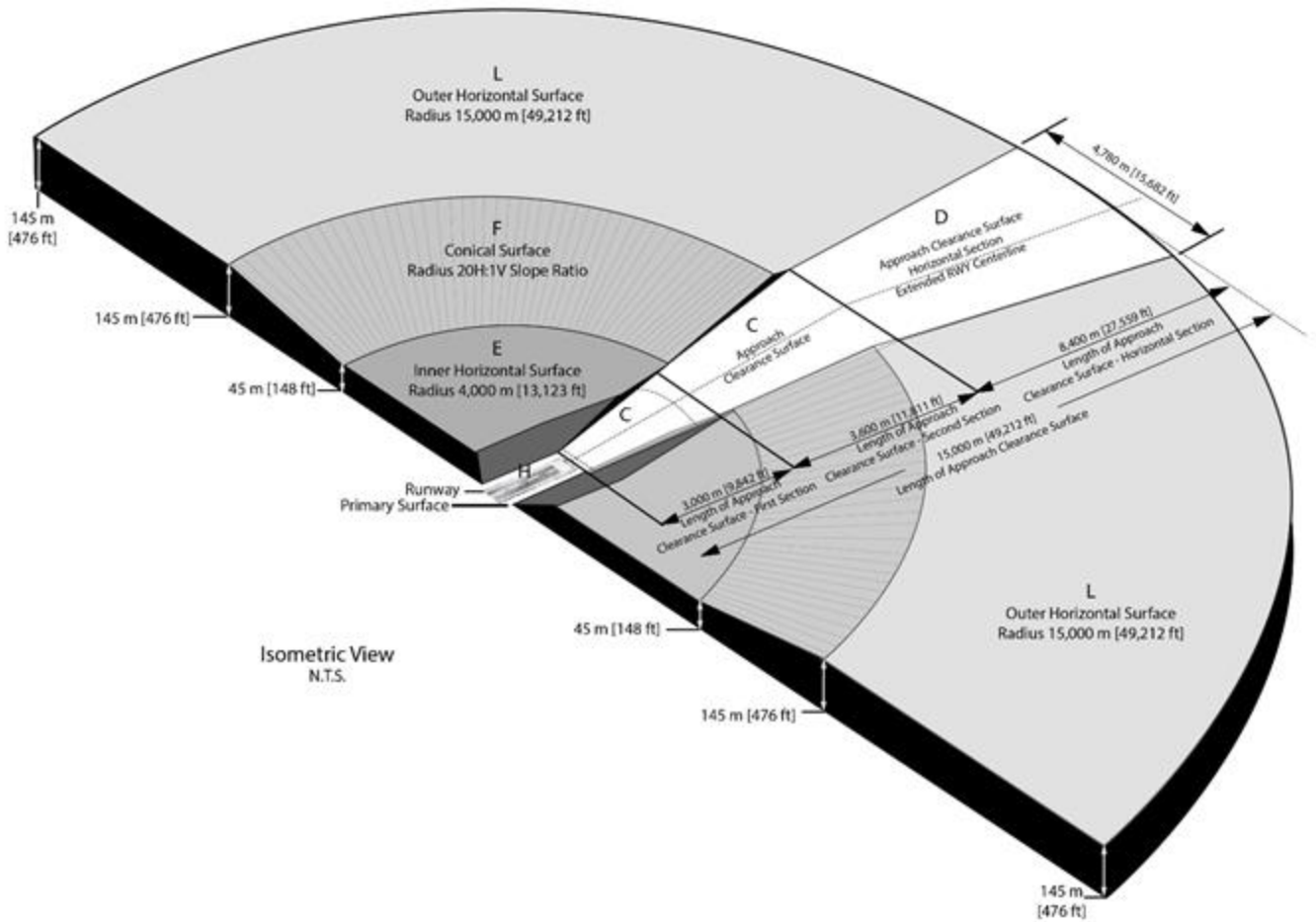


Figure 3.10. USAFE-AFAFRICA IFR Obstacle Limitation Surfaces.

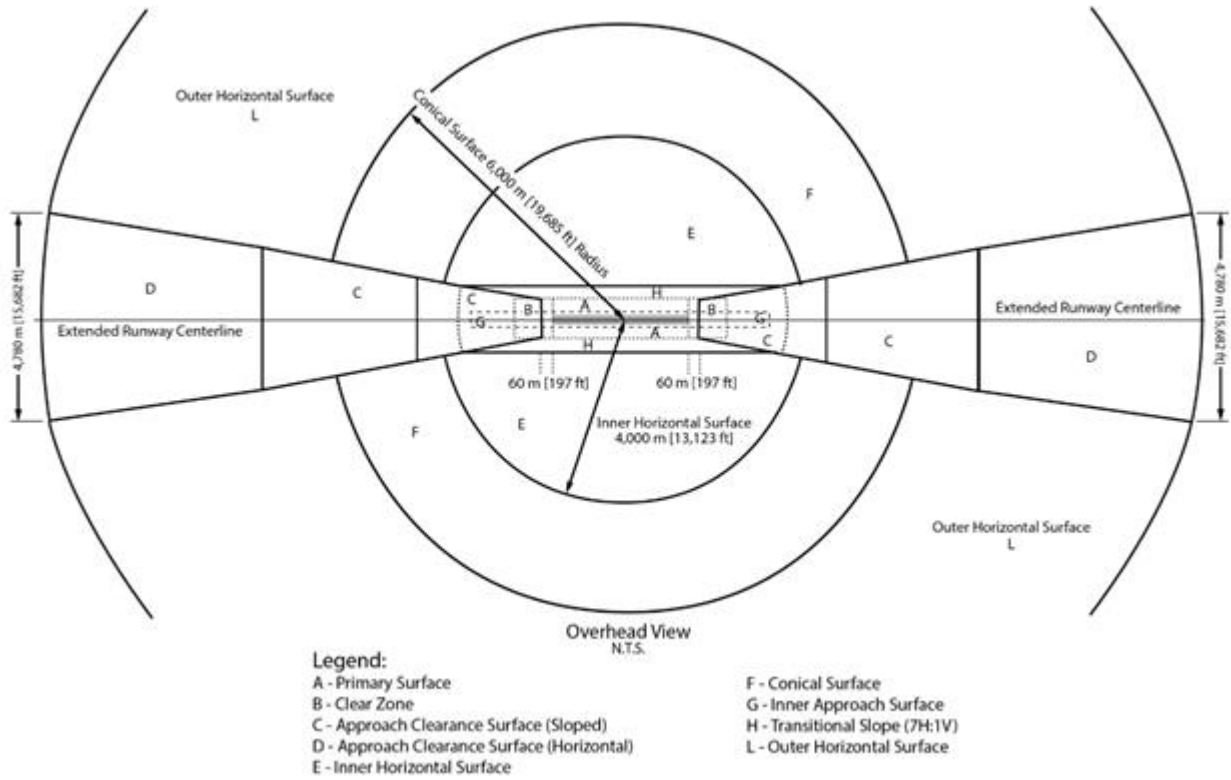
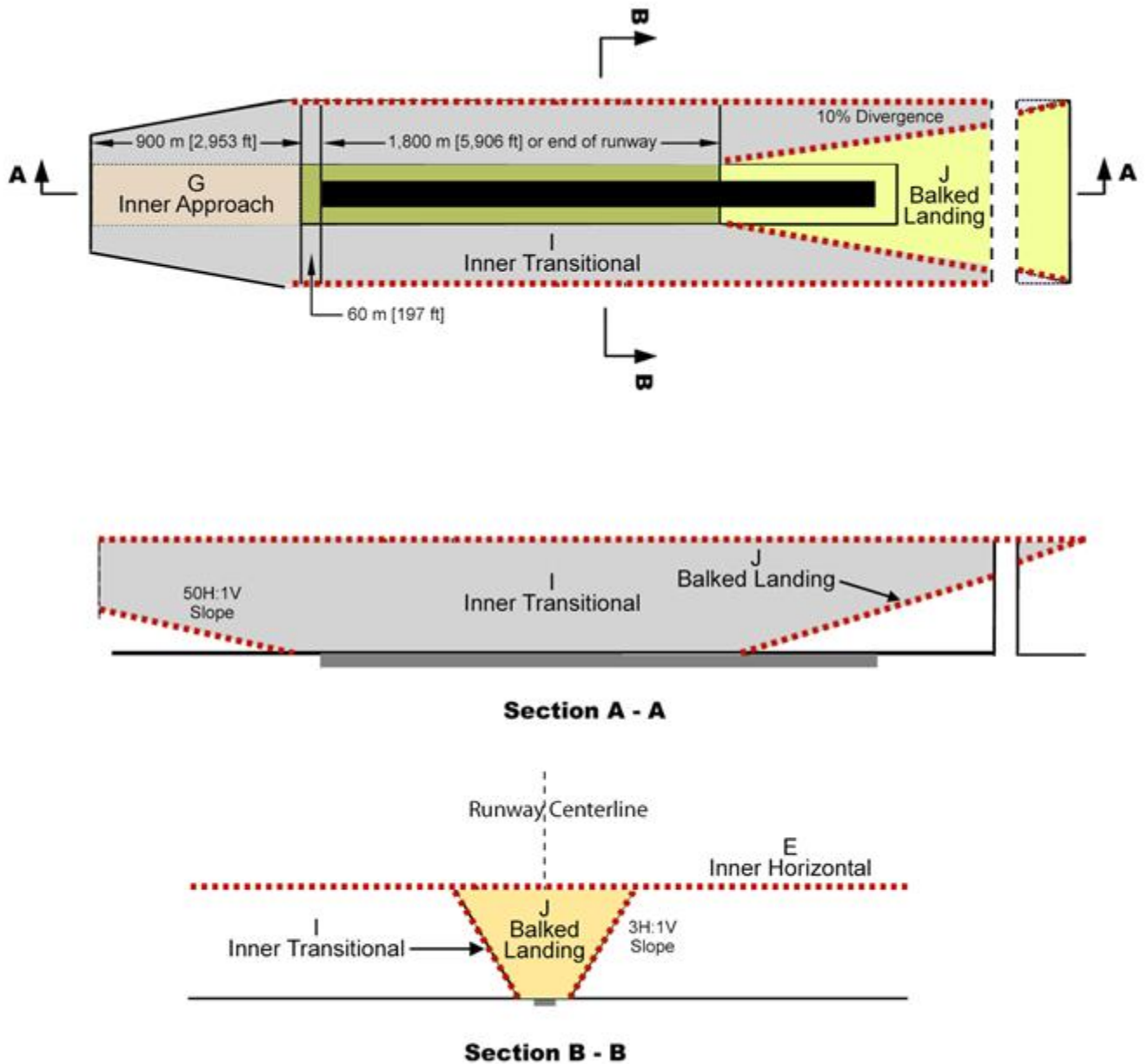


Figure 3.11. Balked Landing Obstruction Limitation Surfaces and Departure Surfaces.



**3.15. Obstructions to Air Navigation.** An existing object (including a mobile object) is, and a future object would be, an obstruction to air navigation if it is higher than any of the heights or surfaces described in this instruction and its country-specific appendices.

**3.15.1. Aircraft Operating Area (AOA).** No part of the airfield (runway/taxiway aprons) where aircraft operate under their own power will be considered an obstruction if the applicable grading criteria are met. (See [Attachment 1](#), *Glossary of References and Supporting Information*, for the definition of “aircraft operating area,” as used in this instruction).

3.15.2. **Determining Obstructions.** For USAFE-AFAFRICA airfields, an obstruction to air navigation is determined in accordance with either host nation standards in the appendices to this instruction, or USAFE-AFAFRICA standards in the main body of this instruction, whichever is more stringent.

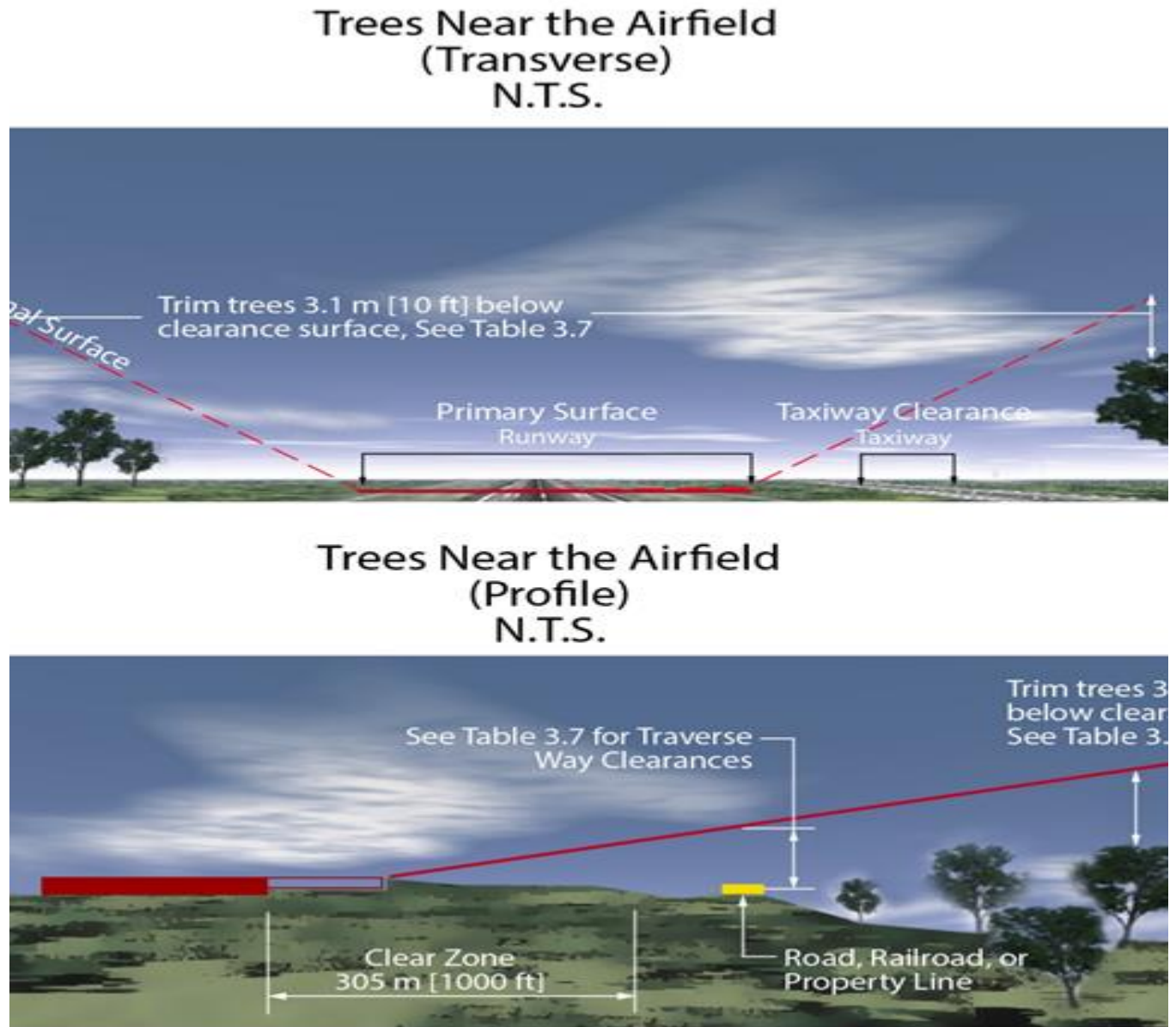
3.15.3. **Trees.** Trees must not penetrate the transitional slope (7:1) or the approach clearance surface (50:1), or the departure clearance surface (50:1). Trees that project into the imaginary surfaces must be removed or lowered to a distance below the imaginary surface, as specified in **Table 3.7**. Trees are permitted near an airfield provided that they do not cause Bird Aircraft Strike Hazards (BASH), penetrate the imaginary surfaces, the taxiway clearance distance, the apron clearance distance, or instrument procedure obstacle identification surfaces (OIS) as described in TERPS regulations. See **Figure 3.12**.

**Table 3.7. Imaginary Surfaces Minimum Clearance Over Highway, Railroad, Waterway, and Trees.**

Item No.	Item Description	Traverse Way/Objects	Class A and Class B Runways
			Dimensions
1	Minimum vertical clearance between established imaginary surfaces and traverse ways/ objects (measured from the highest and nearest elevation of the traverse ways/objects).	Interstate highway that is part of the National System of Military and Interstate Highways.	5.2 m (17 ft)
2		Other public highways not covered in Item 1.	4.6 m (15 ft)
3		Private or military road.	3.1 m (10 ft) minimum or height of highest mobile object that would usually traverse them, whichever is greater.
4		Railroad	7.0 m (23 ft)
5		Waterway or traverse way, not previously covered.	A distance equal to the height of the highest mobile object that usually would traverse them.
6		Trees	3.1 m (10 ft)

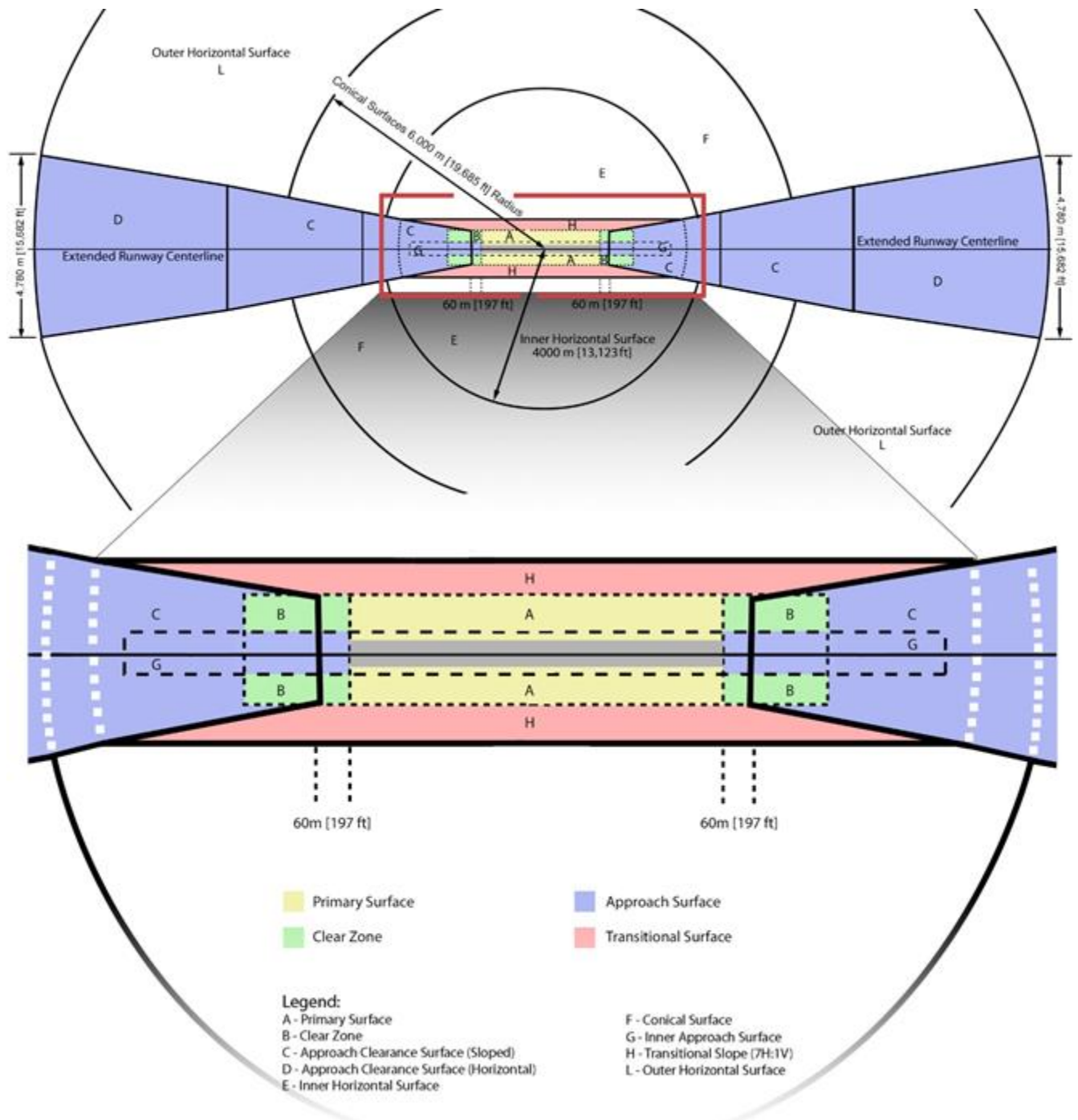
**Note:** Trees will be removed or topped the distance shown below the applicable imaginary surface. Always consult with your TERPS office to determine if trees violate TERPS criteria

Figure 3.12. Trees Near the Airfield.



**Note:** For object clearance requirements, see [Table 3.7](#).

Figure 3.13. USAFE-AFAFRICA Airfield Clearance Surfaces (Example).



**3.16. Aircraft Arresting Systems.** Aircraft arresting systems consist of engaging devices and energy absorbers. Engaging devices are net barriers, disc-supported pendants (hook cables), and cable support systems that allow the pendant to be raised to the battery position or retracted below the runway surface. Energy-absorbing devices are ships’ anchor chains, textile brake arresting systems, rotary friction brakes, such as the BAK-9 and BAK-12, or rotary hydraulic systems such as the BAK-13 and E-28. The systems designated “Barrier, Arresting Kit” (BAK) are numbered in the sequence of procurement of the system design. There is no connection between the Air Force

designations of these systems and their function. The equipment is government-furnished equipment, as discussed in AFMAN 32-1040 Civil Engineer Airfield Infrastructure Systems. Other designations such as E-5, E-28, and M-31 are US Navy designations. The USAF systems are currently in use: MA-1A, E-5, BAK-12, BAK-14, 61QSII (BAK-15), mobile aircraft arresting system (MAAS), textile brake, and Type H hook cable retraction system.

**3.16.1. Requirements, Installation, Design and Repair Considerations.** For the USAF, further information on planning, installing, and repairing an arresting system or arresting system complex is provided in AFMAN 32-1040 and FC 3-260-18F. During the planning, installation and repair process, the following items will be given consideration.

**3.16.1.1. Configuration and Location.** The configuration and location of arresting system installations will be determined in accordance with FC 3-260-18F. Design will conform to the criteria within Section 3 of the appropriate 35E8 series Technical Order (T.O.) and the typical installation drawings. Both may be obtained from: AFLCMC/WNZEC, ATTN: Aircraft Arresting Systems Engineer 235 Byron St, Robins AFB GA 31098-1813 or the AFLCMC/WNZ Workflow Box at: [642CBSG.workflow@us.af.mil](mailto:642CBSG.workflow@us.af.mil)

**3.16.1.2. Runway Pavement.** The 60 m (197 ft) of pavement on both the approach and departure sides of the arresting system pendant is a critical area. Protruding objects and undulating surfaces are detrimental to successful tail-hook engagements and are not allowable. The maximum permissible longitudinal surface deviation in this area is plus or minus 3.0 mm (0.125 in) in 3.6 m (12 ft). Saw-cut grooves in runway pavement to improve surface drainage and surface friction characteristics in accordance with UFC 3-260-02, Pavement Design for Airfields, are not considered protruding objects or undulations; however, the pavement shall not be grooved within the first 3.0 m (10 ft) on either side of the arresting system cables. For USAF facilities, changes in pavement type or an interface between rigid and flexible pavements are not permitted within the center 23 m (75 ft) of the runway for 60 m (197 ft) in either direction from the arresting system cables. Sacrificial panels installed beneath arresting system cables in accordance with AFMAN 32-1040 are not considered a change in pavement type or an interface between rigid and flexible pavements. The prohibition on changes in surface pavement type is not applicable to emergency aircraft arresting systems located in overruns. Portland cement concrete (PCC) foundations designed in accordance with USAF Typical Installation Drawing 67F2013A, BAK-12, are required for aircraft arresting system cable tie-downs and are also exempt from the prohibition on changes in surface pavement type.

**3.16.1.3. Repair of Bituminous Pavements.** Rigid inlays will not be used as a surface repair material beneath the cable in a flexible runway system. This type of repair causes high hook skip potential when the flexible pavement consolidates, exposing the leading edge of the rigid pavement. However, rigid pavement must be used as a foundation for sacrificial pads installed beneath aircraft arresting system cables. No part of the foundation for the panels shall be used as a surface pavement in a flexible runway pavement.

**3.16.2. Joint-Use Airfields.** Arresting systems installed on joint-use civil/military airfields to support military aircraft are sited in accordance with the military rights agreement with the host government. If a separate agreement is specifically required for installation of a system,

the Installation Commander shall coordinate with AFIMSC DET 4/CE. AFIMSC DET 4/CE will coordinate any necessary agreements with the host nation. (T-3)

## Chapter 4

### ROTARY-WING RUNWAYS, HELIPADS, LANDING LANES, AND HOVERPOINTS

**4.1. Criteria for Rotary Wing Runways, Helipads, and Hoverpoints in United States Air Forces in Europe and United States Air Forces Africa (USAFE-AFAFRICA) shall follow the criteria of Chapter 3 of the NATO Standard AATMP-38, Airfield and Heliport/Helipad Clearance Plans, with the following variations:**

4.1.1. **Air Installation Compatible Use Zone (AICUZ).** AICUZ programs are only required within base boundaries of USAFE-AFAFRICA installations. Lands outside of the installation boundary are exempt from AICUZ.

4.1.2. **Accident Potential Zones (APZ).** APZ do not apply in USAFE-AFAFRICA when they extend outside of the installation boundary.

**4.2. Criteria for Rotary Wing Landing Lanes in USAFE-AFAFRICA shall follow the criteria of Chapter 4 of UFC 3-260-01, Airfield and Heliport Planning and Design, with the following variations:**

4.2.1. AICUZ programs are only required within base boundaries of USAFE-AFAFRICA installations. Lands outside of the installation boundary are exempt from AICUZ.

4.2.2. APZ do not apply in USAFE-AFAFRICA when they extend outside of the installation boundary.

## Chapter 5

### TAXIWAYS

**5.1. Contents.** This chapter presents design standards and considerations for fixed- and rotary-wing taxiways.

**5.2. Taxiway Requirements.** Taxiways provide for ground movement of fixed- and rotary-wing aircraft. Taxiways connect the runways of the airfield with the parking and maintenance areas and provide access to hangars, docks and various parking aprons and pads.

#### 5.3. Taxiway Systems.

5.3.1. **Basic.** The basic airfield layout consists of a taxiway connecting the center of the runway with the parking apron. This system limits the number of aircraft operations at an airfield. Departing aircraft must taxi on the runway to reach the runway threshold. When aircraft are taxiing on the runway, no other aircraft is allowed to use the runway. If runway operations are minimal or capacity is low, the basic airfield layout with one taxiway may be an acceptable layout.

5.3.2. **Parallel Taxiway.** A taxiway parallel for the length of the runway, with connectors to the end of the runway and parking apron, is the most efficient taxiway system. Aircraft movement is not hindered by taxiing operations on the runway and the connectors permit rapid entrance and exit of traffic.

5.3.3. **High Speed Taxiway Turnoff.** High-speed taxiway turnoffs are located intermediate of the ends of the runway to increase the capacity of the runway. The high-speed taxiway turnoff enhances airport capacity by allowing aircraft to exit the runways at a faster speed than turnoff taxiways allow.

5.3.4. **Additional Types of Taxiways.** Besides the types of taxiways discussed above, there are other taxiways at an airfield. Taxiways are often referred to based on their function. Common airfield taxiways and their designations are shown in [Figure 5.1](#).

5.3.5. **Taxilanes.** A taxi route through an apron is referred to as a taxilane. See [Chapter 6](#) for more information on taxilanes.

5.3.6. **Taxitraks.** A taxi route connecting a dispersed parking platform (e.g. a fighter loop) to a taxiway or runway is referred to as a taxitrak. Dispersed parking platform and taxitrak use are generally limited to fighter aircraft only. Use of taxitraks by tactical transport aircraft is permitted provided minimum clearances established in [Table 5.8](#) are met.

**5.4. Taxiway Layout.** The following should be considered when planning and locating taxiways at an airfield:

5.4.1. **Efficiency.** Runway efficiency is enhanced by planning for a parallel taxiway.

5.4.2. **Direct Access.** Taxiways should provide as direct an access as possible from the runway to the apron. Connecting taxiways should be provided to join the runway exit points to the apron.

5.4.3. **Simple Taxiing Routes.** A sufficient number of taxiways should be provided to prevent complicated taxiing routes. Turning from one taxiway on to another often creates

confusion and may require additional airfield signs and communication with the air traffic control tower (ATCT).

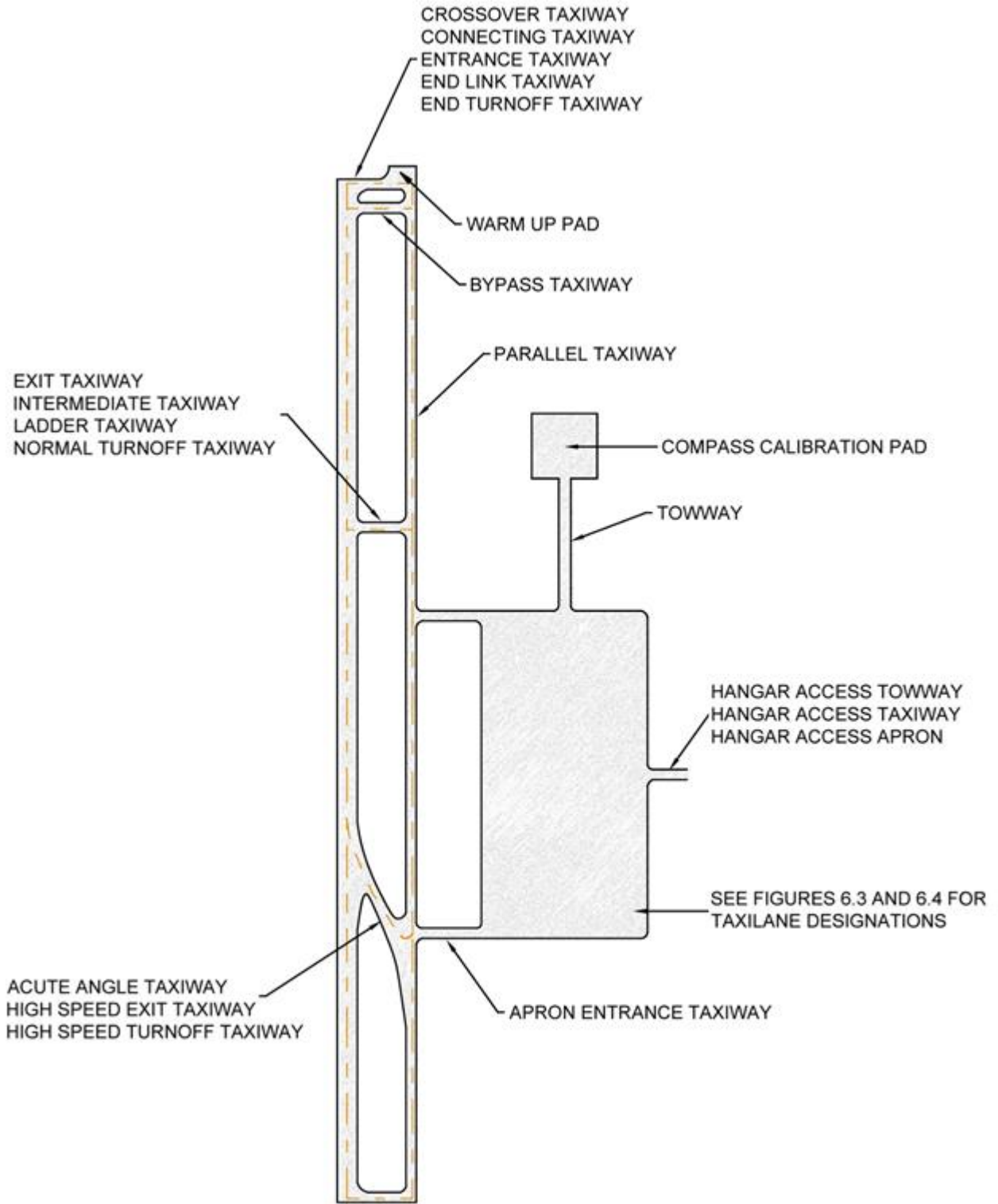
**5.4.4. Delay Prevention.** A sufficient number of taxiways should be provided to prevent capacity delays that may result when one taxiway must service more than one runway.

**5.4.5. Runway Exit Criteria.** The number, type, and location of exits are a function of runway length, as shown in [Figure 5.2](#) and as discussed in Chapter 2 of UFC 3-260-01, *Airfield and Heliport Planning and Design*.

**5.4.6. Taxiway Designation.** Use letters of the alphabet for designating taxiways. Optimally, designation of the taxiways should start at one end of the airport and continue to the opposite end, e.g., east to west or north to south (see UFC 3-535-01, *Visual Air Navigation Facilities*). Designate all separate, distinct taxiway segments. Do not use the letters I, O, or X for taxiway designations.

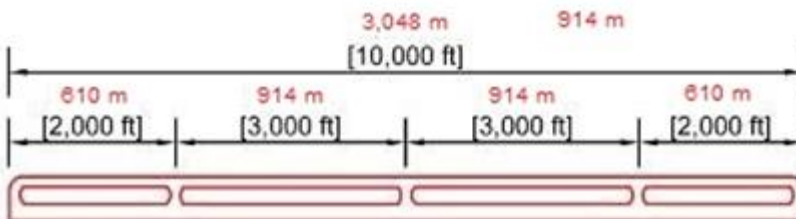
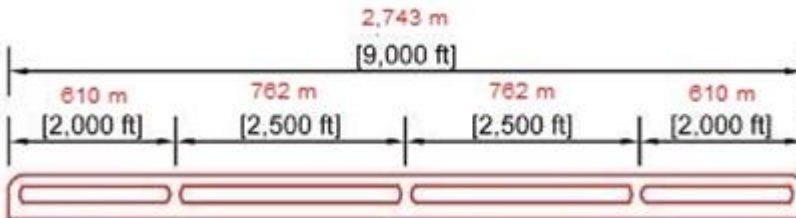
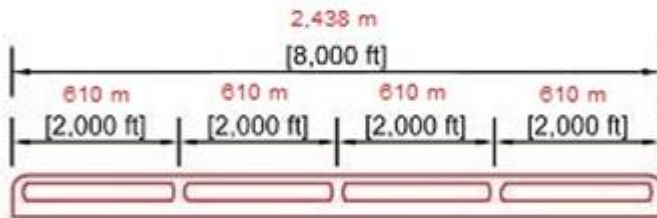
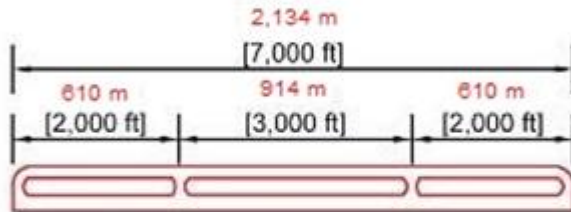
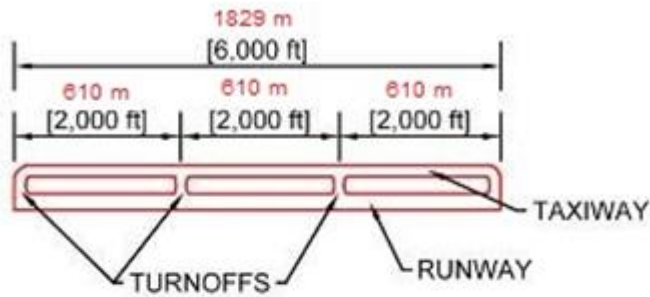
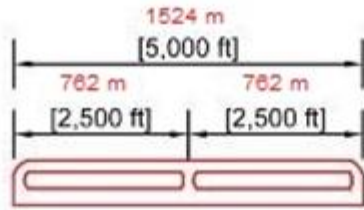
**5.4.7. Deconflict and or Restrict Vehicle Access.** Comply with local Airfield Driving Instructions.

Figure 5.1. Common Taxiway Designations.



N.T.S.

**Figure 5.2. Spacing Requirements - Normal Taxiway Turnoffs.**



N.T.S.

**5.5. Fixed-Wing Taxiway Dimensions.** Taxiway dimensions are based on the class of the runway served.

5.5.1. **Criteria.** Table 5.1. presents the criteria for fixed-wing taxiway design, including clearances, slopes and grading dimensions.

5.5.2. **Transverse Cross-Section.** A typical transverse cross-section of a taxiway is shown in Figure 5.3.

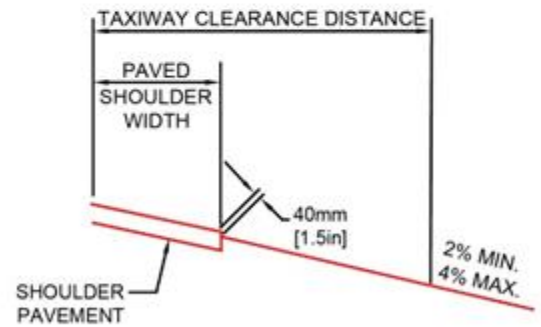
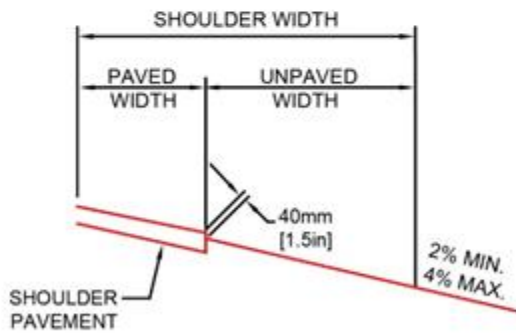
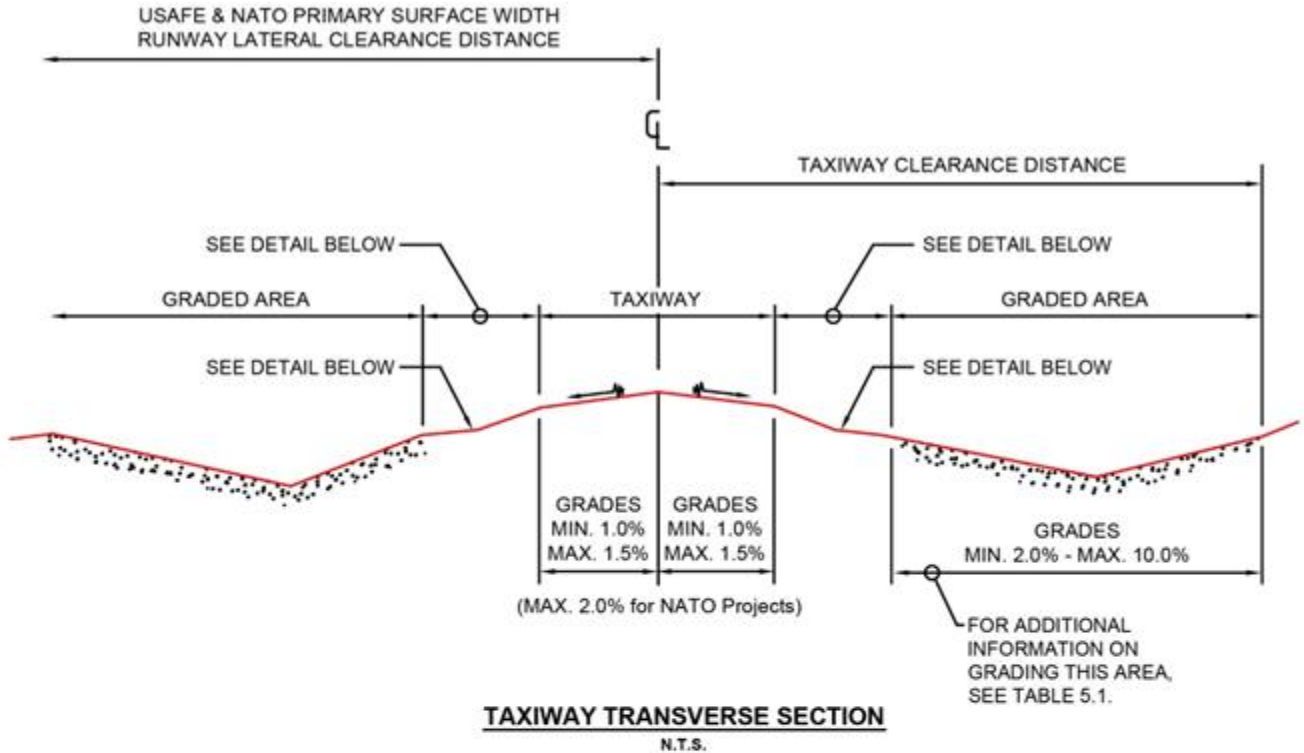
**Table 5.1. Fixed-Wing Taxiways.**

Item No	Item Description	Class A Runway	Class B Runway	Remarks
		Requirements		
1	Width	15.2 m (50 ft)	22.9 m (75 ft)	May be modified for particular mission requirements (special taxiways such as high speed and end turn-off).
2	Total Width of Shoulders (paved and unpaved)	7.6 m (25 ft)	15.2 m (50 ft)	
3	Paved Shoulder Width	7.6 m (25 ft)	7.6 m (25 ft)	All airfields except as noted below. Also see Note 1. For AF funded projects. NATO funded projects require a 3 m (9.8 ft) wide shoulder. Use the USAFE-AFAFRICA shoulders to the extent possible.
		Not applicable	3.0 m (10 ft)	Airfields for fighter and trainer aircraft. A paved shoulder up to 7.6 m (25 ft) is allowed on the outside of taxiway turns of 90 degrees (90°) or more.
		Not applicable	15.2 m (50 ft)	Airfields for B-52 Aircraft. Also see Note 1.
4	Longitudinal Grade of Taxiway and Shoulders	Max 1.5% Max 3.0% for NATO projects		Longitudinal grades of ungraded shoulders shall follow that of the pavement. A gradient exception of 5.0% is also permitted for a distance of not more than 121.9 m (400 ft) unless within 182.9 m (600 ft) of a runway entrance. There, the 3.0% maximum applies.

5	Rate of Longitudinal Grade Change	Max. 1.0% per 30.5 m (100 ft)		The minimum distance between two successive points of intersection (PI) is 152.4 m (500 ft). Changes are to be accomplished by means of vertical curves. Up to a 0.4% change in grade is allowed without a vertical curve. A vertical curve is not necessary where a taxiway crosses a runway or taxiway crown.
6	Longitudinal Sight Distance	Min 300 m (984 ft). Any two points 3 m (9.8 ft) above the pavement must be mutually visible for the distance indicated.		
7	Transverse Grade of Taxiway	Min 1.0% and Max 1.5% Min 1.0% and Max 2.0% for the NATO projects.		New taxiway pavements will be centerline crowned. Slope pavement downward from centerline of taxiway. When existing taxiway pavements have insufficient transverse gradients for rapid drainage, provide for increased gradients when the pavements are overlaid or reconstructed. The transverse gradients requirements are not applicable at or adjacent to intersections where pavements must be warped to match abutting pavements. Grading can follow NATO criteria only if NATO project strictly requires such grading. Otherwise, follow standard grading.
8	Transverse Grade of Paved Shoulders	Min. 2.0% and Max 4.0%		All USAFE airfields, not otherwise specified.
		Not applicable	Min. 1.5% and Max 2.0% Max. 4.0% for NATO	Taxiway designed for B-52 aircraft. Grading can be increased to maximum 4.0% only if NATO project strictly requires such grading. Otherwise, follow standard grading (1.5% to 2.0%).
9	Transverse Grade of Unpaved Shoulders	a) 40 mm (1.5 in) drop-off at edge of pavement $\pm$ 13 mm (0.5 in) b) Min 2.0%, Max 4.0%		For additional information, see <b>Figure 5.3</b> . Unpaved shoulders shall be graded to provide positive surface drainage away from paved surfaces.

10	Clearance from Taxiway Centerline to Fixed or Mobile Obstacles (taxiway clearance line)	Min. 45.7 m (150 ft)	Min. 60.9 m (200 ft)	All items sited within taxiway clearance zone must be frangible, see Unified Facilities Criteria (UFC) 3-260-01, <i>Airfield and Heliport Planning and Design</i> , Appendix B, Section 13 ( <i>Deviations from Criteria for Air Force and Army Airfield Support Facilities</i> ).
11	Distance Between Taxiway Centerline and Parallel Taxiway/ Taxi-lane Centerline	53.3 m (175 ft)	72.4 m (237.5 ft) or wingspan + 15.3 m (50 ft), whichever is greater	
12	Grade of area between taxiway shoulder and taxiway clearance line	Min. of 2.0% prior to channelization Max. 10.0%		Airfields, except as noted below. For additional information, see <b>Figure 5.3</b> . Unpaved areas shall be graded to provide positive surface drainage away from paved surfaces. For cases where the entire shoulder is paved (Class A airfields and taxiways designed for B-52 aircraft), provide a 40 mm (1.5-in) drop-off at pavement edge, +/- 13 mm (0.5 in).
<p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. A 15 m (50 ft) paved shoulder is allowed for C-5, E-4, and 747 aircraft where vegetation cannot be established. Transverse grade of paved shoulder is 2% minimum to 4% maximum.</li> <li>2. Metric units apply to new airfield construction and where practical, to modification of existing airfields and heliports, as discussed in <b>paragraph 1.4.4</b>.</li> <li>3. The criteria in this instruction are based on aircraft specific requirements and are not direct conversions from inch-pound (English) dimensions. Inch-pound units are included only as a reference to the previous standard.</li> <li>4. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from inch-pound to SI units.</li> </ol>				

Figure 5.3. Taxiway and Primary Surface Transverse Sections.



**5.6. Rotary-Wing Taxiway Dimensions.** Rotary-wing taxiways are either paved or unpaved. Wheel-gear configured rotary wing aircraft require a paved surface on which to taxi. Skid-gear configured rotary-wing aircraft taxi by hovering along a paved or unpaved taxiway. [Table 5.2](#) presents the criteria for rotary-wing taxiway design, including taxiway widths, clearances, slopes and grading dimensions.

**Table 5.2. Rotary-Wing Taxiways.**

Item No.	Item Description	Requirement	Remarks
1	Width	Min. 15 m (50 ft)	Basic width applicable to taxiways that support helicopter operations only. For AF funded projects. NATO funded projects require a 12 m (39.4 ft) wide rotary-wing taxiway. Use the USAFE-AFAFRICA taxiway criteria to the extent possible.
2	Longitudinal Grade	Max. 2.0% Max. 3.0% for NATO projects	Grading can follow NATO criteria only if NATO project strictly requires such grading. Otherwise, follow standard grading.
3	Transverse Grade	Min. 1.0% Max. 1.5% Max. 2.0% for NATO projects	New taxiways are to be centerline crowned. Grading can follow NATO criteria only if NATO project strictly requires such grading.
4	Rate of Longitudinal Grade Change	Max. 2.0% per 30 m (98.4 ft)	Longitudinal grade changes are to be accomplished using vertical curves. Up to a 0.4% change in grade is allowed without a vertical curve. A vertical curve is not necessary where a taxiway crosses a runway or taxiway crown.
5	Paved Shoulders		See <b>Table 5.3.</b>
6	Clearance from Centerline to Fixed and Mobile Obstacles (taxiway clearance line)	Min 30.5 m (100 ft)	Basic helicopter clearance. Increase as appropriate for dual use taxiways. See <b>Table 5.2.</b> , Item 12 for definitions of fixed and mobile obstacles.
7	Grades Within the Clear Area	Max 5.0%	Clear area is the area between the taxiway shoulder and the taxiway clearance line.
8	Intersection Fillet Radius	See <b>Table 5.4.</b> and <b>Table 5.5.</b>	Use the appropriate fillet depending on the width of the rotary- wing taxiway.
<p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. Metric units apply to new airfield construction and, where practical, modification to existing airfields and heliports.</li> <li>2. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from inch- pound to SI units.</li> </ol>			

**5.7. Taxiways at Dual Use (Fixed- and Rotary-Wing) Airfields:**

5.7.1. **Criteria.** For taxiways at airfields supporting both fixed- and rotary-wing aircraft operations, the appropriate fixed-wing criteria will be applied, except as noted for shoulders or for STOVL requirements.

5.7.2. **Taxiway Shoulders.** A paved shoulder will be provided at dual use airfields. Shoulder widths may be increased beyond the requirement presented in [Table 5.3](#), when necessary, to accommodate dual operations with fixed-wing aircraft.

**5.8. Taxiway Intersection Criteria.** To prevent the main gear of an aircraft from becoming dangerously close to the outside edge of the taxiway during a turn, fillets and lead-in to fillets are provided at taxiway intersections. When an aircraft turns at an intersection, the nose gear of the aircraft usually follows the painted centerline marking. The main gear, located to the rear of the nose gear, do not remain a constant distance from the centerline stripe during the turn due to the physical design of the aircraft. The main gear pivot on a shorter radius than the nose gear during a turn. Intersections should be designed to ensure that the main gear wheels stay a minimum of 3.1 m (10 ft) from the pavement edge. Intersection geometry can be determined using wheel-tracking simulation tools, or using the criteria described in [paragraph 5.8.1](#) For rotary-wing taxiway intersections, use [Table 5.4](#) and [Table 5.5](#) with the appropriate taxiway width to determine the fillet dimensions. For additional support see CE Dash Airfield geometrics page for report “Developing Aircraft Turning Templates” at: <https://usaf.dps.mil/teams/CEDASH/SitePages/Service%20Page.aspx?Service=Airfield%20Geometry>.

5.8.1. **Fillet Only Dimensions.** Only fillets (not lead-ins to fillets) are required at runway-taxiway and taxiway-taxiway intersections. Fillets at runway-taxiway intersections are arcs installed in accordance with [Table 5.4](#) and [Figure 5.4](#). Fillets at taxiway-taxiway intersections are installed in accordance with [Table 5.5](#) and [Figure 5.5](#). Centerline and fillet radii used for these figures and tables are based on a 45.7 m (150 ft) centerline turning radius for runway/taxiway intersections and a 38.1 m (125 ft) centerline turning radius for taxiway/taxiway intersections using the geometry of the C-5 aircraft and a taxiway width of 22.9 m (75 ft). Larger centerline turning radii, other aircraft (e.g. Boeing 747-800 or Airbus A380), or narrower taxiways may require larger fillets; therefore, the designer must consider the most demanding situation and ensure the 3.1 m (10 ft) edge safety margin is provided. Use of these specific criteria are not mandatory. **(T-3)**

5.8.1.1. Deviations from these criteria for NATO funded projects are allowed, as none of these criteria are mandatory. NATO Bi-SC Directive 85-5 criteria for fillets (Item 3) require a minimum fillet radius of 30 m (98.4 ft) for intersections with other taxiways and aprons or 45 m (147.5 ft) for intersections with a runway (see [Table 5.6](#)). NATO can fund these larger fillets if so desired.

**Table 5.3. Rotary-Wing Taxiway Shoulders.**

Item No.	Item Description	Requirement	Remarks
1	Total Width of Shoulder (Paved and Unpaved)	7.6 m (25 ft)	May be increased when necessary to accommodate dual operations with fixed-wing aircraft.
2	Paved Shoulder Width Adjacent to All Operational Pavements	7.6 m (25 ft)	May be increased when necessary to accommodate dual operations with fixed-wing aircraft. See <b>Note 3</b> where fire hydrants are installed along apron shoulders.

Item No.	Item Description	Requirement	Remarks
3	Longitudinal Grade	Variable	Conform to the longitudinal grade of the abutting primary pavement.
4	Transverse Grade	Min. 2%; Max. 4%	Slope downward from edge of pavement.
5	Grade (adjacent to paved shoulder)	(a) 40 mm (1.5 in) drop-off at edge of paved shoulder. (b) Min. 2%; Max. 5%	Slope downward from edge of shoulder. For additional grading criteria in primary surface and clear area, see <b>Chapter 3</b> for fixed-wing facilities and <b>Chapter 4</b> for rotary-wing facilities.

**Notes:**

1. Metric units apply to new airfield construction and, where practical, modification to existing airfields and heliports.
2. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from inch-pound to SI units.
3. Hydrants are to be “30-35 ft” outside the “Apron” edge. Provide paved access lane to fire hydrants where needed.

**Table 5.4. Runway/Taxiway Intersection Fillet Radii.**

Runway Width W	Taxiway Width T	Fillet Radius R1	Fillet Radius R2	Fillet Radius R3
More than 22.9 m (75 ft) but less than 45.7 m (150 ft)	22.9 m (75 ft)	45.7 m (150 ft)	38.1 m (125 ft)	76.2 m (250 ft)
45.7 m (150 ft) or more	22.9 m (75 ft)	38.1 m (125 ft)	38.1 m (125 ft)	76.2 m (250 ft)
More than 22.9 m (75 ft) but less than 45.7 m (150 ft)	15.2 m (50 ft)	18.3 m (60 ft)	18.3 m (60 ft)	18.3 m (60 ft)
45.7 m (150 ft) or more	15.2 m (50 ft)	15.2 m (50 ft)	15.2 m (50 ft)	15.2 m (50 ft)
More than 22.9 m (75 ft) but less than 45.7 m (150 ft)	12.2 m (40 ft)	15.2 m (50 ft)	15.2 m (50 ft)	15.2 m (50 ft)
45.7 m (150 ft) or more	12.2 m (40 ft)	15.2 m (50 ft)	15.2 m (50 ft)	15.2 m (50 ft)

**Notes:**

1. Metric units apply to new airfield construction and, where practical, modification to existing airfields and heliports.
2. Deviations are permitted for NATO-funded projects.

**Table 5.5. Taxiway/Taxiway Intersection and Taxiway Turns Fillet Radii.**

<b>Taxiway Width W</b>	<b>Fillet Radius R4</b>	<b>Fillet Radius R5</b>	<b>Fillet Radius R6</b>
22.9 m (75 ft)	45.7 m (150 ft)	38.1 m (125 ft)	76.2 m (250 ft)
15.2 m (50 ft)	18.3 m (60 ft)	12.2 m (40 ft)	27.4 m (90 ft)
12.2 m (40 ft)	18.3 m (60 ft)	12.2 m (40 ft)	27.4 m (90 ft)

**Notes:**

1. Metric units apply to new airfield construction and, where practical, modification to existing airfields and heliports.
2. Deviations are permitted for NATO-funded projects.

**Table 5.6. Bi-SC Directive 85-5 Curve and Fillet Radii.**

<b>Curve or Fillet</b>	<b>RWA, TFA, TTA (except MPA)</b>	<b>AEW, AGS, STA, STA+, SBA (and MPA)</b>
All curves (Minimum centre-line radius)	75 m	100 m
Intersection with Runway or Parallel Taxiway/ Emergency Runway (Minimum Edge (fillet) radius)	30 m	45 m
Intersection with Taxiway, Platform or Apron (Minimum Edge (fillet) radius)	10 m	30 m

**Note:** NATO Aircraft Operating Surfaces (AOS) Groups.

RWA – Rotary Wing Aircraft	AEW – Airborne Early Warning & Control Aircraft
TFA – Tactical Fighter Aircraft	AGS – Alliance Ground Surveillance Aircraft
TTA – Tactical Transport Aircraft	STA – Strategic Transport Aircraft
MPA – Maritime Patrol Aircraft	STA+ - Strategic Transport Aircraft, Heavy (> 300,000kg)
	SBA – Strategic Bomber Aircraft

Figure 5.4. Runway/Taxiway Intersection Fillets.

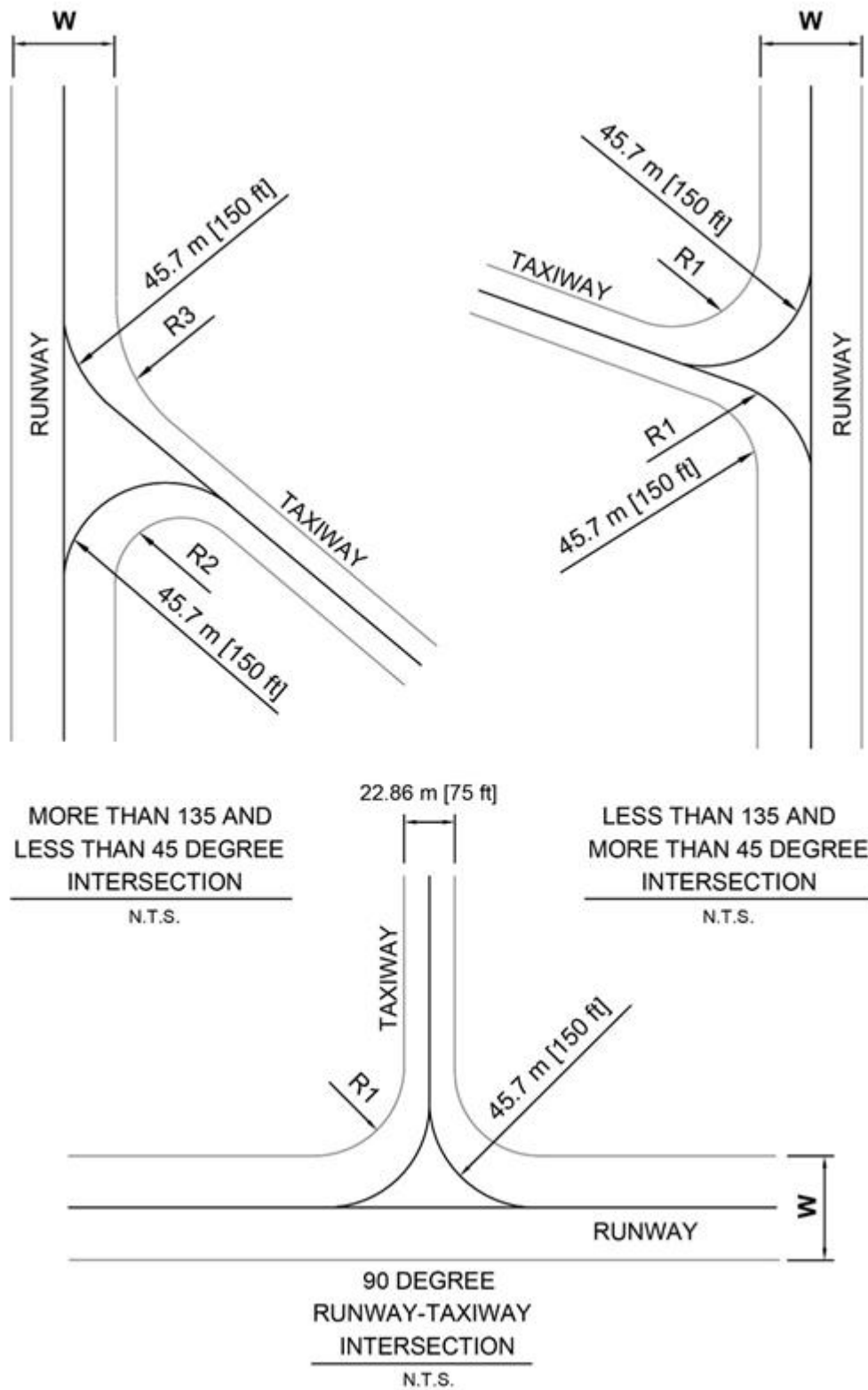
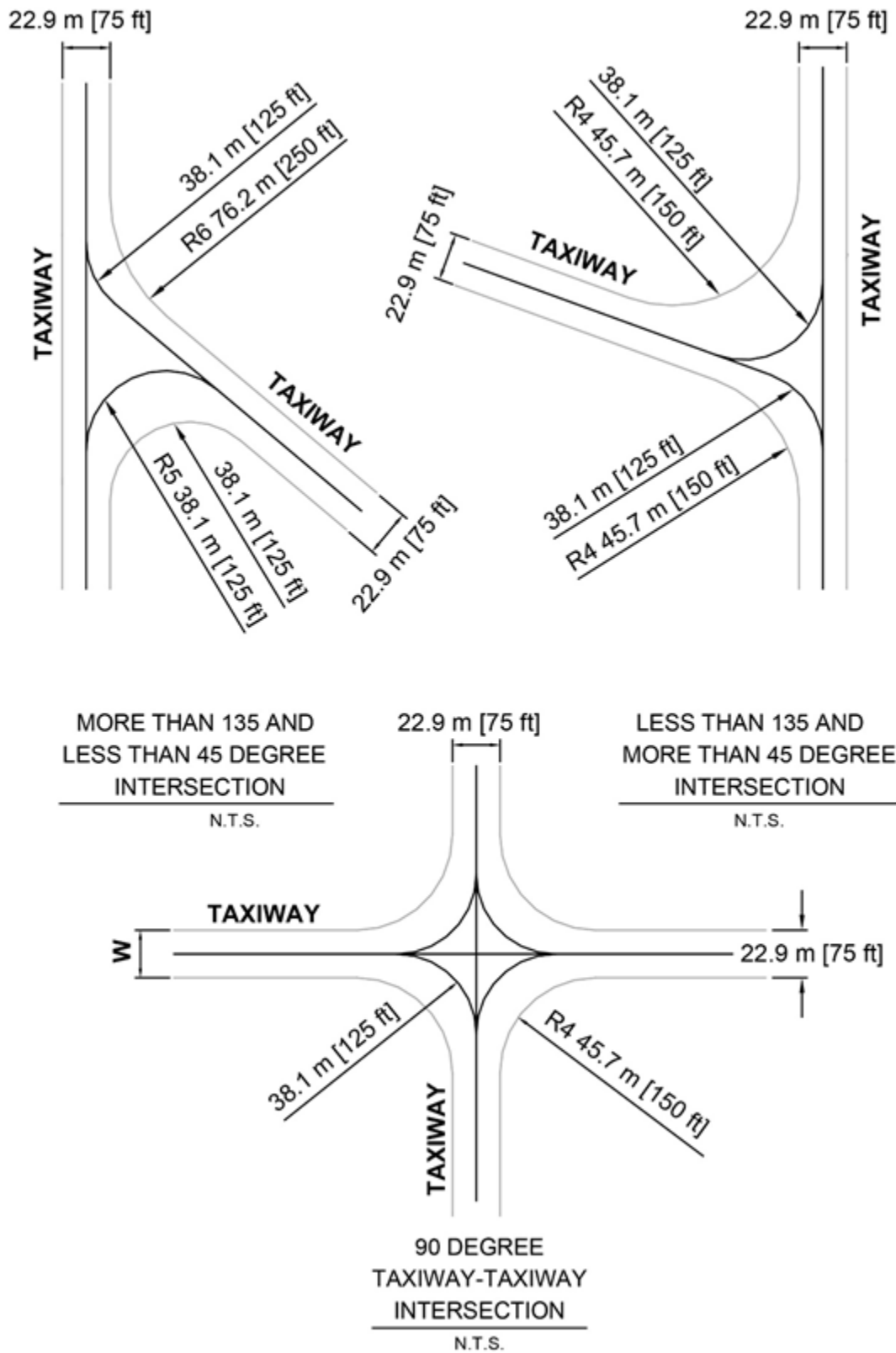


Figure 5.5. Taxiway/Taxiway Intersection Fillets.



**5.9. High-Speed Taxiway Criteria.** If peak operations are expected to exceed 30 take-offs and landings per hour, aircraft may be required to exit runways at greater than normal taxi speeds to maintain airfield capacity. In these cases, an acute-angle exit taxiway may be required. BCE designated representative should contact the USAFE-AFAFRICA Pavements Engineer or Headquarters Air Force Civil Engineer Center for assistance.

**5.10. Apron Access Taxiways.** Apron access taxiways are provided for aircraft access onto an apron. The number of apron taxiways should allow sufficient capacity for departing aircraft. The apron access taxiways should be located to enhance the aircraft's departing sequence and route.

5.10.1. **Parking Aprons.** The minimum number of apron access taxiways for any parking apron will be two.

5.10.2. **Fighter Aircraft Aprons.** Three apron access taxiways should be provided for aprons with over 24-parked fighter aircraft. Four entrance taxiways should be provided for aprons with over 48-parked fighter aircraft.

**5.11. Shoulders.** Shoulders are provided along a taxiway to allow aircraft to recover if they leave the paved taxiway. Paved shoulders prevent erosion caused by jet blast, support an occasional aircraft, which may wander off the taxiway, support vehicular traffic, and reduce maintenance of unpaved shoulder areas.

5.11.1. **For Fixed-Wing Taxiways.** The shoulder for fixed-wing taxiways may be either paved or unpaved, depending on the class of runway and type of aircraft. Criteria for fixed-wing taxiway shoulders, including widths and grading requirements to prevent the ponding of storm water, are presented in [Table 5.1](#). See Paragraph 2-12 of UFC 3-260-01 for requirements for designing buried utility structures in shoulders.

5.11.2. **For Rotary-Wing Taxiways.** Paved shoulders are required adjacent to rotary-wing taxiways to prevent blowing dust and debris due to prop-wash. The criteria for a rotary-wing taxiway shoulder layout, including shoulder width, cross slopes and grading requirements, are presented in [Table 5.3](#).

**5.12. Towways.** A towway is used to tow aircraft from one location to another or from an apron to a hangar.

5.12.1. **Dimensions.** In [Table 5.7](#) presents the criteria for towway layout and design including clearances, slopes, and grading dimensions. When designing for access to a hangar, flare the pavement to the width of the hangar door from a distance beyond the hangar sufficient to allow maintenance personnel to turn the aircraft around.

5.12.2. **Layout.** A typical transverse cross-section of a towway is shown in [Figure 5.6](#).

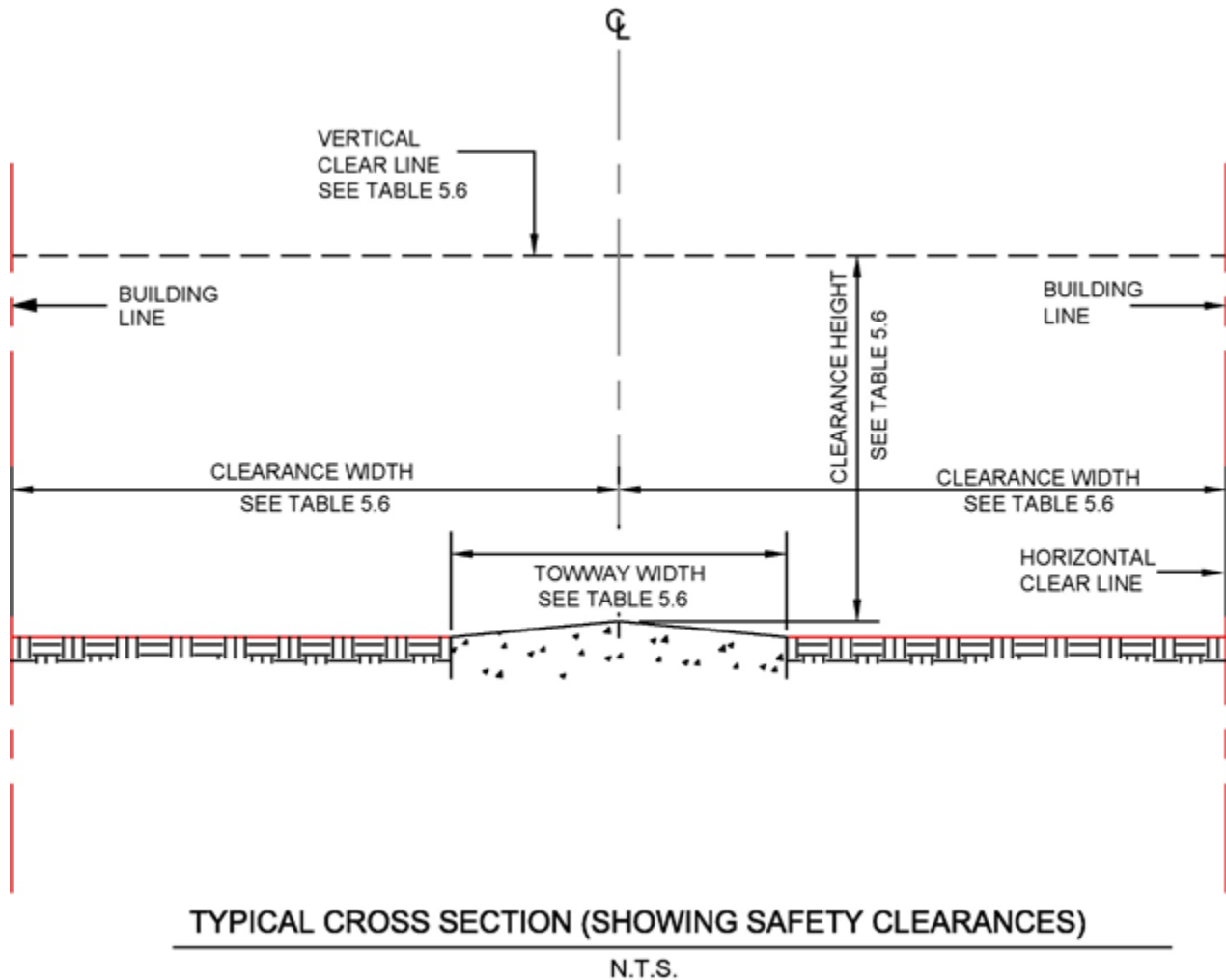
5.12.3. **Existing Roadway.** When existing roads or other pavements are modified for use as towways, provide for necessary safety clearances, pavement strengthening (if required), and all other specific requirements set forth in [Table 5.7](#) and [Figure 5.6](#).

Table 5.7. Towways.

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
1	Towway Width	Outside gear width of towed mission aircraft + 3.0 m (10 ft)		1.5 m (5.0 ft) on each side of gear.
2	Total Width of Shoulders (paved and unpaved)	7.6 m (25 ft)		
3	Paved Shoulder Width	Not Required		
4	Longitudinal Grade of Towway	Max. 3.0%		Grades may be both positive and negative but must not exceed the limit specified.
5	Rate of Longitudinal Grade Change Per 30 m (100 ft)	Max. 1.0%		The minimum distance between two successive PI is 152 m (500 ft). Changes are to be accomplished by means of vertical curves.
6	Longitudinal Sight Distance	Not applicable		
7	Transverse Grade	Min. 2.0% Max. 3.0%		Pavement crowned at towway centerline. Slope pavement downward from centerline of towway.
8	Towway Turning Radius	45.7 m (150 ft) radius		Criteria presented here are for straight sections of towway. Pavement width and horizontal clearance lines may need to be increased at horizontal curve locations, based on aircraft alignment on the horizontal curve.
9	Fillet Radius at Intersections	30.5 m (100 ft) radius		
10	Transverse Grade of Unpaved Shoulder	(a) 40 mm (1.5 in) drop-off at edge of pavement, ± 13 mm (0.5 in). (b) Min. 2.0%, Max. 4.0%		
11	Horizontal Clearance From Towway Pavement Surface to	The greater of: Half the wing span width of the towed mission aircraft + 7.6 m (25 ft);		

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
	Fixed or Mobile Obstacles	or a minimum of 15.2 m (50 ft)		
12	Vertical Clearance From Towway Pavement Surface to Fixed or Mobile Obstacles	Height of towed mission aircraft + 3.0 m (10 ft)		
13	Grade (area between taxiway shoulder and taxiway clearance line)	Min. of 2.0% prior to channelization, Max. 10.0%. (See Note 1.)		
<p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. Bed of channel may be flat.</li> <li>2. Metric units apply to new airfield construction and where practical modification to existing airfields and heliports, as discussed in <b>paragraph 1.4.4.</b></li> <li>3. The criteria in this instruction are based on aircraft specific requirements and are not direct conversions from inch-pound (English) dimensions. Inch-pound units are included only as a reference to the previous standard.</li> <li>4. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from inch-pound to SI units.</li> </ol>				

Figure 5.6. Towway Criteria.



**5.13. Hangar Access.** The pavement, which allows access from the apron to the hangar, is referred to as a hangar access apron and is discussed in more detail in [Chapter 6](#).

#### 5.14. Taxitraks.

5.14.1. Taxitraks connect dispersed tactical fighter aircraft parking platforms to taxiways that connect to the runway.

5.14.2. For tactical fighter aircraft ensure each dispersed parking platform is connected to a taxiway with two means of access to the runway.

5.14.3. For tactical transport and maritime patrol aircraft, ensure the dispersed parking area is connected to a taxiway system providing separate access to either end of the runway.

5.14.4. Taxitraks can be constructed of rigid or flexible pavement.

**Table 5.8. Taxitraks.**

Item No.	Item Description	Requirement	Remarks
1	Width	12 m (39.4 ft)	See Note 1.
2	Paved Shoulder Width	3.0 m (10 ft)	
3	Longitudinal Grade of Taxitrak and Shoulders	Max. 3.0%	Longitudinal grade of shoulders shall follow that of the pavement.
4	Transverse Grade of Taxitrak	Min. 1.0% Max. 2.0%	New taxitraks pavements will be centerline crowned. Slope pavement downward from centerline of taxiway.
5	Transverse Grade of Paved Shoulders	Max. 4.0%	
6	Clearance from Taxitrak Centerline to Fixed or Mobile Obstacles	15 m (49.2 ft) tactical fighter (See <b>Note 2</b> )	Refer to <b>Attachment 1, Glossary of References and Supporting Information</b> , for definitions of tactical fighter aircraft.

**Notes:**

- Standard practice within USAFE-AFAFRICA is to follow Bi-SC Directive 85-5 for taxiways. Taxitraks are referred to as 'stub taxiways' in Bi-SC Directive 85-5 and have the same pavement and clearance requirements as regular taxiways. Additionally, taxitraks are only used for Tactical Fighter Aircraft (TFA). This table reflects the criteria and dimensions contained in Bi-SC Directive 85-5 Part IV Item 3 - Taxiway (Military Criteria) for stub taxiways for TFA only.
- Table 5-7 in UFC 3-260-01 with Change 1 calls for a Min 45.72 m (150 ft) for "Clearance from Taxitrak Centerline to Fixed or Mobile Obstacles". As per Note 1, this dimension is based on Bi-SC Directive 85-5 Part IV Item 3.2d.

**5.15. Parallel Taxiway/Emergency Runway.**

5.15.1. For USAFE-AFAFRICA, parallel taxiways used as emergency runways and emergency landing surfaces are all classified as emergency runways and are subject to these criteria. The purpose of the parallel taxiway and/or emergency runway is to provide aircraft pavement suitable for the dual function of transit to and/or from the runway and to provide an emergency runway for fighter aircraft only. The parallel taxiway and/or emergency runway is for operational redundancy.

5.15.2. In **Table 5.9** provides details for parallel taxiways/emergency runways.

**Table 5.9. Parallel Taxiways/Emergency Runways.**

Item No.	Item Description	Requirement	Remarks
1	Width	22.9 m (75 ft)	

Item No.	Item Description	Requirement	Remarks
2	Total Width of Shoulders (paved and unpaved)	30 m (98.4 ft)	
3	Paved Shoulder Width	7.6 m (25 ft)	USAFE-AFAFRICA-funded projects. NATO requires only 3.0 m (9.8 ft) paved shoulder.
		3.0 m (9.8 ft)	NATO-funded projects and USAFE-AFAFRICA airfields for fighter and trainer aircraft.
		15.2 m (50 ft)	Airfields for B-52 aircraft.
4	Longitudinal Grade of Taxiway and Shoulders	Max. 1.0%	Grades may be both positive and negative but must not exceed the limit specified.
5	Rate of Longitudinal Grade Change	Max. 0.167% per 30 linear meters (98.4 linear feet) of runway	The minimum distance between two successive changes of grade (distance between tangent points) will not be less than 300 m (984 ft).
6	Longitudinal Sight Distance	Min 1,800 m (5,905 ft) at 3 m (9.8 ft) height above the runway, and 900 m (2,953 ft) at 1.5 m (4.9 ft) height above the runway.	
7	Transverse Grade of Taxiway	Min. 1.0% Max. 1.5%	New taxiway pavements will be centerline crowned. Slope pavement downward from centerline of taxiway. Existing taxiway pavements with insufficient transverse gradients for rapid drainage should provide for increased gradients when overlaid or reconstructed. The transverse gradients requirements are not applicable at or adjacent to intersections where pavements must be warped to match abutting pavements.
8	Transverse Grade of Paved Shoulders	Min. 2.0% Max. 4.0%	All airfields, not otherwise specified. Sloped away from the pavement. The transverse gradient may vary along the length of the runway to conform to natural gradients.
9	Distance Between Taxiway Centerline	(a) 40 mm (1.5 in) drop-off at edge of	For additional information, see <b>Figure 3.2</b> .

Item No.	Item Description	Requirement	Remarks
	and Parallel Taxiway/Taxilane Centerline	pavement, $\pm 13$ mm (0.5 in). (b) Min. 2.0%, Max. 3.0%	
10	Distance Between Taxiway Centerline and Parallel Taxiway/Taxilane Centerline	100 m (328 ft)	
11	Grade (area between taxiway shoulder and taxiway clearance line)	Min. of 2.0% prior to channelization Max. 10.0%	For additional information, see <b>Figure 3.2</b> . Unpaved areas shall be graded to provide positive surface drainage away from paved surfaces.
12	Clearance from Taxiway Centerline to Fixed or Mobile Obstacles (taxiway clearance line)	Minimum 100 m (328 ft)	All items sited within taxiway clearance zone must be frangible, see UFC 3-260-01, Appendix B, Section 13-2.2.
13	Clear Zone Length	275 m (902 ft)	Clear zone starts at parallel taxiway threshold.
14	Clear Zone Width	200 m (656 ft)	Centered on parallel taxiway centerline.
15	Approach Departure Surface	Slope 50:1	50 horizontal units over one vertical unit.
16	Approach Departure Surface Beginning Width	200 m (656 ft)	Centered on parallel taxiway centerline.
17	Approach Departure Surface Length	2,500 m (8,202 ft)	From threshold.
18	Transitional Slope	Slope 7:1	The 7:1 transitional slope starts at the edge of the parallel taxiway's lateral clearance zone at the elevation nearest to the centerline of the parallel taxiway. The slope terminates at the runway's inner horizontal surface.
<p><b>Note:</b> The criteria within this table are derived primarily from Bi-SC Directive 85-5, <i>NATO Approved Criteria and Standards for Airfields</i>, (Item Parallel Taxiway/Emergency Runway [Military Criteria]) with minor adjustments to account for more protective standards found in UFC 3-260-01, with Change 1</p>			

Figure 5.7. Parallel Taxiway Emergency Runway Imaginary Surfaces.

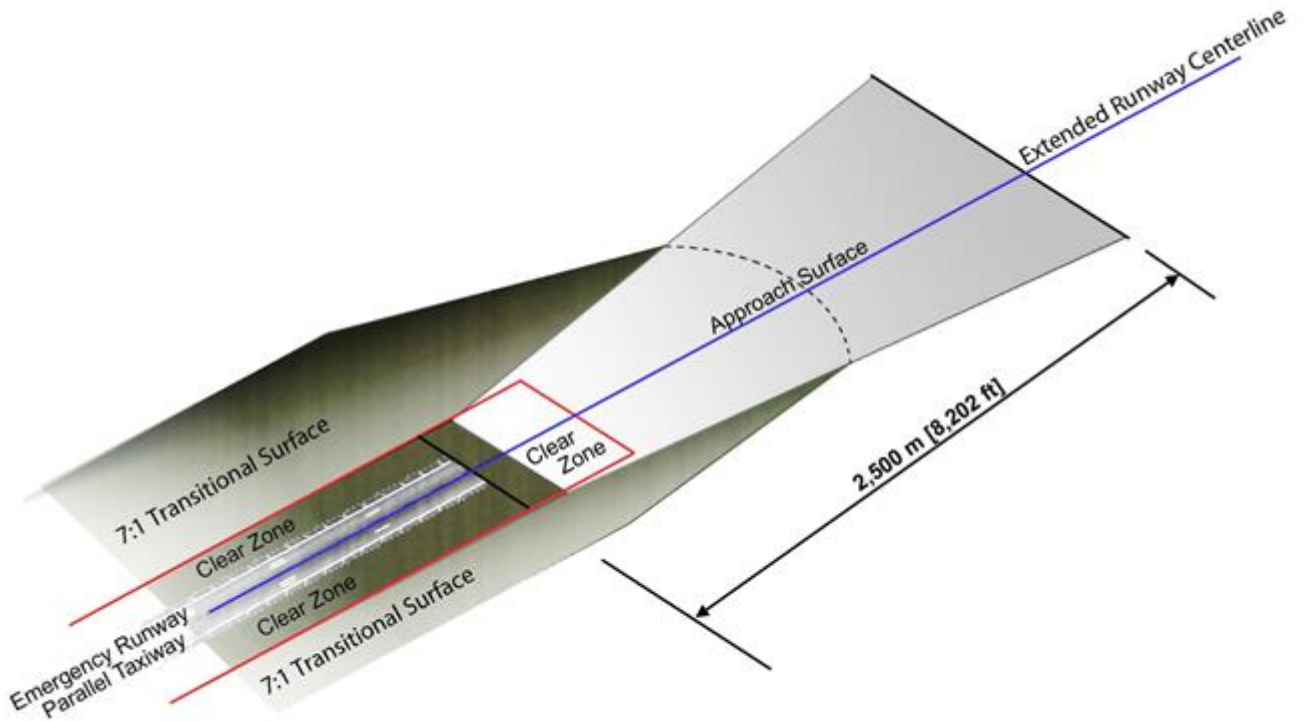
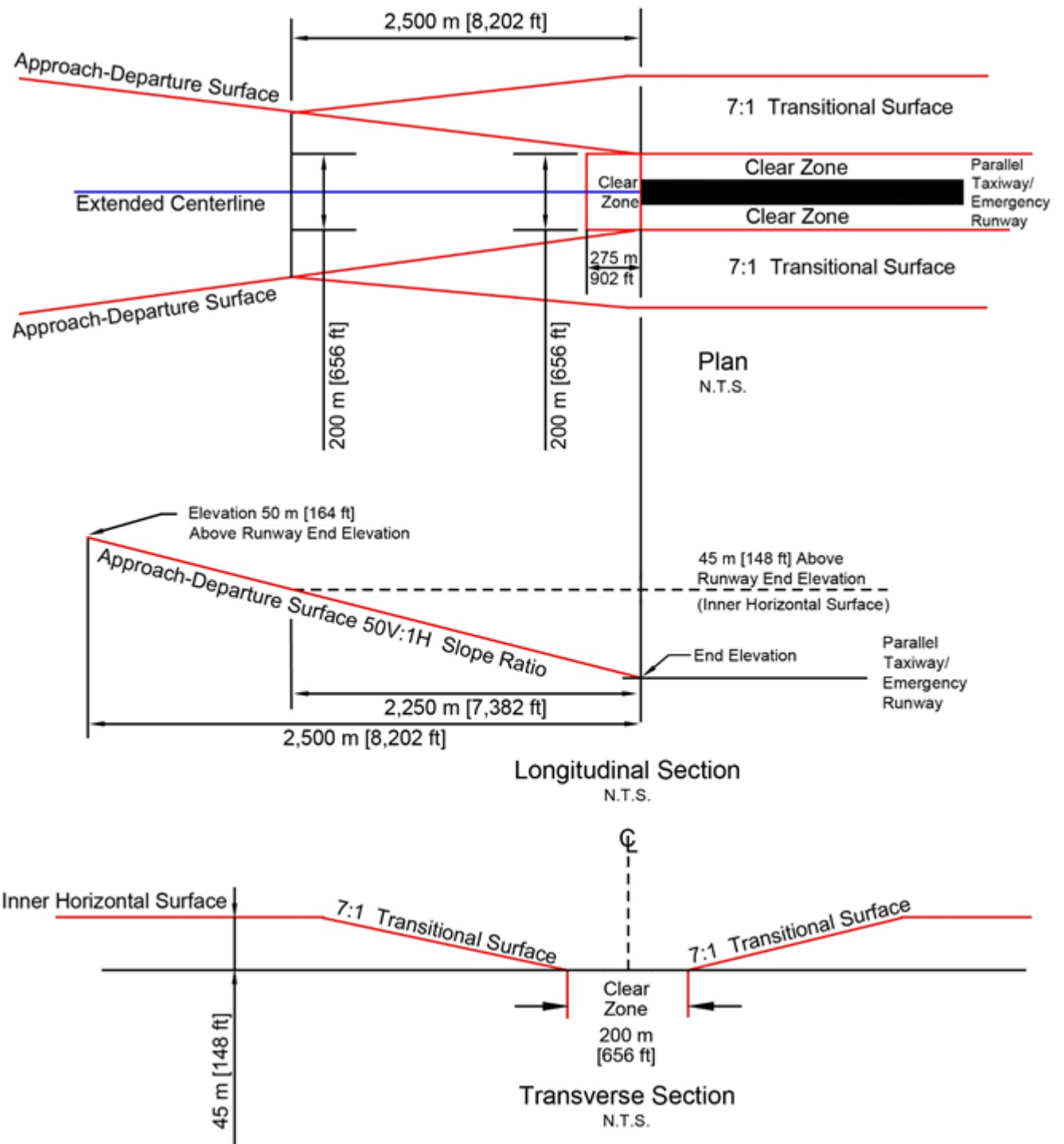


Figure 5.8. Parallel Taxiway Emergency Runway Clear Zone Details.



## Chapter 6

### APRONS AND OTHER PAVEMENTS

**6.1. Contents.** This chapter presents design standards for fixed and rotary-wing aircraft parking aprons, access aprons, maintenance pads and wash racks. It provides minimum wing-tip clearance requirements, grades and lateral clearance standards, as well as typical aircraft parking arrangements.

**6.2. Apron Requirements.** Aprons must provide sufficient space for parking fixed- and rotary-wing aircraft. They should be sized to allow safe movement of aircraft under their own power. Consider the effects of jet blast turbulence and temperature during design. Programming requirements for AF aviation facilities are found in AFMAN 32-1084, Facility Requirements. Use High Temperature Concrete and neoprene joint sealants in locations where stationary V-22 nacelle exhaust exposure is ten minutes or greater. This will likely include but is not limited to fuel pits, warm-up areas, and aprons. Rinse facilities supporting V-22s must also include High Temperature Concrete due to heat and vapor flux.

**6.3. Types of Aprons and Other Pavements.** The following is a list of aprons and other aviation facilities:

- 6.3.1. Aircraft parking apron.
- 6.3.2. Transient parking apron.
- 6.3.3. Mobilization apron.
- 6.3.4. Aircraft maintenance apron.
- 6.3.5. Hangar access apron.
- 6.3.6. Warm-up pad (holding apron).
- 6.3.7. Unsuppressed power check pads.
- 6.3.8. Arm/dearm pad.
- 6.3.9. Compass calibration pad.
- 6.3.10. Hazardous cargo pad.
- 6.3.11. Alert pad.
- 6.3.12. Aircraft wash rack.

**6.4. Aircraft Characteristics (U.S. Army Corps of Engineers (USACE)).** Dimensional characteristics of various military, civil, and commercial fixed- and rotary-wing aircraft are available in the USACE Transportation Systems Center (TSC) Report 13-2 (Aircraft Characteristics for Military Aircraft) and in TSC Report 13-3 (Aircraft Characteristics for Selective Commercial Aircraft).

**6.5. Parking Apron for Fixed-Wing Aircraft.** Fixed-wing parking may consist of separate aprons for parking operational aircraft, transient aircraft, and transport aircraft, or an apron for consolidated parking.

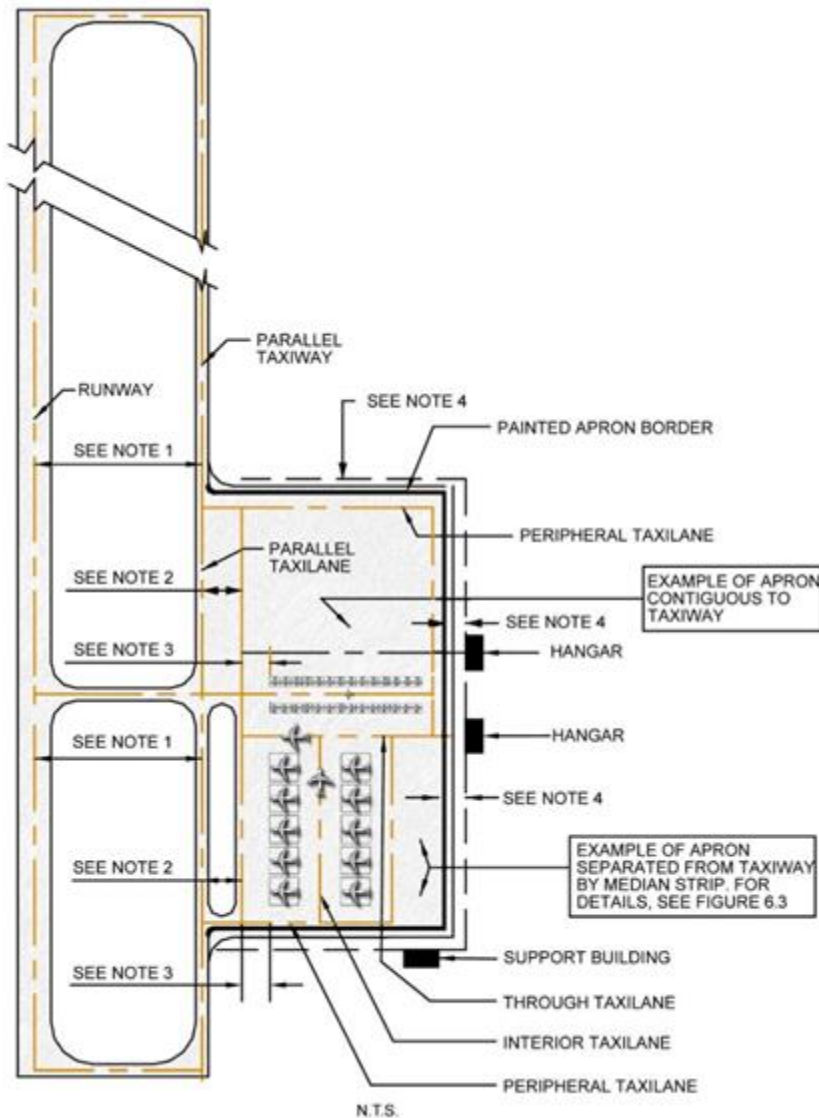
6.5.1. **Location.** Parking aprons should be located near and contiguous to maintenance and hangar facilities. Do not locate them within runway and taxiway lateral clearance distances and transitional surfaces. A typical parking apron is illustrated in [Figure 6.1](#).

6.5.2. **Size.** As a general rule, there are no standard sizes for aircraft aprons. Aprons are individually designed to support aircraft and missions at specific facilities. Base the actual dimensions of an apron on the number and type of authorized aircraft, maneuvering space, and type of activity the apron serves. **(T-3)** Allowances are provided in AFMAN 32-1084. The ideal apron size affords the maximum parking capacity with a minimum amount of paving. Generally, achieve this by reducing the area dedicated for use as taxi lanes by parking aircraft perpendicular to the long axis of the apron.

6.5.3. **Parking Apron Layout.** Parking apron dimensions for USAFE-AFAFRICA facilities will be based on the specific aircraft assigned to the facility and the criteria presented in AFMAN 32-1084. A typical mass-parking apron should be arranged in rows, as shown in [Figure 6.3](#).

6.5.4. **Layout for Combined Army and AF Parking Aprons.** Parking apron dimensions for combined Army and AF facilities will be based on the largest aircraft assigned to the facility.

Figure 6.1. Apron Nomenclature and Criteria.

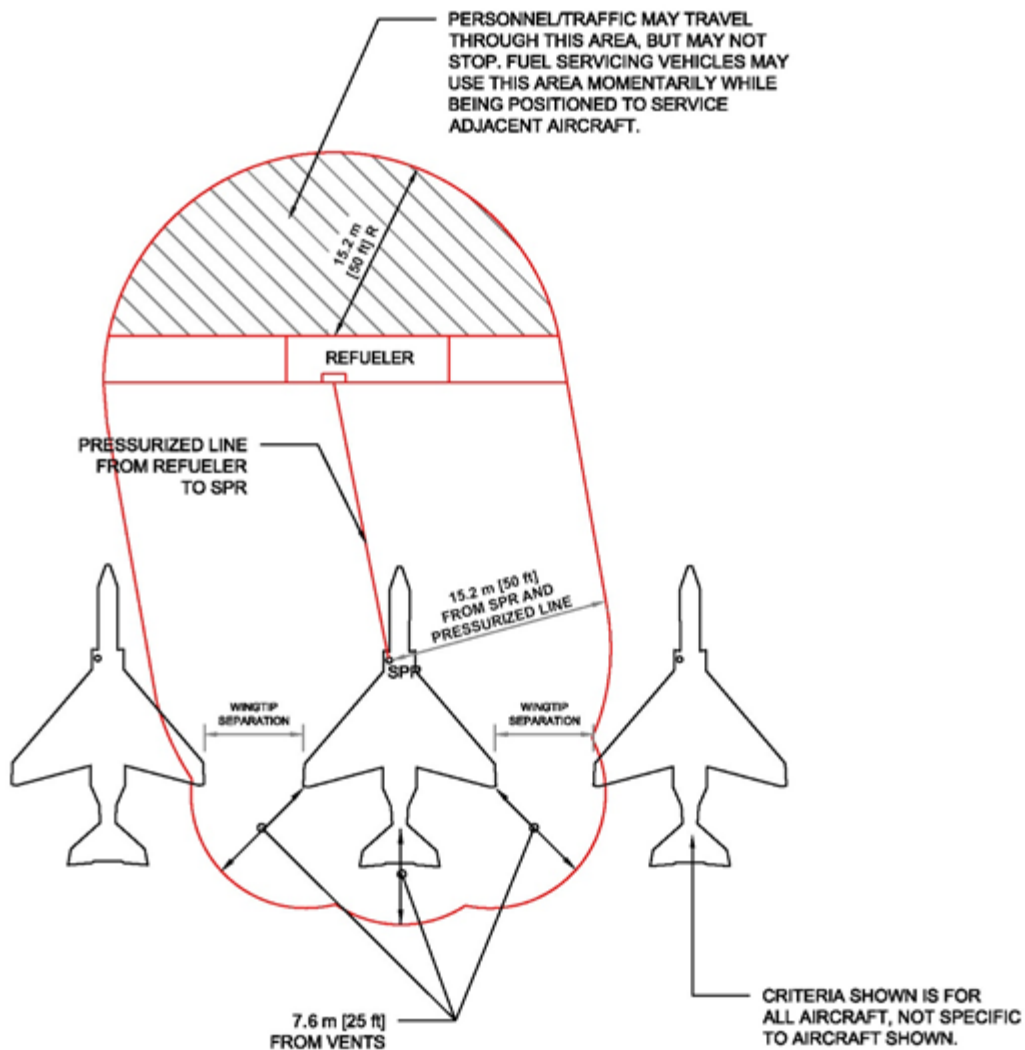
**Notes:**

1. Runway Lateral Clearance distance, USAFE-AFAFRICA and NATO criteria.
2. Distance between taxiway centerline and parallel taxiway and, or taxilane centerline.
3. One-half wingspan plus wingtip clearance.
4. Clearance from edge of apron to fixed or mobile objects.
5. See [Table 3.2.](#), [Table 5.1.](#) and [Table 6.1.](#) for criteria.

**6.5.5. Tactical/Fighter Parking Apron Layout.** The recommended tactical/fighter aircraft parking arrangement is to park aircraft at a 45-degree angle as discussed in AFMAN 32-1084. Arranging these aircraft at a 45-degree angle may be the most economical method for achieving the clearance needed to dissipate jet blast temperatures and velocities to levels that will not endanger aircraft or personnel ([Figure 6.4](#)). Jet blast relationships are discussed in TSC Report 13-2.

6.5.6. **Refueling Considerations.** Layout of aircraft parking locations and taxilanes should consider aircraft taxiing routes when an aircraft is refueled. Refueling operations should not prevent an aircraft from leaving the parking apron. Two routes in and out of the apron may be required. During refueling, active ignition sources such as sparks from ground support equipment or jet engines (aircraft) are prohibited from a zone around the aircraft, the fuel servicing safety zone (FSSZ). An example of the FSSZ around a fixed-wing aircraft is shown in **Figure 6.2**. The safety zone is the area within 15.2 m (50 ft) of a pressurized fuel carrying servicing component (e.g., servicing hose, fuel nozzle, single-point receptacle (SPR), hydrant hose car, ramp hydrant connection point) and 7.6 m (25 ft) around aircraft fuel vent outlets. The FSSZ is established and maintained during pressurization and movement of fuel. For additional information, see AF technical order (T.O.) 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding*. For additional Navy information, see MILHDBK-274.

**Figure 6.2. Fuel Servicing Safety Zone (FSSZ) Example.**



6.5.7. **Parking Dimensions.** In **Table 6.1** presents minimum geometric criteria for fixed-wing apron design.

6.5.7.1. **Jet Blast Considerations.** The clearances listed in [Table 6.1](#) do not consider the effects of temperature and velocity due to jet blast. The effects of jet blast and minimum standoff distance to edge of pavement are described in Unified Facilities Criteria (UFC) 3-260-01, Appendix B, Sections 7, *Jet Blast Effects*.

6.5.8. **Cargo Loading Considerations.** Consider the effects of jet blast on aircraft loading operations and cargo storage locations designing a layout for parking cargo aircraft.

6.5.9. **Tie-downs and Mooring Points.** Tie-downs or mooring points are required. See UFC 3-260-01, Appendix B, Section 11, *Tiedowns, Mooring, and Grounding Points, for grounding requirements*.

**Table 6.1. Fixed-Wing Aprons.**

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
1	Size and Configuration	Variable See criteria listed below and AFMAN 32-1084.		As a general rule there are no standard sizes for aprons; they should be individually designed to support specific aircraft uses. The dimensions are determined by the number and type of aircraft, the function of the apron, the maneuvering characteristics of the aircraft, jet blast of the aircraft and the degree of unit integrity to be maintained. Other determinants are the physical characteristics of the site, relationship of the apron area to other airfield facilities, and the objective of the comprehensive plan. <b>(T-3)</b>
2	Parking Space Width (“W”)	Design aircraft wingspan		Air Force Aprons. For V-22 parking dimensions, see <b>Figure 6.9</b> .
		Design aircraft wingspan + 5.0 m (16.4 ft)		NATO-funded aprons.
3	Parking Space Length (“L”)	Design aircraft length		Air Force Aprons. For V-22 parking dimensions, see <b>Figure 6.9</b> .
		Design aircraft length + 10 m (32.8 ft) for tactical fighter 5.0 m (16.4 ft) for tactical and strategic transport		NATO-funded aprons.
4	Wingtip Clearance of	3.1 m (10 ft)		Aircraft with wingspans up to 33.5 m (110 ft). For V-22 wingtip clearances, see <b>Figure 6.9</b> .

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
	Parked Aircraft (“P”)	6.1 m (20 ft)		Aircraft with wingspans of 33.5 m (110 ft) or more except as noted below. See <b>Note 1</b> .
		7.6 m (25 ft)		Transient aprons C-5 and C-17 aircraft (also see <b>paragraph 6.5.8</b> ). See <b>Note 1</b> .
		15.3 m (50 ft)		KC-10, KC-46 and KC-135 aircraft to accommodate refueling and defueling operations. See <b>Note 1</b> .
		6.0 m (20 ft) for tactical fighter		NATO funded projects. Refer to <b>Attachment 1, Glossary of References and Supporting Information</b> , for definitions of tactical fighter, tactical transport, and strategic transport aircraft.
		9.0 m (29.5 ft) for strategic transport with wingspans ≤ 30 m (98.4 ft)		
		15 m (49.2 ft) for all other aircraft		
5	Wingtip Clearance of Aircraft on Interior or Secondary Peripheral Taxi lanes (“I”)	6.1 m (20 ft)		Aircraft with wingspans up to 33.5 m (110 ft), except transient aprons. For V-22 wingtip clearances, see <b>Figure 6.9</b> and <b>Note 1</b> . Taxilanes that provide access to individual parking spots or hangars are considered secondary taxi routes.
		7.6 m (25 ft)		Transient aprons. Taxilanes that serve multiple types of aircraft or serve to provide circulation beyond access to individual parking spots or hangars are considered primary facilities. See <b>Note 1</b> . For V-22 wingtip clearances, see <b>Figure 6.9</b> .
		9.2 m (30 ft)		Aircraft with wingspans of 33.5 m (110 ft) or more, see <b>Note 1</b> . Taxilanes that serve multiple types of aircraft or serve to provide circulation beyond access to individual parking spots or hangars are considered primary facilities.
6	Wingtip Clearance of Aircraft on Through or Primary	9.2 m (30 ft)		Aircraft with wingspans up to 33.5 m (110 ft). For V-22 wingtip clearances, see <b>Figure 6.9</b> and <b>Note 1</b> .
		15.3 m (50 ft)		Aircraft with wingspans of 33.5 m (110 ft) or more.

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
	Peripheral Taxi lanes ("T")			See <b>Note 1</b> .
7	Distance from Peripheral Taxilane Centerline to the Apron Edge ("C")	7.6 m (25 ft)		Designed for aircraft with wingspan up to 33.5 m (110 ft). For V-22 wingtip clearances, see <b>Figure 6.9</b> . Also applies to taxi lanes for aircraft parking taxi lines and spots near the apron edge.
		11.5 m (37.5 ft)		Designed for aircraft with wingspan of 33.5 m (110 ft) and greater. Also applies to taxi lanes for aircraft parking spots near the apron edge.
		7.5 m (24.6 ft) for tactical fighter.		NATO funded projects. Refer to <b>Attachment 1, Glossary of References and Supporting Information</b> , for definitions of tactical fighter, tactical transport, and strategic transport aircraft.
		17.5 m (57.4 ft) for strategic transport.		
		22.5 m (73.8 ft) for all other aircraft.		
8	Clear Distance Around Aircraft During Fueling (FSSZ)	7.6 m (25 ft)		Around aircraft fuel vent outlets, see T.O. 00-25-172, <i>Ground Servicing of Aircraft and Static Grounding/Bonding</i>
		15.2 m (50 ft)		From a pressurized fuel carrying servicing component, see TO 00-25-172.
		See Remarks		Consider refueling operations when locating taxilanes.
9	Grades in the Direction of Drainage	Min 0.5% Max 1.5%  (NATO: Min 1.0% Max 1.5%)		Avoid surface drainage patterns with numerous or abrupt grade changes. This can produce excessive flexing of aircraft and structural damage. Lateral and transverse slopes must be combined to derive maximum slope in the direction of drainage. (i.e., the square root of the transverse slope squared plus longitudinal slope squared is equal to the slope in the direction of drainage.). No grade changes are allowed for individual parking positions within the aircraft block dimensions (not including clearance distances) of the design aircraft. Exceptions are allowed for fuel hydrant pits.

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
				NATO: Minimum grading can be increased to 1% only where a NATO project strictly requires such grading.
10	Width of Shoulders (Total Width Including Paved and Unpaved)	7.6 m (25 ft)	15.2 m (50 ft)	
11	Paved Width of Shoulders	7.6 m (25 ft) 3.05 m (10 ft for NATO)		Airfields not otherwise specified. For apron shoulders where fire hydrants must be installed, see Note 5. Also see UFC 3-260-01, Appendix B, Section 13, <i>Deviations from Criteria for Air Force Airfield Support Facilities</i> , for the minimum set back from the taxilane centerline.
		Not applicable	15 m (50 ft)	Airfields that accommodate B-52, C-5, E-4 and 747 aircraft. For apron shoulders where fire hydrants must be installed, see UFC 3-260-01, Appendix B, Section 13, for the minimum set back from the taxilane centerline.
12	Longitudinal Grade of Shoulders	Variable Min. 1.0%, Max. 1.5% for NATO		Conform to longitudinal grade of the abutting primary pavement. Follow NATO grading for NATO funded projects.
13	Transverse Grade of Paved Shoulder	Min. 2.0%, Max. 4.0% Min. 1.0%, Max. 1.5% for NATO		All airfields, except as noted below. Grading can be reduced to NATO criteria only if NATO project strictly requires such grading. Otherwise, follow standard grading.

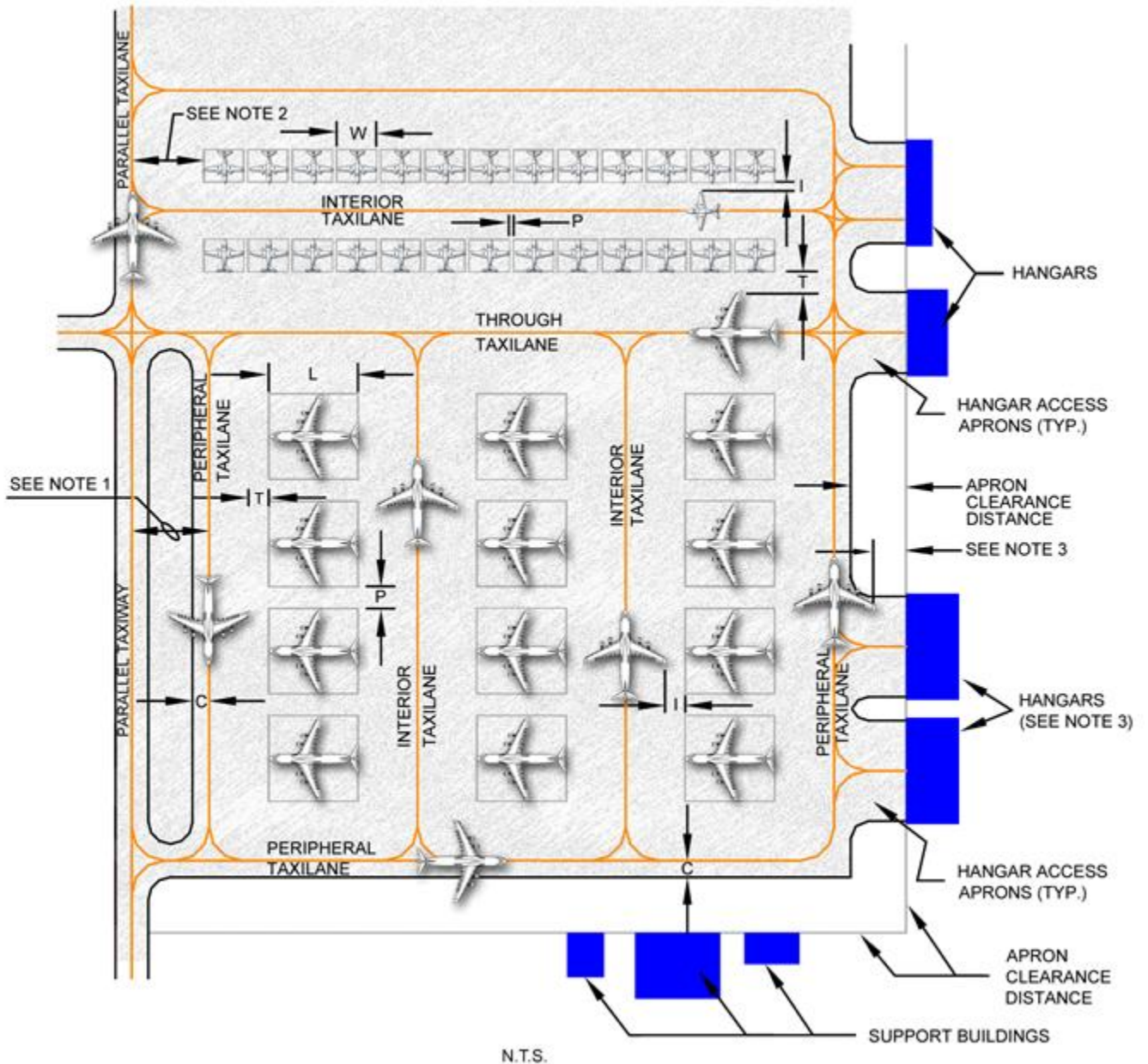
Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
		Not applicable	Min. 1.5% Max. 2.0%	Airfields that accommodate B-52 aircraft.
14	Transverse Grade of Unpaved Shoulders	Min. 2.0%	a) 40 mm (1.5 in) drop-off at edge of paved shoulder, $\pm 13$ mm (0.5 in). b) Min. 2.0%, Max. 4.0%	Unpaved shoulders shall be graded to provide positive surface drainage away from paved surfaces.
15	Clearance from Apron Boundary Marking to Fixed or Mobile Obstacles	Provide a minimum clearance from apron boundary marking and above ground obstacles equal to the greater of: 0.5 x Wingspan Tactical Fighter Aircraft (TFA) - 15 m (49.2 ft) Tactical Transport Aircraft (TTA) - 20 m (65.6 ft)* Strategic Transport Aircraft (STA) - 35 m (114.8 ft) Refer to <b>Attachment 1, Glossary of References and Supporting Information</b> , for definitions of tactical fighter, tactical transport, and strategic transport aircraft. Note: For C-17, clearances are to be 27.5 m (90.2 ft)		Clearance is measured from apron boundary marking, not centerline of taxiway. This distance to be clear of all fixed and mobile obstacles except those noted in UFC 3-260-01, Appendix B, Section 13. <i>For Morón Air Base, see Attachment 6 as to how this clearance distance should be calculated.</i> <b>Note:</b> Light poles are not allowed within this distance without waiver. Implement operational controls to ensure that aircraft larger than the design aircraft do not use the apron without wing-walkers. <b>(T-3)</b> Submit a revised summary of airfield restrictions to allow update to the Air Mobility Command (AMC) Airfield Suitability and Restrictions Report. Send the revision to: HQ AMC/DOAS 402 Scott Drive Unit 3A1 Scott AFB, IL 62225-5302
16	Grades in Cleared Area Beyond Shoulders to Fixed or	(a) 40 mm (1.5 in) drop-off at edge of paved shoulder, $\pm 13$ mm	Min. 2.0% Max. 10.0%	40 mm (1.5 in) drop-off ( $\pm 13$ mm (0.5 in)) at edge of pavement when the entire shoulder is paved. When a slope reversal is required within this area, a flat bottom ditch that is

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
	Mobile Obstacles	(0.5 in). (b) Min. 2.0%, Max. 10.0%		graded to drain adequately shall be provided.

**Notes:**

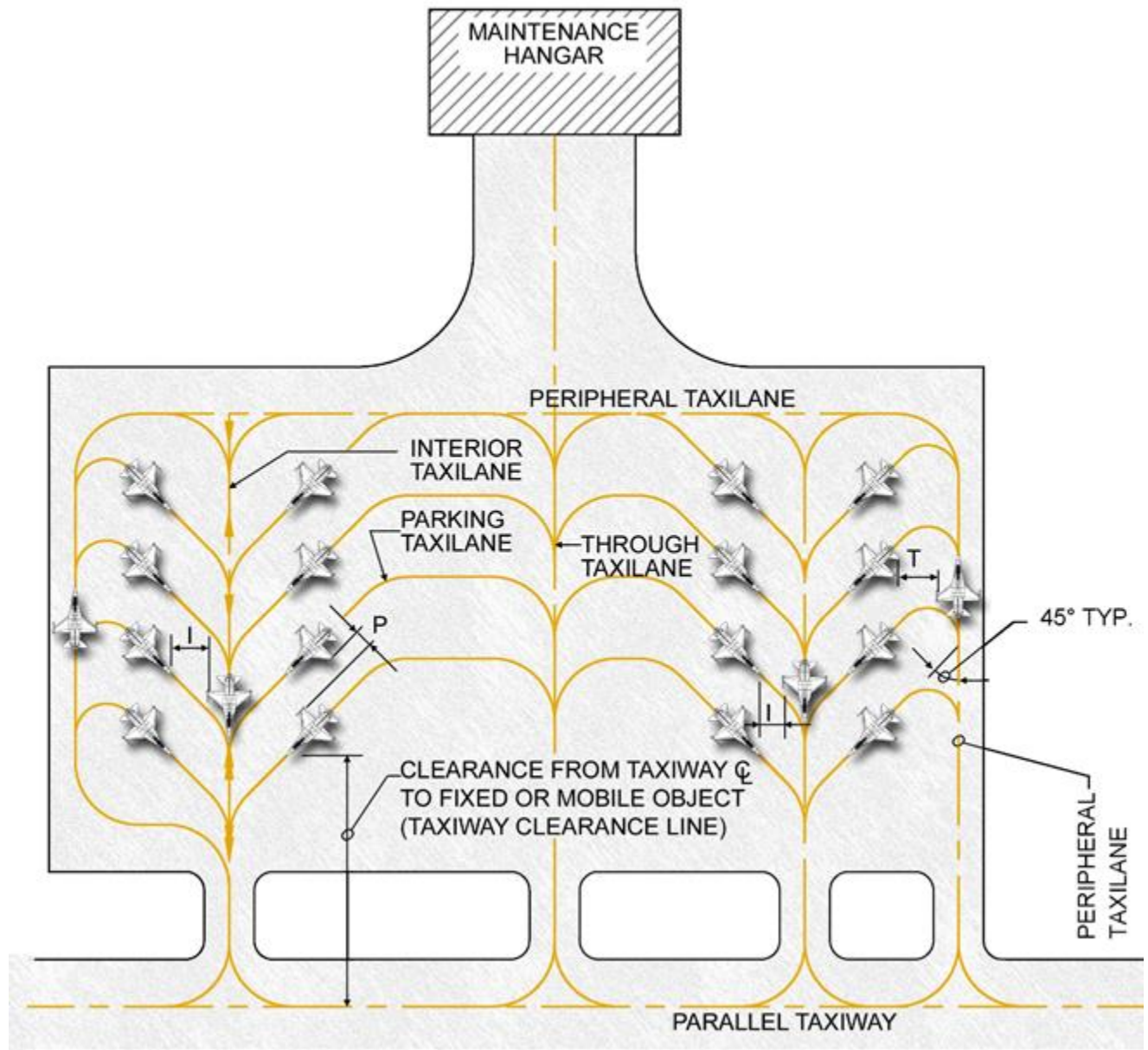
1. For day-to-day operations, wingtip clearances may be reduced to those allowed by AFMAN 11-218, *Aircraft Operations and Movement on the Ground*, with a waiver. A waiver will be granted only if no other viable options exist. For reduced wingtip clearances during contingency operations, see **Attachment 2, USAFE-AFAFRICA Airfield Waiver Program**.
2. Metric units apply to new airfield construction, and where practical, to modifications to existing airfields and heliports, as discussed in **paragraph 1.4.4**.
3. The criteria in this instruction are based on aircraft specific requirements and are not direct conversions from inch-pound (English) dimensions. Inch-pound units are included only as a reference to the previous standard.
4. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from inch-pound to SI units.
5. For apron edges where fire hydrants must be installed, widen paved shoulders to within 3.0 m (9.8 ft) of the hydrants to allow paved access for firefighting vehicles.

Figure 6.3. Typical Parking Plan.

**Notes:**

1. Taxiway Clearance distance at facilities with parallel taxiways; see [Table 5.1.](#), Item 11.
2. See [Table 6.1.](#) for dimensional definitions.
3. Ensure minimum wingtip clearance is provided to hangars or other permissible deviations, see [Table 6.1.](#), Items 6 and 15 and UFC 3-260-01, Appendix B, Section 13, *Deviations from Criteria for Air Force Airfield Support Facilities.*

Figure 6.4. Apron with Diagonal Parking.

**Notes:**

1. See [Table 6.1](#) for dimensional criteria.
2. This parking arrangement is shown for information only and not necessarily an ideal parking arrangement.

**6.6. Taxiing Characteristics on Aprons for Fixed-Wing Aircraft.**

6.6.1. **Apron Taxilanes.** Taxi routes across parking aprons, referred to as taxilanes, are marked on the apron for safe passage of the aircraft. Typical taxilane locations are illustrated in [Figure 6.1](#), [Figure 6.3](#), and [Figure 6.4](#). Minimum wingtip clearances between parked and taxiing aircraft are listed in [Table 6.1](#) and shown on [Figure 6.3](#). AFMAN 11-218, *Aircraft Operations and Movement on the Ground*, provides authorization for operation of aircraft at

reduced clearances under certain circumstances with a USAFE-AFAFRICA/A3 approved waiver. If a decision is made to reduce clearances based upon this authorization, you must waive the safe clearance requirements provided within this chapter in accordance with [Attachment 2](#). Waivers should be pursued only when all avenues for compliance have been exhausted. (T-3)

6.6.2. **Turning Capabilities (Aircraft Turning and Maneuvering Characteristics).** TSC Report 13-2 (Aircraft Characteristics for Airfield Pavement Design and Evaluation Air Force and Army Aircraft) and TSC Report 13-3 (Aircraft Characteristics for Airfield Pavement Design and Evaluation Selective Commercial Aircraft) provide sources for obtaining various turning diagrams for US Army, Air Force, and numerous civil and commercial fixed-wing aircraft.

6.6.3. **Departure Sequencing.** Egress patterns from aircraft parking positions to taxiways should be established to prevent congestion at the apron exits. For parking apron access taxiway requirements, see [paragraph 5.10](#).

6.6.4. **Minimum Standoff Distances from Edge Pavements.** See UFC 3-260-01, Appendix B, Section 7, for information on minimum standoff distances from edge pavements.

**6.7. Parking Apron for Rotary-Wing Aircraft.** Mass parking of rotary-wing aircraft will require a designated apron. Transient rotary-wing aircraft may be parked on aprons designated for fixed-wing aircraft. At aviation facilities with assigned rotary-wing aircraft, a transport apron for fixed-wing aircraft is desirable.

6.7.1. **Location.** Parking aprons for rotary-wing aircraft should be located similar to parking aprons for fixed-wing aircraft. Rotary-wing aprons must not be located within the Lateral Clearance Distances and Transitional Surfaces discussed in [Chapter 3](#) and [Chapter 4](#). Generally, company and/or squadron units should be parked together in rows for organizational integrity in locations adjacent to their assigned hangars. Parking aprons for small helicopters (observation helicopter (OH), utility helicopter (UH) and attack helicopter (AH)) should be separate from parking areas used by cargo helicopters (CH) due to the critical operating characteristics of the larger aircraft.

6.7.2. **Apron Size.** As with fixed-wing aircraft aprons, there is no standard size for rotary-wing aircraft aprons. Dimensions should be based on the number and type of aircraft, maneuvering space and type of activity the apron serves.

6.7.3. **Maneuverability.**

6.7.3.1. **Approach.** Rotary-wing aircraft approach the parking spaces with either a front or sideways approach.

6.7.3.2. **Undercarriage.** Rotary-wing aircraft are equipped with either skid gear or wheel gear. Once on the ground, skid-gear equipped helicopters cannot be easily moved. Wheeled rotary-wing aircraft can be moved on the ground.

6.7.4. **Air Force Parking Apron Layout.** Rotary-wing aircraft are parked in a layout similar to fixed-wing aircraft. Parking space, taxilane and clearance dimensions will be based on the rotor diameter of the specific aircraft assigned to the facility. Minimum clearance distances provided in Table 2.13 of AFMAN 32-1084 are preferred. USAFE-AFAFRICA activities may use the Army criteria presented in UFC 3-260-01 for rotary-wing aircraft except CH-53 and

CH-54. These criteria are shown below and in **Table 6.2.** and illustrated in **Figure 6.5** to **Figure 6.8.**

**6.7.5. Army Parking Apron Layout.** Rotary-wing aircraft are parked in one of two configurations, referred to as Type 1 or Type 2.

**6.7.5.1. Type 1.** In this configuration, rotary-wing aircraft are parked in a single lane, which is perpendicular to the taxilane. In this configuration, the parking arrangement resembles that of fixed-wing aircraft. This parking arrangement is preferred for wheeled aircraft.

**6.7.5.1.1. Parking Space, All Aircraft Except CH-47.** In the Type 1 configuration, the parking space dimensions for all rotary-wing aircraft except the CH-47 is a width of 25 m (80 ft) and a length of 30 m (100 ft). This is illustrated in **Figure 6.5.**

**6.7.5.1.2. Parking Space, CH-47.** In the Type 1 configuration, the parking space dimensions for the CH-47 rotary-wing aircraft is a width of 30 m (100 ft) and a length of 46 m (150 ft). This is illustrated in **Figure 6.6.**

**6.7.5.2. Type 2.** In this configuration, rotary-wing aircraft are parked in a double lane, which is parallel to the taxilane. This parking arrangement is preferred for skid-gear aircraft.

**6.7.5.2.1. Parking Space, Skid-Gear Aircraft.** The parking space dimensions for all skid-gear rotary-wing aircraft in the Type 2 configuration is a width of 25 m (80 ft) and a length of 30 m (100 ft). This is illustrated in **Figure 6.7.**

**6.7.5.2.2. Parking Space, Wheeled.** The parking space dimensions for all wheeled rotary-wing aircraft in the Type 2 configuration is a width of 30 m (100 ft) and a length of 50 m (160 ft). This is illustrated in **Figure 6.8.**

**Table 6.2. Rotary-Wing Aprons for Army Airfields.**

Item No.	Item Description	Requirement	Remarks
1	Size and configuration	Variable See criteria listed below and AFMAN 32-1084.	Aprons are determined by the types and quantities of helicopters to be accommodated. Other determinants are the physical characteristics of the site and the objective of the master plan. <b>(T-3)</b>
2	Type 1 parking space width	24.4 m (80 ft)	Army helicopters not otherwise specified.
		30.5 m (100 ft)	Army CH-47 helicopters. Helicopters parked in a single lane and perpendicular to the taxilane. Park helicopter in center of parking space.
3	Type 1 parking space length	30.5 m (100 ft)	Army helicopters not otherwise specified.
		45.7 m (150 ft)	Army CH-47 helicopters.

Item No.	Item Description	Requirement	Remarks
			Helicopters parked in a single lane and perpendicular to the taxilane. Park helicopter in center of parking space.
4	Type 2 parking space width	24.4 m (80 ft)	Army helicopters, skid configuration.
		30.5 m (100 ft)	Army helicopters, wheeled configuration.
			Helicopter parked in double lanes and parallel to the taxilane. Park helicopter in center of parking space.
5	Type 2 parking space length	30.5 m (100 ft)	Army helicopters with skid configuration.
		48.8 m (160 ft)	Army helicopters with wheeled configuration.
			Helicopter parked in double lanes and parallel to the taxilane. Park helicopter in center of parking space.
6	Distance between the edge of the parking space and the taxilane centerline	18.3 m (60 ft)	All Army helicopters.
7	Grades in the direction of drainage	Min 0.5% Max 1.5%	Engineering analysis occasionally may indicate a need to vary these limits; however, arbitrary deviation is not intended. Avoid surface drainage with numerous or abrupt grade changes that can cause adverse flexing in the rotor blades.
8	Interior taxilane/ hoverlane width (between rows of aircraft)	36.6 m (120 ft)	From edge of parking space to edge of parking space.
9	Peripheral taxilane/ hoverlane width	25.9 m (85 ft)	From edge of parking space to edge of apron.
10	Distance between the peripheral taxilane centerline and the edge of apron	7.6 m (25 ft)	From taxilane centerline to edge of apron.
11	Clear distance around refueling aircraft	3.1 m (10 ft)	Outside of an area formed by lines connecting the tips of the blades and tail.
12	Shoulders		See <b>Table 5.3</b> .

Item No.	Item Description	Requirement	Remarks
13	Clearance from the edge of the apron to fixed and mobile obstacles (clear area)	22.9 m (75 ft)	Measured from rear and side of apron. Distance to other aircraft operational pavements may require a greater clearance except as noted in Appendix B, Section 13.
		22.9 m (75 ft)	When aircraft are towed on and off washracks the rotor clearance can be reduced to 25 feet.

**Notes:**

1. Metric units apply to new airfield construction and where practical modification to existing airfields and heliports, as discussed in **paragraph 1.4.4**.
2. The criteria in this instruction are based on aircraft specific requirements and are not direct conversions from inch-pound (English) dimensions. Inch-pound units are included only as a reference to the previous standard.
3. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from inch-pound to SI units.

**6.7.6. Refueling Considerations.** As discussed in **paragraph 6.5.6**, layout of aircraft parking locations and taxilanes should consider aircraft taxiing routes when an aircraft is refueled. There are two primary aircraft fueling systems used:

**6.7.6.1. Aircraft Direct-Refueling System.** Aircraft direct fueling stations provide outlets located in the apron where aircraft can be fueled from closed circuit fuel system utilizing multi-arm pantographs or hydrant servicing vehicles (HSV). For design criteria, see UFC 3-460-01. Aircraft direct-refueling systems are designed primarily for “hot” refueling of aircraft.

**6.7.6.1.1. Hot Refueling Criteria and Requirements.** Hot refueling is performed with engines running, it provides minimum aircraft turnaround times and reduces fueling personnel and equipment support requirements. However, it presents hazards not normally encountered during normal fueling operations. Hot refueling is performed while the fuel lines are under pressure. Hot refueling requires the approval of HQ USAFE-AFAFRICA and will not be permitted unless individual aircraft technical order guidance, appropriate checklists and individual fueling systems are available. For additional information, see Air Force T.O. 00-25-172.

**6.7.6.2. Mobile Aircraft Refuelers.** Mobile Aircraft Refuelers are tanker trucks of various capacities and configurations and are used primarily for normal (cold) fueling operations with occasional hot-refueling operations at stations where installation of a direct refueling system is not justified. If continuous or extensive hot fueling is being performed with mobile refuelers, the use of an anchored pantograph should be considered.

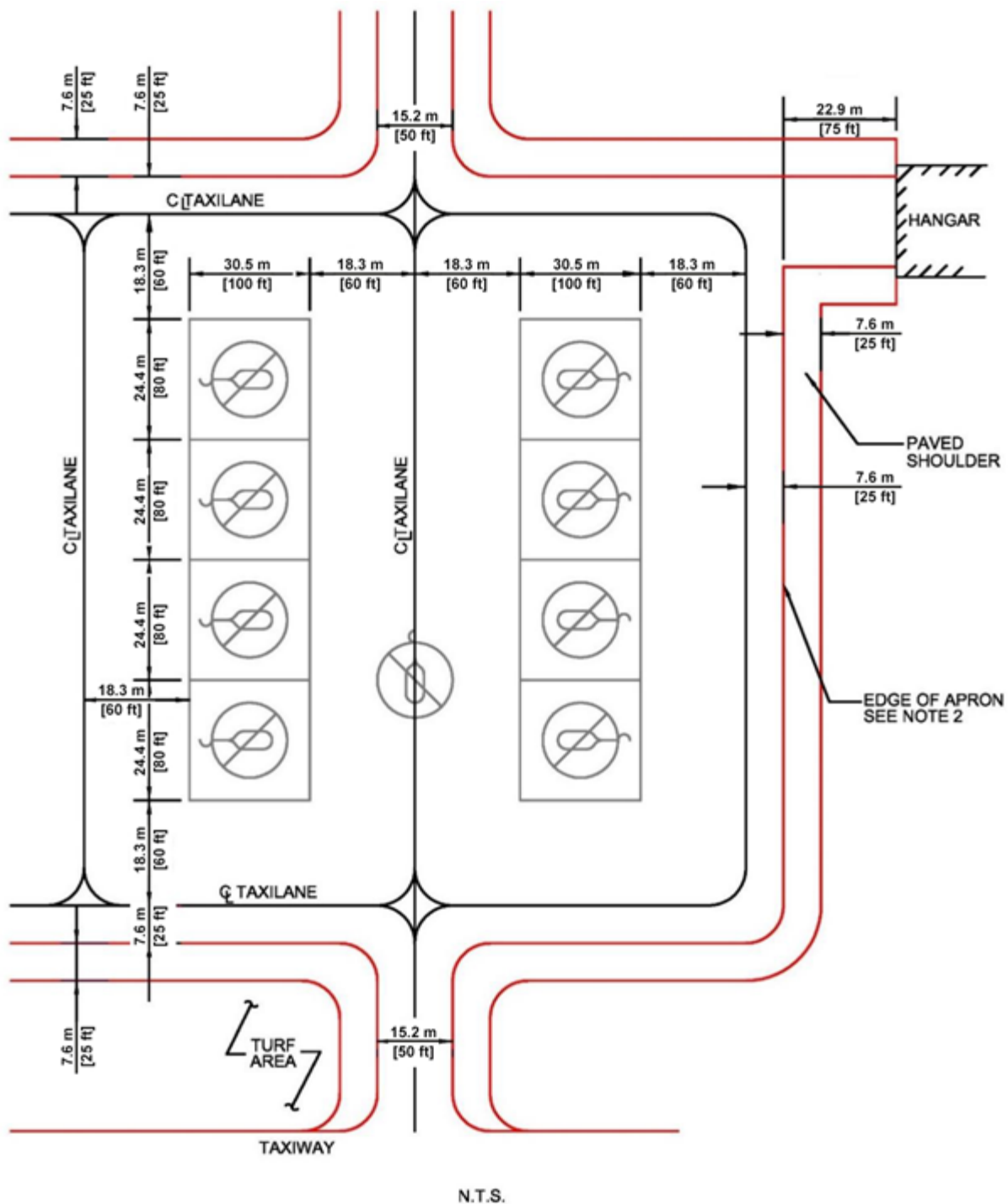
**6.7.6.3. Safety Zone.** The safety zone for rotary-wing aircraft is the area 3.0 m (10 ft) greater than the area bounded by the blades and tail of the aircraft as shown on **Figure 6.10** and **Figure 6.11** for mobile aircraft refuelers and for aircraft direct-refueling system (pit). As shown for direct-refueling systems, the pit should be located outside of the aircraft

safety zone, at a minimum, for safe operation. For additional information, see Air Force T.O. 00-25-172.

**6.7.6.4. Tie-downs and Mooring Points.** Tie-downs or mooring points are required. See UFC 3-260-01 Appendix B, Section 11, for grounding requirements.

**6.7.7. Parking Dimensions.** In **Table 6.2** presents the criteria for rotary-wing apron design for Army airfields, which can be used in USAFE-AFAFRICA. Included in this table are parking space widths, grade requirements, and clearances. Criteria for Air Force rotary-wing apron design are presented in AFMAN 32-1084.

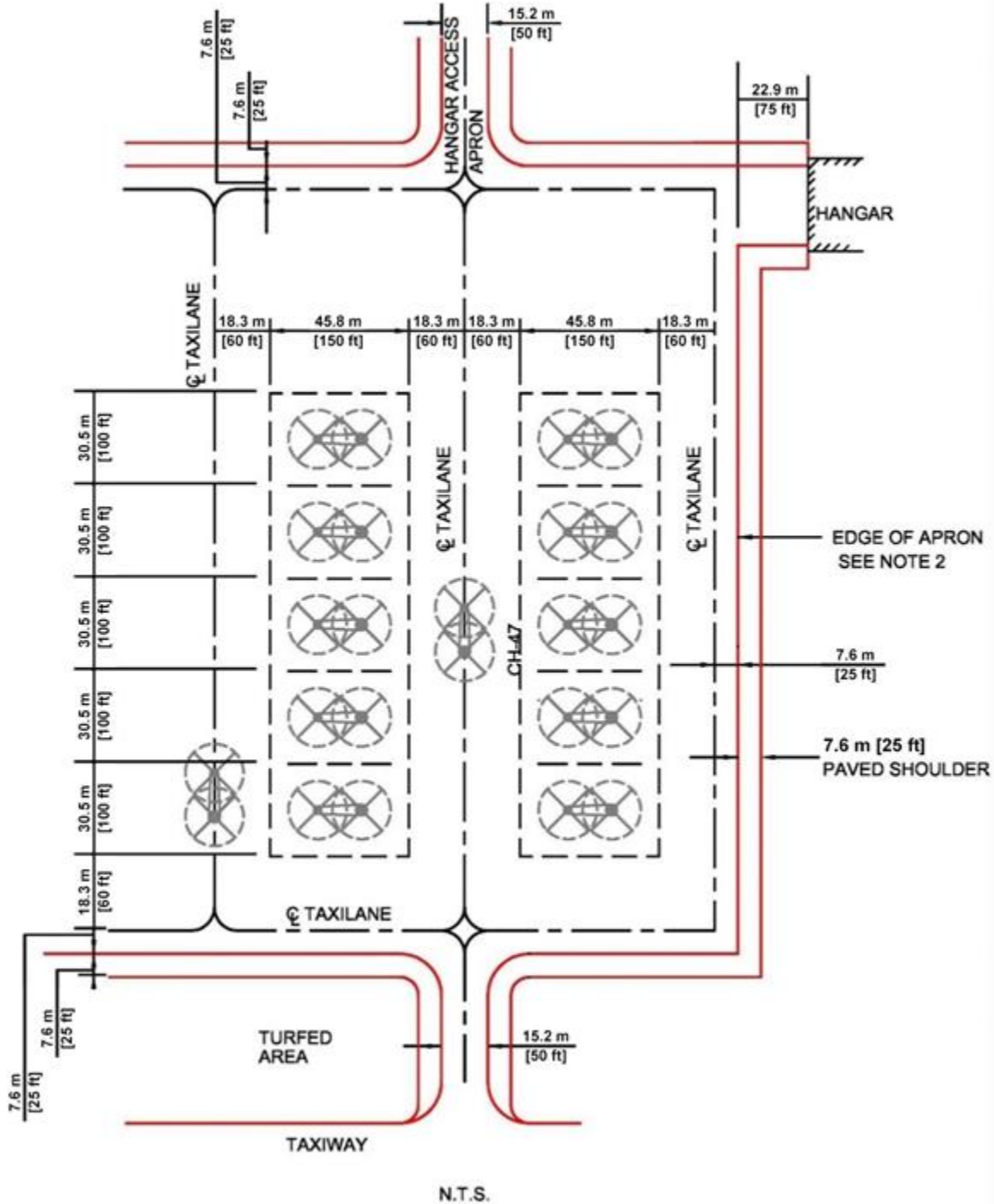
Figure 6.5. Type 1 Parking for All Rotary-Wing Aircraft Except CH-47.



**Notes:**

1. The dashed lines forming boxes around the parking positions show the limits of the safety zone around the parked aircraft. Aircraft are to be parked in the center of the box to provide proper taxiing clearances.
2. Edge of apron is defined as edge of parked aircraft block or edge of perimeter taxiway.

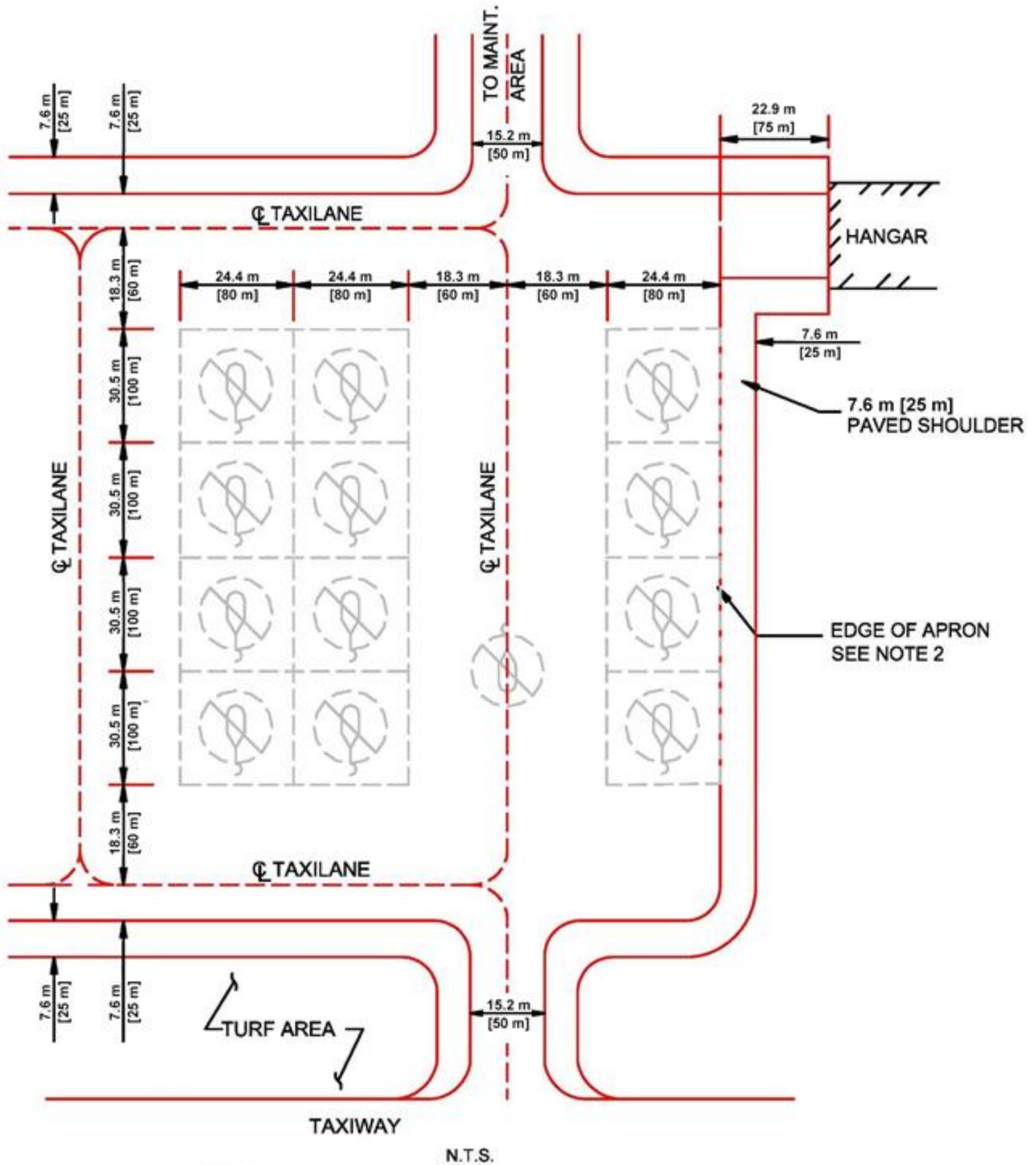
Figure 6.6. Type 1 Parking for CH-47.



**Notes:**

1. The dashed lines forming boxes around the parking positions show the limits of the safety zone around the parked aircraft. Aircraft are to be parked in the center of the box to provide proper taxiing clearances.
2. Edge of apron is defined as edge of parked aircraft block or edge of perimeter taxiway.

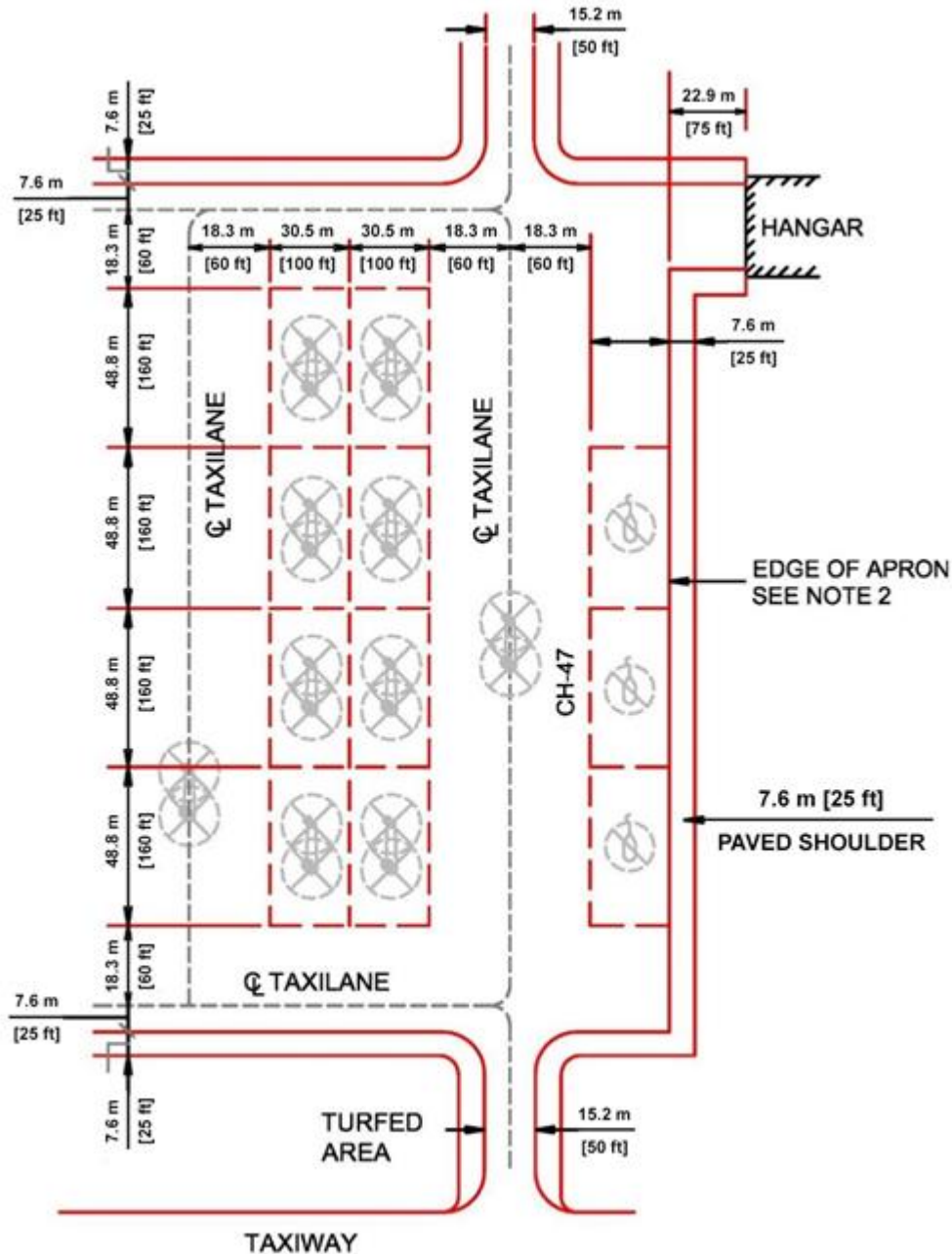
Figure 6.7. Type 2 Parking for Skid Rotary-Wing Aircraft.



**Notes:**

1. The dashed lines forming boxes around the parking positions show the limits of the safety zone around the parked aircraft. Aircraft are to be parked in the center of the box to provide proper taxiing clearances.
2. Edge of apron is defined as edge of parked aircraft block or edge of perimeter taxiway.

Figure 6.8. Type 2 Parking for Wheeled Rotary-Wing Aircraft.

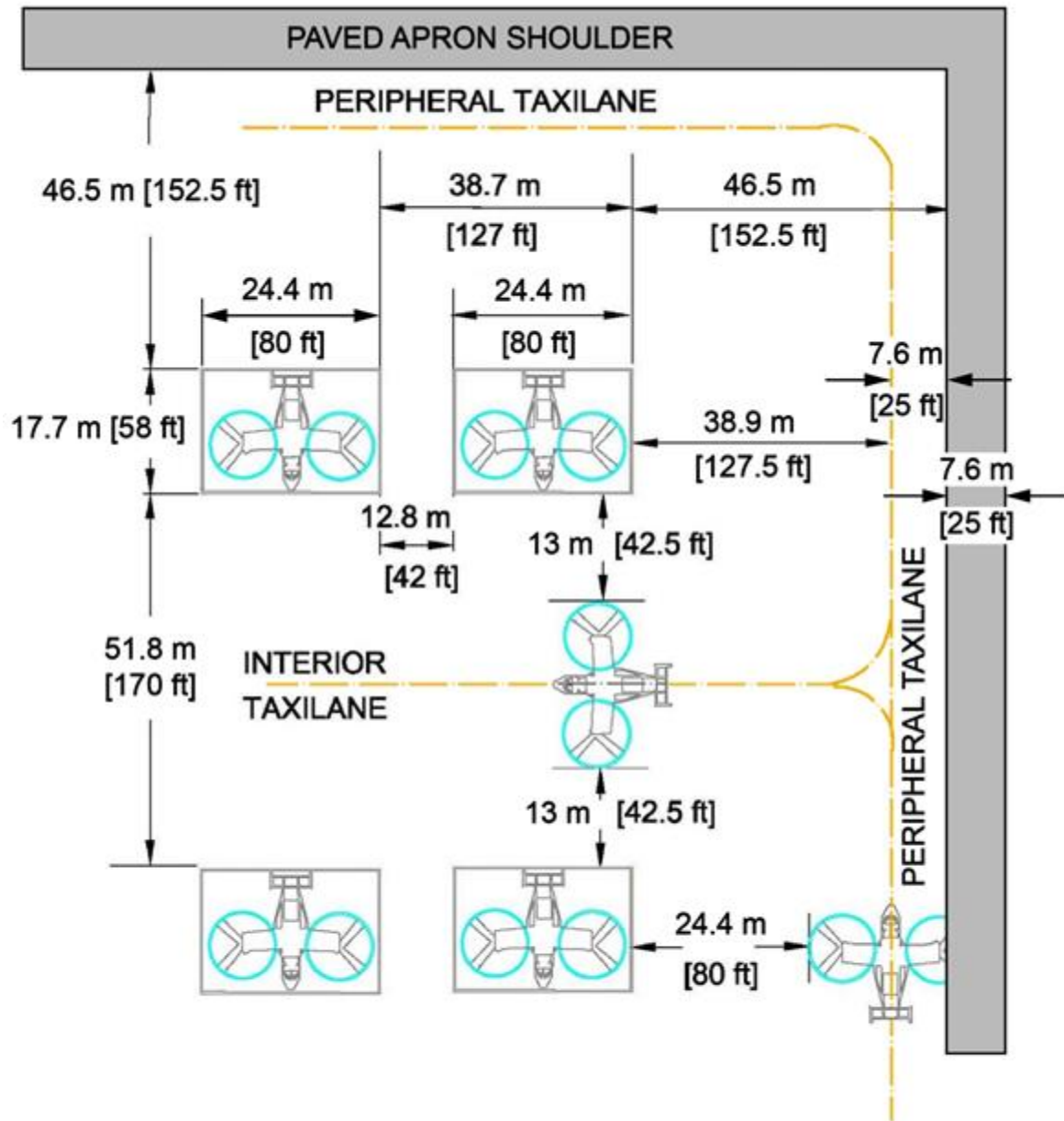


N.T.S.

**Notes:**

1. The dashed lines forming boxes around the parking positions show the limits of the safety zone around the parked aircraft. Aircraft are to be parked in the center of the box to provide proper taxiing clearances.
2. Parking aprons accommodating both CH-47 aircraft and AH-64/UH-60 should allow for sufficient distance for safe taxiing operations.
3. Edge of apron is defined as edge of parked aircraft block or edge of perimeter taxiway.

Figure 6.9. V-22 Apron Clearance Requirements.

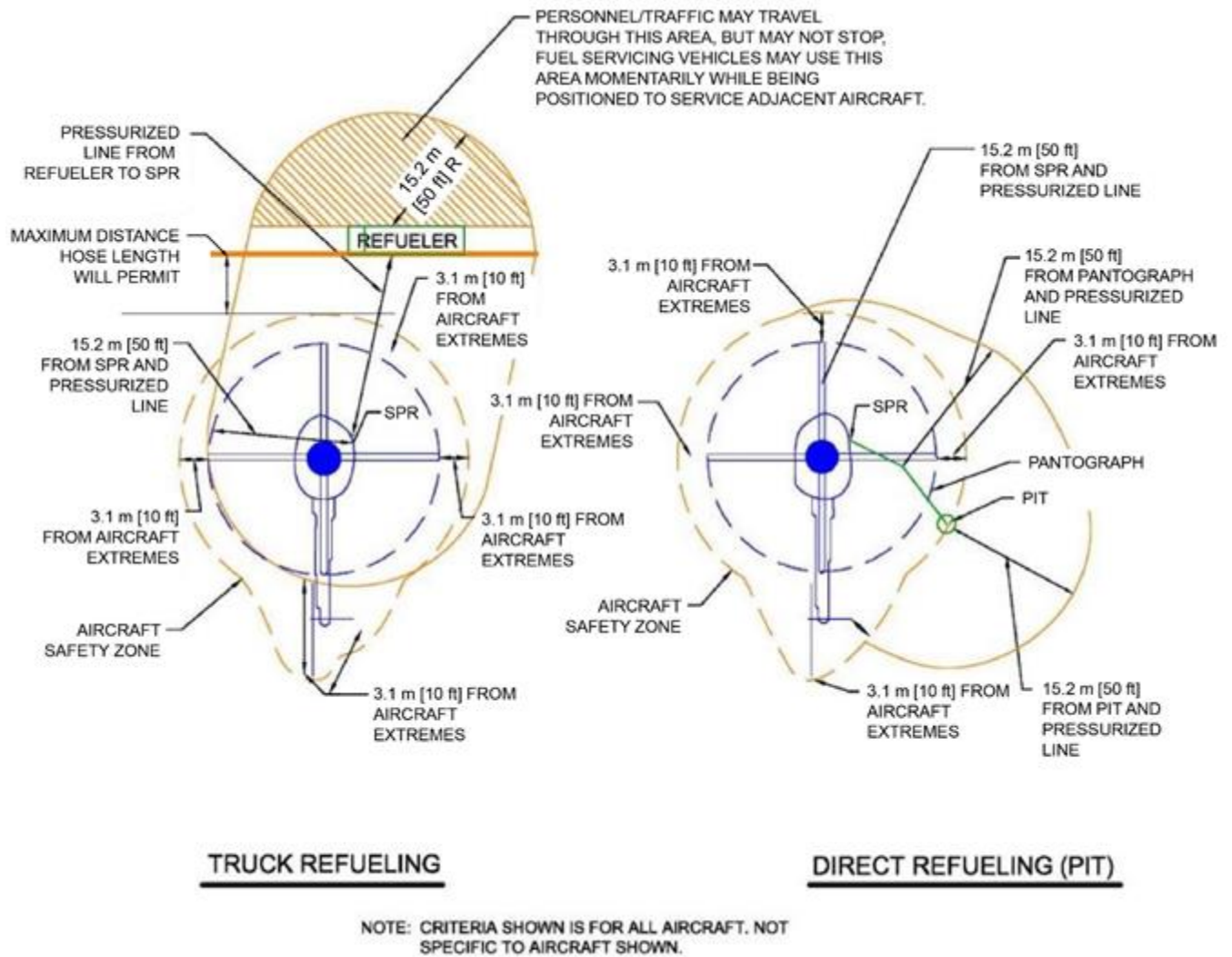


NORMAL PARKING ARRANGEMENT  
(INCLUDES FUEL PROBE FOR CV-22)

N.T.S.



**Figure 6.11. Refueling Safety Zone Example for Rotary-Wing Aircraft for Hot Refueling Operations (Requires HQ USAFE-AFAFRICA approval).**



**6.8. Warm-Up Pads.** A warm-up pad, also referred to as a holding apron, is a paved area adjacent to a taxiway at or near the end of a runway. The intent of a warm-up pad is to provide a parking location, off the taxiway, for aircraft, which must hold due to indeterminate delays. It allows other departing aircraft unencumbered access to the runway. Pads must be sized to provide a minimum of 7.6 m (25 ft) of blast-resistant pavement behind the tail of an aircraft to prevent damage from jet blast.

**6.8.1. Location.**

**6.8.1.1. At End Turnoff Taxiway.** The most advantageous position for a warm-up pad is adjacent to the end turnoff taxiway, between the runway and parallel taxiway, as shown in [Figure 6.12](#) However, other design considerations such as navigational aids (NAVAIDS) may make this location undesirable. Do not site warm-up pads, other aprons, hot cargo spots, or taxiways in a way that will allow penetration of the approach or departure clearance surface.

6.8.1.2. **Along Parallel Taxiway.** If airspace and NAVAIDS prevent locating the warm-up pad adjacent to the end turnoff taxiway, the warm-up pad should be located at the end of and adjacent to the parallel taxiway, as shown in [Figure 6.13](#).

#### 6.8.2. **Siting Considerations.**

6.8.2.1. **End of Runway.** Locate a warm-up pad as close to the runway as possible.

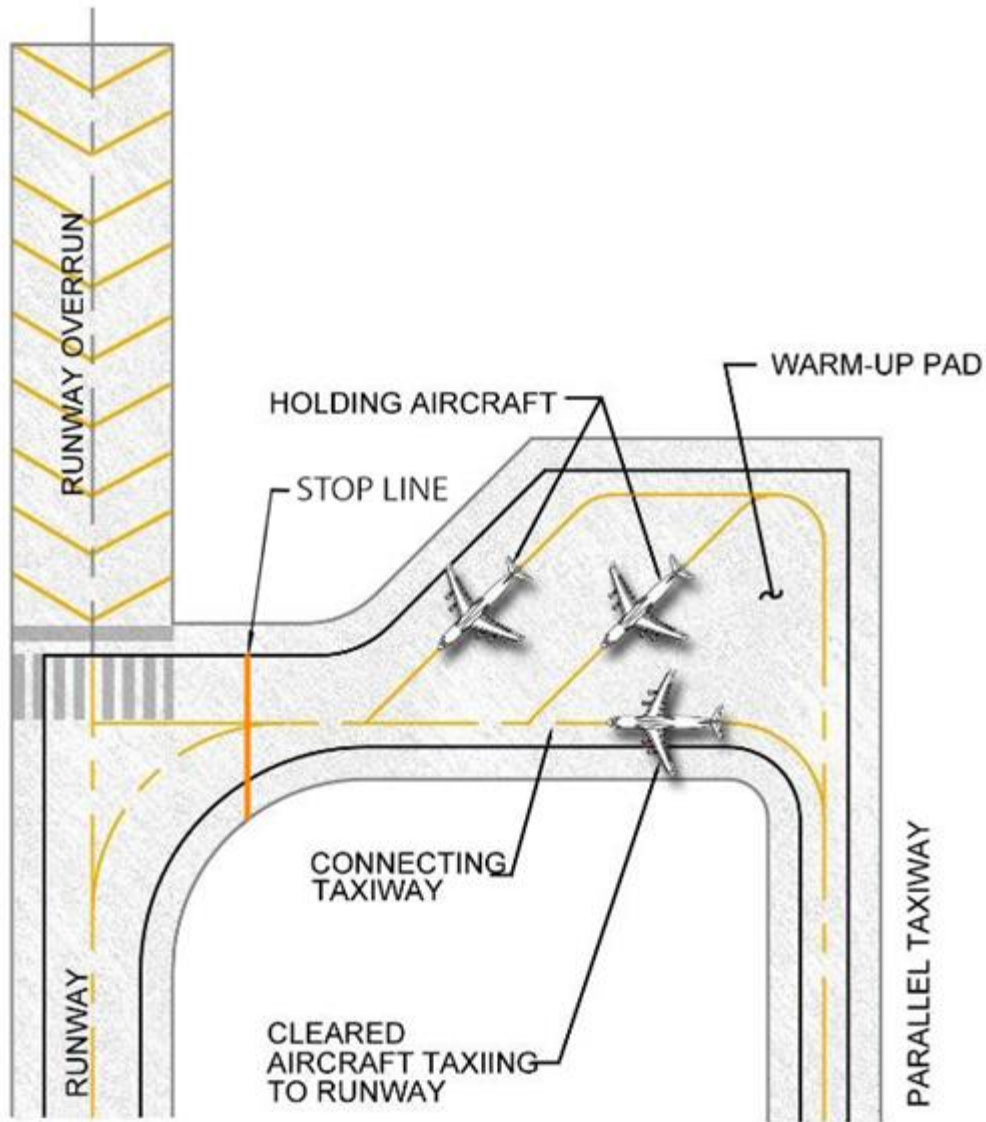
6.8.2.2. **Approach or Departure Clearance Surfaces.** As discussed in [Chapter 3](#), an obstruction to air navigation occurs when the imaginary surfaces are penetrated. Do not site warm-up pads, other aprons, hot cargo spots, or taxiways to these facilities in a way that will allow penetration of either the Approach or Departure Clearance Surfaces. Such aircraft penetrations may require revisions to TERPS procedures. Properly sited warm-up positions are illustrated in [Figure 6.14](#) and [Figure 6.15](#).

6.8.2.3. **NAVAIDS.** Warm-up pads must be located so that holding aircraft do not interfere with the operation of NAVAIDS, including instrument landing system (ILS) equipment and precision approach radar (PAR) facilities. To eliminate interference of the ILS signal by holding aircraft, holding aircraft on or off a warm-up pad must be outside the critical areas. The critical area for ILS equipment is illustrated in [Figure 6.16](#) through [Figure 6.18](#). Additional discussion of ILS critical areas is provided in Technical Manual (TM) 5-823-4, *Marking of Army Airfield-Heliport Operational and Maintenance Facilities*, AFI 13-204 V4, *Management of Ground Radar and Airfield Systems*, and UFC 3-260-04, *Airfield and Heliport Marking*.

6.8.3. **Warm-Up Pad Size.** The size of the warm-up pad will be such to allow accommodating two of the largest aircraft assigned to the facility simultaneously. Wingtip clearances are presented in [Table 6.1](#). Additional clearances provide a minimum of 7.6 m (25 ft) of blast-resistant pavement behind the tail of an aircraft to prevent damage from jet blast.

6.8.4. **Taxi-In/Taxi-Out Capabilities.** The parking locations will have taxi-in/taxi-out capabilities to allow aircraft to taxi to their warm-up position under their own power, as shown in [Figure 6.19](#).

Figure 6.12. Warm-Up Pad at End of Parallel Taxiway.



N.T.S.

Figure 6.13. Warm-Up Pad Next to Parallel Taxiway.

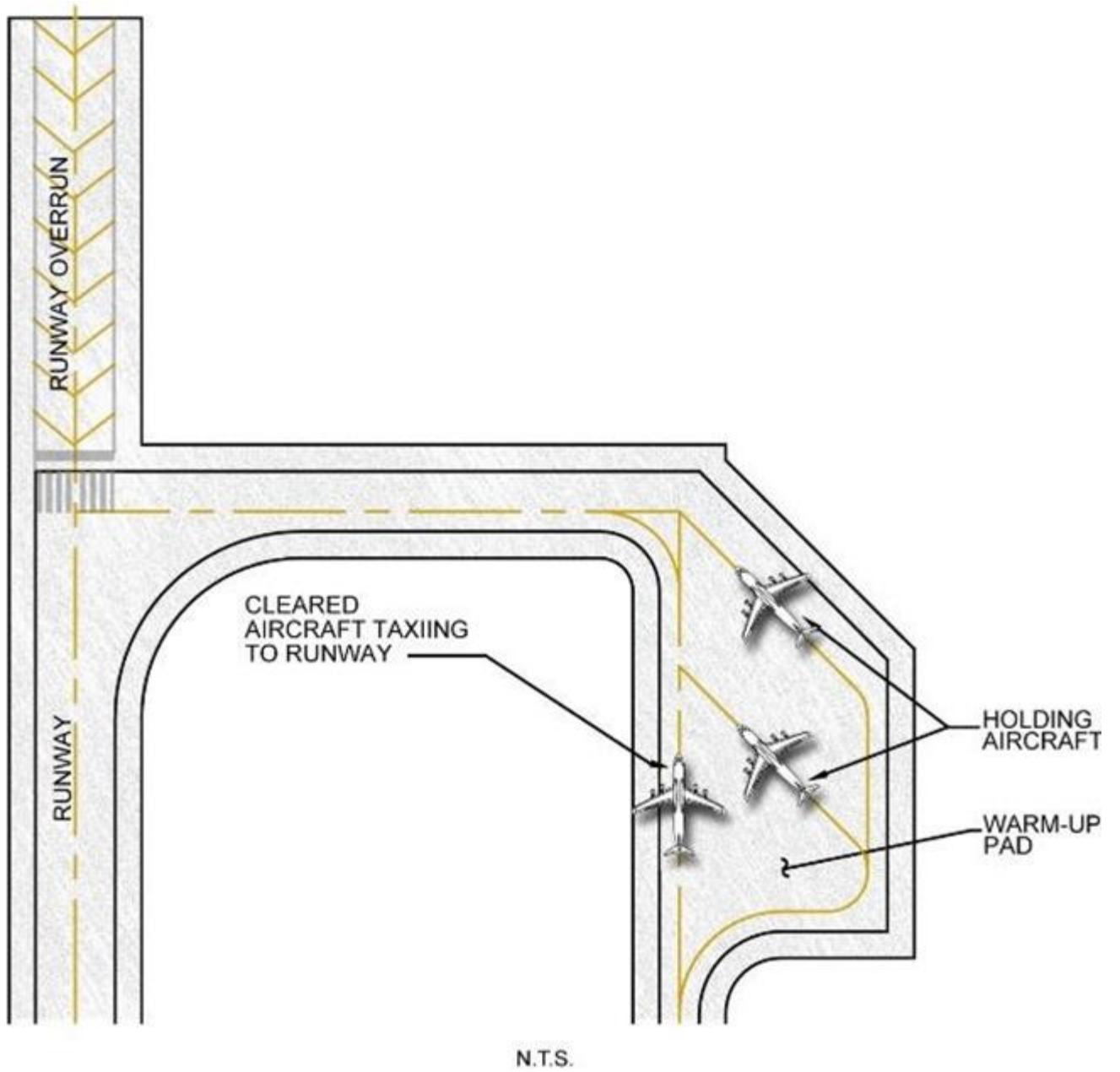


Figure 6.14. Warm-Up Pad Located in Clear Zone.

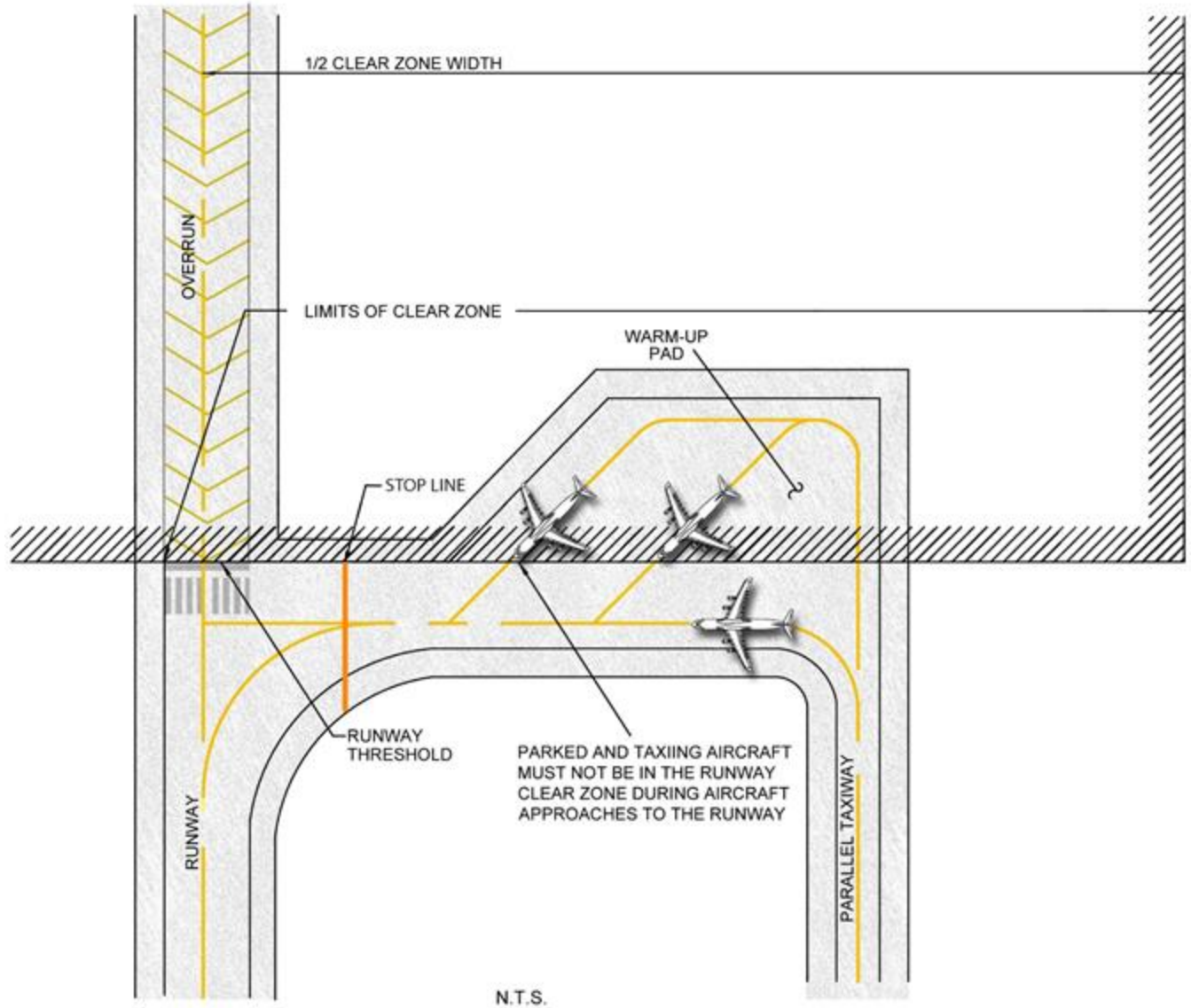
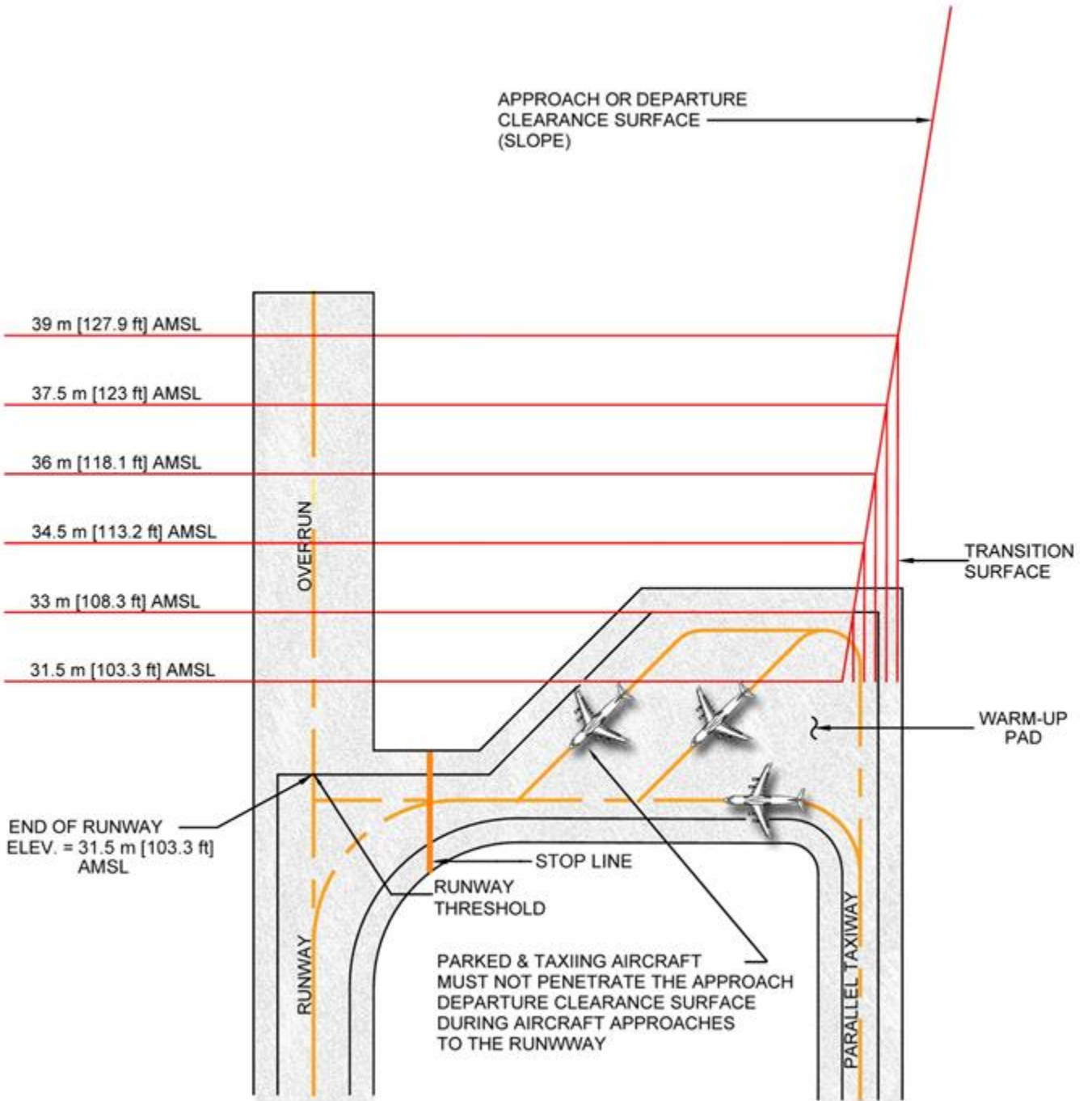
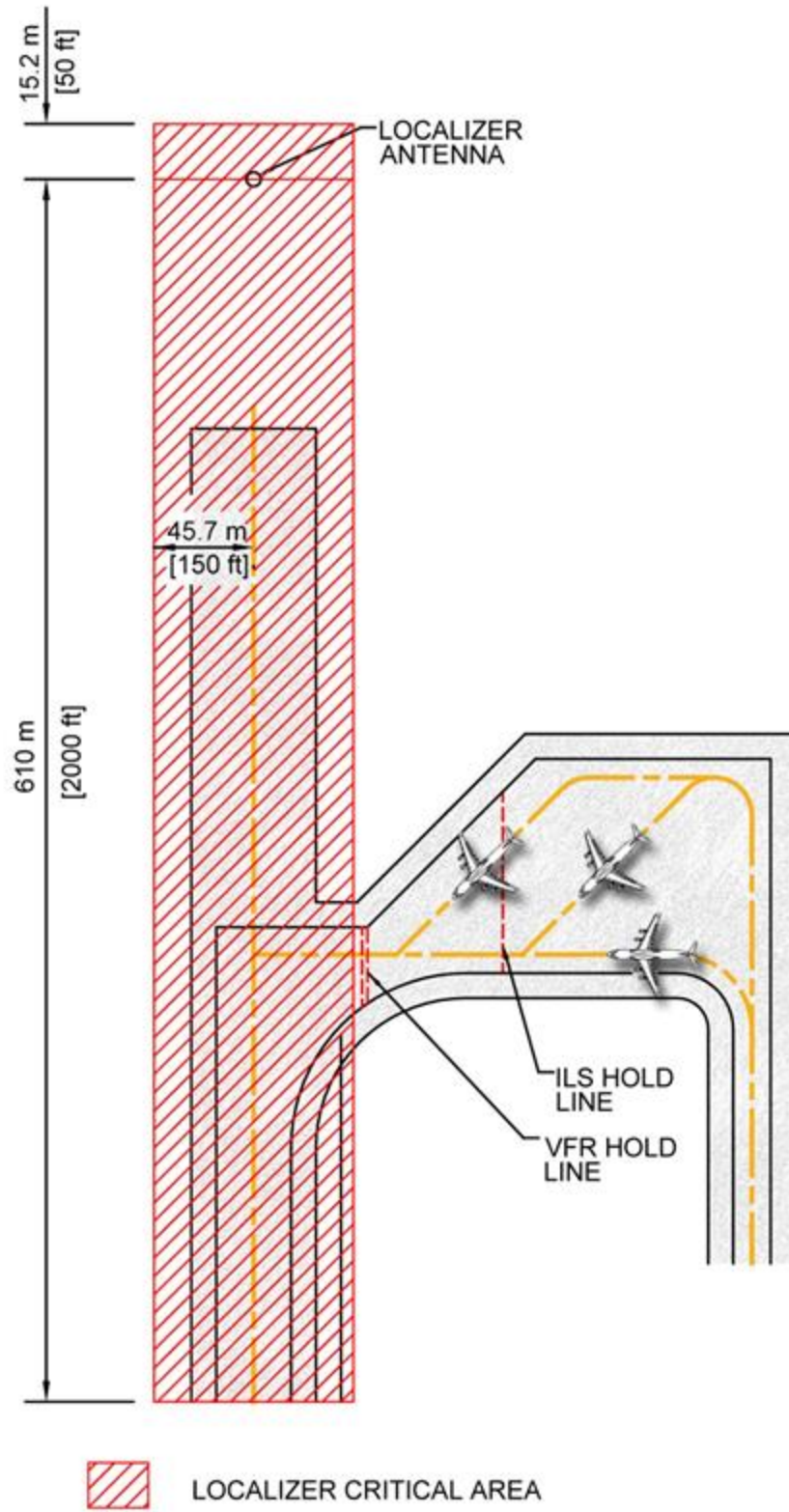


Figure 6.15. Warm-Up Pad Located in Approach or Departure Clearance Surface.



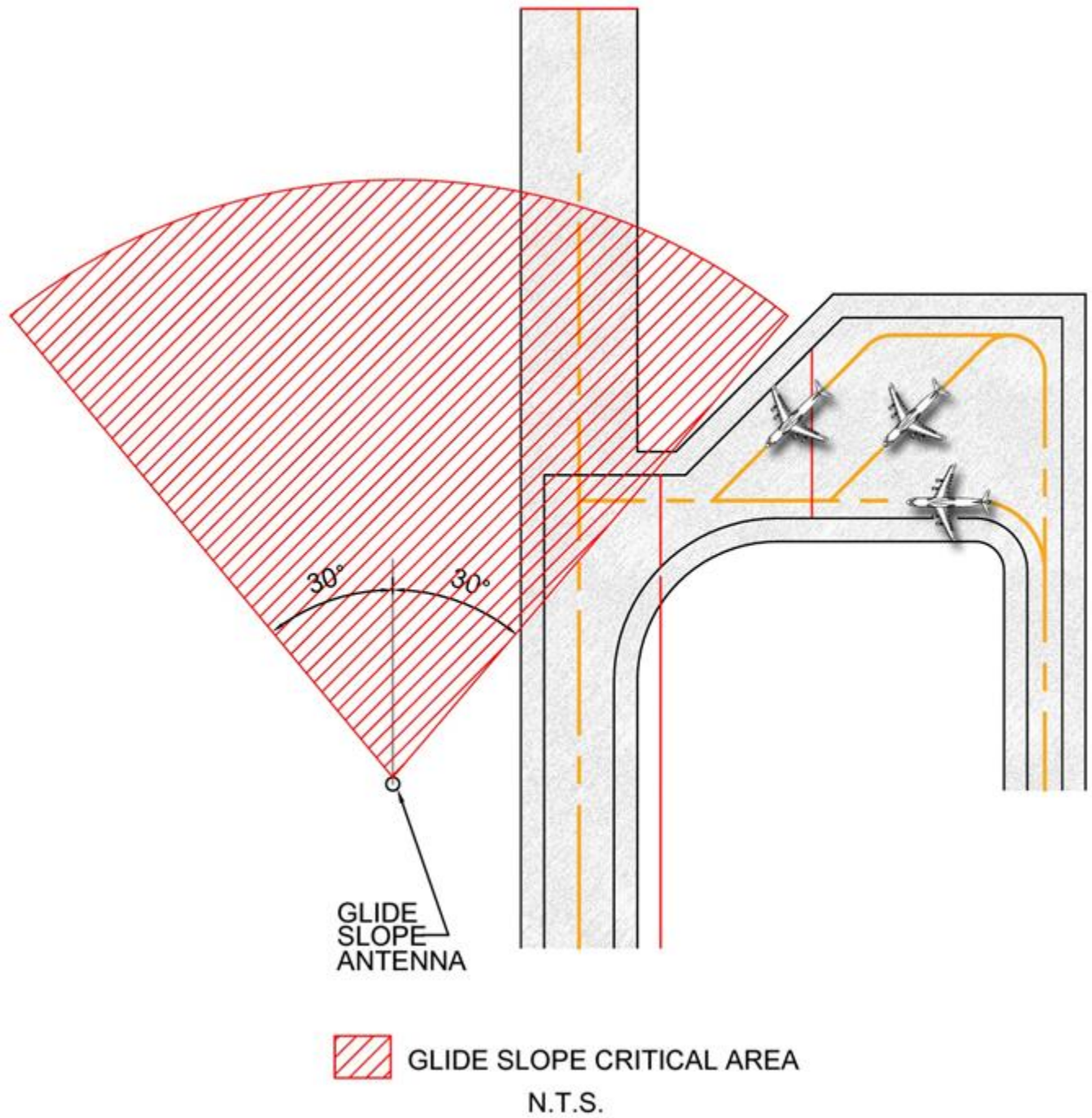
N.T.S.

**Figure 6.16. Warm-Up Pad Localizer Critical Area.**



N.T.S.

Figure 6.17. Air Force Warm-Up Pad Glide Slope Critical Area.



**Figure 6.18. Warm-Up Pad ILS Critical Area.**

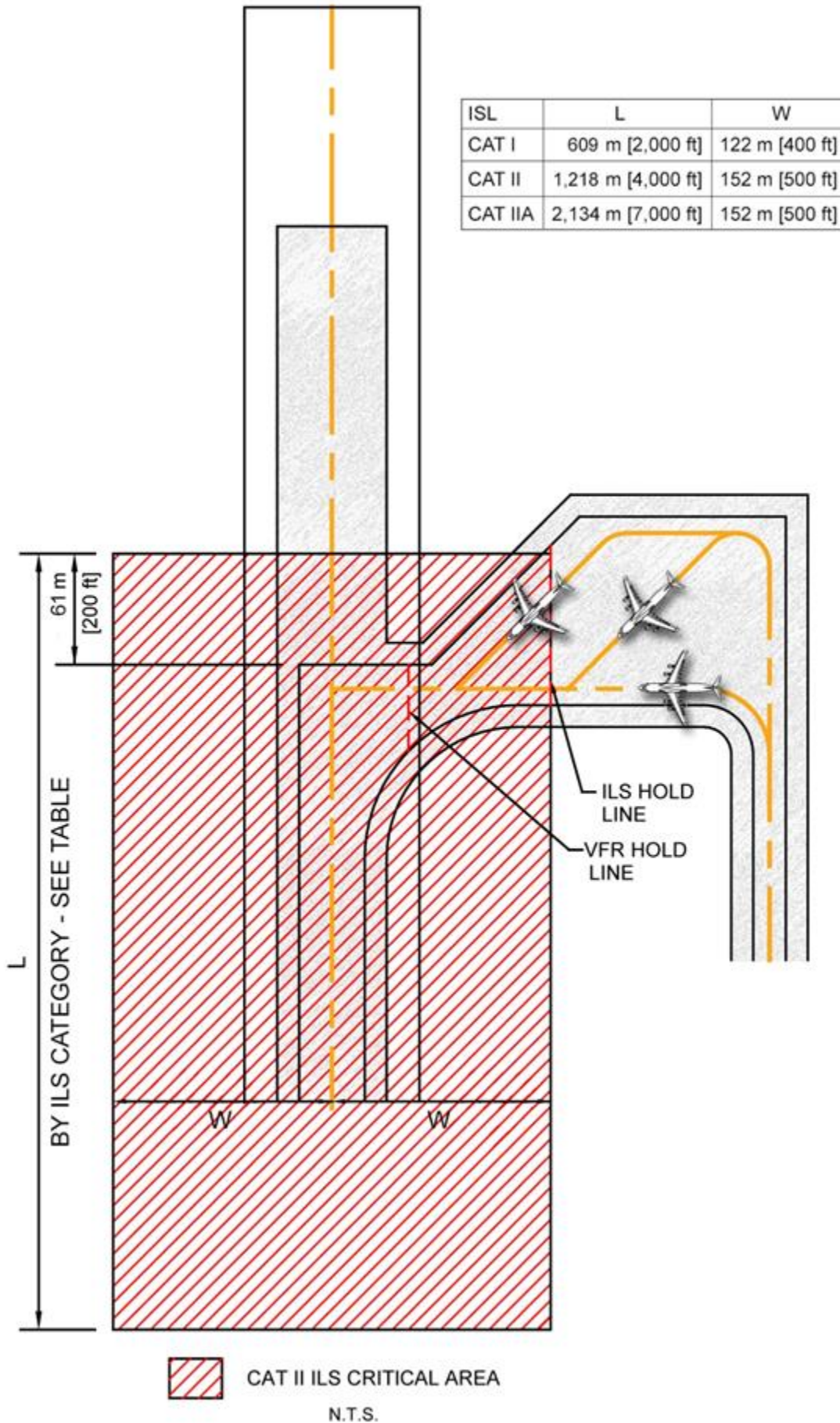
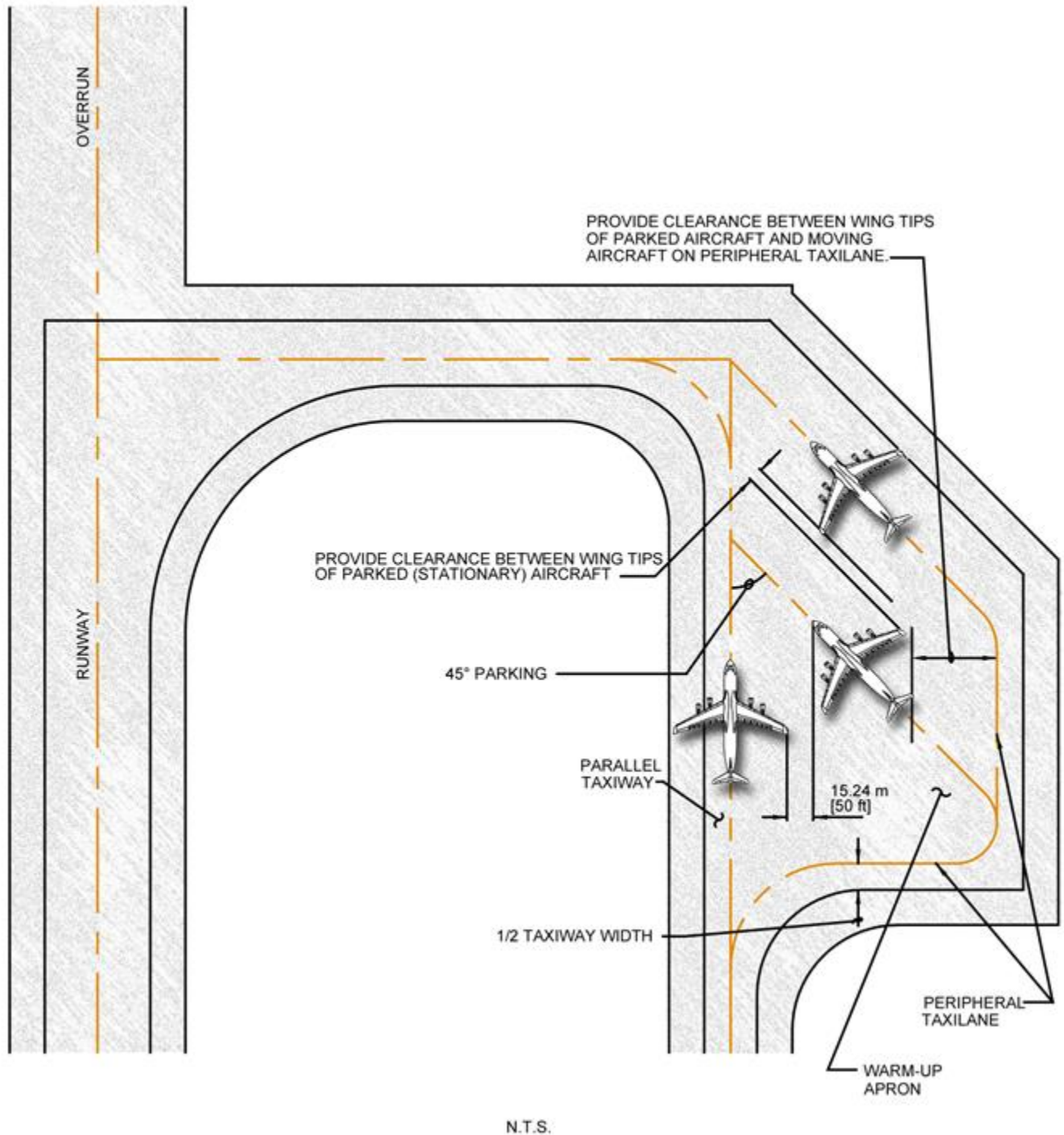


Figure 6.19. Warm-Up Pad Taxiing and Wingtip Clearance Requirements.



6.8.5. **Parking Angle.** Aircraft should be parked at a 45-degree (45°) angle to the parallel taxiway to divert the effects of jet blast away from the parallel taxiway. See UFC 3-260-01, Appendix B, Sections 7 for minimum standoff distances. This is shown in [Figure 6.19](#).

6.8.6. **Turning Radius.** The turning radius on warm-up pads will be designed to provide the minimum allowable turn under power for the largest aircraft assigned to the base.

6.8.7. **Taxilanes on Warm-Up Pads.** Taxilanes on the warm-up pads will meet the lateral clearance requirements discussed in [Table 6.1](#). Lateral and wingtip clearance for a taxilane on a warm-up pad are illustrated in [Figure 6.19](#).

6.8.8. **Tie-Downs and Grounding Points.** Tie-downs, mooring points, and grounding points are not required on warm-up pads.

**6.9. Power Check Pad.** An aircraft power check pad is a paved area, with an anchor block in the center, used to perform full-power engine diagnostic testing of aircraft engines while the aircraft is held stationary.

6.9.1. **Location and Siting Considerations.** Unsuppressed power check pads should be located near maintenance hangars, but at a location where full power engine diagnostic testing of jet engines can be performed with minimal noise exposure to inhabited areas on and off the base.

6.9.2. **Unsuppressed Power Check Pad Layout.** Power check pads may either be rectangular, square or circular, and are illustrated in [Figure 6.20](#), [Figure 6.21](#), and [Figure 6.22](#).

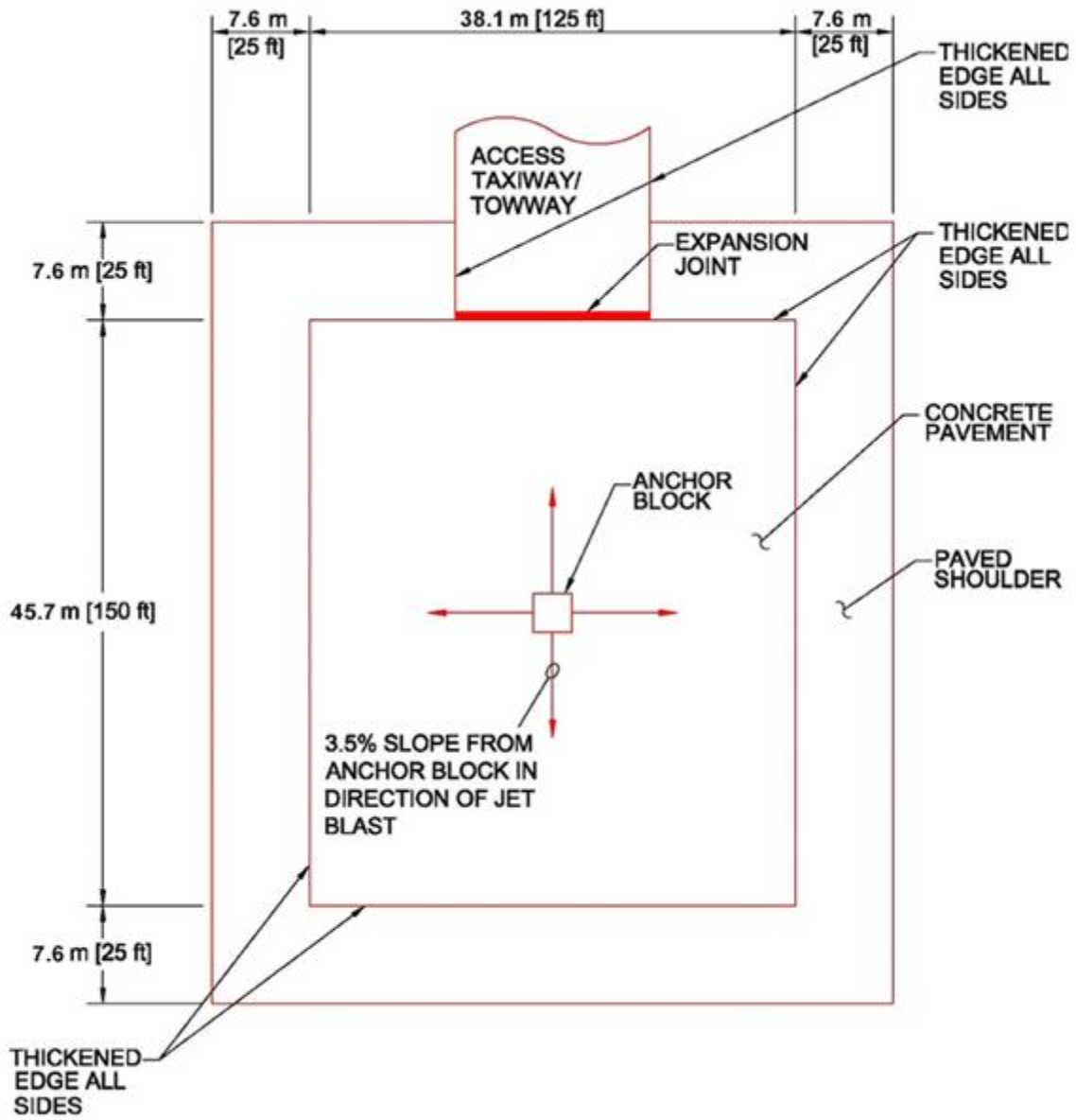
6.9.3. **Access Taxiway/Towway.** An access taxiway will be provided for access from the primary taxiway to the power check-pad. If the aircraft may be towed to the unsuppressed power check-pad, the access taxiway must be designed as a towway. Taxiway and towway design requirements are presented in [Chapter 5](#).

6.9.4. **Grading.** The surface of the unsuppressed power-check pad must slope 3.5% away from the anchor block to pavement edge to divert the effect of jet blast away from the concrete surfaces and pavement joints. See [Figure 6.23](#).

6.9.5. **Thrust Anchors.** Thrust anchors are required on unsuppressed power check pads. Layouts for these anchors are interdependent of joint spacing and the two should be coordinated together. Tie-down and grounding points are discussed further in UFC 3-260-01, Appendix B, Section 11.

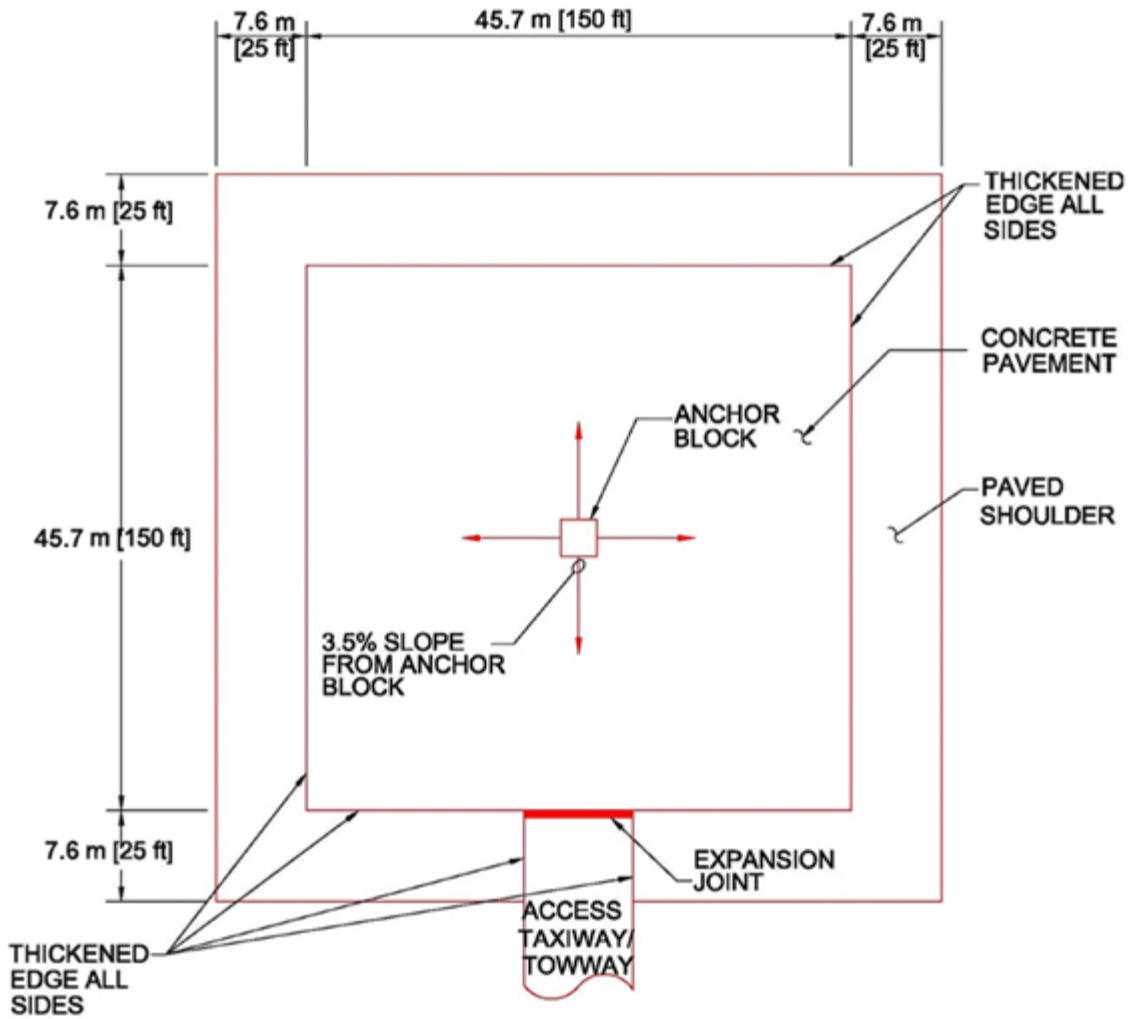
6.9.5.1. Power check pads (thrust anchor) designed for up to 267 kN (60,000 lbs) and for 445 kN (100,000 lb) are provided in UFC 3-260-01, Appendix B, Section 15.

Figure 6.20. Geometry for Rectangular Power Check Pad.



N.T.S.

Figure 6.21. Geometry for Square Power Check Pad.



N.T.S.

Figure 6.22. Geometry for Circular Power Check Pad.

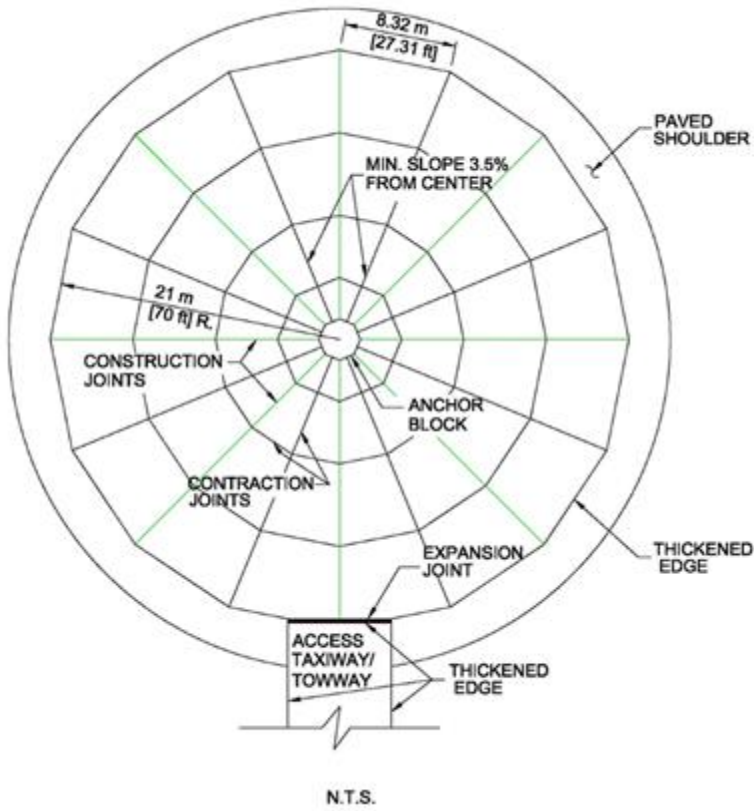
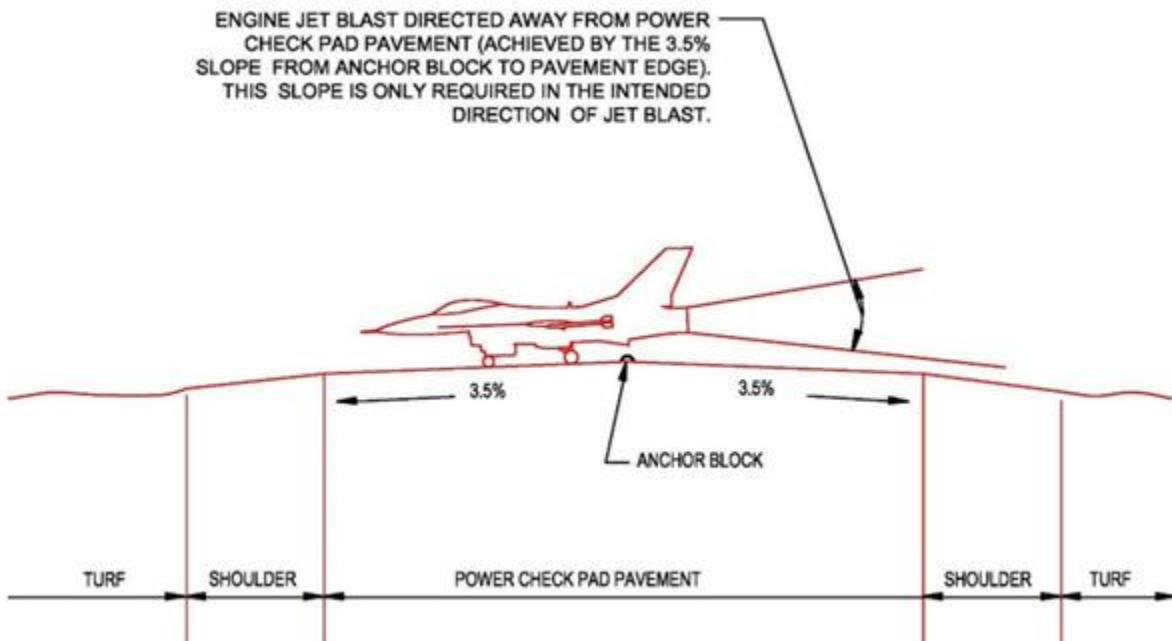


Figure 6.23. Power Check Pad Grading.



Notes:

1. Provide a 150mm brass monument anchored within the thrust block that indicates the following: “BIDIRECTIONAL THRUST ANCHOR MAXIMUM CAPACITY IS 60,000”
2. On the monument, show a bidirectional arrow indicating the intended directions for loading.

**6.9.6. Anchor Blocks.** All unsuppressed power check pads have a thrust anchor block installed in the center of the power-check pad to anchor the aircraft during engine testing. Anchor blocks are structurally designed for all tactical (non-transport) aircraft in the USAF inventory. The designer must verify structural adequacy of the anchor block for the mission aircraft and engine types. Thrust anchor blocks for USAFE-AFAFRICA aviation facilities are found in UFC 3-260-01, Appendix B, Section 15.

**6.9.7. Power Check Pad Facilities.**

**6.9.7.1. Required Facilities.** The unsuppressed power check pad should consist of:

6.9.7.1.1. Paved surface.

6.9.7.1.2. Paved shoulders (see UFC 3-260-01, Appendix B, Sections 7 and 8 for minimum standoff distances).

6.9.7.1.3. A thrust anchor or anchors for aircraft serviced at the pad.

6.9.7.1.4. Blast deflectors if required to protect the surrounding area from jet blast damage.

**6.9.7.2. Optional Facilities.** The unsuppressed power-check pad may include:

6.9.7.2.1. Floodlighting for night operations.

6.9.7.2.2. Water supply to wash down fuel spills.

6.9.7.2.3. Oil separators, holding tanks and fuel treatment to address fuel spillage prior to discharge into sanitary or storm sewer.

6.9.7.2.4. Communication link with the maintenance control room.

6.9.7.2.5. Fire hydrants.

6.9.7.2.6. A paved roadway to the unsuppressed power check pad for access by fire fighting, towing and aircraft maintenance support vehicles.

**6.9.8. Noise Considerations.** The noise level at unsuppressed power check pads may exceed 115 decibels (dB(a)) during power-up engine tests. Caution signs should be placed around the power check pad indicating both the presence of hazardous noise levels and the need for hearing protection.

**6.10. Arm/Dearm Pads.** The arm/dearm pad is used for arming aircraft immediately before take-off and for dearming (safing) weapons retained or not expended upon their return. Do not site new warm-up pads, other aprons, hot cargo spots, or taxiways to these facilities in a way that will allow penetration of the approach or departure clearance surfaces.

**6.10.1. Location.** Arm/dearm pads should be located adjacent to runway thresholds and sited such that armed aircraft are oriented in the direction of least populated areas or towards revetments.

**6.10.2. Siting Considerations:**

6.10.2.1. **Aircraft Heading.** The criteria for establishing the exact heading of the parked aircraft depend on the type of aircraft and associated weapons. This information is contained within the classified portion of the aircraft manuals. The most economical means of parking aircraft on the arm/dearm pads is at 45 degrees (45°) to the taxiway. However, because of the requirement to orient armed aircraft away from populated areas, this angle may vary.

6.10.2.2. **Forward Firing Munitions Protection Zone.** Coordinate with the responsible safety office to determine the specific risks associated with the mission aircraft and establish protection zones or available measures to mitigate risk. It is good practice to keep all buildings out of this protection zone to prevent damage from accidental weapon firing. This forward firing munitions protection zone may cross a runway, taxiway, or runway approach as long as the landing and taxiing aircraft can be seen by the arm/dearm quick check crews and the arming/dearming operations can cease for the period in which the aircraft passes. Parked aircraft or parked vehicles must not be located in the forward firing munitions protection zone. If a protection zone appropriate for the type of munitions to be used cannot be obtained, earth revetments or similar risk mitigation measures (barricades, etc.) should be used, but must be sited properly relative to wingtip and airspace clearance requirements.

6.10.2.3. **Electromagnetically Quiet Location.** Prior to construction of any pad, local field measurements must be taken to ensure that the location is electromagnetically quiet. To avoid potential electromagnetic interference from taxiing aircraft, pads should be located on the side of a runway opposite the parallel taxiway. Use concrete encased rigid steel conduits for any electrical conductors located within 200 ft of the pad. The Air Force conducts electromagnetic radiation (EMR) surveys with regard to explosives safety in accordance with AFI 91-208, *Hazards of Electromagnetic Radiation to Ordnance (HERO)*. The specific information for each emitting device should be available through the installation communications squadron.

6.10.2.4. **Arm/Dearm Pad Clearances.** Arm/dearm pads should be situated to provide a minimum of 75 m (250 ft) between any part of an aircraft using the pad and the runway centerline.

6.10.3. **Arm/Dearm Pad Size.** Each arm/dearm pad should be capable of servicing four or six aircraft at a time. The dimensions may vary with the length and wingspan of the aircraft to be served. Jet blast must also be taken into account. Typical layout of arm/dearm pads are shown in Figures 6.24 through 6.27. Arm/Dearm pad size may be increased as mission requirements dictate.

6.10.4. **Taxi-In/Taxi-Out Capabilities.** The parking locations should have taxi-in/taxi-out capabilities to allow aircraft to taxi to their arm/dearm location under their own power.

6.10.5. **Parking Angle.** The parking angle is dependent on the type of aircraft, type of weapons and the associated “uninhabited clear zone” location.

6.10.6. **Turning Radius.** The turning radius for taxilanes on arm/dearm pads should be designed to provide the minimum allowable turn under power of the largest aircraft, which will use the arm/dearm pad.

6.10.7. **Access Road.** An all-weather access road should be constructed to the arm/dearm pad from outside the airfield’s taxiway and runway clearance areas. Design this road in accordance with UFC 3-250-18FA, *General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas* and UFC 3-250-01FA, *Pavement Design for Roads, Streets, Walks, and Open Storage Areas*. Access roads must not encroach on taxiway clearances or taxilane wingtip clearance requirements (except at necessary intersections with these areas), nor shall any parking area associated with the access road be sited so that maintenance vehicles will violate the approach or departure clearance surfaces or any NAVAID critical area.

6.10.8. **Tie-Downs and Grounding Points.** Tie-downs and mooring points are not required on arm/ dearm pads. See UFC 3-260-01, Appendix B, Section 11, Tie-downs, Mooring, and Grounding Points, for grounding requirements.

6.10.9. **Ammunition and Explosives Safety Standards.** Ammunition and explosive safety standards are discussed in UFC 3-260-01, Appendix B, Section 9, *Explosives On or Near Airfields* and DESR 6055.09\_AFMAN 91-201, *Explosive Safety Standards*.

Figure 6.24. Arm/Dearm Pad for F-15 Fighter.

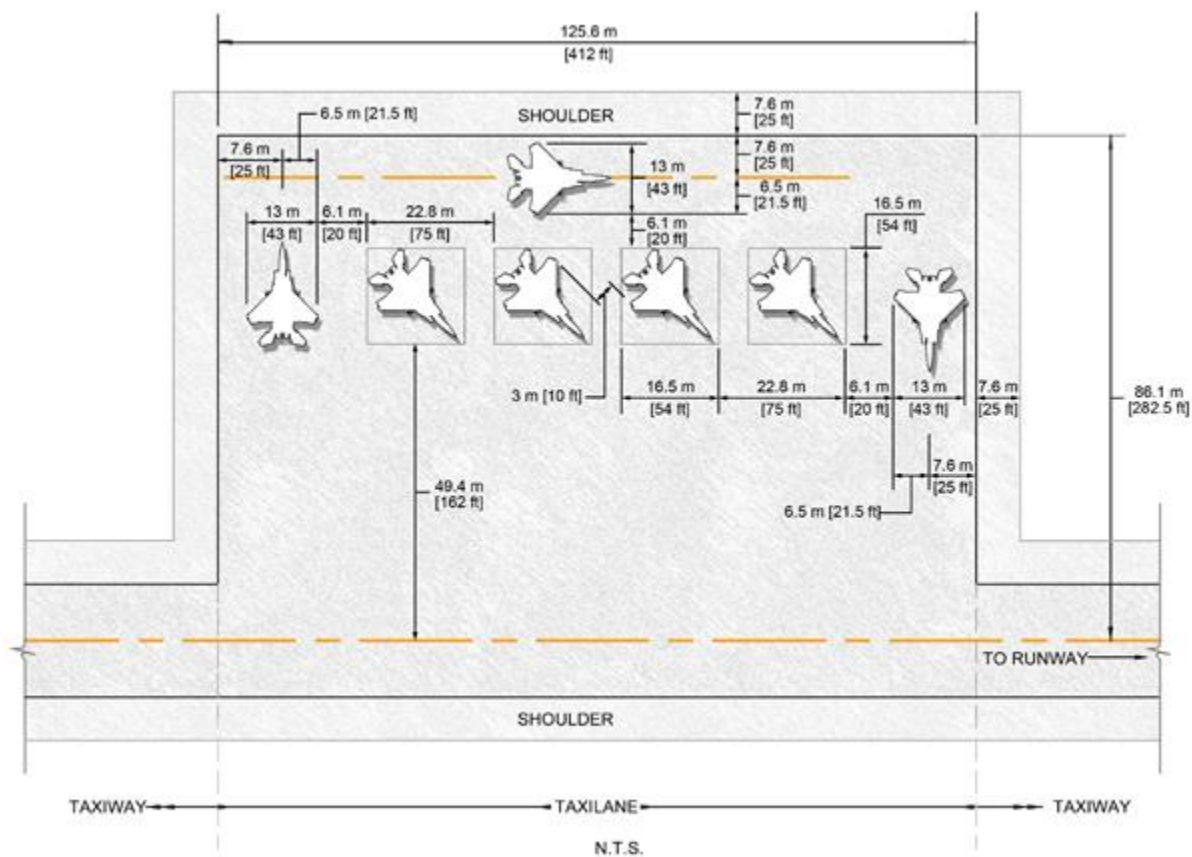




Figure 6.26. Arm/Dearm Pad for F-22 Fighter.

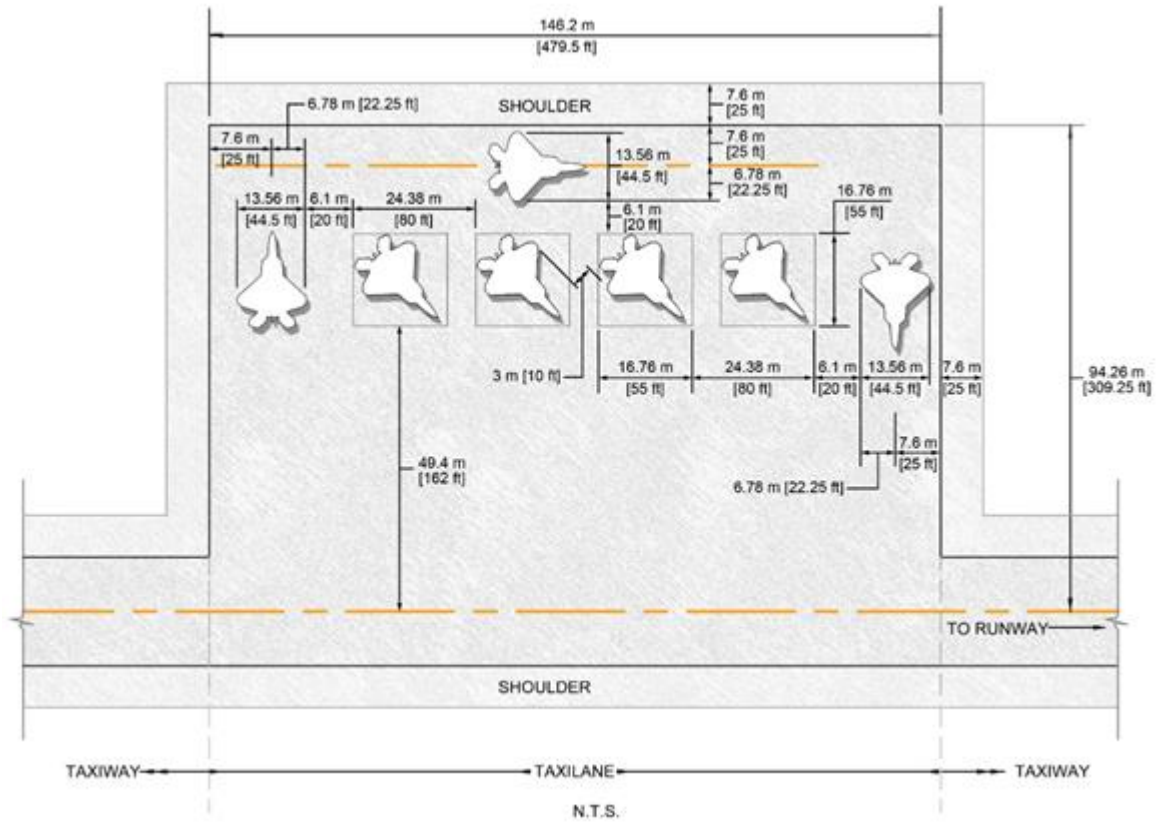
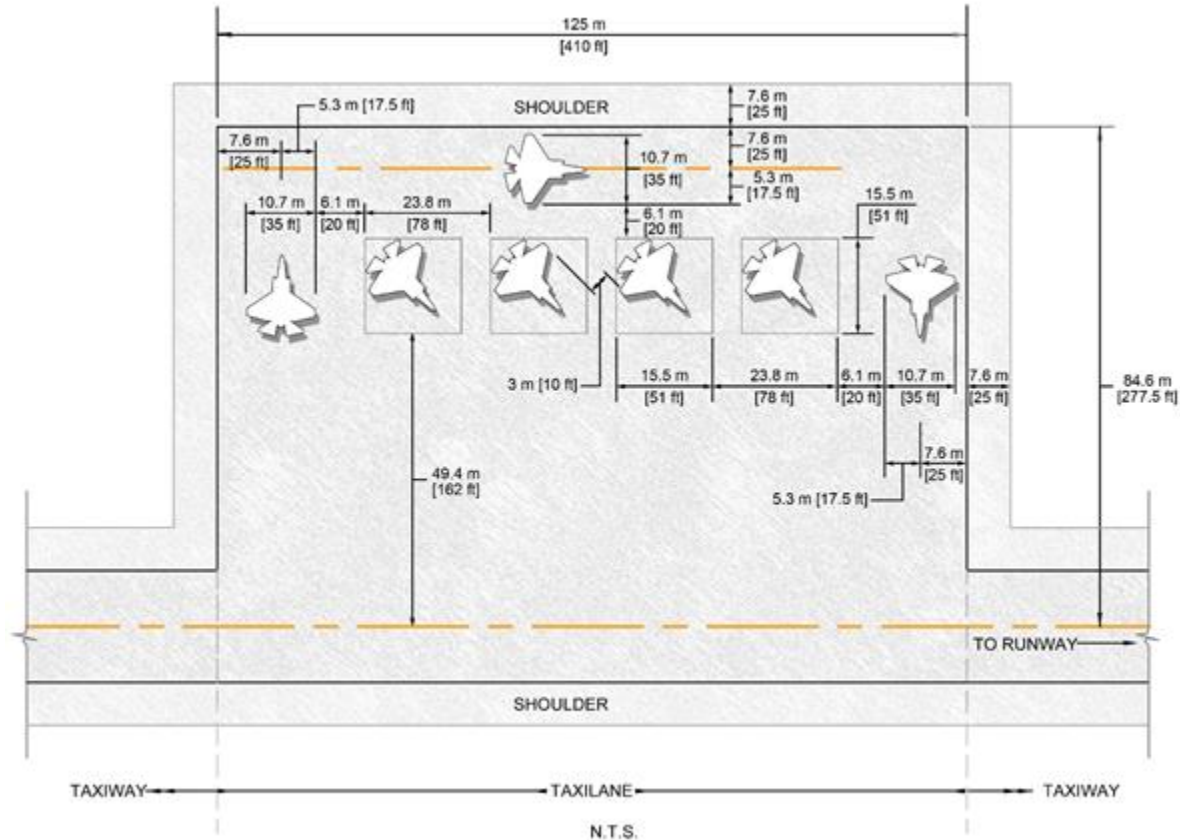


Figure 6.27. Arm/Dearm Pad for F-35 Fighter (JSF).



**6.11. Compass Calibration Pad (CCP).** An aircraft compass calibration pad (CCP) is a paved area in a magnetically quiet zone where an aircraft's compass is calibrated.

**6.11.1. USAFE-AFAFRICA Options.** The Air Force has the option of using the criteria presented here or using the criteria provided in Appendix 4 of the Federal Aviation Administration Advisory Circular (FAA AC 150/5300-13, Airport Design). For CCP marking requirements, use the controlling aircraft technical order (T.O.) or use the information in FAA AC 150/5300-13 for general purpose CCPs.

**6.11.2. Location.** The CCP should be located off the side of a taxiway at sufficient distance to satisfy the runway and taxiway lateral clearance distance and airspace criteria discussed in [Chapter 3](#), [Chapter 4](#) and [Chapter 5](#). Do not site new CCPs, other aprons, hot cargo spots, or taxiways to these facilities in a way that will allow penetration of the approach or departure clearance surfaces.

**6.11.3. Siting Considerations.**

**6.11.3.1. Separation Distances.** To meet the magnetic quiet zone requirements and prevent outside-magnetic fields from influencing the aircraft compass calibration, efforts must be taken to make sure that minimum separation distances are provided. See UFC 3-260-01, Appendix B, Section 10, Compass Calibration Pad Magnetic Survey, for CCP separation distances.

6.11.3.2. **Preliminary Survey.** During the site selection process, the proposed sites for compass calibration pads must be checked for magnetic influences to ensure that the area is magnetically quiet regardless of adherence to separation distances. Conduct a preliminary survey, as described in UFC 3-260-01, Appendix B, Section 10 to determine if the proposed site is magnetically quiet. A survey, similar to the preliminary survey, must be conducted after construction of any new item, building, within or near the separation distances of the pad. This will ensure that the newly constructed item has not created new magnetic influences in the magnetic quiet zone.

6.11.3.3. **Magnetic Survey.** The CCP magnetic survey is an airfield engineering survey used to ensure that the CCP area is magnetically quiet, to determine the magnetic variation (MagVar) of the area, and to layout the markings for the pad. A magnetic survey shall be conducted after construction of a new CCP and at regular intervals thereafter to ensure the CCP remains suitable for aircraft magnetic compass calibrations. The procedure to conduct magnetic surveys is outlined in UFC 3-260-01 Appendix B, Section 10. The magnetic survey for CCPs should be performed in accordance with UFC 3-260-01, Appendix B, Section 10.

6.11.3.3.1. **Magnetic Survey Frequency.** Because the Magnetic North Pole is constantly moving, the MagVar at any location on the Earth is constantly changing at varying rates. Check the MagVar and the MagVar rate of change for any latitude/longitude using <https://www.ngdc.noaa.gov/geomag/declination.html>. Every CCP must be re-surveyed periodically to update the MagVar, update the alignment with Magnetic North, and update the CCP markings. The CCP markings shall be removed and replaced when the new MagVar differs by more than 30 arc-minutes (0.5 degrees) from the existing CCP markings. In addition, periodic re-surveys ensure the CCP area remains a magnetically quiet zone, which is essential for accurate aircraft magnetic compass calibrations.

6.11.3.3.1.1. A CCP must be re-surveyed and the markings updated when the MagVar changes by more than 30 arc-minutes from the existing markings. For CCPs where the MagVar rate of change is low (7 arc-minutes or less per year), a re-survey must be conducted at an interval of 5 years or less. At locations where the MagVar rate of change is greater than 7 arc-minutes per year, more frequent re-surveys are required. **Table 6.3** lists the re-survey frequency needed based on MagVar rates of change. If at any time the difference exceeds the tolerance of the aircraft compass or calibration equipment, the Airfield Manager may schedule a survey more frequently. **(T-3)**

6.11.3.3.1.2. Periodic surveys to re-calibrate the marked directions on the CCP are required at a minimum every five years. In locations where the magnetic variation over time is high, more frequent re-calibration is required. **Table 6.3** lists re-survey frequency needed to keep the difference between marked north and magnetic north less than 50 arc-minutes. If the difference exceeds the tolerance of the aircraft compass or calibration equipment, the Airfield Manager may schedule a survey more frequently. **(T-3)**

**Table 6.3. Magnetic Survey Frequency Requirements.**

<b>Magnetic Variation Rate of Change [arc-minutes per year]</b>	<b>Re-Survey Frequency</b>
≤ 7	5 years
8	4 years
9-10	3.5 years (42 months)
11	3 years
12-14	2.5 years (30 months)
15-18	2 years
≥ 19	1.5 years (18 months)

6.11.3.3.2. **Additional Information.** The Naval Air Warfare Center-Aircraft Division (NAWCAD-4.5.3), an authority on CCPs, substantially contributed to this criteria. For additional information on CCP survey and maintenance, contact: Naval Air Warfare Center-Aircraft Division, NAWCAD-4.5.3, Core Avionics Engineering Division Building 2187, NAS Patuxent River, MD. Phone: (301) 342-9122

6.11.4. **CCP Size.** CCP size requirements are shown on [Figure 6.28](#) Unless otherwise stated in the datasheets of the primary programmed aircraft using the pad, the CCP shall be sized as follows: (Wingspan + 5 m [16.4 ft]) by (Length + 10 m [32.8 ft]).

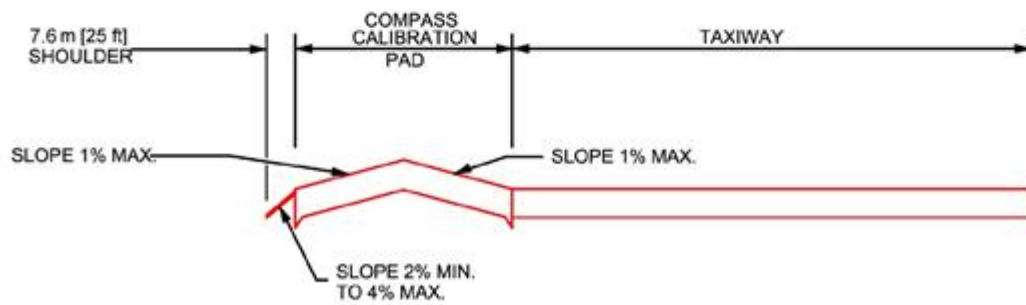
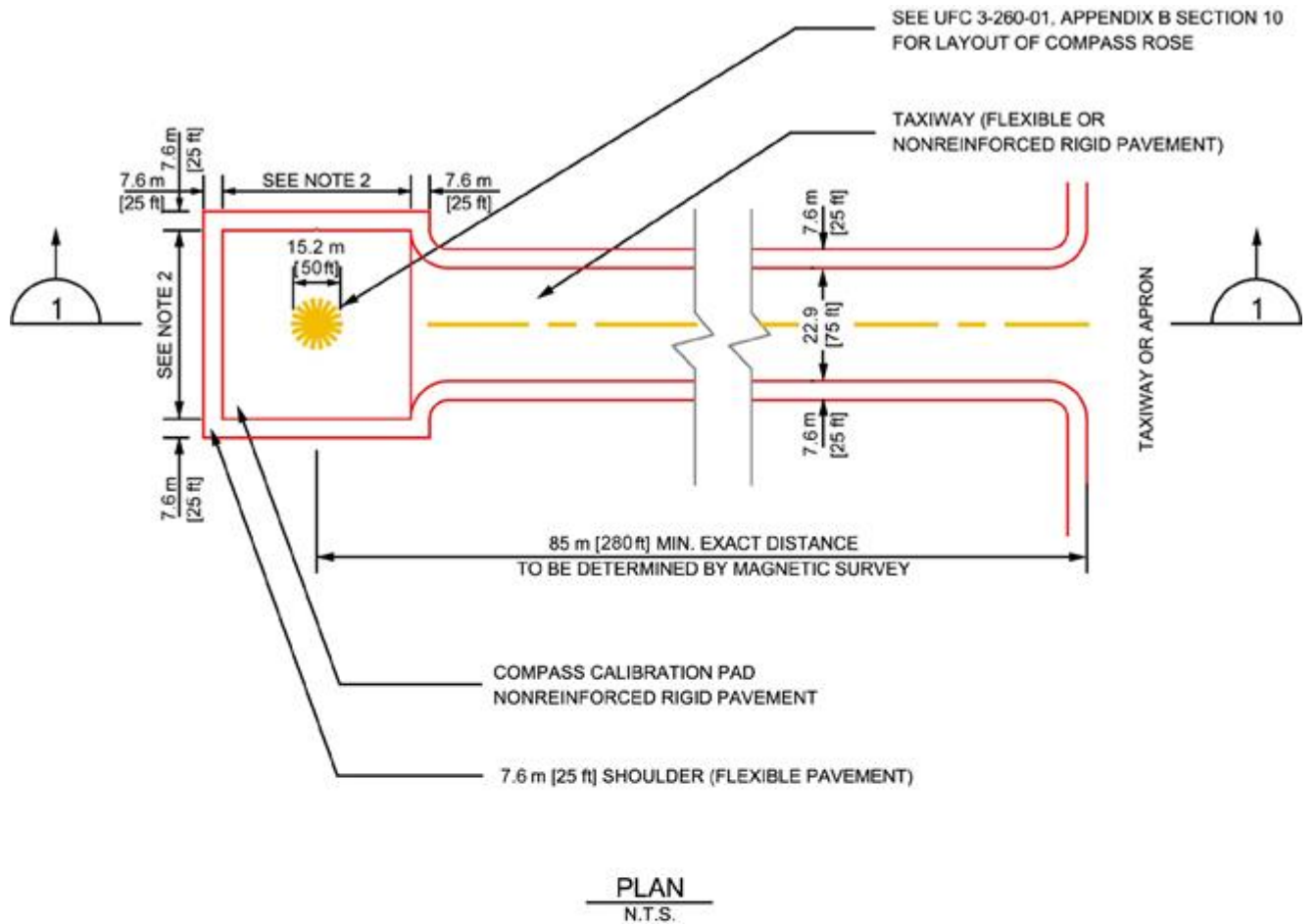
6.11.5. **Access Taxiway/Towway.** An access taxiway will be provided for access from the primary taxiway to the CCP. The access taxiway must be oriented to facilitate moving the aircraft onto the CCP on a magnetic north heading. If the aircraft should be towed to the CCP, the access taxiway must be designed as a towway. Taxiway and towway design requirements are presented in [Chapter 5](#).

6.11.6. **Grading.** Compass calibration pads will be graded as follows:

6.11.6.1. **Perimeter Elevation.** The elevation of the perimeter of the pad will be the same around the entire perimeter.

6.11.6.2. **Cross-slope.** The CCP should be crowned in the center of the pad with a constant cross slope of 1% in all directions to provide surface drainage while facilitating alignment of the aircraft pad.

Figure 6.28. Compass Calibration Pad (CCP).



Notes:

1. Thickness of concrete and base course, base course density, type of shoulder surfacing and Chemical, Biological, Radiological (CBR) of shoulder base course are governed by existing criteria or are dependent upon site conditions.

2. Size of CCP is (Wingspan + 5 m [16.4 ft]) by (Length + 10 m [32.8 ft]) of the primary programmed aircraft.

6.11.7. **Tie-downs/Mooring Points.** Do not place aircraft tie-down/mooring points/tie-down mooring eyes, or any static grounding points in the CCP pavement.

6.11.8. **Embedded Material.** Due to the influence of ferrous metal on a magnetic field, the Portland Cement Concrete (PCC) pavement for the CCP and access taxiway must not contain any embedded ferrous metal items such as dowels bars, reinforcing steel or steel fibers. In addition, ferrous metal must not be placed in or around the CCP site.

6.11.9. **Control Points.** A control point will be set in the center of the CCP. This point will consist of a brass pavement insert into which a bronze marker is grouted in accurate alignment. This point will be stamped with "Center of Calibration Pad." The layout of the control points is discussed in UFC 3-260-01, Appendix B, Section 10.

6.11.10. **Markings.** See UFC 3-260-01, Appendix B, Section 10.

**6.12. Hazardous Cargo Pads.** Hazardous cargo pads are paved areas for loading and unloading explosives and other hazardous cargo from aircraft. Hazardous cargo pads are required at facilities where the existing aprons cannot be used for loading and unloading hazardous cargo. Do not site new hazardous cargo pads, other aprons, hot cargo spots, or taxiways to these facilities in a way that will allow penetration of the approach or departure clearance surfaces. A Hazardous Cargo Pad is not authorized in a runway Clear Zone.

6.12.1. **Siting Criteria.** Hazardous cargo pads require explosives site planning as discussed in UFC 3-260-01, Appendix B, Section 9.

6.12.2. **Hazardous Cargo Pad Size.** New Hazardous Cargo Pads shall be designed to accommodate the largest programmed aircraft for the airfield. Coordination with HQ USAFE-AFAFRICA/SEW is required. An access taxiway will be provided for access from the primary taxiway to the hazardous cargo pad. The taxiway should be designed for the aircraft to taxi onto the hazardous cargo pad.

6.12.2.1. **Circular Pad.** At aviation facilities used by small cargo aircraft, the hazardous cargo pad is a circular pad as shown in [Figure 6.29](#).

6.12.2.2. **Semicircular Pad.** At aviation facilities used by large cargo aircraft and at aerial ports of embarkation (APOE) and aerial ports of debarkation (APOD), the hazardous cargo pad is semicircular, as shown in [Figure 6.30](#) The semicircular pad is adequate for aircraft up to and including the dimensions of the C-5.

6.12.2.3. **Other Pad Size.** The hazardous cargo pad geometric dimensions as shown in [Figure 6.29](#) and [Figure 6.30](#) are minimum requirements. Hazardous cargo pads may be larger than these dimensions if the design aircraft cannot maneuver on the pad. Sources for obtaining information concerning minimum turning radii for various aircraft are presented in Army USACE TSC Report 13-2.

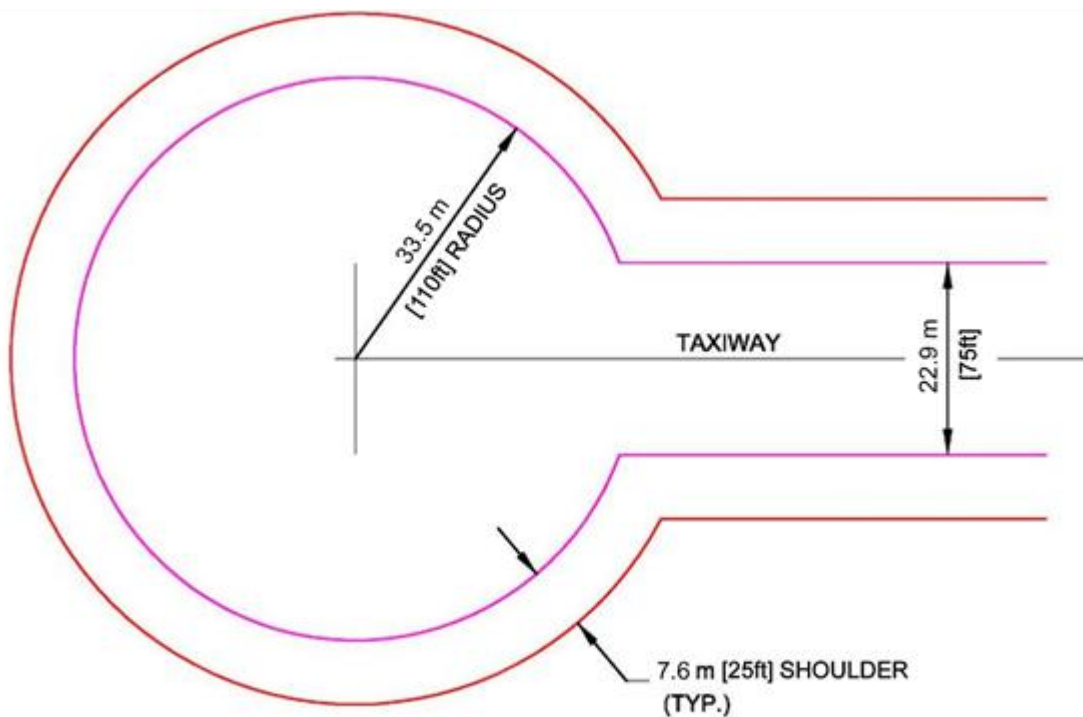
6.12.3. **Tie-Down and Grounding Points.** Provide tie-downs/mooring capabilities and grounding points on each hazardous cargo pad. See UFC 3-260-01, Appendix B, Section 11 for further information.

6.12.4. **Miscellaneous Considerations.** The following items need to be considered for hazardous cargo pads:

6.12.4.1. **Utilities.** Telephone service, apron lighting, airfield lighting and water/fire hydrants are required for safety.

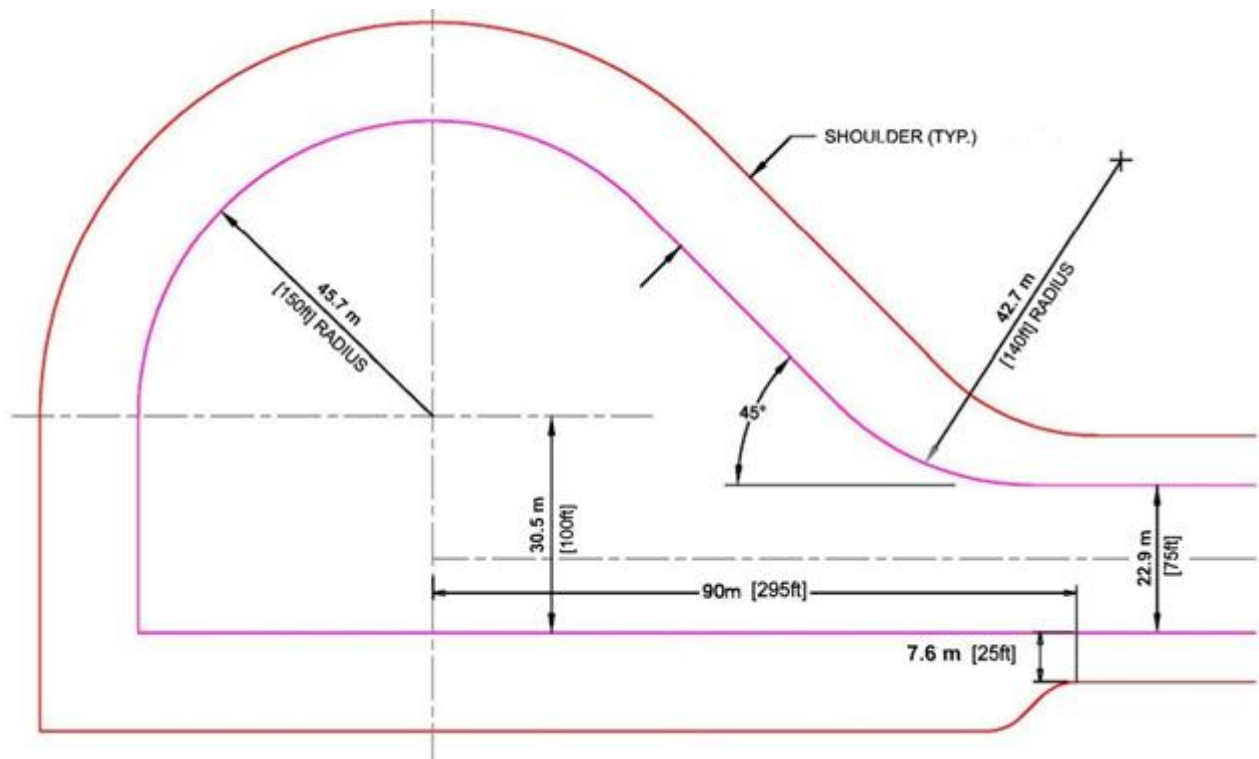
6.12.4.2. **Access Road.** Provide a paved roadway to improve access to the hazardous cargo pad by trucks and other vehicles.

**Figure 6.29. Hazardous Cargo Pad Other than APOE/Ds.**



N.T.S.

**Figure 6.30. Typical Hazardous Cargo Pad for APOE/Ds.**



**Note:** This hazardous cargo pad is adequate for aircraft up to and including the C-5. The dimensions may be adjusted to accommodate limiting constraints at individual facilities.

**6.13. Alert Pad.** An alert pad, often referred to as an alert apron, is an exclusive paved area for armed aircraft to park and have immediate, unimpeded access to a runway. In the event of a declared alert, alert aircraft must be on the runway and airborne in short notice. An alert apron and an alert pad are shown on [Figure 6.31](#) and [Figure 6.32](#) respectively.

**6.13.1. Location.** Locating the alert apron/pad adjacent to a runway end will allow alert aircraft to proceed directly from the apron/pad to the runway threshold without interruptions from other traffic. Alert pads must be located close to the runway threshold to allow alert aircraft to be airborne within the time constraints stipulated in their mission statements. The preferred location of alert pads is on the opposite side of the runway, away from normal traffic patterns to allow aircraft on the alert apron/pad direct, unimpeded access to the runway. Alert aprons/pads must not be located so that the aircraft or shelters are within the clear zone or penetrate the approach or departure clearance surfaces.

#### 6.13.2. Siting Criteria.

**6.13.2.1. Airspace Imaginary Surfaces.** As discussed in [paragraph 6.8.2.2](#), aircraft parked on the alert aprons/pads must not project into airspace imaginary surfaces.

**6.13.2.2. Explosives Consideration.** Aircraft loaded with explosives on alert pads should be located to minimize the potential for explosive hazards. Explosives safety site plans must be prepared for explosive-loaded alert aircraft. See UFC 3-260-01, Appendix B, Section 9.

6.13.3. **Alert Apron/Pad Size.** Alert aprons/pads dimensions should vary with the length and wingspan of the aircraft to be served and the explosives on the aircraft. Wingtip clearances, presented in [Table 6.4](#), are minimum separation distances to be observed at all times.

**Table 6.4. Minimum Separation Distance on Tanker/Bomber Alert Aprons from the Centerline of a Through Taxilane to a Parked Aircraft.**

Aircraft	Standard (m)	Standard (ft)	Minimum (m)	Minimum (ft)
B-52 or B-52 Mixed Force B-1 B-2	45.7	150	38.1	125
KC-46	41.91	137.5	34.3	112.5
KC-135	38.1	125	30.5	100
KC-10	30.5	100	22.9	75

**Figure 6.31. Typical Alert Apron for Bombers and Tanker Aircraft.**

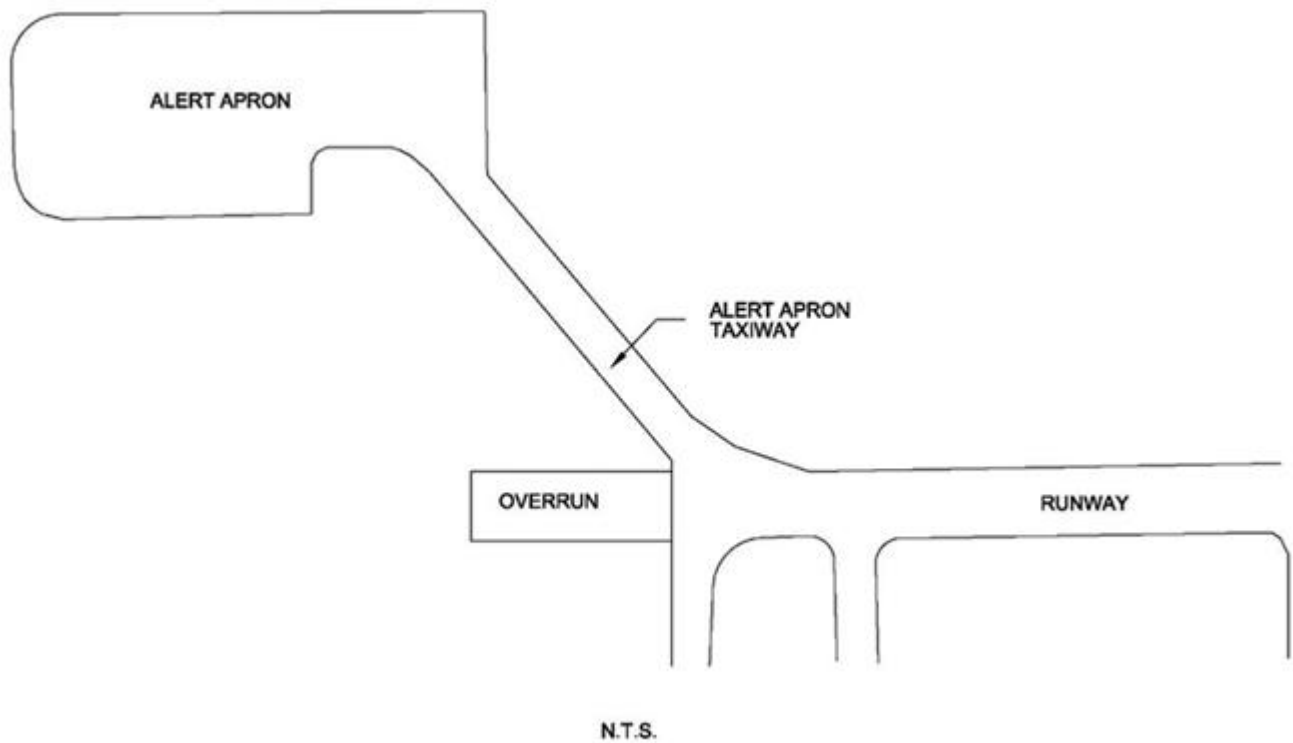


Figure 6.32. Typical Alert Pad for Fighter Aircraft.

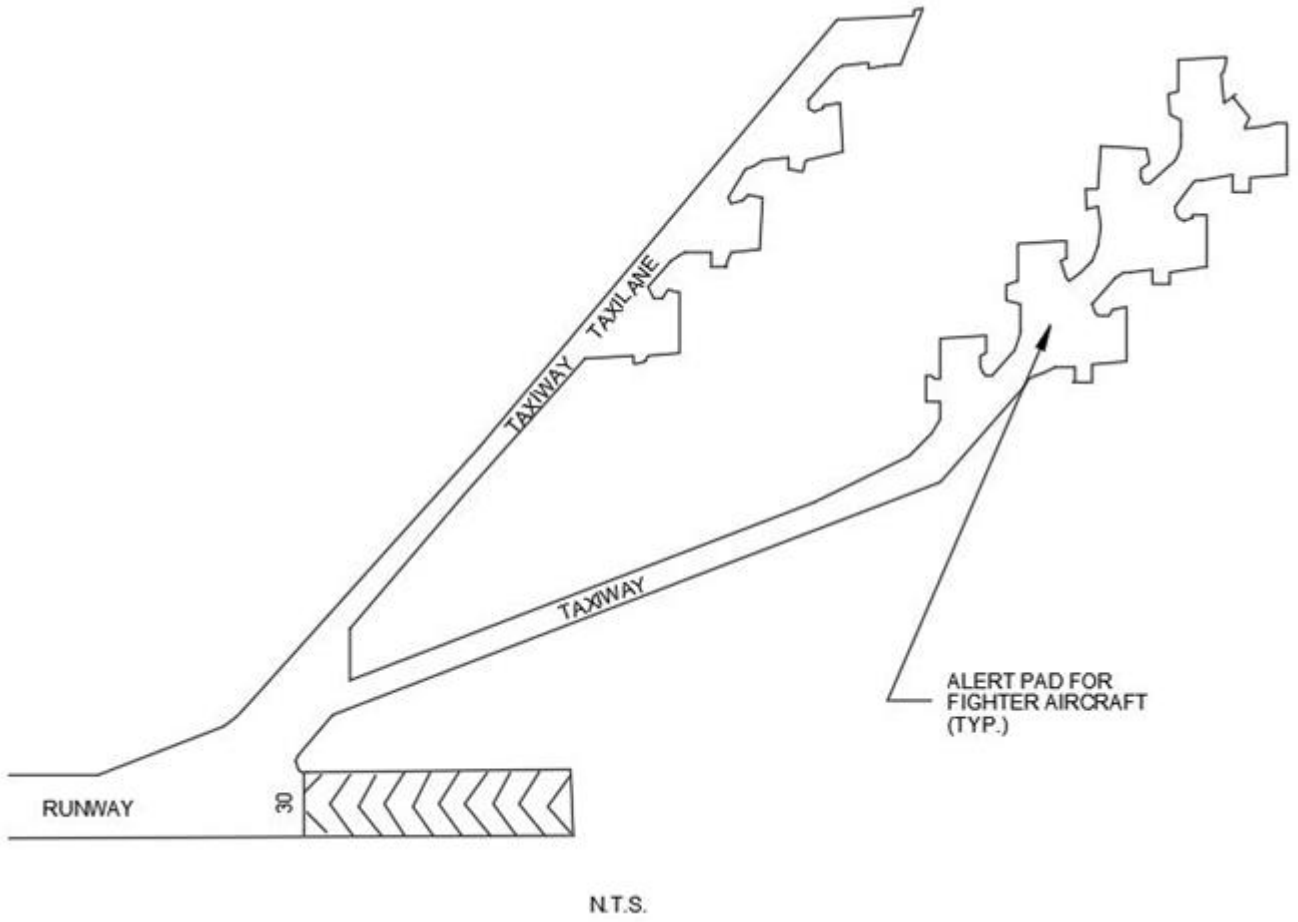
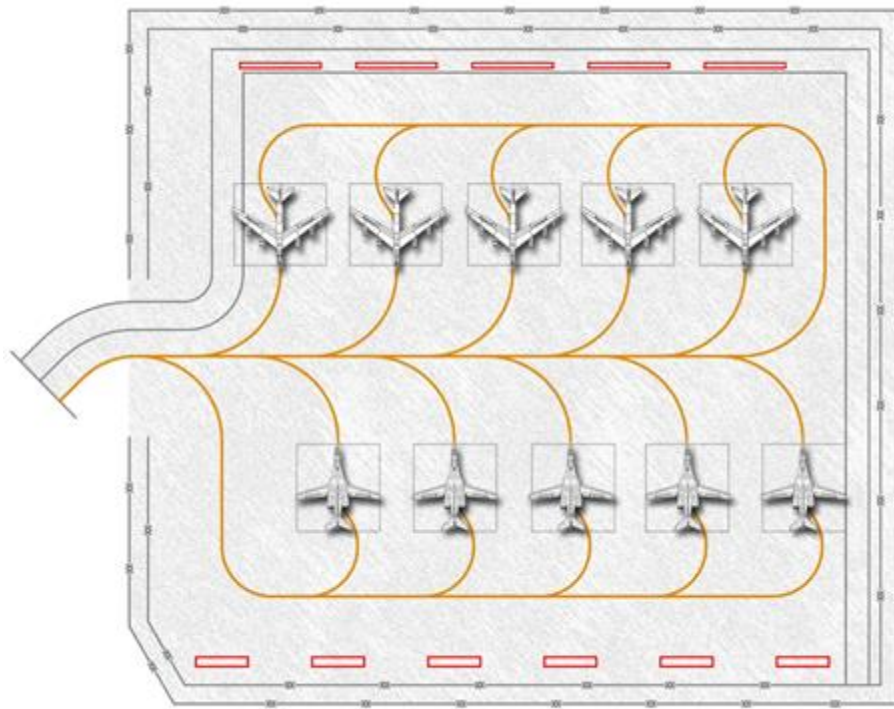
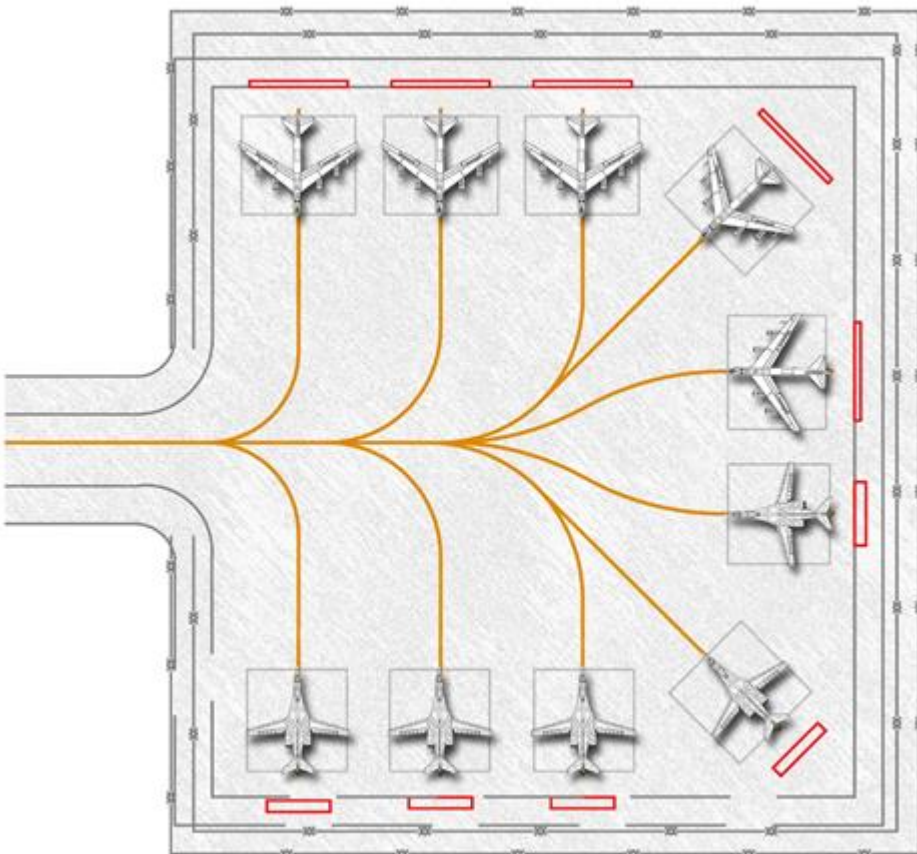


Figure 6.33. Alert Apron Taxi-In Taxi-Out Parking.



N.T.S.

**Figure 6.34. Alert Apron Back-In Parking.**

N.T.S.

6.13.4. **Design Aircraft.** To facilitate flexibility in future operations, new alert ramp construction should be designed to accommodate the largest programmed aircraft for the airfield. Aircraft parked in shelters are exempt from the above parking separation criteria.

6.13.5. **Alert Aircraft Parking Arrangements.**

6.13.5.1. **Fighter Arrangements.** Fighter aircraft are parked at 45-degree angles to dissipate the heat and velocity of jet blast.

6.13.5.2. **Non-Fighter Arrangements.** Non-fighter aircraft should be parked in rows.

6.13.6. **Jet Blast Distance Requirements.** Jet blast safe distances should be considered when planning and designing parking locations on alert pads. Safe distance criteria are presented in UFC 3-260-01, Appendix B, Section 7.

6.13.7. **Taxi-In/Taxi-Out Capabilities.** Alert aprons and pads should be designed either for taxi-in/ taxi-out parking or for push-back parking. Taxi-in/taxi-out parking, shown in [Figure 6.33](#) is preferred since alert aircraft can be quickly taxied into position under their own power. Back-in parking, shown in [Figure 6.34](#), requires less paved area.

6.13.8. **Turning Radius.** The turning radius on the alert pad taxilanes will be designed to provide the minimum allowable turn under power of the largest aircraft, which will use the alert apron/pad. In no case will the initial turnout from the alert apron/pad parking space to the

through taxilane exceed 90 degrees. For alert pads for bombers and tankers, the initial turn from the parking space will have a turn radius equal to the distance from the taxilane centerline to the nose of the aircraft (See [Table 6.1](#)).

**6.13.9. Dedicated Access Taxiway.** At alert pads, provide a single dedicated taxiway from the alert pad to the runway for aircraft to progress directly without traffic interruptions. Having no other taxiways intersect the dedicated taxiway is the ideal way to ensure the dedicated taxiway is not obstructed.

**6.13.10. Tie-Downs and Grounding Points.** Provide tie-downs/mooring capabilities and grounding points at each aircraft parking location, as discussed in UFC 3-260-01, Appendix B, Section 11.

**6.14. Aircraft Wash Racks.** Refer to UFC 3-260-01, Chapter 6, Aprons and Other Pavements, for aircraft wash rack design criteria. Also refer to the respective host nation’s Final Governing Standards (FGS) for environmental requirements. Where an FGS does not exist for a specific host nation, refer to the Overseas Environmental Baseline Guidance Document (OEBGD).

**6.15. Hangar Access Aprons.** Hangar access aprons provide access to the hangars from the parking apron and allow free movement of aircraft to the various hangar facilities. Access aprons should be provided as a supporting item for each hangar and should be sized for the type of aircraft to be accommodated.

**6.15.1. Dimensions.** Generally, hangar access aprons should be as wide as the hangar doors and extend from the edge of the apron to the hangar door. Hangar access apron dimension requirements are summarized in [Table 6.5](#).

**6.15.2. Grades for Aircraft Fueling Ramps.** Grades for hangar access ramps on which fueling of aircraft will occur must slope away from aircraft hangars in accordance with NFPA Standard 415.

**6.15.3. Grades for Aircraft Access into Hangars.** The grades in front of the hangar must allow access into the hangar. When aircraft are backed into the hangar, a tug vehicle pushes the aircraft in, tail first. Due to the location of the aircraft gear and the slope of the hangar access apron, the tail of the aircraft may be higher than the top of the hangar door. The hangar access apron grades may require adjustment to allow the aircraft tail to clear the hangar door.

**Table 6.5. Hangar Access Apron.**

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
1	Length	Distance to the adjoining operational pavement		Facilities for fixed-wing aircraft. <b>Note:</b> If the distance from the main operational pavement to the hangar exceeds the apron clearance distance (see <a href="#">Table 6.1</a> , Item 15), consider constructing a maneuvering area immediately outside the hangar, large enough to allow turning the aircraft

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
				around. The width of the maneuvering area should be equal to the width of the hangar door opening. Connect this maneuvering area to the main apron with a taxiway or towway.
		30.5 m (100 ft)		Air Force facilities for rotary-wing aircraft, except as noted below. Includes additional 50ft vehicular buffer required in front of hangars.
		See Remarks		Access aprons are located between the apron and the front of the hangar. Maintenance hangars can be located within the apron clearance distance except, see <b>Table 6.1.</b> , Item 15.
2	Width	Equal to or greater than hangar door width.		Pavement should be sized for type of aircraft, number of hangar bays and location of hangar bays.
3	Grades in Direction of Drainage	Min. 0.5%, Max. 1.5% Min. 1.0%, Max. 1.5% for NATO		Avoid grades that prevent aircraft tail from clearing hangar doors. Minimum grading can be increased to NATO criteria only if NATO project strictly requires such grading. Otherwise, follow standard grading.
		Min. -1.0% first 15 m (50 ft) from hangar		NFPA 415 requires aircraft fueling ramps to slope away from terminal buildings, aircraft hangars, aircraft loading walkways or other structures.
4	Width of Shoulders (Total Width Including Paved and Unpaved)	7.6 m (25 ft)		
5	Width of Paved Shoulders	Not Required		
6	Sight Distance	Not applicable		
7	Transverse Grade of Unpaved Shoulder	(a) 40 mm (1.5 in) drop-off at edge of pavement. (b) Min. 2.0%, Max. 4.0%		

Item No.	Item Description	Class A Runway	Class B Runway	Remarks
		Requirement		
8	Wingtip Clearance to Fixed or Mobile Obstacles	7.6 m (25 ft)		Along length of access apron. Wingtip clearance at entrance to hangar may be reduced to 3.05 m (10 ft).
9	Grade (Area Between Access Apron Shoulder and Wingtip Clearance Line)	Max. 10.0% (See Note 1)		If the wingtip clearance line falls within the Access Apron Shoulder, no grading is required beyond the Access Apron Shoulder.
<p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. Bed of channel may be flat.</li> <li>2. Metric units apply to new airfield construction and where practical modification to existing airfields and heliports, as discussed in <b>paragraph 1.4.4</b>.</li> <li>3. The criteria in this instruction are based on aircraft specific requirements and are not direct conversions from inch-pound (English) dimensions. Inch-pound units are included only as a reference to the previous standard.</li> <li>4. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from inch-pound to SI units.</li> </ol>				

**6.16. Taxiing Characteristics on Aprons for Rotary-Wing Aircraft.** Taxi routes across parking aprons are marked to provide safe passage. A hoverlane is a designated aerial traffic lane used exclusively for the movement of helicopters. A taxilane is a designated ground traffic lane.

6.16.1. **Hoverlane/Taxilane Width.** The hoverlane/taxilane width is based on the rotor diameter of the largest helicopter generally using the apron.

### 6.17. Fixed-Wing and Rotary-Wing Grading Standards.

6.17.1. **Fixed-Wing Aircraft.** Grading standards for fixed-wing parking aprons and shoulders are presented in **Table 6.1** All parking aprons, pads and miscellaneous pavements should follow these grading standards unless a particular mission requirement, such as a power check pad, dictates otherwise. Surface drainage patterns with numerous or abrupt grade changes can produce excessive pavement flexing and structural damage of aircraft and therefore should be avoided.

6.17.2. **Rotary-Wing Aircraft.** USAFE-AFAFRICA activities should use the Army grading criteria presented in UFC 3-260-01 for all rotary aircraft except CH-53 and CH-54. For those aircraft, see their respective Mission Design Series Facility Requirements Documents.

6.17.3. **Grades for Aircraft Fueling Ramps.** Grades for ramps on which fueling of aircraft will occur should be in accordance with NFPA Standard 415 (See **Table 6.2**).

**6.18. Shoulders.** Paved shoulders are provided around the perimeter of an apron to protect against jet blast and foreign object damage (FOD), to support blast deflectors, for support equipment storage, to provide paved access to fire hydrants, and to facilitate drainage. Criteria for apron shoulders are presented in [Table 6.1](#) for fixed-wing aprons and [Table 6.2](#) and AFMAN 32-1084 for rotary-wing facilities. To prevent storm water from ponding on the outside edge of the shoulder, the turf adjacent to the paved shoulder should be graded to facilitate drainage. See Paragraph 2-12 of UFC 3-260-01 for requirements for designing buried utility structures in shoulders.

**6.19. Miscellaneous Apron Design Considerations.** In addition to the apron design criteria, consideration should be given to providing room for support structures, equipment (e.g., AGE, hydrant refueling systems), and facilities

6.19.1. **Jet Blast Deflectors.** Jet blast deflectors will substantially reduce the damaging effects of jet blast on structures, equipment and personnel, as well as the related noise and fumes associated with jet engine operation. Additional information on jet blast deflectors is found in UFC 3-260-01, Appendix B, Section 8.

6.19.2. **Line Vehicle Parking and Aerospace Ground Equipment (AGE).** Line vehicle and AGE parking areas are provided for parking of mobile station-assigned and squadron-assigned vehicles and AGE equipment. These areas must remain outside of the apron clearance. Additional information on line vehicle parking is found in UFC 3-260-01, Appendix B, Section 12.

6.19.3. **Utilities.** The following items are normally found on parking aprons. These items are not a part of airfield geometric design. However, the designer needs to be aware that they are an integral part of a parking apron and should make provisions for them accordingly.

6.19.3.1. Storm water runoff collection system including inlets, trench drains, manholes and pipe.

6.19.3.2. De-icing facilities and de-icing runoff collection facilities (refer to the respective host nation's FGS for environmental requirements. Where an FGS does not exist for a specific host nation, refer to the OEBGD)

6.19.3.3. Apron illumination.

6.19.3.4. Fire hydrants.

6.19.3.5. Refueling facilities.

6.19.3.6. Apron edge lighting.

**6.20. V-22 Apron Clearances.** In [Figure 6.9](#) provides parking block dimensions as well as peripheral and interior taxiway clearance requirements. The V-22 Parking Block will not overhang the apron shoulder.

## Chapter 7

### LANDING ZONES (LZ) FOR C-130 AND C-17

**7.1. Criteria for LZs for C-130 and C-17.** Criteria for LZs for C-130 and C-17 in the United States Air Forces in Europe and United States Air Forces Africa (USAFE-AFAFRICA) shall follow the criteria of Chapter 7 of the UFC 3-260-01, *Airport and Heliport Planning and Design*.

## Chapter 8

### FIXED-WING SHORT TAKEOFF AND VERTICAL LANDING (STOVL) FACILITIES

**8.1. Criteria for STOVL Facilities.** Criteria for STOVL facilities in the United States Air Forces in Europe and United States Air Forces Africa (USAFE-AFAFRICA) shall follow the criteria of Chapter 8 of the UFC 3-260-01, *Airport and Heliport Planning and Design*.

## Chapter 9

### UNMANNED AIRCRAFT SYSTEMS (UASS)

**9.1. Criteria for Unmanned Aircraft Systems (UAS).** Criteria for Unmanned Aircraft Systems (UAS) in the United States Air Forces in Europe and United States Air Forces Africa (USAFE-AFAFRICA) shall follow the criteria of Chapter 9 of the UFC 3-260-01, *Airport and Heliport Planning and Design*.

**9.2. UAS operations in HN controlled air space.** UAS operations must be coordinated and integrated through existing USAFE-AFAFRICA airspace due to HN controlled airspace considerations.

RONALD E. JOLLY, Brigadier General, USAF  
Director of Logistics, Engineering and Force  
Protection

**Attachment 1****GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

DoDI 4165.57, *Air Installations Compatible Use Zones (AICUZ)*, DD MMM YYYY

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AFMAN 11-218, *Aircraft Operations and Movement on the Ground*, 4 April 2019

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FAA Order 8260.3, *United States Standard for Terminal Instrument Procedures (TERPS)*

FAR Part 77, *Objects Affecting Navigable Air Space*

ICAO Document 9157, *Aerodrome Design Manual*

E-1, *On-base Obstruction to Airfield and Airspace Criteria*

Map E-2, *Approach and Departure – Zone Obstructions to 10,000 Feet*

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

International Standards and Recommended Practices, Aerodromes, Annex 14, Volume 1, Seventh Edition, *Aerodrome Design and Operations*

BI-CD 085-005, *NATO Approved Criteria and Standards for Airfields*

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UFC 3-250-18FA, *General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas*, 6 January 2006

UFC 3-260-02, *Pavement Design for Airfields*, 30 June 2001

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UFC 3-535-01, *Visual Air Navigation Facilities*, 17 November 2005

UFC 3-260-04, *Airfield and Heliport Marking*, 16 May 2018

UFC 3-260-1, *Airport and Heliport Planning and Design*, 4 February 2019

USACE TSC Report 13-2, *Aircraft Characteristics for Military Aircraft*

USACE TSC Report 13-3, *Aircraft Characteristics for Selective Commercial Aircraft*

NATO. EUCOM OP ORD 18-11, *Physical Security*

### ***Prescribed Forms***

USAFE-AFAFRICA Form 582, *Request for Waiver to Airfield and Airspace Criteria*

USAFE-AFAFRICA Form 583, *Approved Waivers to Airfield and Airspace Criteria*

### ***Adopted Forms***

AF Form 679, *Air Force Publication Compliance Item Waiver Request/Approval*

AF Form 847, *Recommendation for Change of Publication*

### ***Abbreviations and Acronyms***

**AC**—Advisory Circular

**AF**—Air Force

**AFAFRICA**—Air Forces Africa

**AFCEC**—Air Force Civil Engineering Center

**AFFSA**—Air Force Flight Standards Agency

**AFH**—Air Force Handbook

**AFI**—Air Force Instruction

**AFIMSC Det 4/CE**—Detachment 4 (USAFE) of the Air Force Installation and Mission Support Center/Civil Engineering

**AFM**—Airfield Manager

**AFMAN**—Air Force Manual  
**AFPD**—Air Force Policy Directive  
**AFRC**—Air Force Reserve Command  
**AGE**—Aerospace Ground Equipment  
**AH**—Attack Helicopter  
**AICUZ**—Air Installation Compatibility Use Zone  
**ALRS**—Alternate Launch Recovery Surface  
**AM**—Airfield Management  
**AMC**—Air Mobility Command  
**ANG**—Air National Guard  
**AOB**—Airfield Operations Board  
**AORI**—Airfield Obstruction Reduction Initiative  
**APZ**—Accident Potential Zone  
**APZ I**—Accident Potential Zone I  
**APZ II**—Accident Potential Zone II  
**AR**—Army Regulation  
**ARP**—Aerodrome Reference Point  
**ATAP**—Air Traffic Act Permit  
**ATC**—Air Traffic Control  
**ATCAL**S—Air Traffic Control and Landing Systems  
**ATCT**—Air Traffic Control Tower  
**BAK**—Barrier, Arresting Kit  
**BASH**—Bird/Wildlife Aircraft Strike Hazard  
**BCE**—Base Civil Engineer  
**CAT I ILS**—Category I Instrument Landing System  
**CAT II ILS**—Category II Instrument Landing System  
**CBR**—Chemical, Biological, Radiological  
**CC**—Commander  
**CCP**—Compass Calibration Pad  
**CE**—Civil Engineer  
**CH**—Cargo Helicopter  
**CoC**—Chain of Command

**CZ**—Clear Zone  
**DA**—decision altitude  
**dB(a)**—Decibel  
**DH**—Decision Height  
**DoD**—Department of Defense  
**DoDI**—DoD Instruction  
**EMR**—Electromagnetic Radiation  
**ETL**—Engineering Technical Letter  
**FAA**—Federal Aviation Administration  
**FAA AC**—Federal Aviation Administration Advisory Circular  
**FAR**—Federal Aviation Regulations  
**FGS**—Final Governing Standards  
**FIM**—Facility Investment Metric  
**FOD**—Foreign Object Damage  
**FSSZ**—Fuel Servicing Safety Zone  
**ft**—foot  
**FY**—Fiscal Year  
**HH**—Heavy Helicopter  
**HQ AFCEC**—Headquarters Air Force Civil Engineering Center  
**HQ USAFE-AFAFRICA/A3**—Directors of Operations  
**HQ USAFE-AFAFRICA/A3Y**—Air Operations Command and Control  
**HQ USAFE-AFAFRICA/A4**—Logistics, Engineering and Forced Protection  
**HQ USAFE-AFAFRICA/A4S**—Security Forces Division  
**HQ USAFE-AFAFRICA/A6**—Communications Directorate  
**HQ USAFE-AFAFRICA/A7PP**—Plans and Requirements  
**HQ USAFE-AFAFRICA/A7P**—Programs Division  
**HQ USAFE-AFAFRICA/JA**—Office of Staff Judge Advocate  
**HQ USAFE-AFAFRICA/SE**—Safety Directorate  
**HQ USAFE-AFAFRICA**—Headquarters United States Air Forces in Europe-Air Forces Africa  
**ICAO**—International Civil Aviation Organization  
**IFR**—Instrument Flight Rules  
**ILS**—Instrument Landing System

**In**—Inch

**Kg**—Kilogram

**kN**—Kilonewton

**kPa**—Kilopascal

**Lb**—Pound

**LED**—Light-Emitting Diode

**LZ**—Landing Zone

**MAAS**—Mobile Aircraft Arresting System

**MAJCOM/CD**—Major Command Deputy Commander

**MAJCOM**—Major Command (USAF)

**Max**—Maximum

**MDA**—Minimum Descent Altitude

**MFZ**—Mandatory Frangibility Zone

**MILCON**—Military Construction

**min**—Minimum

**m**—Meter

**mm**—Millimeter

**MOB**—Main Operating Base

**MSG/CC**—Mission Support Group Commander

**MSL**—Mean Sea Level

**N.T.S.**—not to scale

**N/A**—not applicable

**NATO**—North Atlantic Treaty Organization

**NAVAID or NavAIDS**—Navigational Aids

**NfL**—Nachrichten für Luftfahrer

**NFPA**—National Fire Protection Association

**NOTAM**—Notice to Airmen

**O&M**—Operation and Maintenance

**OCR**—Office of Collateral Responsibility

**OEBGD**—Overseas Environmental Baseline Guidance Document

**OG/CC**—Operations Group Commander

**OH**—Observation Helicopter

**OPNAVINST**—Operations Naval Instruction  
**OPR**—Office of Primary Responsibility  
**OSA**—Operational Support Airlift  
**OSS**—Operations Support Squadron  
**PANSOPS**—Terminal Instrument Procedures  
**PCC**—Portland Cement Concrete  
**POV**—Privately Owned Vehicle  
**Psi**—pounds per square inch  
**RAC**—Risk Assessment Code  
**RDS**—Records Disposition Schedule  
**RM**—Operational Risk Management  
**SABER**—Simplified Acquisition Base Engineer Requirements  
**SI**—International System of Units  
**SII**—Special Interest Item  
**SPR**—Single Point Receptacle  
**STANAG**—Standardization Agreement  
**T.O.**—Technical Order  
**TERPS**—Terminal Instrument Procedures  
**TM**—Technical Manual  
**UFC**—Unified Facilities Criteria  
**UH**—Utility Helicopter  
**US**—United States  
**USACE TSC**—U.S. Army Corps of Engineers Transportation Systems Center  
**USACE**—U.S. Army Corps of Engineers  
**USAF**—United States Air Force  
**USAFE**—United States Air Forces in Europe  
**USAFE**—AFAFRICA/DCOM—USAFE-AFAFRICA Deputy Commander  
**USAFEI**—United States Air Forces in Europe Instruction  
**VFR**—Visual Flight Rules  
**V-STOL**—Vertical/Short Take-Off and Landing

*Terms*

**Aircraft, Class A**—Aircraft listed under Class A Runways in [Table 3.1](#) of this instruction.

**Aircraft, Class B**—Aircraft listed under Class B Runways in [Table 3.1](#) of this instruction.

**Balked Landing**—An unsuccessful landing.

**Balked Landing Surface**—An inclined plane starting 1800 meters (m) after the threshold, extending between the inner transitional surface, established to protect aircraft in the event of a balked landing.

**Combined IC/MF**—Defines the geographic area that must be monitored for encroachment.

**Departure (Take-off Climb) Surface**—An inclined plane or combined inclined and horizontal planes arranged symmetrically about the runway centerline extended.

**External ICEMAP**—A more detailed, comprehensive analysis of the IC/MF completed in close coordination with the IEMT, usually by or in coordination with a contractor. The external ICEMAP process includes the components of the internal study process, as well as comprehensive reviews of Air Force programs, comprehensive reviews of relevant installation reports and documents, interviews with internal and external stakeholders, and research of external programs, policies, and conditions that contribute to potential encroachment, as appropriate. The external ICEMAP provides the context for each of the encroachment and sustainment challenge areas and the team's findings, including proposed solution strategies, a detailed outreach and engagement strategy, and the Commander's Action Plan.

**Fuel Servicing Safety Zone (FSSZ)**—The FSSZ is the area required for safety around pressurized fuel carrying servicing components; i.e. servicing hose, fuel nozzle, single point receptacle (SPR), hydrant hose car, ramp hydrant connection point, etc. and around aircraft fuel vent outlets. The FSSZ is established and maintained during pressurization and movement of fuel.

**Imaginary Surfaces**—Surfaces in space established around airfields in relation to runway(s), helipad(s), or helicopter runway(s) that are designed to define the obstacle free airspace around the airfield. The imaginary surfaces for DoD airfields are the primary surface, the approach or departure clearance surfaces, the transitional surface, the inner horizontal surface and the conical surface (fixed-wing only).

**Inner Approach Surface**—A rectangular portion of the approach surface immediately preceding the threshold.

**Inner Transitional Surface**—A surface similar to the transitional surface but closer to the runway. The limits of an inner transitional surface shall comprise a lower edge beginning at the end of the inner approach surface and extending down the side of the inner approach surface to the inner edge of that surface, from there along the strip parallel to the runway center line to the inner edge of the balked landing surface and from there up the side of the balked landing surface to the point where the side intersects the inner horizontal surface; and an upper edge located in the plane of the inner horizontal surface.

**Installation Complex (IC)**—The installation plus other associated systems outside the fenceline that are critical to successful execution of the installation mission; these include airspace, ranges, and other geographically separate facilities and sites (e.g., missile fields, radar relays, and drop zones).

**Internal ICEMAP**—A basic analysis of the IC/MF that leverages foundational programs and resources to produce a baseline encroachment analysis and associated proposed management actions to prevent or reduce encroachment. The internal ICEMAP also includes a brief analysis of

existing stakeholder relationships and the development of Management Actions, which will drive resource prioritization.

**Mission Footprint (MF)**—Units at one location may routinely require the use of facilities, ranges, and airspace that are associated with another installation, or even another Service.

**Primary Surface (Fixed-Wing Runways)**—An imaginary surface symmetrically centered on the runway, extending 60m (200 ft) beyond each runway end. The width varies depending upon the class of runway and coincides with the lateral clearance distance. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.

**Primary Surface (Rotary-Wing Runways and Landing Lanes)**—An imaginary surface symmetrically centered on the runway, extending beyond the runway ends. The width and length depends upon whether the runway/landing lane is to accommodate VFR or IFR operations. The lateral clearance distance coincides with the width of the primary surface. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.

**Strategic Transport Aircraft (STA/STA+)**—Long range, wide bodied aircraft employed for the carriage of personnel and cargo (STA: up to 300000kg max take-off weight; STA+: equal to or above 300000kg max take-off weight) over long distances. Strategic transport aircraft include: A-400M An-124 Airbus A-310 B-1B, B-52G/H B-747, B-767 C-5A/B, C-17 Il-76 KC-10, KC-135R Tu-154.

**Tactical Fighter Aircraft (TFA)**—Fixed-wing, manned aircraft primarily employed for non-transport military roles; Air Defence and Bomber (air-to-surface attacks), Electronic Warfare (EW), Suppression of Enemy Air Defence (SEAD) as well as Tactical Air Reconnaissance. These roles may also be provided by the use of Unmanned Aircraft Systems (UASs). Tactical (non-transport) aircraft include the following: Alpha Jet AMX A-7, A-10 AV-8B (Harrier) (C)F-18 Eurofighter F-1, F-3, F-4, F-5, F-15C/D, F-15E, F-16, F-22, F-35 L-159 Mig-29 Mirage 5 Mirage 2000 SU-22.

**Tactical Transport Aircraft (TTA)**—Fixed-wing military aircraft with relatively short take-off and landing characteristics primarily employed for carriage of personnel and cargo over short/medium distances. Tactical transport aircraft include the following: An-24, An-26 C-2, C-9, C-12, C-26, C-27J, C-130, C-160 Cessna 525, G-222 F-4 V-22.

**Taxitrak**—A specially prepared or designated path, on an airfield other than mass parking areas, on which aircraft move under their own power to and from taxiways to dispersed platforms.

**Transitional Surface**—An imaginary surface that extends outward and upward at right angles to the runway centerline and the runway centerline extended at a slope ratio of 7H:1V. The transitional surface connects the primary and the approach departure clearance surfaces to the inner horizontal, the conical and the outer horizontal surfaces.

**Waiver, Construction**—A temporary airfield waiver used to identify, coordinate and approve construction activity on or near the airfield. The Installation Commander is the approval authority for construction waivers.

**Waiver, Contingency**—An airfield waiver used to support a contingency operation. Contingency waivers cannot exceed 180 days (6 months) without Headquarters United States Air Forces in

Europe and United States Air Forces Africa (USAFE-AFAFRICA) approval. The Installation Commander or equivalent, is the contingency waiver approval authority for an installation.

**Waiver, Permanent**—An airfield waiver established for violations that cannot be reasonably corrected and pose little or no risk to flying operations. Such violations are typically caused by natural topographic features. The Major Command Vice Commander (MAJCOM/CD) is the approval authority for permanent waivers.

**Waiver, Temporary**—An airfield waiver established to address safety mitigation for correctable obstructions or violations of other airfield criteria such as grades. MAJCOM/CD is the approval authority for temporary waivers. These waivers require CD approval each year (continuous 12 months).

## Attachment 2

### USAFE-AFAFRICA AIRFIELD WAIVER PROGRAM

#### A2.1. Waivers to USAFE-AFAFRICA Instruction 32-1007 Criteria.

A2.1.1. **General.** Waivers are required when compliance with criteria cannot be achieved. The waiver process is designed to ensure leadership is aware of potential risk and to ensure that all alternatives have been considered. Approval of a waiver is an acknowledgment of the associated risk (it is not project approval). The Base Civil Engineer (BCE) initiates an airfield waiver request as soon as project design indicates aircraft criteria in this document cannot be met. A thorough examination of potential alternatives must be completed and documented prior to installation site approval, and before a waiver is requested from the HQ USAFE-AFAFRICA Deputy Commander (USAFE-AFAFRICA/DCOM) or other approving official described in [paragraph A2.3](#).

A2.1.1.1. When requesting a waiver, consider grouping adjacent supporting items with a controlling obstruction or grouping related items, such as a series of drainage structures, as one waiver.

A2.1.1.2. USAFE-AFAFRICA I 32-1007 waivers do not apply to off-installation development or obstructions to airspace off- installation (the TERPS Office is the data steward for obstructions to air space criteria for off installation as outlined in AFI 32-1015, *Integrated Installation Planning*. Also see the host nation-specific attachments to this instruction). The only exception would be building a new airfield in an area with existing development already in place.

A2.1.1.3. Under most circumstances, funding or budgetary constraints are not adequate justification for granting a waiver. Criteria violations caused by terrain located on Air Force controlled property will be classified as a non-conforming object, exemption or temporary waiver, not a permanent waiver. Criteria violations located on property not controlled by the Air Force will be classified as non-conforming facilities/ structures or objects (see [paragraph A2.3.5](#)).

A2.1.2. **Clear Zones.** Additionally, waivers to criteria in this instruction should be pursued for violations located within the graded area of the clear zone. A land use variance should be pursued if the proposal creates an incompatible land use violation in the remaining area of Air Force controlled clear zones, (See AFI 32-1015, *Integrated Installation Planning*. In some circumstances, a proposal may require a waiver from this instruction and an AICUZ clear zone variance, if the proposal creates an incompatible land use, and violates criteria in this instruction (i.e. penetration into an imaginary surface).

A2.1.3. **Operational Waivers.** Certain existing facilities may require the supported aircraft activity to have an operational waiver in order to operate, such as taking off and landing on a shorter runway or inadequate wingtip clearance inside existing hangars and sunshades. These are operational waivers and not USAFE-AFAFRICA I 32-1007 waivers. See AFMAN 11-218, *Aircraft Operations and Movement on the Ground*, for additional information (This note applies to wing tip clearance in sunshades).

A2.1.4. Types of Waivers. There are four types of waivers (permanent, temporary, construction, and airshow). Additionally, non-compliant features not requiring a waiver can be

classified as permissible deviations, exemptions, or non-conforming facilities/structures/objects, as described in [paragraph A2.3](#).

## **A2.2. Responsibilities.**

### **A2.2.1. AFCEC/CO.**

A2.2.1.1. Develops and maintains United Facilities Criteria (UFC) for Airfield and Heliport Planning and design and provides secondary technical support on the airfield waiver program.

A2.2.2. AFIMSC Det 4/CEB (USAFE-AFAFRICA). Air Force Installation and Mission Support Center, Detachment 4/Civil Engineering/Basing and Beddown:

A2.2.2.1. Receives and coordinates all waiver requests.

A2.2.2.2. Coordinates with Directors of Operations and Nuclear Integration (HQ USAFE-AFAFRICA/A3); Logistics, Engineering & Force Protection (HQ USAFE-AFAFRICA/A4); Safety (HQ USAFE-AFAFRICA/SE), Staff Judge Advocate (HQ USAFE-AFAFRICA/JA); and Security Forces (HQ USAFE-AFAFRICA/A4S) and Communications (HQ USAFE-AFAFRICA/A6), as necessary, before submitting waiver requests to the USAFE-AFAFRICA/DCOM for approval or disapproval.

A2.2.2.3. Monitors actions to correct temporarily waived items within specified periods.

A2.2.2.4. Establishes procedures to ensure an annual review of all temporarily waived items.

A2.2.2.5. Establishes the administrative procedures for processing waivers.

A2.2.2.6. Establishes guidance for the development and implementation of an obstruction reduction program.

A2.2.2.7. Maintains (for record) one copy of all pertinent documents relative to each waiver, including a record of staff coordination on actions at base and command levels.

### **A2.2.3. AFCEC/CP.**

A2.2.3.1. Provides policy direction on the airfield waiver and waiver review programs.

### **A2.2.4. HQ AFFSA.**

A2.2.4.1. Reviews all policy changes to airfield planning and design criteria before implementation to determine operational impact on airfield and aircraft operations.

A2.2.4.2. Reviews all requests for waivers to instrument procedure criteria.

A2.2.4.3. Processes requests for waivers to instrument procedure design criteria in accordance with guidance outlined in AFMAN 11-230, *Instrument Procedures*.

A2.2.4.4. Provides documentation to AFCEC/CO to justify adding any new permissible deviations (such as newer navigational aids or weather equipment. Documentation would include siting diagrams and signed Risk Assessment by AFFSA/CC or AFFSA/CD recommending the item and associated siting requirements be added to UFC 3-260-01 and/or USAFE-AFAFRICA/32-1007 for the new permissible deviation.

### **A2.2.5. Base Civil Engineer (BCE).**

A2.2.5.1. Coordinates with airfield management, flight and occupational safety, flight operations, TERPS, and others as appropriate during waiver package preparation.

A2.2.5.2. Annotates proposed waiver location on appropriate E-series map for base and HQ USAFE-AFAFRICA evaluation.

A2.2.5.3. Establishes and updates (at least annually) geospatial data sets of approved waived items in accordance with AFI 32-1015, *Integrated Installation Planning*, in conjunction with the latest published Installation Development Plan (IDP) GIS guidance. Also see AFMAN 11-230, *Instrument Procedures*.

A2.2.5.4. Develops a military construction (MILCON) program or other project to systematically correct violations noted in temporary waivers. Project listing should include (by waiver) facilities board priority, facility investment metric (FIM) rating, integrated priority list (IPL) rating (or other installation or AFIMSC prioritization rating system), risk assessment rating, funds type required (e.g., O&M, MILCON, 3080), and projected fiscal year.

A2.2.5.5. Record, review, and process waiver requests (see paragraph A2.4 through A2.6) and maintain (for record) one copy of all pertinent documents relative to each waiver, including a record of staff coordination on actions at base and MAJCOM levels.

A2.2.5.6. Lead the annual review of Permanent and Temporary waivers and brief the Facilities Board per paragraph A2.6 below.

A2.2.5.7. Presents a summary of the number and status of permanent/temporary airfield waivers to the Airfield Operations Board (AOB), as required under AFI 13-204, *Airfield Operations Procedures and Programs*, Volume 3, Attachment 3 Paragraph A3.2.6..

A2.2.5.8. Participates in an annual assessment of the airfield/airspace criteria using the Air Force Airfield Certification/Safety Inspection Checklist (See AFI 13-204, *Airfield Operations Standardizations and Evaluations*, Volume 2, Attachment 4).

A2.2.5.9. Establishes a procedure for recording, reviewing and acting on waivers, permissible deviations, exemptions and non-conforming facilities/structures/objects.

A2.2.5.10. Advises AFIMSC Det 4/CEB of any cancelled or mitigated waivers.

### **A2.3. Waivers, Permissible Deviations, Exemptions and Non-Conforming Facilities/Structures/ Objects.**

A2.3.1. All waivers, permissible deviations, exemptions, and non-conforming facilities/structures/ objects must be documented and reviewed annually.

#### **A2.3.2. Permanent and Temporary Waivers.**

A2.3.2.1. **USAFE-AFAFRICA/DCOM.** The USAFE-AFAFRICA/DCOM may grant permanent and temporary waivers for deviations from criteria in this instruction. The USAFE-AFAFRICA/DCOM approves or disapproves these waivers after coordination with all appropriate staff offices and concurrence by Directors of Operations and Nuclear Integration (HQ USAFE-AFAFRICA/A3); Logistics, Engineering & Force Protection (HQ USAFE-AFAFRICA/A4); Staff Judge Advocate (HQ USAFE-AFAFRICA/JA); Safety (HQ USAFE-AFAFRICA/SE); AFIMSC Det 4/CE; and as necessary Security Forces (HQ USAFE-AFAFRICA/A4S), and Communications (HQ USAFE-AFAFRICA/A6). In the

event of a prolonged absence by USAFE-AFAFRICA/DCOM, waiver approval authority is delegated to HQ USAFE-AFAFRICA/A3. Temporary and permanent waiver authority is not delegated below Major Command (MAJCOM) level.

**A2.3.2.2. Permanent Waivers.** Permanent waivers are established for criteria violations that cannot be reasonably met. If the criteria to be waived under this USAFE-AFAFRICA/32-1007 would also result in a violation of UFC 3-535-01, Visual Air Navigation Facilities, then consult with the Air Force Flight Standards Agency (AFFSA) and/or the Air Force Safety Center. The waiver request should be initiated by the BCE's designated representative as soon as it is determined criteria can't be met, and be approved before siting, programming, and/or design is finalized. Permanent waivers are appropriate for violations associated with development of facilities on overseas installations where the U.S. has no authority to implement Air Force standards. See [paragraph A2.4](#) below for waiver request package content. These waivers are approved/disapproved by the USAFE-AFAFRICA/DCOM. Approval of a waiver constitutes acceptance of the risk associated with criteria violations. The USAFE-AFAFRICA/DCOM may delegate approval/disapproval authority to another organization within the Headquarters.

**A2.3.2.3. Temporary Waivers.** Temporary waivers are established for criteria violations that can be corrected within eight years. During the two years following waiver approval, CE will develop/ program an action to correct the violation, including a description of the proposed action, project number, and cost estimate. The remaining six years will be used to implement the corrective action. If the violation cannot be brought into compliance within eight years, the violation should be reclassified as a permanent waiver (Reclassification requests to permanent status will require USAFE-AFAFRICA/DCOM approval). See [paragraph A2.4](#) below for waiver request package content. These waivers are approved/disapproved by the USAFE-AFAFRICA/DCOM. Approval of a waiver constitutes acceptance of the risk associated with criteria violations. The USAFE-AFAFRICA/DCOM may delegate approval/disapproval authority to another organization within the USAFE-AFAFRICA Headquarters.

### **A2.3.3. Construction and Air Show Waivers.**

**A2.3.3.1.** Authority for deviations to the criteria in this instruction is delegated to the Installation Commander when temporary waivers for construction activities or air shows are necessary.

**A2.3.3.2. Construction Waivers.** A construction waiver (sometimes referred to as temporary construction waiver) is obtained when one or more elements of a construction project (equipment, facilities, personnel, etc.) violates criteria in this instruction. Construction waivers should only be planned for the duration of the construction project unless circumstances dictate otherwise. See UFC 3-260-01, Appendix B, Section 14, "Construction Phasing Plan and Operational Safety on Airfields during Construction" for additional guidance. Construction waivers must be approved before construction activities begin. The Installation Commander is the approval authority for construction waivers. See [paragraph A2.4](#) below for waiver request package content. **Note:** Emergency maintenance and repair requirements, as well as routine maintenance activities (mowing, snow removal, rubber removal and maintenance of airfield systems), are exempt from this requirement; however, the BCE will coordinate with the airfield management, flight safety,

and flight operations offices to ensure implementation of appropriate safety measures, including Notices to Airmen (NOTAM).

**A2.3.3.3. Air Show Waivers.** Air Show waivers are processed for events that will temporarily create criteria violations. The Installation Commander is the approval authority for Air Show Waivers. See [paragraph A2.4](#) for waiver request package content. Event waivers other than airshows require USAFE- AFAFRICA/DCOM approval.

#### **A2.3.4. Permissible Deviations.**

**A2.3.4.1.** Authority to classify an obstruction as a permissible deviation to airfield and airspace criteria is delegated to the Installation Commander provided the obstruction meets siting criteria listed in UFC 3-260-01, Appendix B, Section 13.

**A2.3.4.2.** Permissible deviations are for airfield support facilities or equipment that are not required to meet airfield criteria, however, they must meet siting criteria specified in UFC 3-260-01 Appendix B, Section 13. The USAFE-AFAFRICA/DCOM may grant permissible deviation status for other airfield-related facilities or systems that are unique to USAFE-AFAFRICA, but must provide acceptable construction standards, siting criteria, and aircraft clearance requirements for such items. Before an item can be classified as a permissible deviation, this documentation must be field verified by a representative from Civil Engineering and Airfield Management, approved by the BCE and others as appropriate, and sent to the Installation Commander for approval.

**A2.3.5. Exemptions.** Facilities constructed under previous standards should be documented as exemptions and programmed for replacement away from the airfield environment at the end of their useful life or when mission needs dictate earlier replacement. If improvements are proposed that would extend the useful life of the facility, a waiver must be requested. If the exempted facility is demolished any use of that site should conform to the criteria in this instruction.

**A2.3.6. Non-Conforming Facilities/Structures/Objects.** Existing facilities, structures, or objects (which could include equipment or terrain features) identified as not meeting criteria in this instruction, and are not exempted or have an existing waiver, will be classified and documented as Non-Conforming until they are evaluated to determine whether they should be classified as an exemption, or should have a permanent or temporary waiver. These may be identified during annual airfield inspections, special inspections, survey efforts, or while conducting day to day observations. The BCE will coordinate with airfield management, flight safety, and flight operations offices (and others as appropriate) to ensure implementation of appropriate safety measures.

**A2.3.7. Amendment of Waivers.** Amendments to existing waivers (temporary and permanent) will be developed when there are proposed changes to the scope of the original violation. This may include increasing/decreasing criteria violations included in the original waiver request (e.g. lights, sunshades, improving grade, etc.). When the number/extent of criteria violations is reduced, note the improvement on the annual review. If the number/extent of criteria violations is increased, USAFE-AFAFRICA/ DCOM approval is required.

**A2.3.8. Host Nation Involvement.** Consult the applicable country-specific Annex to this instruction to determine host nation waiver approval requirements, if any. If host nation approval is required, follow the general processes in the country-specific attachment

(Attachment 5 through Attachment 11) to obtain the necessary approval. All host nation approval must be obtained before USAFE-AFAFRICA/DCOM will approve any waiver requests/changes.

#### A2.4. Contents of Waiver Requests.

A2.4.1. Generally, each request must contain the following information unless otherwise noted in the subsections below:

A2.4.1.1. Criteria to be waived. Reference publication, paragraph, and page number of the specific criteria to be waived.

A2.4.1.2. Alternative Courses of Action (COA) Considered. Describe any alternative courses of actions that were considered when developing the solution proposal and why they were not acceptable for meeting the purpose and need of the proposal/action.

A2.4.1.3. Rationale/Justification of Selected COA. Explain the rationale for the selected COA and why the approving official should accept the risks associated with the proposal.

A2.4.1.4. Risk Assessment. Complete the AF Form 4437, *Deliberate Risk Assessment Worksheet*. Utilize a cross functional team to complete the risk assessment. Contributing organizations may include civil engineering, safety, airfield operations and others as appropriate. See AFI 90-802 and Attachment 3 of this instruction for additional information. The risk analysis should include a detailed explanation of the methodology used, data considered, and rationale for determining the risk (see Attachment 8 of AFPAM 90-803).

A2.4.1.5. Graphics. Pictures, diagrams, and charts must clearly illustrate condition, distances, imaginary surfaces, clear zones, etc.

A2.4.1.6. Proof of Coordination. The waiver preparer documents installation coordination from the appropriate stakeholders, for example: Safety, Operations Support, Maintenance, terminal instrument procedures (TERPS), Security Forces, Communications, Civil Engineering (and any other organizations that the installation feels should coordinate on the waiver request) before requesting approval from the installation commander. At the USAFE-AFAFRICA level, Temporary and Permanent waiver requests should be coordinated with the same functional offices as at installation level in addition to any additional offices deemed necessary. **Note:** Ensure any packages to support reclassification of waivers will include all the information above.

A2.4.2. **Permanent and Temporary Airfield Airspace Waiver Request Package Requirements.** This information provides the minimal data necessary to request a waiver to the criteria of this instruction. In the future, it is possible that airfield obstructions/waivers could be eliminated. Civil Engineering must remain vigilant to preserve the safe operations of the airfield by providing wing leadership with new construction alternatives that do not violate airfield criteria. Waiver requests will be highly scrutinized by HQ USAFE-AFAFRICA A3/A4/A6/SE/JA, and AFIMSC Det 4/CEB because final approval authority is the USAFE-AFAFRICA/DCOM. Each request shall consist of the following:

A2.4.2.1. Cover Letter. The airfield airspace waiver request package cover letter must be signed out by the Installation Commander and contain the following mandatory

attachments which provide the details necessary to staff the request to USAFE-AFAFRICA/DCOM for action.

A2.4.2.2. In **Attachment 1**, Completed USAFE-AFAFRICA FORM 582, *Request for Waiver to Airfield and Airspace Criteria* (see **paragraph A2.6.**).

A2.4.2.3. In **Attachment 2**, Location Plan on map E-1 at 1:5000 m scale. Map must include:

A2.4.2.3.1. Proposed location and its perpendicular distance to runway and taxiway centerlines, to apron, from ends of runways and to existing adjacent structures, as appropriate.

A2.4.2.3.2. Alternate sites considered in the selection process.

A2.4.2.3.3. All existing waivers in the project area, with a minimum distance of 300 m from the project area.

A2.4.2.3.4. Elevations of the proposed facility and project area.

A2.4.2.3.5. Elevations at runway centerline at points perpendicular to the proposed facility (for facilities beyond along the extended runway centerline, use threshold elevation).

A2.4.2.4. In **Attachment 3**, Risk Assessment results using AF Form 4437, *Deliberate Risk Assessment Worksheet*. Specific requirements for the Risk Assessment are located in **Attachment 3** of this instruction.

A2.4.2.5. In **Attachment 4**, Digital photos of obstruction(s).

A2.4.2.6. In **Attachment 5**, Proposed Corrective Action for temporary waivers. Corrective action to include:

A2.4.2.6.1. Project number or Civil Engineer Work Request (AF IMT 332, *BCE Work Request*) number.

A2.4.2.6.2. Project Description.

A2.4.2.6.3. Programmed Cost.

A2.4.2.6.4. FIM Rating.

A2.4.2.6.5. Risk Assessment Code (RAC).

A2.4.2.6.6. Estimated Execution Date (FY).

A2.4.2.6.7. Wing Facilities Board Priority based on Consolidated Priority List (CPL)

A2.4.2.7. In **Attachment 6**, Safety Precautions. Provide details of the safety precautions that will mitigate the hazard of the waived item (i.e., local Notice to Airmen (NOTAM), obstruction lighting and marking, publication in the Flight Information Publication, locally developed procedures for movement around the item, etc.).

A2.4.2.8. Proof of Coordination. Provide proof of base level coordination with the following offices, as appropriate for specific installation (a copy of the AF IMT 1768, *Staff Summary Sheet* or equivalent electronic form will suffice):

A2.4.2.8.1. Mission Support Group.

A2.4.2.8.2. Civil Engineering.

A2.4.2.8.3. Operations Group.

A2.4.2.8.4. Airfield Operations Flight.

A2.4.2.8.5. TERPS Representative.

A2.4.2.8.6. Flight and Occupational Safety; and

A2.4.2.8.7. others as appropriate, such as Communications and Security Forces.

**A2.4.3. Construction Waiver Request Package Requirements.** The BCE must request a waiver from the Installation Commander for any construction projects and activity that violate any airfield clearance criteria during the construction project. Construction waiver requests must be submitted at least 45 days before the scheduled construction start date, or an emergency construction waiver when 45 days are not possible. Construction waivers must be approved prior to start of construction. Construction waivers must contain:

A2.4.3.1. Description of Proposed Waivered Object to include: dimensions, type of construction on the airfield including equipment; number of construction personnel; if the activity will produce emissions of any kind; and the duration of the construction activity.

A2.4.3.2. Location Plan at 1:5000 m scale to include: proposed location and its perpendicular distance to runway and taxiway centerlines, to apron, from ends of runways, and to existing adjacent structures, as appropriate; elevations of the proposed facility and project area; elevations at runway centerline at points perpendicular to the proposed facility (for facilities beyond along the extended runway centerline, use threshold elevation); and size of largest piece of construction equipment used in the construction area(s).

A2.4.3.3. Risk assessment results. Specific requirements for the risk assessment are in [Attachment 3](#).

A2.4.3.4. A construction phasing plan (see UFC 3-260-01, Appendix B, Section 14, "Construction Phasing Plan and Operational Safety on Airfields During Construction"). Provide details of the safety precautions that will mitigate the hazard of the waived item (i.e., local NOTAM, obstruction lighting and marking, publication in the Flight Information Publication, locally developed procedures for movement around the item, equip all construction personnel with orange vests, mark or flag equipment, etc.).

A2.4.3.5. Ensure all deviations from UFC 3-535-01, Visual Air Navigation Facilities standards are coordinated with the TERPS office.

## **A2.5. Review of Waivers, Permissible Deviations, Exemptions and Non-conforming Facilities/ Structures/Objects.**

A2.5.1. **Construction Waivers.** Construction activities will be monitored regularly, by Civil Engineers (CE), Flight Safety and AM to ensure all information contained in the construction waiver remains accurate. Construction activities often change from the original plan and must be reevaluated to ensure there is no change in the level of risk; mitigation efforts must be reevaluated for their effectiveness during construction. A review process is required at the start of each project phase.

**A2.5.2. Permanent and Temporary Waivers, Permissible Deviations, Exemptions and Non-conforming Facilities/Structures/Objects.** It is recommended that each installation develop their own review procedures that meet the specific needs of their installation, provided that all temporary and permanent waivers, permissible deviations, exemptions and non-conforming facilities/structures/objects are reviewed at least annually for accuracy and currency. The review must physically verify the waiver's existence and update the status of the corrective action. Noted changes to approved waivers should receive USAFE-AFAFRICA/DCOM approval prior to being incorporated into the E-1 map and installation GIS. Regardless of the format and method used, the review results are to be briefed to the Facilities Board with a copy sent to AFIMSC Det 4/CEB on an annual basis, furnished by 1 December each year. AFIMSC Det 4 will forward a copy to USAFE-AFAFRICA/A4C for approval.

**A2.5.3. Annual Waiver Review Participants.** At a minimum the annual airfield airspace waiver process must include representation from:

- A2.5.3.1. Civil Engineering.
- A2.5.3.2. Airfield Manager.
- A2.5.3.3. Terminal Instrument Procedures (TERPS).
- A2.5.3.4. Flight Safety.
- A2.5.3.5. Air Traffic Control (ATC).

**A2.5.4. Annual Waiver Review Package.** Installations should include the following in the review package sent to AFIMSC Det 4/CEB:

- A2.5.4.1. A letter from the Installation Commander to AFIMSC Det CEB documenting the formal review highlighting general issues such as the effectiveness or challenges of implemented risk mitigation actions and control measures.
- A2.5.4.2. Documentation from the annual review meeting.
- A2.5.4.3. USAFE-AFAFRICA FORM 583.
- A2.5.4.4. A list of all permissible deviations, exemptions and non-conforming facilities/structures/objects.
- A2.5.4.5. Updated E-1 Airfield and Airspace Obstructions Map, E-2 Approach and Departure – Zone Obstructions to 10,000 ft, E-3 Approach and Departure Zone Obstruction Beyond 10,000 ft, E-4 Airspace Obstructions – Vicinity and E-9 Aircraft Parking Plan drawn to a scale of 1:5000 m.
- A2.5.4.6. A summary of waivers approved and/or cancelled within the last year.
- A2.5.4.7. An update of the status of action/projects associated with each temporary waiver and time remaining to resolve waiver. Temporary waivers are approved for eight years with the expectation that they are resolved within that period of time. Identify any new risks for each temporary waiver.
- A2.5.4.8. Prioritized plan/budget for waiver reduction for the next year.

**A2.6. Instructions for USAFE-AFAFRICA FORM 583.** USAFE-AFAFRICA FORM 583 summarizes corrective action information for approved airfield airspace waivers. This form is not intended for use to request new waivers. Order obstructions on USAFE-AFAFRICA FORM 583 so they match Wing priority for removal (i.e., the first waiver on USAFE-AFAFRICA FORM 583 is the Wing's # 1 priority for removal). Detailed instructions for completing the USAFE-AFAFRICA FORM 583 are as follows:

A2.6.1. **Block 1.** Base. Provide the name of your installation.

A2.6.2. **Block 2.** Submittal Date. Enter the date the biennial waiver package was completed.

A2.6.3. **Block 3.** Control Surface. Enter the specific surface that the obstruction is violating such as Primary Surface, Clear Zone, etc. Sort out obstructions by control surface violated.

A2.6.4. **Block 4.** Alpha Prefix. Enter the prefix of the violation taken from the surface codes found in **Chapter 3** of this instruction. Example for Primary surface violation would be coded as A.

A2.6.5. **Block 5.** Waiver Information

A2.6.5.1. **Column a.** Waiver Number. Enter the number for approved airfield waivers. Waiver numbers shall be standardized in the command. Waiver number will have a violation prefix designating the surface violated and a three-digit numerical identification number. **Example:** For Primary surface violation at Ramstein AB, Germany = A001. Surface codes for violation prefix are found in **Chapter 3, Figure 3.10** of this instruction.

A2.6.5.2. **Column b.** Lat/Long Coordinates. Enter the lat/long coordinates of the obstruction location. These coordinates available from your local GIO office.

A2.6.5.3. **Column c.** Waiver Description. Provide a short description of the obstruction (i.e. light pole, water tower, tree, fence, etc.).

A2.6.5.4. **Column d.** List the criteria violated. Ensure references are current and refer to criteria in this instruction.

A2.6.5.5. **Column e.** Frangibility. Note if the obstruction is frangible as described in UFC 3-260- 01, Appendix B, Section 13.

A2.6.5.6. **Column f.** Elevation Runway Centerline. Provide closest runway elevation perpendicular to the obstruction.

A2.6.5.7. **Column g.** Distance from Runway, Taxiway or Taxitrak Centerline or Edge of Parking Apron. Provide perpendicular distance from the obstruction to the centerline or edge of the violation such as runway, taxiway, taxitrak, or parking apron.

A2.6.5.8. **Column h.** Distance from Threshold. Provide distance from the obstruction to a line perpendicular to the nearest threshold.

A2.6.5.9. **Column i.** Obstruction Marked and, or Lit. Place an L in the column if the object is lit and an M if the object is marked according to Standardization Agreement (STANAG) 3346, *Marking and Lightning of Airfield Obstructions*.

A2.6.5.10. **Column j.** Elevation of Control Surface at Most Severe Point of Violation. Provide closest elevation of control surface (e.g. transitional surface, approach or departure surface, etc.) perpendicular to the obstruction.

A2.6.5.11. **Column k.** Ground Elevation at Most Severe Point of Violation. Provide ground elevation of the obstruction.

A2.6.5.12. **Column l.** Obstruction Height. Provide the actual height of the obstruction. This measurement is taken from ground level to the highest point of the obstruction.

A2.6.5.13. **Column m.** Violation. Provide the actual violation of the obstruction. This number may be either a height or distance violation depending the control surface.

A2.6.5.14. **Column n.** Remarks. Provide any additional information here. If the waiver is temporary enter the project number, and planned removal or correction date. It is understood this is driven by funding and this date is subject to change.

A2.6.5.15. **Column o.** Date Approved by HQ USAFE-AFAFRICA or Installation Commander. Provide the original date of approval for the waived item. If original approval documentation is not available to complete this field provide a brief explanation why in the cover letter. After the submittal is approved, submit a new waiver request to obtain official approval for the waived obstruction.

**A2.7. Contingency Waiver Request Package Requirements.** The Installation Commander is the approval authority for contingency waivers not exceeding six months. If a contingency waiver is needed for up to one year (twelve months), a temporary waiver request must be submitted to HQ USAFE through the Installation Commander. If the contingency lasts longer than one year, contact AFIMSC Det 4/CEB Community Planning for guidance. Contingency waivers must contain:

A2.7.1. Description of proposed activity to include: criteria violated, how the current contingency is forcing the base to not comply with criteria, and expected length of operation.

A2.7.2. Location Plan at 1:5000 m scale to include: proposed location of activity and its relationship to the runway.

A2.7.3. Risk Assessment results. Specific requirements for the risk assessment are located in **Attachment 3** of this instruction.

A2.7.4. Provide details of the safety precautions that will mitigate the hazard of the waived item (i.e., local NOTAM, obstruction lighting and marking, publication in the Flight Information Publication, locally developed procedures for movement around the item, implementation of wing walkers or other personnel, etc.).

### Attachment 3

## RISK MANAGEMENT (RM) FOR AIRFIELD OBSTRUCTIONS AND WAIVERS REQUESTS

### A3.1. Risk Management (RM).

A3.1.1. RM provides a systematic way to identify and select control measures that do not rely simply on intuition and experience. It follows the requirements of AFI 90-802, Risk Management, consists of five primary steps, namely: (1) hazard identification, (2) hazard assessment, (3) develop controls, (4) implement controls, and (5) supervise and evaluate. A Civil Engineering (CE) representative will be the Office of Primary Responsibility (OPR) for the RM process for airfield obstructions, with Safety and Airfield Management (AM) acting as Offices of Collateral Responsibility (OCRs). However, the OPR and the OCRs must collaborate to complete the RM

A3.1.1.1. RM is defined as a logic-based, common-sense approach to making calculated decisions on human, material and environmental factors before, during and after potentially dangerous activity, both on and off duty. RM has played an ever-increasing role in the airfield waiver process. Currently, all airfield waiver requests require an RM assessment be completed prior to submittal to AFIMSC DET 4/CEB. The material in this attachment is designed to: (1) assist base personnel with RM guidelines as they pertain to the airfield environment, and (2) provide examples of RM assessments for different types of waiver packages.

A3.1.1.2. When discussing RM, it is important to understand the difference between hazard and risk. The hazard is the condition; it only becomes a risk when the hazard has been assessed for how likely it is to cause an accident (probability), and how severe that accident would be if the hazard did cause an accident (severity).

A3.1.1.3. Airfield waivers require a full risk management assessment before submittal to AFIMSC DET 4/CEB. Locally approved airfield waivers require only a risk assessment (Step 2) prior to Installation Commander approval.

A3.1.1.4. To be a systematic process, there must be tools to use that will provide a reasonable assurance that all hazards have been identified. The amount of time available will be suited to a particular operation than others.

A3.1.1.4.1. **Operations Analysis.** An operational analysis is a list of the major steps of an operation, usually listed in chronological order. The idea is to use this as a checklist to make sure you identify the hazards in each phase of an operation. This tool is used in virtually all risk management operations to include the most time critical.

A3.1.1.4.2. **Scenario Building.** Scenario building involves mentally visualizing what will occur during each phase of an operation. Then, visualize the operation again including the things that can go wrong and noting the outcomes. This will help to identify hazards that must be addressed. Because of its simplicity, this tool should be included in most hazard identification applications to include some time-critical situations.

A3.1.1.4.3. **Change Analysis.** The change analysis tool is used to detect the hazard implications of both planned and unplanned changes to a process. This allows the risk management process to focus only on aspects that have changed, eliminating the need to reanalyze a total operation just because a change has occurred in one area. This tool can save a great deal of effort in those situations where a process has already been risk managed; thus there is focus on the changes rather than the whole operation.

A3.1.1.4.4. **What If.** What if asks what could go wrong and what hazards would show up as a result. It is designed to add structure to the intuitive and experimental expertise of personnel. One of the most powerful and effective of the hazard identification tools.

A3.1.1.4.5. **Logic Diagram.** The logic diagram tool is used to add detail and rigor to the hazard identification process. Its graphic structure is an excellent means of capturing and correlating the hazard data produced by other tools. Because it is more structured than some of the other tools, the logic diagram requires more time and effort to complete, limiting its use to higher risk issues.

A3.1.1.5. **The Five Step USAFE-AFAFRICA RM Process.** The five step RM process follows the RM processes of AFI 90-802. Below, the USAFE-AFAFRICA RM Process is presented in an airfield-specific set of examples to further illustrate the importance to USAFE-AFAFRICA airfield and heliport planning.

### **A3.2. RM Process for Airfield Airspace Waiver Packages (Example).**

A3.2.1. The purpose of integrating RM into the airfield waiver process is to identify the hazard (obstruction), analyze the risk (risk assessment), implement controls (safety precautions) and reevaluate the controls (corrective action). The RM process applies to temporary, permanent and temporary- construction waiver requests. The following example is of an RM analysis representing a temporary airfield waiver request for a perimeter road project.

A3.2.2. Temporary Waiver Request (Example). For this example a project is constructing a perimeter road that will violate clear zone and apron criteria. A RM assessment is performed as part of the temporary waiver request as required in [Attachment 2](#). Using the five-step process this example outlines the minimal requirements for a risk assessment submitted as part of a waiver request to AFIMSC DET 4/CEB.

A3.2.2.1. **RM Assessment for Perimeter Road Project. Background.** The Perimeter Road Project is a Fiscal Year (FY) 50 Military Construction (MILCON) project that will construct a perimeter road around the airfield. The current base boundary lies within the runway and apron clearance zones, therefore the perimeter road will violate these two airfield clearances. Utilizing RM will facilitate assessing the risk involved in constructing the road at its proposed location. The long-range plan to correct this hazard is to acquire land and relocate the base boundary and perimeter road outside of the airfield clearances.

A3.2.2.1.1. **Step 1.** Identify hazards associated with constructing the perimeter road in the runway and apron clear zones:

A3.2.2.1.1.1. Aircraft mishap (lands short and hits vehicle or pedestrian).

A3.2.2.1.1.2. Aircraft mishap (exits runway on departure and hits vehicle or pedestrian).

A3.2.2.1.1.3. Aircraft mishap (aircraft ingests foreign object damage (FOD))

resulting from vehicular traffic near apron).

A3.2.2.1.1.3.1. Equipment mishap (vehicle departs road and damages Navigational Aid).

A3.2.2.1.2. **Step 2.** Assess the risk of each identified hazard then develop an overall risk level for the project.

A3.2.2.1.2.1. Assessment for Aircraft Mishap (landing short striking vehicle or pedestrian).

A3.2.2.1.2.2. Severity. If an aircraft did land short, for whatever reason, and did strike a vehicle or pedestrian, the resulting accident would be catastrophic. There would certainly be system loss (aircraft damage) and possible loss of life or permanent disability.

A3.2.2.1.2.3. Probability. USAF pilots are professionals and receive training to handle emergency situations, therefore it is unlikely that a pilot would cause the aircraft to land short and cause a mishap.

A3.2.2.1.2.3.1. Following the risk assessment matrix found in AFI 90-802 and presented in **Table A3.1**, the landing short striking vehicle score = I-E. This is a medium overall risk.

**Table A3.1. Sample Risk Assessment Matrix.**

Risk Assessment Matrix				PROBABILITY				
				Frequency of Occurrence Over Time				
				A Frequent (Continuously experienced)	B Likely (Will occur frequently)	C Occasional (Will occur several times)	D Seldom (Unlikely; Can be expected to occur)	E Unlikely (Improbable; but possible to occur)
SEVERITY	EFFECT OF HAZARD	<b>Catastrophic</b> (Death, Loss of Asset, Mission Capability or Unit Readiness)	I	EH	EH	H	H	M
		<b>Critical</b> (Severe Injury or Damage, Significantly Degraded Mission Capability or Unit Readiness)	II	EH	H	H	M	L
		<b>Moderate</b> (Minor Injury or Damage, Degraded Mission Capability or Unit Readiness)	III	H	M	M	L	L

	<b>Negligible</b> (Minimal Injury or Damage, Little or No Impact to Mission Readiness or Unit Readiness)	IV	M	L	L	L	L
			<b>Risk Assessment Levels</b>				
			EH = Extremely High; H = High; M = Medium; L = Low				

A3.2.2.1.2.4. Assessment for Aircraft Mishap (exiting runway at departure end and striking vehicle or pedestrian).

A3.2.2.1.2.5. Severity. If an aircraft did exit the runway, for whatever reason, and did strike a vehicle or pedestrian, the resulting accident would be catastrophic. There would certainly be system loss (aircraft damage) and possible loss of life or permanent disability.

A3.2.2.1.2.6. Probability. USAF pilots are professionals and receive training to handle emergency situations. Runway 18/36 is equipped with 305 m (1000 ft) overruns and redundant BAK-12 aircraft arresting systems. On average, the overrun barrier is engaged once every 5 years. Pilot skill and the in-place safety features of Runway 18/36 provides for an unlikely exiting of the runway at the departure end resulting in an aircraft mishap.

A3.2.2.1.2.6.1. Following the risk assessment in **Table A3.1** above, the exiting runway at departure end and striking vehicle or pedestrian = I-E. This is a medium overall risk.

A3.2.2.1.2.7. Assessment for Aircraft Mishap (ingests FOD resulting from vehicular traffic near apron).

A3.2.2.1.2.8. Severity. When an aircraft ingests FOD it is possible for the engine to sustain damage. If the damage is immediate the engine could be destroyed and prevent the aircraft from accomplishing its mission. Engine damage is major system damage. The resultant mishap would be critical.

A3.2.2.1.2.9. Probability. Our maintenance crews, safety personnel and airfield managers (AFMs) are professionals and follow an installation approved FOD control plan that has all but eliminated FOD incidents at this installation. It is recognized that the FOD plan must be modified to incorporate the new perimeter road and therefore is not applicable to this assessment. Given the distance of the perimeter road from the apron and dedication of installation leadership and the airfield crew, it is unlikely that an aircraft would experience FOD damage and cause a mishap.

A3.2.2.1.2.9.1. Following the risk assessment in **Table A3.1**, the ingesting FOD and damaging aircraft = II-E. This is a low overall risk.

A3.2.2.1.2.10. Assessment for Vehicular Mishap (vehicle departs perimeter road and strikes navigational aid).

A3.2.2.1.2.11. Severity. Speed limits on perimeter road are set at 50 KPH and navigational aids (NAVAIDS) on our airfield are frangible and obstruction lit. If a vehicle departed the perimeter road and struck a nearby navigational aid there would be minor systems damage to the NAVAIDS and possibly minor injury to the vehicle operator resulting in moderate overall damage.

A3.2.2.1.2.12. Probability. The probability of a vehicle departing the perimeter road is occasional. Poor visibility from less than desirable weather conditions has caused two Privately Owned Vehicles (POVs) to depart other portions of the perimeter road in the last 5 years.

A3.2.2.1.2.12.1. Following the risk assessment in **Table A3.1**, the vehicle striking navigational aid = III-C. This is a medium overall risk.

A3.2.2.1.2.13. Overall risk rating for project = Medium.

A3.2.2.1.3. **Step 3. Risk Controls.** The requirements for a perimeter road and the unavailability of land, dictate the perimeter road be sited in the proposed location, therefore we cannot avoid, spread or transfer the risk. The only appropriate controls are to reduce the risk by implementing the following:

A3.2.2.1.3.1. Engineer - The proposed perimeter road site is located as far from the runway end and apron edge as possible. NAVAIDS near the perimeter road are frangible and obstruction lit.

A3.2.2.1.3.2. Guard or Control – Traffic control lights have been integrated into the perimeter road design. These “stop lights” are controlled by the tower and will halt vehicular traffic when aircraft are taking off or landing on the runway.

A3.2.2.1.3.3. Limit Exposure – Traffic control lights are located outside of the runway clear zones and are frangible. NAVAIDS are set back from the perimeter road as far as possible and are frangible.

A3.2.2.1.3.4. Selection of Personnel – Not applicable. We investigated limiting GOVs with flightline certified drivers to the perimeter road, however some community functions are only accessible only via the perimeter road therefore we cannot limit access to flightline certified drivers in GOVs.

A3.2.2.1.3.5. Procedures – Traffic control lights contain an information sign requiring drivers to stop when lights are red. Traffic light information has been posted on the installation website and been passed to squadron orderly rooms for dissemination. A local Notice to Airmen (NOTAM) has been published to inform operators of the control lights.

A3.2.2.1.3.6. Training and Education – Traffic control lights are briefed to all new arrivals at the base new comers briefing.

A3.2.2.1.3.7. Warn – Information signs warning of the hazards of low flying aircraft are posted adjacent to the traffic control lights.

A3.2.2.1.3.8. Reduce Effect – The only equipment provided with the perimeter road project is the traffic control lights.

A3.2.2.1.3.9. Installation Commander has approved use traffic control lights on the

perimeter road project. The traffic lights added \$5,000 to the cost of the project and require \$100/year for maintenance for the life of the waiver. Land acquisition is expected to take 10 years so the maintenance cost for the life of the control lights is expected to be \$1,000 and is deemed an acceptable resource cost.

A3.2.2.1.4. **Step 4.** Risk Control Implementation. With Installation Commander approval, the BCE has incorporated the traffic control lights into the perimeter road project. Since the project is still in design and awaiting waiver approval, the traffic lights are on hold pending approval of the waiver and awarding of the construction project. A RM assessment must be prepared, in cooperation, by CE, SE and OSS and approved by the Installation Commander. If an Installation Commander approves a temporary construction waiver, it is assumed that by doing that the Commander also endorses the risk assessment.

A3.2.2.1.5. **Step 5.** Supervise and Evaluate. The waiver OPR/OCR will review the on-going effectiveness of the approved risk controls and make changes as deemed necessary and brief the Installation Commander of any updates.

**Attachment 4****LAND USE COMPATIBILITY GUIDELINES FOR CLEAR ZONES**

**A4.1. Criteria Land Use Compatibility Guidelines for Critical Airfield Safety Areas.** Criteria land use compatibility guidelines for critical airfield safety areas in the USAFE-AFAFRICA shall follow those presented in AFI 32-1015 and AFH 32-7084.

A4.1.1. USAFE-AFAFRICA airfields shall also consider any host nation requirements or national standards, where applicable and as stipulated in a written host nation agreement.

## Attachment 5

### AIRFIELD CRITERIA AND WAIVER PROCESSING PROCEDURES FOR GERMAN INSTALLATIONS

**A5.1. Introduction.** This attachment is intended to provide Ramstein Air Base and Spangdahlem Air Base personnel with guidance on applicable airfield criteria, waiver processing procedures, and new construction siting information.

**A5.2. Air Traffic Act Permit (ATAP).** Ramstein Air Base and Spangdahlem Air Base operate under approved ATAPs, which are permits granted by the German Government under the German Air Traffic Act (Luftverkehrsgesetz) in connection with Article 53 and 53A of the German NATO SOFA Supplementary Agreement. These agreements implement a modified set of ICAO and NATO criteria for Ramstein AB and Spangdahlem AB.

**A5.3. Applicable Airfield Criteria.** The ATAP for each installation implements modified ICAO, Annex 14 (NfL I – 328/01) criterion for the runway surfaces and NATO criteria for aprons, parallel taxiway/emergency runways, and taxitraks. See **Chapter 3** of this USAFEI for details on establishing airfield imaginary surfaces consistent with these standards.

A5.3.1. Other airfield criteria, such as parking area design and wingtip clearances, follow the standards found in **Chapter 4** and **Chapter 5** of this instruction. Where inadequate space is available, modified NATO BI SC Directive 85-5, *NATO Approved Criteria and Standards for Airfields*, standards are applied and documented. For planning purposes, use this instruction unless approved deviations are already established.

A5.3.2. Many of the ICAO clearance surfaces evolve from the Aerodrome Reference Point (ARP). The ARP for each installation is defined in the ATAP and must be used for surface calculation and obstruction evaluation.

A5.3.3. **Ramstein Air Base.** Obstacles violating the criteria in this instruction must be reported to AFIMSC Det 4/CE and the Luftfahrtamt der Bundeswehr (LufABw). Airfield obstructions must be marked and lighted according to ICAO Annex 14 and NATO standards.

#### A5.3.3.1. Ramstein Air Base ARP:

A5.3.3.1.1. Location. 49° 26' 12.872" N 007° 36' 01.119" E (WGS-84 grid coordinate system).

A5.3.3.1.2. Elevation. 235.74 m above Mean Sea Level (MSL).

A5.3.4. **Spangdahlem Air Base.** Obstacles violating the criteria in this instruction must be reported to AFIMSC Det 4/CE and the LufABw. Airfield obstructions must be marked and lighted IAW ICAO Annex 14 and NATO standards.

#### A5.3.4.1. Spangdahlem Air Base ARP:

A5.3.4.1.1. Location. 49° 58' 35.544" N 006° 41' 54.609" E (WGS-84 grid coordinate system).

A5.3.4.1.2. Elevation. 357.49 m above Mean Sea Level (MSL).

**A5.4. Taxiways and Taxilanes.** Criteria in **Chapter 5** and **Chapter 6** apply for taxiways and aprons (including taxilanes) respectively with the following exceptions.

A5.4.1. At German installations, clearances from taxiway centerlines to fixed or mobile obstacles (Item 10 in [Table 5.1](#)) will conform to the standards in [Table A5.1](#), Column (a).

A5.4.2. At German installations, taxilane clearances (Item 6 in [Table 6.1](#)) will conform to the standards in [Table A5.1](#), Column (b).

**Table A5.1. Taxiway and Taxilane Clearances to Fixed or Mobile Obstacles in Germany.**

<b>Code of Primary Aircraft Using the Taxiway or Taxilane (See Table A5.2.)</b>	<b>Minimum Distance from Taxiway Centerline to Obstacles (a)</b>	<b>Minimum Distance from Taxilane Centerline to Obstacles (b)</b>
A	15.5 m (50.8 ft)	12 m (39.4 ft)
B	20 m (65.6 ft)	16.5 m (54.1 ft)
C	26 m (85.3 ft)	22.5 m (80.4 ft)
D	37 m (121.4 ft)	33.5 m (118.1 ft)
E	43.5 m (142.7 ft)	40 m (131.2 ft)
F	51 m (167.3 ft)	47.5 m (155.8 ft)

A5.4.3. Applicable aircraft codes are determined by wingspan. Code letters, their associated wingspans, and common USAFE aircraft falling within each category are presented in [Table A5.2](#). These aircraft codes are necessary for determining appropriate clearances for both taxiways and taxilanes within this Attachment.

**Table A5.2. Aircraft Codes for Taxiway and Taxilane Clearances.**

<b>Code Letter</b>	<b>Wingspan Range</b>	<b>Common USAFE Aircraft</b>
A	Less than but not including 15 m	A-4, AV-8, C-21, C-26, E/F/A-18, EA-18, F-15, F-16, F-22, F-35, F-5, R/F-4, T-1, T-28, T-28, T-3, T-34, T-38, T-41, T-45, T-6, U-21
B	15 m up to but not including 24 m	A-10, A-6, C-12, C-20, C-23, C-38, E-1, EA-6B, MQ-1, RQ-9, S-3, T-44, UC-35, UV-18
C	24 m up to but not including 36 m	C-1, C-22, C-27J, C-37, C-40, C-9,

Code Letter	Wingspan Range	Common USAFE Aircraft
		DASH-7, DASH-8, E-2, P-3, T-43, TR-1, U-2, V-22
D	36 m up to but not including 52 m	B-1, C-130, C-135, C-137, C-17, C-2, C-32, E-3, E-6, E-8, KC-10, KC-135, KC-46, MQ-4, P-8, RQ-4
E	52 m up to but not including 65 m	B-2, B-52, B-747/400, E-4, VC-25
F	65 m and greater	C-5

**A5.5. Waiver Process Supplement.** Exceptions (waivers) to these criteria require LufABw and HQ USAFE approval. Process waivers according to [Attachment 2](#). USAFE bases will coordinate waiver requests with LufABw before submitting them to AFIMSC Det 4/CE.

A5.5.1. Obstacles at and surrounding all military airfields in Germany shall be surveyed annually by the Zentrum für Geoinformationswesen der Bundeswehr (ZGeoBw).

**A5.6. New Construction Planning and Siting.** In addition to on-base project review and approvals, Ramstein Air Base and Spangdahlem Air Base personnel must be aware of off-base programs and projects that can impact flight safety and established clearance planes.

A5.6.1. Section §18a Luftverkehrsgesetz (LuftVG) [Air Traffic Act] defines the rules regarding construction in the airfield construction protection zones (*Bauschutzbereich*). The competent aviation authority must be informed in advance of any construction project.

A5.6.2. Refer to the following German regulations regarding established military zones, encroachment management, and obstacle clearances:

A5.6.2.1. NfL I 328/01 Bundesministerium für Verkehr, Bau- und Wohnungswesen: Richtlinien über die Hindernisfreiheit für Start- und Landebahnen mit Instrumentenflugbetrieb (Federal Ministry of Transport, Building and Housing: Guidelines on obstacle clearances for runways with instrument flight operations). 29 Nov 2001.

A5.6.2.2. NfL I 92/13 (Replaced NfL I 327/01) Bundesministerium für Verkehr, Bau- und Stadtentwicklung: Gemeinsame Grundsätze des Bundes und der Länder für die Anlage und den Betrieb von Flugplätzen für Flugzeuge im Sichtflugbetrieb (Federal Ministry of Transport, Building and Housing: Common Guidelines of the Federal and State authorities on the construction and operation of airfields for visual flight operations). 2 May 2013.

A5.6.2.3. Luftverkehrsgesetz (LuftVG) [Air Traffic Act]. 10 May 2007 (last updated 20 July 2017).

A5.6.2.4. Luftrechtliche Genehmigung für die Erweiterung des Militärflugplatzes Ramstein (Air Traffic Act Permit for the expansion of Ramstein Air Base). Wehrbereichsverwaltung West Militärische Luftfahrtbehörde. 11.6.2003.

A5.6.2.5. Luftrechtliche Genehmigung für die Erweiterung des Militärflugplatzes Spangdahlem (Air Traffic Act Permit for the expansion of Spangdahlem Air Base). Wehrbereichsverwaltung West Militärische Luftfahrtbehörde. 30.9.2002.



## Attachment 6

### AIRFIELD CRITERIA AND WAIVER PROCESSING PROCEDURES FOR SPANISH INSTALLATIONS

**A6.1. Introduction.** This attachment is intended to provide Morón Air Base personnel with guidance on applicable airfield criteria, waiver processing procedures, and new construction siting information.

**A6.2. Runway Certification.** Morón Air Base operates as a military airfield and is operated under a Joint Statement of Understanding (JSU) between the Spanish Air Force (SpAF) and United States Forces. Morón Air Base is a Spanish property and under the operational command of the SpAF Base commander (SpAF/ CC). The airfield is a USAF Operational and Support Installation (IDA) funded and maintained by the USAF and represented by the Commander of the United States Forces at Morón Air Base (US/CC).

**A6.3. Applicable Airfield Criteria.** The JSU establishes that Morón Air Base will be operated/managed in accordance with whichever of the following standards is more restrictive (NATO, SpAF, ICAO, USAF). Morón Air Base establishes airfield obstacle and clearance surfaces per this instruction and per Decree no. 584/1972. This is consistent with the NATO and ICAO Annex 14, Chapter 3, for a Code 4 runway standards adopted into this instruction. See [Chapter 3](#) of this USAFEI for details on establishing airfield imaginary surfaces.

A6.3.1. Airfield design criteria in Spain follow NATO and ICAO Annex 14 standards. For planning purposes, use the criteria from this instruction. This instruction already incorporated/considered the NATO and ICAO design criteria in addition to US standards derived from UFC 3-260-01, with Change 1.

A6.3.2. Many of the airfield imaginary surfaces evolve from the Aerodrome Reference Point (ARP). The ARP is defined in the certification document and must be used for surface calculation and obstruction evaluation. The following information is intended as guidance.

A6.3.2.1. **Morón Air Base ARP.** Obstacles violating the established imaginary surfaces must be reported to AFIMSC Det 4/CE and the Spanish Air Force (SpAF) via the SpAF Chain of Command (CoC) and following the process presented in [paragraph A6.4](#) below. Airfield obstructions must be marked and lighted according to ICAO Annex 14 and NATO standards. The Morón Air Base ARP is as follows:

A6.3.2.1.1. Location. 37° 10' 30"N 5° 36' 58"W (WGS-84).

A6.3.2.1.2. Elevation. 87 m above Mean Sea Level (MSL).

**A6.4. Aprons and Taxilanes.** Criteria in [Chapter 6](#) apply for aprons, with the exception of clearances from apron boundary marking to fixed or mobile obstacles (Item 15 in [Table 6.1](#)). At Morón Air Base this clear distance will be calculated by multiplying 0.5 x the wingspan of the most demanding aircraft that will use the apron, adding the appropriate wingtip clearance required by Item 5 or 6 in [Table 6.1](#) and subtracting the distance from the taxilane centerline to the outside edge of the apron boundary marking (Item 7 in [Table 6.1](#)), per UFC 3-260-01.

**A6.5. Morón Air Base Waiver Request Process Supplement.** Management and coordination of airfield operations is delegated to the “Jefe de Escuadrilla de Control Tránsito Aéreo” (JECTA)

for the SpAF and the Operations Support Flight Commander (OS/CC) for the USAF or their designated representatives. Process waivers according to [Attachment 2](#).

A6.5.1. Waivers are relevant to USAF only and are not coordinated with the Spanish Air Force.

A6.5.2. The Cartography and Photography Center (CECAF) maintains a database of known obstructions, that is completely updated every 5 years. The obstructions identified in this database feed into the Morón Air Base AIP and also into the GDSs used by USAFE-AFAFRICA pilots.

A6.5.3. If the OS/CC identifies an obstruction they coordinate with the SpAF CoC. The SpAF then coordinate with CECAF who make a decision as to the way forward and whether the obstruction should be added to the AIP. In the meantime, the USAFE-AFAFRICA will file a temporary or permanent waiver to USAFE.

**A6.6. New Construction Planning and Siting.** In addition to on-base project review and approvals, Morón Air Base personnel must be aware of off-base programs and projects that can impact flight safety, imaginary surfaces, and established clearance planes.

A6.6.1. Any new construction on Morón Air Base must adhere to the standards in this instruction to the extent practicable. Modified standards conforming to Spanish law (which generally follows NATO and ICAO standards) can be used when these standards cannot be met and when approved by the SpAF. Any such deviations from the standards in this instruction require a waiver per [paragraph A6.5](#) above. The review and approval process via the SpAF and USAFE-AFAFRICA usually happen concurrently.

A6.6.2. All approved airfield construction projects will be governed, designed, and built using the standards listed in [paragraph A6.3](#) above.

A6.6.3. Mutual approval for projects within IDAs is not required. However, all airfield projects within the confines of the USAF IDA must be operationally coordinated between the JECTA and OS/CC, to the full extent possible.

A6.6.4. Spanish law requires local authorities to consider impacts to Morón AB and other aerodromes before granting off-base construction permits. Royal Decrees 689/1978, 10 February (B.O.E. No 89, 14 April 1978), and 584/1972, 24 February (B.O.E. No. 69, 21 March 1972), last modified in 2013, establish a restriction zone 300 meters around any installation that prevents encroachment. These decrees further regulate any construction exceeding 50ft in height and prevents the construction of large structures in flight paths (e.g., windmills). When such construction is proposed the local community planning office is responsible for coordinating planning permission /objections with all affected parties, including Morón AB.

A6.6.5. Airfield construction projects should be coordinated via design, pre-construction and construction meetings.

A6.6.6. Refer to the following Spanish laws regarding established military zones, encroachment management, and military/municipal project reviews:

A6.6.6.1. Decreto 584/1972, de 24 de febrero, de servidumbres aeronáuticas (*Última modificación: 17 de mayo de 2013*). Ministerio del Aire «BOE» núm. 69, de 21 de marzo de 1972. Referencia: BOE-A-1972-426 (Decree no. 584/1972 of 24 February, On Obstacle Limitation Surfaces [*Last Modified 17 May 2013*].)

A6.6.6.2. Decreto 3748/1970, de 19 de diciembre, por el que se fijan las servidumbres aeronáuticas y las de los terrenos inmediatos a las instalaciones radioeléctricas de ayuda a la navegación aérea de la Base Aérea de Morón de la Frontera (Sevilla). (Decree 3748/1970, of December 19, by which the aeronautical obstructions and those of the immediate terrain are fixed to the radioelectric installations to aid air navigation of the Air Base of Morón de la Frontera (Seville).)

A6.6.6.3. Joint Statement of Understanding between the Spanish Air Force and United States Forces, Morón Air Base. 26.2.2009.

**Attachment 7****AIRFIELD CRITERIA AND WAIVER PROCESSING PROCEDURES FOR INSTALLATIONS IN THE UNITED KINGDOM (UK)**

**A7.1. Introduction.** This attachment is intended to provide RAF Lakenheath, RAF Mildenhall and RAF Fairford personnel with guidance on applicable airfield criteria, waiver processing procedures, and new construction siting information.

**A7.2. Runway Certification.** RAF Fairford, RAF Lakenheath, RAF Mildenhall and RAF Mildenhall are military airfields and do not operate under any permit issued by the UK, ICAO, or other recognized body.

**A7.3. Applicable Airfield Criteria.** Airfield criteria for the UK installations are in accordance with Regulatory Articles (RA) 3501 - 3599 Series - *Aerodrome Design and Safeguarding*, published by the Military Aviation Authority (MAA). These regulations are in line with ICAO Annex 14. See **Chapter 3** of this USAFEI for details on establishing airfield imaginary surfaces.

A7.3.1. Other airfield criteria, such as parking area design and wingtip clearances, follow the standards found in **Chapter 4** and **Chapter 5** of this instruction which are consistent with the RA 3501 - 3599 standards at the time of this publication. Where uncertainty exists and for any future airfield developments, the RA 3501 - 3599 standards must be consulted.

A7.3.2. Many of the airfield imaginary surfaces evolve from the Aerodrome Reference Point (ARP). The ARP is defined in the AIP document and must be used for surface calculation and obstruction evaluation. The following information is intended as guidance.

A7.3.3. **RAF Fairford.** Obstacles violating the established clearance surfaces must be reported to AFIMSC Det4/CE and the DIO representative following the process presented in **paragraph A7.4** below. Airfield obstructions must be marked and lighted according to ICAO Annex 14 and NATO standards.

A7.3.3.1. RAF Fairford ARP.

A7.3.3.1.1. Location. 51° 41' 00.66" N 1° 47' 24.02" W (WGS-84 grid coordinate system).

A7.3.3.1.2. Elevation. 86.87 m above Mean Sea Level (MSL).

A7.3.4. **RAF Lakenheath.** Obstacles violating the established clearance surfaces must be reported to AFIMSC Det 4/CE and the Defence Infrastructure Organisation (DIO) representative and following the process presented in **paragraph A7.4** below. Airfield obstructions must be marked per this instruction.

A7.3.4.1. RAF Lakenheath ARP:

A7.3.4.1.1. Location. 52° 24' 33.85" N 0° 33' 39.64" E (WGS-84 grid coordinate system).

A7.3.4.1.2. Elevation. 9.45 m above Mean Sea Level (MSL).

A7.3.5. **RAF Mildenhall.** Obstacles violating the established clearance surfaces must be reported to AFIMSC Det 4/CE and the DIO representative following the process presented in

**paragraph A7.4** below. Airfield obstructions must be marked and lighted according to ICAO Annex 14 and NATO standards.

**A7.3.5.1. RAF Mildenhall ARP:**

A7.3.5.1.1. Location. 52° 21' 43.00" N 0° 29' 11.00" E (WGS-84 grid coordinate system).

A7.3.5.1.2. Elevation. 9.75 m above Mean Sea Level (MSL).

**A7.4. UK Installations Waiver Request Process Supplement.** The DIO is charged with the management and safeguarding of all MOD assets, to include all MOD airfields, related air space and encroachments impinging on these assets. For each waiver, follow these instructions as a minimum, in addition to the processes described in **Attachment 2** of this Instruction:

A7.4.1. Survey installations and surrounding land to identify obstacles. Annual partial surveys and full surveys every five years are conducted by the DIO.

A7.4.2. The Base Civil Engineer (BCE) representative compiles the waiver packages following USAFE Instruction guidance. See **Attachment 2** of this document for details on content requirements for waiver documentation.

A7.4.3. The waiver packages are coordinated through the base chain of command.

A7.4.4. The BCE reviews and approves the waiver package and forwards to AFIMSC Det 4/CE.

A7.4.5. See **Attachment 2** of this document for details on approving authority for each type of waiver.

**A7.5. New Construction Planning and Siting.** In addition to on-base project review and approvals, UK Base personnel must be aware of off-base programs and projects that can impact flight safety, imaginary surfaces, and established clearance planes. DIO Safeguarding represents the MOD, and by reference UK installations, in the UK planning system to ensure designated exclusion zones around key operational defense sites are not adversely affected by development.

A7.5.1. Military Aerodrome Design and Safeguarding is in accordance with criteria specified within RA 3501 - 3599 - *Aerodrome Design and Safeguarding*. These regulations are in line with ICAO Annex 14.

A7.5.2. Under the authority of Secretary of State for Defence, the DIO creates and maintains site-specific statutory safeguarding maps in accordance with RA 3501 - 3599 and lodges these with the Ministry of Housing, Communities and Local Government (MHCLG). The MHCLG provides a copy of the relevant safeguarding maps to Local Planning Authorities as stipulated by DfT/ODPM circular 1/2003.

A7.5.3. The Town and County Planning Act 1990 and as amended obligates local planning authorities to consult the site-specific safeguarding maps to identify whether a project is encroaching on a base, one of its established protection zones or imaginary surfaces.

A7.5.4. The DIO is notified of any encroachments. The DIO represents UK installations in regard to off-base obstacles.

A7.5.5. Refer to the following UK regulations and MAA regulatory publications (MRP) regarding established military zones, encroachment management, and military/municipal project reviews:

A7.5.5.1. RA 3500 (RA 3501 - 3599) Series - *Aerodrome Design and Safeguarding*. 21 Sep 2018.

A7.5.5.2. DfT/ODPM circular 1/2003 - *The Town and Country Planning (Safeguarding Aerodromes, Technical Sites and Military Explosives Storage Areas) Direction, 2002*.

## Attachment 8

### AIRFIELD CRITERIA AND WAIVER PROCESSING PROCEDURES FOR TURKISH INSTALLATIONS

**A8.1. Introduction.** This attachment is intended to provide Incirlik Air Base personnel with guidance on applicable airfield criteria, waiver processing procedures, and new construction siting information.

**A8.2. Runway Certification.** Incirlik Air Base operates as a military airfield and is operated under the Defense and Economic Cooperation Agreement (DECA) between the Turkish and United States Governments. Incirlik Air Base is a Turkish property and under the operational command of the Turkish Air Force (TurAF) 10th Tanker Base commander (TurAF/CC). The airfield is a USAF Operational and Support Installation (IDA) funded and maintained by the USAF and represented by the Commander of the United States Forces at Incirlik Air Base (US/CC).

A8.2.1. **Incirlik Air Base Instruction 13-204.** This instruction prescribes local procedures and policies concerning aircraft, vehicle and navigational aid (NAVAID) operations at Incirlik AB. It provides a common operating picture to all flying and support units. It does not supersede United States Air Force (USAF), United States Air Forces in Europe and Air Forces Africa (USAFE-AFAFRICA), or ICAO directives.

**A8.3. Applicable Airfield Criteria.** Incirlik Air Base establishes airfield obstacle and clearance surfaces per this agreement. This is consistent with the ICAO Annex 14, Chapter 3, for a Code 4 runway and North Atlantic Treaty Organization (NATO) standards adopted into this instruction. See [Chapter 3](#) of this USAFEI for details on establishing airfield imaginary surfaces.

A8.3.1. Airfield design criteria in Turkey follow NATO and ICAO Annex 14 standards. For planning purposes, use the criteria from this instruction. This instruction already incorporated/considered the NATO and ICAO design criteria in addition to US standards derived from UFC 3-260-01.

A8.3.2. Many of the airfield imaginary surfaces evolve from the Aerodrome Reference Point (ARP). The ARP is defined in the certification document and must be used for surface calculation and obstruction evaluation. The following information is intended as guidance.

A8.3.2.1. **Incirlik Air Base.** Obstacles violating the established imaginary surfaces must be reported to AFIMSC Det 4/CE and the Turkish Air Force (TurAF) via the TurAF Chain of Command (CoC) and following the process presented in [paragraph A8.4](#) below. Airfield obstructions must be marked and lighted according to ICAO Annex 14 and NATO standards. The Incirlik Air Base ARP is as follows:

A8.3.2.1.1. Location. 37° 00' 07" N 35° 25' 33" E (WGS-84 grid coordinate system).

A8.3.2.1.2. Elevation. 73 m [239.5 ft] above Mean Sea Level (MSL).

**A8.4. Incirlik Air Base Waiver Request Process Supplement.** For each waiver, follow these instructions as a minimum, in addition to the processes described in [Attachment 2](#) of this Instruction:

A8.4.1. Identify obstacle using established survey techniques.

A8.4.2. The Base Civil Engineer (BCE) or their designated representative compiles the waiver request packages following USAFE Instruction guidance. See [Attachment 2](#) of this document for details on content requirements for waiver documentation.

A8.4.3. Waivers to airfield/airspace Criteria must be coordinated through 39 OSS/OSA for the appropriate level of approval. Current waivers are on file with the Airfield Manager (39 OSS/OSAB).

A8.4.4. Airfield Operations Board (AOB) provides a forum for discussing, updating, and tracking various activities in support of the wing flying mission. The AOB convenes at least once per quarter (based upon the fiscal year) and will at a minimum discuss items IAW Incirlik ABI 13-204.

A8.4.5. The BCE reviews and approves the waiver request package and forwards to the appropriate authorizing agency. See [Attachment 2](#) of this document for details on approving authority for each type of waiver.

**A8.5. New Construction Planning and Siting.** In addition to on-base project review and approvals, Incirlik Air Base personnel must be aware of off-base programs and projects that can impact flight safety, imaginary surfaces, and established clearance planes.

A8.5.1. Any new construction on Incirlik Air Base contracted by USAF must establish a construction phasing plan with guidelines and constraints contractors must follow during construction IAW with this plan.

A8.5.2. Turkish law requires local municipalities to consider impacts to Incirlik AB and other aerodromes before granting off-base construction permits. When such construction is proposed, local municipalities are required to coordinate with TurAF for project approval. IAW the DECA the 10th Tanker is the USAF's liaison with all off-base agencies. USAF concerns that need to be addressed with the local municipalities are coordinated via the TurAF.

A8.5.3. Should other projects outside of this immediate restriction zone raise concern to Incirlik, the TurAF has a process in place to engage with local municipalities and mayors.

A8.5.4. USAF personnel at Incirlik Air Base must participate in all local Air Operations Review Board meetings and request detailed information from TurAF equivalents on any known off-base projects. These projects, to the extent practical, must be assessed to determine impact on established clearance planes. Should any concerns arise, USAF shall contact TurAF to intervene on their behalf and engage local municipal leaders and planners to determine alternatives and avoid further encroachments.

## Attachment 9

### AIRFIELD CRITERIA AND WAIVER PROCESSING PROCEDURES FOR PORTUGUESE INSTALLATIONS

**A9.1. Introduction.** This attachment is intended to provide Lajes Field personnel with guidance on applicable airfield criteria, waiver processing procedures, and new construction siting information.

**A9.2. Runway Certification.** Lajes Field operates a dual-use airfield with civil and military operations. The runway is certified for civil use by the Portuguese Civil Aviation Authority.

**A9.3. Applicable Airfield Criteria.** The Lajes Field airfield establishes airfield obstacle and clearance surfaces per this instruction. This is consistent with the North Atlantic Treaty Organization (NATO) and ICAO Annex 14, Chapter 3, for a Code 4 runway standards adopted into this instruction. See [Chapter 3](#) of this USAFEI for details on establishing airfield imaginary surfaces.

A9.3.1. Other airfield criteria, such as parking area design and wingtip clearances, follow the standards found in [Chapter 4](#) and [Chapter 5](#) of this instruction. Where inadequate space is available, modified NATO BI SC Directive 85-5, *NATO Approved Criteria and Standards for Airfields*, standards are applied and documented in local Aeronautical Information Publications (AIP). For planning purposes, use this instruction unless Portuguese Air Force (PoAF)-approved deviations are already established.

A9.3.2. Many of the airfield imaginary surfaces evolve from the Aerodrome Reference Point (ARP). The ARP is defined in the certification document and must be used for surface calculation and obstruction evaluation. The following information is intended as guidance.

A9.3.2.1. **Lajes Field ARP.** Obstacles violating the established imaginary surfaces must be reported to AFIMSC Det 4/CE and the PoAF via the Headquarters Azores Air Zone (HAAZ) Commander and following the process presented in [paragraph A9.4](#) below. Airfield obstructions must be marked and lighted according to ICAO Annex 14 and NATO standards. The Lajes Field ARP is as follows:

A9.3.2.1.1. Location. 38° 45' 49.9" N 27° 05' 34.3" W (WGS-84).

A9.3.2.1.2. Elevation. 111.1 m above Mean Sea Level (MSL).

**A9.4. Lajes Field Waiver Request Process Supplement.** A USAF Commander cannot sign airfield waiver requests until the PoAF Commander has reviewed and concurred with the waiver request:

A9.4.1. Identify obstacle using established survey techniques.

A9.4.2. USAF (65 ABG/CE) or their designated representative drafts a letter directly to the HAAZ Commander, copying established PoAF Points of Contact. This letter contains the necessary detail on the waiver request type, impacts to airfield operations, potential corrective action, and/or duration of the waiver. See [Attachment 2](#) of this document for details on content requirements for waiver request documentation.

A9.4.3. HAAZ Commander reviews and concurs/non-concurs with the waiver request.

A9.4.4. 65 ABG/CC reviews and signs the waiver request package and forwards to the appropriate authorizing agency. See **Attachment 2** of this document for details on approving authority for each type of waiver.

**A9.5. New Construction Planning and Siting.** In addition to on-base project review and approvals, Lajes Field personnel must be aware of off-base programs and projects that can impact flight safety, imaginary surfaces, and established clearance planes.

A9.5.1. Portugal has an established anti-encroachment and construction review program administered by the PoAF and local municipalities. This program requires review of all construction activities to ensure new construction does not impact runway clearance planes. As part of this program and Portuguese law, several military restriction zones have been established, as per **Figure A9.1** below:

A9.5.1.1. The first military zone. In the first zone, no activity that would impact on flight operations or construction is permitted.

A9.5.1.2. The second military zone. In the second zone, projects causing major flight safety concerns can be prohibited. This is determined by local municipal leaders. However, PoAF is permitted to comment and participate in the process.

A9.5.2. USAF personnel at Lajes Field must participate in all local Air Operations Review Board meetings and request detailed information from PoAF equivalents on any known off-base projects. These projects, to the extent practical, must be assessed to determine impact on established clearance planes. Should any concerns arise, USAF shall contact PoAF to intervene on their behalf and engage local municipal leaders and planners to determine alternatives and avoid further encroachments.

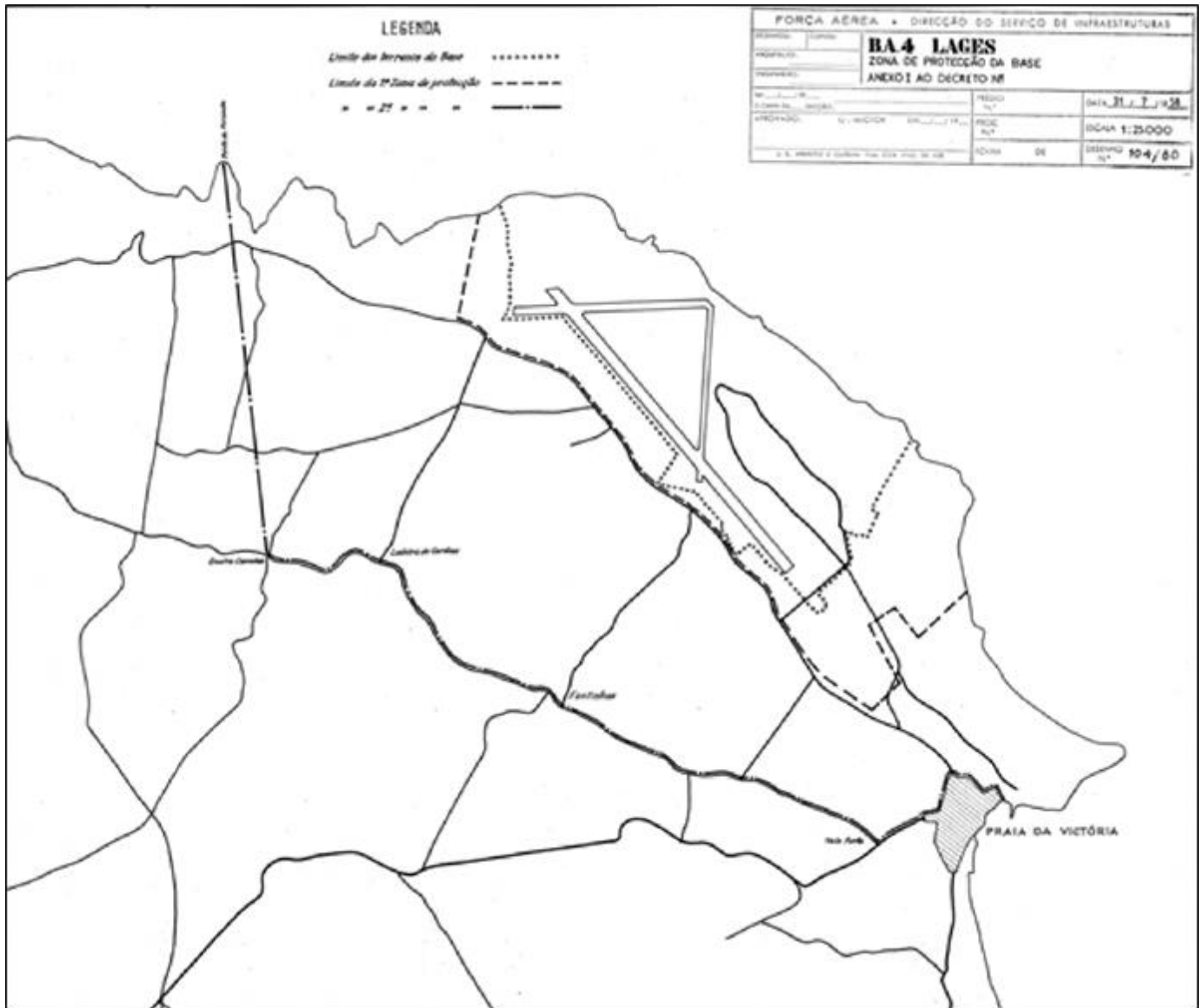
A9.5.3. Refer to the following Portuguese laws regarding established military zones, encroachment management, and military/municipal project reviews:

A9.5.3.1. Decreto n.1/2019, O presente decreto procede a modificacao da servidaomilitar da Base Aerea n.4 (BA4), localizada na ilha Terceira, Regiao Autonoma dos acores, procedendo a criacao de zonas de servidao military terrestre, aeronautica e radioelectrica nas imediacoes de unidades imobiliaries da BA4, bem como do Comando da Zona Aerea dos Acores (CZAA). (this decree establishes the change of the military easement of Base Aerea no 4 (BA4, Lajes Field), Autonomous Region of Azores, establishing the ordnance of the land aeronautics and radio- electric military easements zones in the vicinity of BA4's facilities, and also of the Headquarters of the Azorean Air Zone (HAAZ).

A9.5.3.2. Decreto-Lei n. 45 987, Estabelece o regime a que ficam sujeitas a servidoes aeronauticas as zonasconfinantes com aerodromos civis e instalacoes de apoio a à aviação civil — as chamadas servidões aeronáuticas (Establishes a regime in the vicinity of civil aerodromes and aviation support facilities to safeguard air navigation and people and property on the ground - known as aeronautical easements.). 22 Oct 1964.

A9.5.3.3. Portaria n. 22 591 estabelecer regras relativas às servidões militares (Ordnance establishing rules regarding military easements). 23 Mar 1967.

Figure A9.1. Lajes Field Military Zones of Protection.



## Attachment 10

### AIRFIELD CRITERIA AND WAIVER PROCESSING PROCEDURES FOR ITALIAN INSTALLATIONS

**A10.1. Introduction.** This attachment is intended to provide Aviano Air Base personnel with guidance on applicable airfield criteria, waiver processing procedures, and new construction siting information.

**A10.2. Runway Certification.** Aviano Air Base operates as a military airfield and is authorized by the Italian Military Aviation Authority.

**A10.3. Applicable Airfield Criteria.** Aviano Air Base establishes airfield obstacle and clearance surfaces per this instruction. This is consistent with the North Atlantic Treaty Organization (NATO) and ICAO Annex 14, Chapter 3, for a Code 4 runway standards adopted into this instruction. See [Chapter 3](#) of this USAFEI for details on establishing airfield imaginary surfaces.

A10.3.1. Airfield design criteria in Italy follow ICAO Annex 14 and NATO standards. For planning purposes, use the criteria from this instruction. This instruction already incorporated/considered the ICAO and NATO design criteria in addition to US standards derived from UFC 3-260-01, with Change 1.

A10.3.2. Many of the airfield imaginary surfaces evolve from the Aerodrome Reference Point (ARP). The ARP is defined in the certification document and must be used for surface calculation and obstruction evaluation. The following information is intended as guidance.

A10.3.2.1. **Aviano Air Base ARP.** Obstacles violating the established imaginary surfaces must be reported to AFIMSC Det 4/CE and the Italian Air Force (ITAF) via the ITAF Chain of Command (CoC) and following the process presented in [paragraph A10.4](#) below. Airfield obstructions must be marked and lighted according to ICAO Annex 14 and NATO standards. The Aviano Air Base ARP is as follows:

A10.3.2.1.1. Location. 46° 01' 48.26"N 12° 35' 55.82"W (WGS-84).

A10.3.2.1.2. Elevation. 125.88 m above Mean Sea Level (MSL).

**A10.4. Aviano Air Base Waiver Request Process Supplement.** A USAF Commander cannot sign airfield waiver requests until the ITAF Commander has reviewed and concurred with the waiver request. For each waiver, follow these instructions as a minimum, in addition to the processes described in [Attachment 2](#) of this Instruction:

A10.4.1. Identify obstacle using established survey techniques. Once a new airfield obstacle that may require a waiver has been identified, coordinate with the ITAF Operations Group Commander, or their designated representative, to ensure ITAF are involved in the obstacle identification process.

A10.4.2. The Base Civil Engineer (BCE), ITAF Flight Safety Officer or their designated representatives compile the waiver request packages following USAFE Instruction guidance. See [Attachment 2](#) of this document for details on content requirements for waiver documentation.

A10.4.3. The waiver packages are coordinated through the base CoC with ITAF for review and, as a minimum, concurrence. Permanent waivers require review and approval by ITAF

headquarters in Milan or Rome, depending on the type of obstruction. This process is handled internally to the ITAF and can be lengthy. Ensure adequate time for ITAF Headquarters to review the waiver request package. The ITAF POC at the Base-level is the ITAF Operations Group Commander.

A10.4.4. Upon ITAF concurrence of the waiver request, the BCE reviews and staffs the waiver request package to the appropriate authorizing agency. See [Attachment 2](#) of this document for details on approving authority for each type of waiver.

**A10.5. New Construction Planning and Siting.** In addition to on-base project review and approvals, Aviano Air Base personnel must be aware of off-base programs and projects that can impact flight safety, imaginary surfaces, and established clearance planes.

A10.5.1. Any new construction on Aviano Air Base must adhere to the standards in this instruction to the extent practicable. Modified standards conforming to Italian law (which follows NATO and ICAO standards) can be used when these standards cannot be met and when approved by the ITAF and the Mixed Commission. Any such deviations from the standards in this instruction require a waiver per [paragraph A10.4](#) above. The review and approval process via the ITAF and USAFE-AFAFRICA usually happen concurrently.

A10.5.2. Aviano Air Base has an established Installation Complex Encroachment Management Action Plan (ICEMAP). This document supports ITAF, USAFE-AFAFRICA and local municipalities in identifying, preventing and managing off-base programs and projects that can impact flight safety, imaginary surfaces, and established clearance planes. Consult the ICEMAP for current strategies in place to manage off base encroachments and obstacles.

A10.5.3. Italian law As per Italian law, local authorities are required to consider impacts to Aviano AB and other aerodromes before granting off-base construction permits. In fulfillment of article 707-717 of the Italian Navigation Code (as amended by Legislative Decree 15 March 2006 no. 151), Ministry of Defense Decree 19 December 2012 no. 258 establishes a restriction zone 300 meters around any installation that prevents encroachment. The above provisions further regulate any construction exceeding ICAO established height and prevent the construction of large structures in flight paths (e.g., windmills). When such construction is proposed in areas outside flight paths, local municipalities are required to coordinate with ITAF and IMOD authorization for project approval.

A10.5.4. Should other projects outside of this immediate restriction zone raise concern to Aviano, the ITAF has a process in place to engage with local communities and mayors.

A10.5.5. USAF personnel at Aviano Air Base must participate in all local Air Operations Review Board meetings and request detailed information from ITAF equivalents on any known off-base projects. These projects, to the extent practical, must be assessed to determine impact on established clearance planes. Should any concerns arise, USAF shall contact ITAF to intervene on their behalf and engage local municipal leaders and planners to determine alternatives and avoid further encroachments.

A10.5.6. Refer to the following Italian laws regarding established military zones, encroachment management, and military/municipal project reviews:

A10.5.6.1. CODICE DELLA NAVIGAZIONE, artt. 707-717 (Italian Navigation Code, article 707-717).

A10.5.6.2. DECRETO LEGISLATIVO 15 marzo 2006, n. 151 Disposizioni correttive ed integrative al decreto legislativo 9 maggio 2005, n. 96, recante la revisione della parte aeronautica del codice della navigazione. (Legislative Decree no. 151, 15 March 2006 Corrective and supplementary provisions to the legislative decree 9 May 2005, n. 96, concerning the revision of the aeronautical part of the navigation code.).

A10.5.6.3. DECRETO MINISTERO DELLA DIFESA 19 dicembre 2012, n. 258 Regolamento recante attività di competenza del Ministero della difesa in materia di sicurezza della navigazione aerea e di imposizione di limitazioni alla proprietà privata nelle zone limitrofe agli aeroporti militari e alle altre installazioni aeronautiche militari. (Ministry of Defense Decree No. 258, 19 December 2012 Regulation laying down the competence of the Ministry of Defense in matters of air navigation safety and the imposition of restrictions on private property in areas adjacent to military airports and other military aeronautical installations.).

## Attachment 11

### AIRFIELD CRITERIA AND WAIVER PROCESSING PROCEDURES FOR BELGIAN INSTALLATIONS

**A11.1. Introduction.** This attachment is intended to provide Chièvres Air Base personnel with guidance on applicable airfield criteria, waiver processing procedures, and new construction siting information.

**A11.2. Runway Certification.** Chièvres Air Base is a NATO airfield that, in this case, is operated by U.S. Air Force. Supreme Headquarters Allied Powers Europe (SHAPE) operates the airfield and runways, while overall airfield maintenance operations, base operations and support facilities are entrusted to the United States Army Garrison (USAG) Benelux. The airfield is mainly used to provide support to the Supreme Allied Commander Europe (SACEUR), NATO, and training support to the 86 AW in Ramstein, Germany. Operations of other NATO countries must be coordinated through the Airfield Management team via a Prior Permission Request (PPR) form.

**A11.3. Applicable Airfield Criteria.** Chièvres Air Base establishes airfield obstacle and clearance surfaces per this instruction. This is consistent with the North Atlantic Treaty Organization (NATO) and ICAO Annex 14, Chapter 3, for a Code 4 runway standards adopted into this instruction. See [Chapter 3](#) of this USAFEI for details on establishing airfield imaginary surfaces.

A11.3.1. Airfield design criteria in Belgium follow NATO and ICAO Annex 14 standards. For planning purposes, use the criteria from this instruction. This instruction already incorporated/considered the NATO and ICAO design criteria in addition to US standards derived from UFC 3-260-01, with Change 1.

A11.3.2. Many of the airfield imaginary surfaces evolve from the Aerodrome Reference Point (ARP). The ARP is defined in the certification document and must be used for surface calculation and obstruction evaluation. The following information is intended as guidance.

A11.3.2.1. **Chièvres Air Base.** Obstacles violating the established imaginary surfaces must be reported to AFIMSC Det 4/CE following the process presented in [paragraph A11.4](#) below. Airfield obstructions must be marked and lighted according to ICAO Annex 14 and NATO standards. The Chièvres Air Base ARP is as follows:

A11.3.2.1.1. Location. 50° 34' 33" N 3° 49' 52" E (WGS-84 grid coordinate system).

A11.3.2.1.2. Elevation. 59.13 m above Mean Sea Level (MSL).

**A11.4. Chièvres Air Base Waiver Request Process Supplement.** For each waiver, follow these instructions as a minimum, in addition to the processes described in [Attachment 2](#) of this Instruction:

A11.4.1. Identify obstacle using established survey techniques.

A11.4.2. Provide data on potential obstacles to Ramstein Air Base for review, modelling and comparison against Chièvres Air Base imaginary surfaces and established clearance planes. The following potential obstacles should be provided (in feet AMSL and nautical miles (NMs) from ARP:

A11.4.2.1. All obstacles within a 7 NMs radius of the ARP.

A11.4.2.2. Obstacles 7 - 10 NMs from the aerodrome and greater than 1200 ft. AMSL.

A11.4.2.3. Obstacles 10 - 30 NMs from the aerodrome and greater than 1500 ft. AMSL.

A11.4.3. As necessary, Ramstein Air Base compiles the waiver request packages following USAFE Instruction guidance. See [Attachment 2](#) of this document for details on content requirements for waiver documentation.

A11.4.4. The Airfield Manager reviews and approves the waiver request packages annually. See [Attachment 2](#) of this document for details on approving authority for each type of waiver.

**A11.5. New Construction Planning and Siting.** In addition to on-base project review and approvals, Chièvres Air Base personnel must be aware of off-base programs and projects that can impact flight safety, imaginary surfaces, and established clearance planes.

A11.5.1. Any new construction on Chièvres Air Base must adhere to the standards in this instruction to the extent practicable. Any deviations from the standards in this instruction require a waiver per [paragraph A11.4](#) above. The review and approval process via NATO and USAFE-AFAFRICA usually happen concurrently.

A11.5.2. Belgian law requires local authorities to consider impacts to Chièvres AB and other aerodromes before granting off-base construction permits. When such construction is proposed, the local Commune is required to coordinate with the Belgian Ministry of Defence (BMoD). The BMoD coordinates directly with Ramstein Air Base to check if there are any issues with flight operations (MAJCOM TERPS) and/ or imaginary surfaces before granting approval to any construction project.

## Attachment 12

### INSTALLATION COMPLEX ENCROACHMENT MANAGEMENT ACTION PLAN (ICEMAP) REQUIREMENTS

**A12.1. Introduction.** USAFE-AFAFRICA installations are encouraged to develop internal and external Installation Complex Encroachment Management Action Plan (ICEMAP) per AFI 90-2001, *Encroachment Management*, to the extent practicable. The USAFE-AFAFRICA environment poses unique challenges when attempting to manage encroachment due to the lack of direct involvement or influence with off-base land owners, regulatory agencies, and other stakeholders. As such, encroachment management at USAFE-AFAFRICA installations will vary by installation and host nation. Because of this, USAFE-AFAFRICA installations must implement this program consistent with applicable international agreements, including status of forces agreements (SOFA) and other government-to-government agreements, USAFE-AFAFRICA policy, Lead Environmental Component (LEC) directives and Final Governing Standards (FGS), and local attitudes toward the presence of US military personnel.

**A12.2. General ICEMAP Process.** The encroachment study is the process used to develop an ICEMAP.

A12.2.1. There are two types of studies: a) the mandatory internal study, which is conducted by the designated Installation Encroachment Management Team (IEMT) using in-house resources and produces an internal ICEMAP, and b) the optional external study, which is conducted by a contractor (in close coordination with installation staff) and produces an external ICEMAP which will build on, and replace, the internal ICEMAP. Both studies apply mission and community constraints to identify encroachment and sustainment challenges.

A12.2.1.1. Additionally, both studies evaluate the installation's encroachment condition, relative to four evaluation factors:

A12.2.1.1.1. Mission Impacts;

A12.2.1.1.2. Community Impacts;

A12.2.1.1.3. Program Implementation and;

A12.2.1.1.4. External Stakeholders.

A12.2.1.2. The major differences between the two studies include the depth and extent of the analysis and the team conducting the study. The IEMT is responsible for maintaining the currency of internal and external ICEMAPs.

A12.2.2. Active encroachment management requires an Action Plan to prioritize the use of resources and initiatives that provide the best opportunities for success. Internal and external ICEMAPs are required to include four basic items:

A12.2.2.1. The identification of encroachment and sustainment challenges;

A12.2.2.2. The identification of resources and opportunities for overcoming identified threats (i.e., Management Actions);

A12.2.2.3. A plan to address each challenge as appropriate, although some challenges may not warrant or require action; and,

A12.2.2.4. A tracking tool for maintaining progress (i.e., a Management Action Spreadsheet).

A12.2.3. ICEMAPs are living documents that require maintenance as conditions change; the IEMT is responsible for maintaining the currency of ICEMAPs by continuously identifying and studying new encroachment and sustainment challenges and solution strategies. An internal ICEMAP should contain, at minimum, a description and map of the IC/MF, encroachment condition summaries for relevant encroachment and sustainment challenge areas, Management Actions and a Management Action Spreadsheet, and a Stakeholder Matrix. (See Attachment 3 of AFI 90-2001 for a notional listing of external ICEMAP contents).

A12.2.4. All ICEMAPs are to be coordinated through AFIMSC Det 4/CEB.

**A12.3. Installation Encroachment Management Team (IEMT) Membership.** The following shall be part of the IEMT, as needed:

A12.3.1. Executive Director: To ensure proper visibility and awareness of encroachment and sustainment challenges for the Executive Director, the position shall not be held by a position lower than a Group Commander (Group/CC) level-equivalent. Installation Commanders should consider appointing a civilian Executive Director, to promote consistency across long-term encroachment management efforts.

A12.3.2. Public Affairs;

A12.3.3. Tenant Commanders;

A12.3.4. Airfield Operations (e.g., Airfield Management, Air Traffic Control);

A12.3.5. Airspace Management;

A12.3.6. TERPS;

A12.3.7. Financial Management;

A12.3.8. Civil Engineer (e.g., Environmental, Community Planner/AICUZ Manager, Real Property, Emergency Manager);

A12.3.9. Communications;

A12.3.10. Manpower, Organization, and Resources;

A12.3.11. Range Management;

A12.3.12. Safety;

A12.3.13. Security Forces;

A12.3.14. Spectrum Management;

A12.3.15. Office of the Staff Judge Advocate;

A12.3.16. Surgeon General (e.g., Bioenvironmental Engineering);

A12.3.17. Weather; and

A12.3.18. Test and Evaluation.

**A12.4. External Stakeholder Relationships.** Building external stakeholder relationships is an essential element of encroachment management, particularly in the USAFE-AFAFRICA

environment. Understanding the quality, type, and frequency of relationships outside the fence line also supports successful encroachment management and engagement strategies. Installation commanders and encroachment managers must understand the value of maintaining positive external stakeholder relationships; these relationships enhance mission readiness, simplify engagement on specific issues, and help the Air Force anticipate changing encroachment trends. Both internal and external encroachment studies will identify existing relationships related to foundational program responsibilities, as well as additional stakeholder relationships (both formal and informal) that exist between the installation and surrounding communities. IEMT members should engage with stakeholders according to their foundational program responsibilities. All engagement activities should be coordinated with the IEMT Executive Director. At USAFE-AFAFRICA locations, external relationships need to be managed in accordance with applicable international agreements, USAFE-AFAFRICA policy, and LEC directives. Installations should contact AFIMSC Det 4/CEB and the nation-specific annex to this instruction for more information on host nation involvement in encroachment and off-installation planning.

A12.4.1. USAFE-AFAFRICA installations must leverage partnerships with host nation military representatives and/or land management organizations that directly interface with external stakeholders on the behalf of USAFE-AFAFRICA. The partners must assist ICEMAP teams in coordinating necessary interviews with host nation environmental regulators as part of the encroachment study process, and to have them participate in the process as appropriate.

A12.4.2. Without the involvement of host nation partners, the development of ICEMAPs will not be possible. Installation ICEMAP teams, along with the host nation representatives, will need to coordinate interviews with host nation agencies on related programs and policies that can affect the Installation Complex (IC) and Mission Footprint (MF), also known as the combined IC/MF.