

**US Army Corps**

**of Engineers**

**Afghanistan Engineer District**

AED Design Requirements: Heliport Planning & Design

Various Locations,

Afghanistan

MARCH 2011

**TABLE OF CONTENTS**

|  |  |
| --- | --- |
| Section | Page |
|  |  |
| 1. General |  |
| 1.1 - Purpose of this Manual |  |
| 1.2 - Scope |  |
| 1.3 - References |  |
| 1.4 – Application of Criteria |  |
| 1.5 – Service Requirements |  |
| 1.6 – Theater of Operation |  |
| 1.7 – Security Considerations for Design |  |
| 1.8 – Waivers to Criteria |  |
| 1.9 – Notice of Construction |  |
| 1.10 - Construction Phasing Plan |  |
| 1.11 – Associated Design Manuals |  |
| 1.12 – Use of Terms |  |
| Table 1 – Associated Design Manuals |  |
|  |  |
| 2. Aviation Facilities Planning Process |  |
| 2.1 – Applicability |  |
| ~~Figure 2.1 – Aviation Facilities Planning Process~~ |  |
| 2.2 – ~~Justification~~ |  |
| 2.3 – ~~General Planning Considerations~~ |  |
| 2.4 – Planning Studies |  |
| 2.5 – Siting Aviation Facilities (Army Only) |  |
| 2.6 – Airside and Landside Facilities |  |
| 2.7 – Landing & Takeoff Area |  |
| 2.8 – Aircraft Ground Movement & Parking Areas |  |
| 2.9 – Aircraft Maintenance Area (other than Pavements) |  |
| 2.10 – Aviation Operations Support Area |  |
|  |  |
| 3. Rotary Wing Runways, Helipads, Landing Lanes, and Hoverpoints |  |
| 3.1 - Contents |  |
| 3.2 - Landing & Take Off Layout Requirements |  |
| 3.3 – Rotary Wing Runway |  |
| Figure 3.1 – Air Force, Navy, and marine Corps Helicopter VFR Runway |  |
| Figure 3.2 - Army Helicopter Runway and Air Force, Navy, and Marine |  |
| Figure 3.3 – Airspace Imaginary Surfaces, Army Helicopter Runway and Helipad, and Air Force, Navy, and Marine Corps IFR Helicopter Runway & Helipad |  |
| 3.4 – Helipads |  |
| Table 3.2 – Rotary Wing Helipads and Hoverpoints |  |
| 3.5 – Same Direction Ingress/Egress |  |
| 3.6 – Hoverpoints |  |
| 3.7 – RotaryWing Landing Lanes |  |
| Figure 3.4 – Standard VFR Helipad for Army Air Force |  |
| Figure 3.5 – Standard VFR Helipad for Navy and Marine Corps and Limited Use VFR Helipad for Air Force |  |
| Figure 3.6 – Army Helipad and Air Force, Navy and Marine Corps and Limited Use VFR Helipad for Air Force |  |
| Figure 3.7 – Air Force Helipad with Same Direction Ingress/Egress |  |
| Figure 3.8 – Army Helipad with Same Direction Ingress/Egress and Air Force IFR Helipad with Same Direction Ingress/Egress |  |
| Figure 3.9 – Helicopter Landing Zone |  |
| 3.8 – Helicopter Slide Areas or “Skid Pads” |  |
| 3.9 – Shoulders for Rotary Wing Facilities |  |
| 3.10 – Overruns for Rotary-Wing Runways and Landing Lanes |  |
| 3.11 – Clear Zone and Accident Potential Zone (APZ) |  |
| Table 3.3 – Rotary-Wing Landing Lanes |  |
| Table 3.4 – Shoulders for Rotary-Wing Facilities |  |
| Figure 3.10 – Helicopter Hoverpoint |  |
| Table 3.5 – Overruns for Rotary-Wing Runways and Landing Lanes |  |
| 3.12 – Imaginary Surfaces for Rotary-Wing Runways, Helipads, Landing Lanes, and Hoverpoints |  |
| Table 3.6 – Rotary-Wing Runway and Landing Lane Clear Zone and Accident Potential Zone (APZ) |  |
| Table 3.7 – Rotary-Wing Imaginary Surfaces for VFR Approaches |  |
| Table 3.8 – Rotary-Wing Imaginary Surfaces for IFR Approaches |  |
| 3.13 – Obstructions and Airfield Airspace Criteria |  |
|  |  |

**Figures**

|  |  |
| --- | --- |
| Figure 1. |  |
|  |  |
| Figure 2. |  |
|  |  |
| Figure 3. |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

**Tables**

|  |  |
| --- | --- |
| Table 1. |  |
|  |  |
| Table 2. |  |
|  |  |
| Table 3. |  |
|  |  |
| Table 4. |  |
|  |  |
| Table 5. |  |
|  |  |
| Table 6. |  |
|  |  |
| Table 7. |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

**1. General**

* 1. **Purpose of this Manual**. The purpose of this document is to provide requirements to Contractors for projects requiring design and construction of helipads.
  2. **Scope**. This manual prescribes dimensional and geometric layout criteria for safe standards for heliports and helipads, some related permanent facilities, as well as the navigational airspace surrounding these facilities. Criteria in this manual pertain to host nation facilities where written agreement exists that require application of NATO, ICAO, or Federal Aviation Administration (FAA) standards.
     1. Terminal Instrument Procedures (TERPS). In addition to a local TERPS review, modifications to existing facilities and construction of new facilities must be closely coordinated with the Major Command (MAJCOM – Air Force), U.S. Army Aeronautical Services Agency (USAASA) and USAASDE, to ensure instrument flight procedures’ compliance with TERPS.
     2. Objects Affecting Navigable Airspace. Modifications to existing and construction of new facilities must consider navigable airspace, and may require filing of a Federal Aviation Administration (FAA) form 7460-1. Attachment X describes when this form may be required. For Afghanistan, host nation criteria apply off base.
     3. Navigational Aids (NAVAIDS) and Lighting. NAVAIDS and airfield lighting must be considered in the planning and design of heliports. NAVAID location, airfield lighting, and grading requirements of NAVAIDS must be considered when locating and designing helipads. Table XXXX in Attachment XXX includes a list of design documents governing NAVAIDS and lighting and the agency where siting and design information can be obtained.
  3. References. Attachment X contains a list of documents referenced in this requirement.
  4. Application of Criteria:
     1. Existing Facilities. The criteria in this requirement are not intended to apply to existing facilities located or constructed under previous standards. This includes cases where heliports may lack unpaved shoulders or other physical features because they were not previously required or authorized. These facilities can continue to be used without impairing operational efficiency and safety.
     2. Modification of Existing Facilities. When existing heliport facilities are modified, construction must conform to the criteria established in this requirement unless waived in accordance with paragraph 1.8. Modified portions of facilities must be maintained at a level that will sustain compliance with current standards.
     3. New Construction. The criteria established in this requirement apply to all new facilities. All new construction will comply with criteria established within this requirement unless the appropriate waivers are obtained as outlined in Attachment XX. New facilities must be maintained at a level that will sustain compliance with current standards.
     4. Metric Application. Geometric design criteria established in this requirement are expressed in SI units. Metric values are based upon aircraft specific requirements rather than direct conversion and rounding. This results in apparent inconsistencies between metric and English dimensions. SI dimensions apply to both new and modification of existing facilities.
     5. HQ USAFE may implement NATO standards in lieu of the standards provided in this requirement.
  5. Service Requirements. Criteria for the Army shall be used wherever possible. Use of criteria of another Service shall be noted.
  6. Theater-of-Operations. Standards for theater-of-operations facilities are contained in Army FM 5-480-00-2/Air Force Joint Pamphlet (AFJPAM) 32-8013, Volume 2, Planning & Design of Roads, Airfields, and Heliports in the Theater of Operations.
  7. Security Considerations for Design. Regulatory requirements for security of assets can have a significant impact on planning and design of 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. Integration of Security Measures. Protective features barriers, fences, lighting, access control, intrusion detection and assessment must be integrated into heliport planning and design to minimize problems with aircraft operations and safety requirements. This is discussed in Chapter 2. Protective measures should be included in the design based on risk and threat analysis or should comply with security-related requirements.
     2. Security-Related Requirements. Detailed discussion of security-related requirements is beyond the scope of this requirement. Designer should refer to the following applicable security regulations for planning and design guidance:
        1. AFI 31-101, The Physical Security Program
        2. OPNAVINST 5513.14B, Physical Security and Loss Prevention
        3. MIL-HDBK-1013/1, Design Guidelines for Physical Security of Facilities
        4. MIL-HDBK-1013/10, Design Guidelines for Security Fencing, Gates, Barriers and Guard Facilities
        5. (U)AR 50-51, Nuclear Weapons Security, (Confidential)
        6. AR 190-11, Physical Security of Arms, Ammunition and Explosives
        7. AR 190-51, Security of Army Property at Unit and Installation Level
  8. DA PAM 190-51, Risk Analysis for Army Property Waivers to Criteria. Each DoD Service component is responsible for setting administrative procedures necessary to process and grant formal waivers. Waivers to the criteria contained in this manual will be processed in accordance with Attachment 2. If a waiver affects instrument approach and departure procedures as defined in TERPS (AFJMAN 11-226/TM 95-226/OPNAVINST 3722.16C), the DoD Service component processing the waiver must also coordinate its action with the applicable TERPS approving authority.
  9. Notice of Construction. The FAA must be notified of all construction that affect air navigation at DoD airfields in the United States and its territories. FAA Form 7460-1, **Notice of Proposed Construction or Alteration (**http://www.faa.gov/arp/ace/faaforms.htm), must be submitted to the Federal Aviation Administration at least 30 days prior to the start of construction, in accordance with Federal Aviation Regulations, Part 77, Objects Affecting Navigable Airspace, subpart B. Airspace surface penetrations will be noted. Applications may be obtained and are filed with the regional FAA office. For Army, Army National Guard and Army Reserves, process the form in accordance with Chapter 8 of AR 95-2, Air Traffic Control, Air Space, Airfield Flight Facilities and Navigational Aids. For DoD facilities overseas, similar requirements by the host country, NATO, or ICAO, may be applicable.
  10. Construction Phasing Plan. A construction phasing plan, as discussed in Attachment 15, should be included in the contract documents.
  11. Associated Design Manuals. The planning and design of airfields and heliports is intricate and may require additional criteria, such as pavement design and pavement marking, not addressed in this manual. Additional manuals which the designer may need to consult are listed in Table 1.
      1. Use of Terms. The following terms, when used in this requirement, indicated the specific requirements: Shall, Will, or Must – Indicate mandatory or required actions.
      2. Should – Indicate recommended, advisory, or desirable actions.
      3. May or Can – Indicate permissible actions.

Table 1 – Associated Design Manuals

|  |  |
| --- | --- |
| Pavement Design, General | TM-5-825-1, General Provisions for Airfield/Heliport Pavement Design |
|  | TM-5-825-3-1, Rigid Pavement Design for Airfields, Elastic layered Method |
|  | TM-5-825-2-1, Flexible Pavement Design for Airfields (Elastic Layered Method) |
|  |  |
| Rigid Pavement Design | TM 5-825-3, Rigid Pavements for Airfields |
|  |  |
| Flexible Pavement Design | TM 5-825-2, Flexible Pavement Design for Airfields |
|  |  |
| Surface Drainage | TM 5-820-1, Surface Drainage Facilities for Airfields/Heliports |
|  |  |
| Airfield Lighting | TM 5-811-5, Army Aviation Lighting |
|  |  |
| Pavement Marking | TM 5-823-4, Marking of Army Airfield-Heliport Facilities |
|  |  |
| Subsurface Drainage | TM 5-820-2, Drainage and Erosion Control, Subsurface Drainage Facilities for Airfield Pavements |
|  |  |
| Drainage and Erosion Control Structures | TM 5-820-3, Drainage and Erosion Control Structures for Airfields and Heliports |
|  |  |
| Theater of Operations | FM 5-430-00-2 |
|  |  |
| Area Lighting | TM 5-811-5, Army Aviation Lighting |
|  |  |

1. **Aviation Facilities Planning**
   1. **Applicability.** Many criterions in this chapter apply to Army Aviation Facilities Planning only and are intended for use together with the design criteria presented elsewhere in this manual. In some cases, Air Force and Navy agencies and documents have been noted.
      1. Terms. The following terms, for the purpose of this manual, define cumulative areas of consideration when planning aviation facilities.
         1. Aviation Facility – Combination of land, airspace, pavements and buildings which are needed to support an aviation movement or action. An aviation facility can be an airfield, heliport, or helipad. The aviation facility includes “airside” and “landside” facilities.
         2. Airside facilities – Facilities associated with the movement and parking of aircraft. These include runways, taxiways, apron areas, associated navigational aids and imaginary surfaces.
         3. Landside facilities – Facilities not associated with the movement and parking of aircraft but are required for the facilities’ mission. These include aircraft maintenance areas, aviation support areas, fuel storage and dispensing, explosives and munitions areas and vehicular needs.
         4. Aviation movement or action – An aviation movement or action includes but is not limited to: the landing and take-off of aircraft; readiness of aircraft; flight training of pilots; loading and unloading of aircraft; and the maintenance and fueling of aircraft.
      2. Planning Process. Aviation facilities planning involves collecting data, forecasting demand, determining facility requirements, analyzing alternatives, and preparing plans and schedules for facility development. The aviation facilities planning process must consider the mission and use of the aviation facility and its effect on the general public. The planning process cannot be completed without knowing the facility's primary mission and assigned organization and types of aircraft. Figure 2.1 provides general steps in the aviation facilities planning process.
      3. Planning Elements. The elements of an aviation facility's planning process will vary in complexity and degree of application, depending on the size, function, and problems of the facility. The technical steps described in this manual should be undertaken only to the extent necessary to produce a well-planned aviation facility.
      4. Additional Planning Factors. There are additional planning factors such as pavement design, airfield marking, and Terminal Instrument Procedures (TERPS) that must be considered when planning aviation facilities.
      5. Space Allowances. The following allowances should be used when planning Army aviation facilities:

|  |  |
| --- | --- |
| **Facility Class 1: Operational and Training Facilities, Category Group 11: Airfields Pavement, General** | |
| **Category**  **Code** | **Item and Allowance** |
| **11140** | **Hoverpoint.** One or more lighted hoverpoints may be authorized at an airfield or heliport where air traffic density requires the constant separation of fixed-wing and rotary-wing traffic or the establishment of separate helicopter traffic patterns or when instrument approach procedures are not possible to a terminal (final) landing area. The hoverpoint is normally a nontraffic area used for air traffic control reference. It consists of a paved 9 m [30 ft] diameter identifier marker centered in a 45.72 m by 45.72 m [150 ft by 150 ft] clear area. Standard helipad approach-departure and transitional surfaces will be provided. The number and location of hoverpoints authorized are dependent upon the helicopter traffic pattern requirements at each particular facility. |
| **11120** | **Rotary-Wing Runway, Surfaced.** A paved airfield or heliport surface provided for the exclusive use of rotary-wing takeoffs and landings. Marked surfaces used as reference or control points for arriving and departing aircraft (hoverpoints) are part of the runway. From an operational point of view, the runway includes the prepared landing surface, shoulders, overruns plus various cleared areas and airspace. For inventory purposes, only the prepared runway surface is included. Basic dimensions are 23 m [75 ft] wide, 490 m [1,600 ft] long. A runway may be provided when helicopter companies are authorized at heliports at Army airfields when air traffic density or other operational problems prohibit mixing of medium rotary- and fixed-wing aircraft. |
| **11121** | **Rotary-Wing Runway, Unsurfaced.** An unpaved, prepared surface used exclusively for training, emergency, and other special takeoff and landing operations of rotary-wing aircraft. From an operational point of view, the runway includes the prepared landing surface, shoulders, overruns, plus various cleared areas and airspace. For inventory purposes, only the prepared runway surface is included. |
| **11222** | **Rotary-Wing Taxiway, Unsurfaced.** Unpaved prepared surfaces which serve as designated pathways on an airfield or heliport and are constructed for taxiing rotary-wing aircraft. From an operational point of view, a taxiway includes the prepared surface, stabilized shoulders, and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| **113** | **Airfield Pavements – Aprons.** Prepared surfaces, other than runways and taxiways, where aircraft are parked or moved about the airfield area. They are designed to support specific types of aircraft and to meet operational requirements such as maintenance and loading/unloading activities. The permanent peace time operation and maintenance of Army aircraft requires construction of apron areas to assure safe, efficient and economical accomplishment of the mission. For Rotary-Wing; see Chapter 6 for additional information. The number of Army rotary-wing aircraft used to estimate apron area is 85% of the authorized aircraft. This assumes that 75% of the aircraft will be operational and 10% will be parked for MOCs. The remaining 15% of the authorized aircraft can be assumed to be in maintenance facilities. Any substantial difference to exceed this allowance should be authenticated and submitted as a request to the MACOM to exceed this allowance. |

|  |  |
| --- | --- |
| **Facility Class 1: Operational and Training Facilities, Category Group 11: Airfields Pavement, General** | |
| **Category**  **Code** | **Item and Allowance** |
| **11370** | **Aircraft Washing Apron, Surfaced.** A rigid pavement area for washing and cleaning aircraft. It normally includes electrical and water service, drainage, and waste water collection equipment. From an operational point of view, an apron includes the prepared surface, stabilized shoulders, lighting and lateral clearance zones. For inventory purposes, only the prepared surface is included. A washing apron is authorized for each aircraft maintenance hangar. Washing aprons will be sized and dimensioned according to the number and type of aircraft to be washed, local environmental conditions (i.e., soil and climate), and scheduling. See paragraph 6.14.2. The wash apron will be provided with 110 volt electrical service, 25 mm [1 in] water service and compressed air. The wash apron will be provided with drainage facilities to include a facility for wash-waste treatment, including at least a 11,400 L [3,000 gal] capacity holding tank. The tank should be sized to the extent required for effluent to be suitable for discharge into a sanitary system. A collection area for POL waste and spillage should be provided, when required, in conjunction with the wash apron. |
| **11371** | **Aircraft Washing Apron, Unsurfaced.** An unpaved, prepared surface for washing and cleaning aircraft. It normally includes electrical and water service, drainage, and waste water collection equipment. From an operational point of view, an apron includes the prepared surface, stabilized shoulders, lighting and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| **11380** | **Aircraft Loading Apron, Surfaced.** A paved surface for loading cargo aircraft; loading personnel for medical evacuation, and transient aircraft operations; or providing an apron area for arming and disarming aircraft weapons, loading and unloading ammunition, special handling or decontamination of chemical, biological, radiological (CBR) warfare items, and for special security operations. An apron area in support of the airfield operations building, not to exceed 5,850 m2 [7,000 yd2] may be authorized for purposes of handling special loading and unloading of personnel, for medical evacuation flights and for transient aircraft operations. (See Category 11382 for aprons requiring safety clearances and/or security facilities). |
| **11382** | **Aircraft Special Purpose Apron.** Special purpose aprons may be authorized for providing safe areas for arming and/or disarming aircraft weapons; loading and unloading ammunition; special handling and/or decontamination facilities for CBR warfare items; and for special security areas. Special-purpose aprons required to conduct defueling operations will be provided at Army aviation facilities. Design will be predicated on the largest aircraft and adequate space for fire support equipment and defueling vehicle and apparatus. Grounding points will be provided. The scope of the apron area and the type of supporting facilities for these special-purpose aprons will be individually justified on the basis of the mission requirements. Safety clearances, appropriate to the requirements of the apron, will be observed. Airfield maps and plans will identify the purpose of the apron and show the required safety clearance distances. Explosives clearances are discussed in Appendix I of this Manual. |

|  |  |
| --- | --- |
| **Facility Class 1: Operational and Training Facilities, Category Group 11: Airfields Pavement, General** | |
| **Category**  **Code** | **Item and Allowance** |
| **11383** | **Aircraft Loading Aprons, Unsurfaced.** An unpaved, prepared surface for loading cargo aircraft; loading personnel for medical evacuation and transient aircraft operations. An aircraft loading apron provides and area for arming and disarming aircraft weapons, loading and unloading ammunition, special handling or decontamination of chemical, biological radiological (CBR) warfare items, and for special security operations. |
| **116 Airfield Pavement, Miscellaneous** | |
| **11610** | **Aircraft Compass Calibration Pad.** A prepared surface for calibration of air navigation equipment. A rigid paved pad in a magnetically quiet zone of the airfield. The pad surface is painted with alignment markings which are used in the precise calibration of air navigation equipment. The facility may include a taxiway which connects the pad to the main taxiway or apron. One compass calibration pad may be provided at Army airfields or heliports where fifteen or more aircraft are permanently assigned, and at Army depots where aircraft maintenance missions are assigned (AR 750-1, Army Material Maintenance Policies and Retail Maintenance Operations. The compass calibration pad is a paved area which should be located in an electronically quiet zone of the airfield. Compass calibration pads are typically circular and are sized to accommodate one of the assigned or mission aircraft. Compass calibration pads are further discussed in Chapter 6 of this manual. |
| **120 Liquid Fueling & Dispensing Facilities** | |
| **121** | **Aircraft Dispensing.** Facilities used to store and dispense liquid aviation fuels directly into aircraft or fueling trucks. These facilities consist of dispensing equipment, whose capacity is recorded in liter per minute (LM) [gallons per minute (GM)]. Control and fueling support buildings are operational facilities accounted for with category code 14165, Fueling/POL Support Building. The capacity of these facilities is based upon the flow rate of the pump facilities, (i.e., the number of liters per minute [gallons per minute]) which can be loaded into the aircraft and/or fuel truck. |
| **12110** | **Aircraft Direct Fueling Facility.** A facility used for dispensing aircraft fuel under pressure from operational storage tanks directly into the fuel tanks of the aircraft. |
| **12120** | **Aircraft Fuel Truck Loading Facility.** A facility for transfer of aircraft fuels from storage tanks to refueling vehicles (tank, truck, fuel, and tank pump units). |
| **12410** | **Aircraft Fuel Storage, AVGAS, Underground.** Storage tanks used in support of direct fueling and/or fueling of aircraft that use aviation gasoline (AVGAS). See the 411 series for bulk fuel storage and 12412 for operational storage tanks above ground. Fuel storage should be installed underground. However, when the quantity of the product to be stored is of such magnitude as to create unreasonable demands in construction time or cost, aboveground storage should be considered. Aboveground considerations include available space, safety clearances, security requirements and underground construction conditions. Fuel storage allowances are for a 30-day supply and will be reduced to a 15-day supply where deliveries can be made within 7 days of placing an order. Where deliveries are to be made by tank car, the minimum fuel storage capacity for each type fuel will be 45,400 L [12,000 gal]. Fuel storage capacity of 18,900 L [5,000 gal] will be allowed for each kind of Army aircraft fuel, not provided for permanently assigned aircraft, to provide storage for fuel withdrawn from or required to refuel aircraft maintained but not assigned at the airfield. Requests for greater capacities or for fuel storage and dispensing facilities for types of aircraft fuel for other than Army aircraft at an Army airfield will be individually justified. Storage capacities will be calculated by the formula a ✕ b ✕ c ÷ 12 = 30 day requirement per aircraft and fuel type. |

|  |  |  |
| --- | --- | --- |
| **Facility Class 1: Operational and Training Facilities, Category Group 12: Liquid Fueling and Dispensing Facilities** | | |
| **Item and Allowance** | | |
|  | | a = the number of each type of Army aircraft assigned or planned to be assigned. b = the basic annual flying hour planning factor per type of aircraft, as listed in current FM 101-20, US Army Aviation Planning Manual, as a peacetime or noncombat environment. c = the fuel consumption rate per type of Army aircraft, as listed in FM 101-20. Use a factor of 0.78 kg per liter [6.5 lb per gallon]. Total storage capacities will be rounded to the nearest 18,900 L [5,000 gal] for quantities over 18,900 L [5,000 gal.] and to the nearest 3,780 L [1,000 gal.] for quantities under 18,900 L [5,000 gal.]. |
| **12411** | | **Aircraft Fuel Storage, Jet, Underground.** Storage tanks used in support of direct fueling and/or fueling of aircraft that use jet fuel (JP-4/5/8). See the 411 series for bulk fuel storage and 12413 for operational storage tanks above ground. |
|  | |  |
| **12413** | | **Aircraft Fuel Storage, Jet, Aboveground.** Storage tanks used in support of direct fueling and/or fueling of aircraft that use jet fuel (JP-4/5/8). See the 411 series for bulk fuel storage and 12411 for operational storage tanks underground. |
| **Facility Class 1: Operational and Training Facilities, Category Group 13, Air Navigation & Traffic Aids Building** | | |
| **133** | **Air Navigation and Traffic Aids Building.** Facilities housing equipment and functions for air traffic control including flight control and navigational aids. | |
| **13310** | **Flight Control Tower**. Terminal facilities which, by the use of communications systems, visual signaling, and other equipment, provide air traffic control service to aircraft at airfields or heliports. One control tower will be provided for each airfield or heliport in accordance with AR 95-2, Air Traffic Control, Air Space, Airfield Flight Facilities and Navigational Aids. Standards for control towers can be obtained from ATZQ-ATC-FG. The tower cab height will permit a clear view of the entire runway and taxiway system and may be combined with the airfield operations building and/or the fire and rescue station. The tower area will be approximately 260 gross m2 [2,800 gross ft2]. At facilities provided direct weather support by an Air Weather Service (AWS) detachment, a separate floor of the control tower may be modified or added to house a Representative Weather Observation Station (RWOS). The tower area for the RWOS will be 37 gross m2 [400 gross ft2]. An observation platform or catwalk may be provided around the exterior of the RWOS floor. | |
| **13320** | **Navigation Building, Air.** A facility which houses designated types of equipment systems for the exchange of information between airfields and aircraft. Also included are air traffic control facilities which provide approach control services to aircraft arriving, departing, and transitioning the airspace controlled by the airfield or heliport. Unmanned structures containing regulators, relays, emergency generators, service feeder switches, and secondary control panels for lighting at airfields or heliports are also included. Type 0 (Equipment room only) 14.4 gross m2 [156 gross ft2] Type 1 (Equipment room plus one generator) 32.1 gross m2 [344 gross ft2] Type 2 (Equipment room plus two generators) 42.3 gross m2 [452 gross ft2] Type 3 (Equipment room plus three generators) 52.0 gross m2 [560 gross ft2]. | |

|  |  |
| --- | --- |
| **134** | **Navigational and Traffic Aids, Other Than Buildings.** Radar approach control, visual navigational aids, antenna systems, vaults, foundations, tower beacons, and other structures which support Army airfield or Army heliport operations. |
| **13410** | **Radio Beacon.** Radio beacons are of three types: non-directional, air navigation marker, and terminal VHF omni-range (TVOR). The non-directional beacon (NDB) transmits a signal from which the pilot of a suitably equipped aircraft can determine the aircraft’s bearing to or from the facility. The NDB operates in the frequency range of 200 to 535.5 kilohertz (kHz) with a variable radio frequency output power between 25 and 50 watts. An air navigation marker is part of an instrument landing system (ILS) and provides accurate radio fixes along the approach zone. Category II ILS require inner and outer markers. TVOR beacon transmits very high frequency (VHF) signals 360 degrees in azimuth, oriented from magnetic north. These signals provide aircraft with course and bearing information. The TVOR periodically identifies itself and may use voice recordings on an automatic terminal information service (ATIS) recorder. These facilities are normally small, unmanned structures. The facility excludes electronic equipment and antenna systems that form integral, equipment-in-place (EIP) components of this navigational aid. As provided in the applicable TDA for each airfield/heliport in accordance with the provisions of AR 310-49, The Army Authorization Documents System. |
| **13430** | **Ground Control Approach System.** A radar approach system operated by air traffic control personnel in support of instrument flight rules (IFR) activities. The approach may be conducted with airport surveillance radar (ASR) only, or with both ASR and precision approach radar (PAR). The facility normally consists of small unmanned structures that house electronic equipment and other equipment installed in the control tower. The real property facility excludes electronic equipment and antenna systems that form integral, equipment-in-place (EIP) components of this navigational aid. Instrument approach facilities normally authorized for precision-instrumented airfields will consist of a Ground Control Approach (GCA) System. (Requisitioning of equipment will be through the Army Communication Command (USACC) in accordance with AR 95-9, Terminal Air Navigation and Air Traffic Control Facilities). |
| **13440** | **Instrument Landing System**. ILS consists of three main elements: a directional localizer, a glide slope indicator, and radio marker beacons. These three precision electronic elements provide aircraft with course alignment, descent and range information, respectively, during instrument flight rules (IFR) approaches to the runway under adverse weather conditions or poor visibility. The ILS normally consists of small, unmanned facilities that house electronic equipment. The real property facility excludes electronic equipment and antenna systems that form integral, equipment-in-place (EIP) components of this navigation aid. |
| **13450** | **Navigational Lighting.** Consists of three types: rotating light beacon, flashing light beacon, and air navigation obstruction lighting. The rotating light beacon is the internationally recognized white and green flashing light signal that indicates an airfield. The facility normally consists of a high candlepower unmanned piece of equipment. Air navigation obstruction lighting is one or more electrically operated red, or high intensity white lights that identify hazards to aircraft operation. Flashing and steady-burning red obstruction lights may be used during darkness or periods of reduced daytime visibility. Flashing high-intensity white lights may be used for both daytime and nighttime conditions. The facility normally consists of an unmanned piece of equipment. |
| **13470** | **Wind Direction Indicator**. A facility which provides a visual indication of surface wind direction at Army airfields, heliports and helipads. These facilities include wind socks, wind cones, and wind tees. Lights are used to illuminate the pointing device. The facility normally consists of an unmanned piece of equipment. |

|  |  |  |
| --- | --- | --- |
| **Table A3.3. Facility Class 1: Operational and Training Facilities, Category Group 13: Air Navigation and Traffic Aids Building** | | |
| **Category**  **Code** | | **Item and Allowance** |
| **136 Airfield and Heliport Pavement Lighting Systems**. Lighting systems along both sides and the approaches of airport and heliport pavements. It excludes airfield perimeter lighting; security lighting, street lighting, and other general illumination (see the 812-series). Airfield and heliport lighting systems will include only the lighting facilities required for support of aircraft operational areas. Controls and equipment vault facilities will be included as necessary to provide a complete and usable system. Design and equipment will conform to criteria contained in TM 5-811-5, Army Aviation Lighting, AFMAN 32-1076, Visual Air Navigation Facilities, and NAVAIR 51-50-AAA-2, General Requirements for Shore Based Airfield Marking and Lighting. For programming purposes, runway, taxiway, hoverlane, and approach lighting requirements will be designated in linear meters [feet] (based on runway centerline length measurements). Helipad lighting will be designated in linear meters [feet] of a perimeter measurement. | | |
| **13610** | **Runway Lighting.** Lighting consisting of two configurations of lights, one that defines the lateral (side) limits of the runway, and the other that defines the longitudinal threshold (end) limits of the runway. The lateral lights are called runway edge lighting and emit white light. The longitudinal lights are called inboard and winged-out threshold lighting. Each threshold fixture emits both red and green light. A medium-intensity system is approximately 45 watts, while a high-intensity system is approximately 200 watts. Floodlights to illuminate hover points are included also. A runway lighting system consisting of runway edge lighting and threshold lighting will be authorized at airfields and/or heliports with surfaced runways. a. Medium intensity lighting with brightness control will be provided on non-instrument runways where justified for flight operations conducted under Visual Flight Rules (VFR). b. High intensity lighting with brightness control will be authorized on runways used for flight operations under Instrument Flight Rules (IFR). | |
| **13612** | **Approach Lighting System.** A configuration of 7 to 15 light bars located along the extended centerline of the runway. These bars are typically elevated and have multiple fixtures that emit white light to assist aircraft in approaching the end of the runway. A Short Approach Lighting System (SALS) will normally be installed at the approach end of an instrument runway served by a Precision Approach Radar (PAR) or Instrument Landing System (ILS). A more extensive system may be approved based on ceiling and visibility minimums derived under TM 95-226, United States Standard for Terminal Instrument Procedures (TERPS) for large transport aircraft where justification exists. A Medium Intensity Approach Lighting System (MALS) may be used where a precision approach is not available or justified. | |
| **13613** | **Precision Approach Path Indicator (PAPI).** A light system made up of red and white lights mounted on bars located near the landing end of the runway. The purpose of the PAPI is to visually assist pilots on their descent to the runway. A Precision Approach Path Indicator (PAPI) may be provided when justified by special requirements. The PAPI is designed to provide, by visual reference, the same information that the glide slope unit of an instrument landing system provides electronically. PAPIs provide a visual flight path within the approach zone, at a fixed plane inclined at 2.5 to 4 degrees from the horizontal, which an approaching fixed-wing aircraft pilot can visually utilize the PAPI for descent guidance during an approach to landing, under either daytime or nighttime conditions on instrument or visual runways. | |

|  |  |
| --- | --- |
| **13615** | **Rotary Wing Parking Pad Lighting.** A perimeter system of yellow lights around the edge of the rotary-wing landing/parking pad. It may also include other systems, such as a landing direction system which is a series of yellow lights placed along the extended landing pad centerline, and an approach system which is a series of white lights that extend out from the landing direction lights. Inset lights are a series of blue lights placed within the landing surface to aid depth perception. Landing pad flood lights are general illumination lights which are placed parallel to the normal approach. Lighting will be provided for helipads to be used at night and during periods of poor visibility. |
| **13620** | **Taxiway Lighting.** A configuration of lighting fixtures which defines the lateral limits of aircraft movement along a taxiway. The configuration normally consists of a line of blue lights paralleling each side of the taxiway, plus yellow entrance and exit lights. Taxiing routes between rotary-wing landing pads and apron areas (hover lanes) have lights consisting of a single row of semi-flush blue lights illuminating the centerline. The ends of the centerlines may also be marked with red limit lights. Lighting is authorized for all taxiways and taxiways used as hover lanes required to be used at night or during periods of poor visibility except access taxiways to compass calibration pads and weapon systems calibration pads. The exterior limits of all apron taxi lanes will be lighted appropriately. The light intensity will be such as to provide adequate taxiing guidance for all meteorological conditions under which the system is to be used. Brightness control and entrance-exit signs may be provided when specifically authorized by Department of the Army. |
| **13621** | **Holding Apron Lighting.** A configuration of blue lights that illuminate the outer edges of a holding apron. Where programmed separately, the scope of holding apron lighting will be the actual length of the outer edges of each holding apron, including pavement fillets. See Item 13620 for taxiway lighting. |
| **13640** | **Aircraft Lighting Equipment Vault.** A single vault, not to exceed 44.5 gross m2 [480 gross ft2] will be provided for fixed-wing runway or separate heliport lighting equipment. A combination vault, not to exceed 70 gross m2 [750 gross ft2], will be provided where both fixed-wing runway and heliport lighting is provided. The area may be increased when a standby generator for the airfield lighting system is authorized. |

* + 1. Operational Information. Functional proponents will provide, at minimum, existing and projected operational information needed for planning aviation facilities:
       1. Mission statements
       2. Aircraft operational counts, traffic levels, and traffic density
       3. Type, size, and number of units/organizations and personnel
       4. Type, size, and number of equipment (aircraft, weapons systems, vehicles, etc.).
       5. Once the above items are established, land requirements to support the aircraft mission can be established.
    2. Engineering Information. Engineering information provided will include, as a minimum: graphical maps and plans, facility condition assessments, and tabulation of existing facilities.
    3. Safety. The planning and design of an aviation facility will emphasize safety for aircraft operations. This includes unobstructed airspace and safe and efficient ground movements. Protect air space by promoting conscientious land use planning, such as compatible zoning and land easement acquisition.
    4. Design Aircraft. Aviation facilities typically are designed for a specific aircraft known as the "critical" or "design" aircraft, which is the most operationally and/or physically demanding aircraft to make substantial use of the facility. The critical or design aircraft is used to establish the dimensional requirements for safety parameters such as approach protection zones, lateral clearance for runways, taxiways and parking positions, and obstacle clearance. In many cases, the "geometric" design aircraft may not be the same aircraft as the "pavement" design aircraft.
    5. Airspace and Land Area. Aviation facilities need substantial air space and land area for safe and efficient operations and to accommodate future growth or changes in mission support.
    6. Land Use Within the Clear Zone and Accident Potential Zones. Requirements for land use below approach-departure surfaces are provided in DoD Instruction 4165.57 and are summarized in Attachment 4.
    7. Explosives. Where explosives or hazardous materials are handled at or near aircraft, safety and separation clearances are required. The clearances are based on quantity-distance criteria as discussed in Attachment 10.
    8. Landside Safety Clearances. Horizontal and vertical operational safety clearances must be applied to landside facilities and will dictate the general arrangement and sizing of facilities and their relationship to airside facilities. Landside facilities will vary in accordance with the role of the mission. There are, however, general considerations which apply in most cases, such as:
       1. Adherence to standards in support of safety in aircraft operations.
       2. Non-interference with line of sight or other operational restrictions.
       3. Use of existing facilities.
       4. Flexibility in being able to accommodate changes in aircraft types or missions.
       5. Efficiency in ground access.
       6. Priority accorded aeronautical activities where available land is limited.
    9. Helipads. Helipads are authorized at locations where aircraft are not permanently assigned but have a need for access based upon supporting a continuing and recurrent aviation mission. For example, hospitals, depot facilities, and headquarters buildings are authorized one or more helipads. These facilities must be included in the approved Airfield Master Plan.
  1. **Siting Aviation Facilities:**
     1. Location. The general location of an aviation facility is governed by many factors, including base conversions, overall defense strategies, geographic advantages, mission realignment, security, and personnel recruitment. These large-scale considerations are beyond the scope of this manual. The information in this chapter provides guidelines for siting aviation facilities where the general location has been previously defined.
     2. Site Selection:
        1. Site Conditions. Site conditions must be considered when selecting a site for an aviation facility. The site considerations include, but are not limited to : topography, vegetative cover, existing construction, weather elements, wind direction, soil conditions, flood hazard, natural and man-made obstructions, adjacent land use, availability of usable airspace, accessibility of roads and utilities, and future expansion capability.
        2. Future Development. Adequate land for future aviation growth must be considered when planning an aviation facility. An urgent requirement for immediate construction should not compromise the plan for future development merely because a usable, but not completely satisfactory, site is available. Hasty acceptance of an inferior site can preclude the orderly expansion and development of permanent facilities. Initial land acquisition (fee or lease) or an aviation easement of adequate area will prove to be the greatest asset in protecting the valuable airfield investment.
        3. Sites not on DoD Property. Site selection for a new airfield or heliport not located on DoD or service controlled property must follow FAA planning criteria and each service's established planning processes and procedures for master planning as previously discussed in paragraph 2.4.1. Siting the aviation facility requires an investigation into the types of ground transportation that will be required, are presently available, or are capable of being implemented. All modes of access and transportation should be considered, including other airports/airfields, highways, railroads, local roadways, and internal roads. The facility's internal circulation plan should be examined to determine linear routes of movement by vehicles and pedestrians to ensure that an adequate access plan is achievable.
     3. Airspace Approval. Construction of new airfields, heliports, helipad or hoverpoints, or modifications to existing facilities affecting the use of airspace or changes in aircraft densities will require notification to the Administrator, FAA, in conformance with AR 95-2, Air Traffic Control, Air Space, Airfield Flight Facilities and Navigational Aids. Copies of FAA airspace approval actions should normally accompany any construction projects when forwarded to Department of the Army (DA) for approval.
  2. Airfield Safety Clearances:
     1. Dimensional Criteria. The dimensions for airfield facilities, airfield lateral safety clearances, and airspace imaginary surfaces are provided in Chapters 3 and 4 of this manual.
     2. Air Force Missions at Army Facilities. Airfield flight safety clearances applicable to Army airfields which support Air Force cargo aircraft missions will be based upon an Army Class B airfield. This will be coordinated between the Army and the Air Force.
     3. Prohibited Land Uses. Airfield airspace criteria prohibit certain land uses within the clear zone and Accident Potential Zones (APZ 1 and APZ 2). These activities include the storage and handling of munitions and hazardous materials, and live-fire weapons ranges. See AICUZ DoD Instruction 4165.57 for more information.
     4. Wake Turbulence. The problem of wake turbulence may be expected at airfields where there is a mix of light and heavy aircraft. At these airfields, some taxiway and holding apron design modifications may help to alleviate the hazards. Although research is underway to improve detection and elimination of the wake, at the present time, the most effective means of avoiding turbulent conditions is provided by air traffic control personnel monitoring and regulating both air and ground movement of aircraft. Planners can assist this effort by providing the controllers line-of-site observation to all critical aircraft operational areas and making allowances for aircraft spacing and clearances in turbulence prone areas. Additional information on this subject is available in FAA AC 90-230, Wake Turbulence.
  3. Airside & Landside Facilities. An aviation facility consists of four land use areas. They are:
     1. Airside Facilities:
        1. Landing & take-off area
        2. Aircraft ground movement and parking areas
     2. Landside Facilities
        1. Aircraft maintenance areas.
        2. Aviation operations support areas.
  4. Landing and Takeoff Area.
     1. Runways & Helipads. Take-off and landing areas are based on either a runway or helipad. The landing and take-off area consists not only of the runway and helipad surface, shoulders, and overruns, but also approach slope surfaces, safety clearances and other imaginary airspace surfaces.
     2. Number of Runways. Aviation facilities normally have only one runway. Additional runways may be necessary to accommodate operational demands, minimize adverse wind conditions or overcome environmental impacts. A parallel runway may be provided based on operational requirements. Methodologies for calculating runway capacity in terms of annual service volume (ASV) and hourly instrument flight rules (IFR) or visual flight rules (VFR) capacity are provided in FAA AC 150/5060-5, Airport Capacity and Delay. Planning efforts to analyze the need for more than one runway should be initiated when it is determined that traffic demand for the primary runway will reach 60 percent of its established capacity (FAA guidance).
     3. The number of helipads authorized is discussed in Attachment 3. At times there are situations at airfields or heliports when a large number of helicopters are parked on mass aprons or are in the process of take-off and landing. When this occurs, there is usually a requirement to provide landing and take-off facilities that permit more rapid launch and recovery operations than can otherwise be provided by a single runway or helipad. This increased efficiency can be obtained by providing one or more of the following, but is not necessarily limited to:
        1. Multiple helipads, hoverpoints, or runways.
        2. Rotary wing runways in excess of 240 meters long.
        3. Landing lanes.
     4. Runway Location. Runway location and orientation are paramount to airport safety, efficiency, economics, practicality, and environmental impact. The degree of concern given to each factor influencing runway location depends greatly on meteorological conditions, adjacent land use and land availability, airspace availability, runway type and instrumentation, environmental factors, terrain features and topography, and obstructions to air navigation.
        1. Obstructions to Air Navigation. The runway must have approaches which are free and clear of obstructions. Runways must be planned so that the ultimate development of the airport provides unobstructed navigation. A survey of obstructions should be undertaken to identify those objects which may affect aircraft operations. Protection of airspace can be accomplished through purchase, easement, zoning coordination, and application of appropriate military directives.
        2. Airspace Availability. Existing and planned instrument approach procedures, control zones, and special use airspace and traffic patterns influence airfield layouts and runway locations. Construction projects for new airfields and heliports or construction projects on existing airfields have potential to affect airspace. These projects require notification to the FAA to examine feasibility for conformance with and acceptability into the national airspace system.
        3. Runway Orientation. Wind direction and velocity is a major consideration for siting runways. To be functional, efficient, and safe, the runway should be oriented in alignment with the prevailing winds, to the greatest extent practical, to provide favorable wind coverage. Wind data, obtained from local sources, for a period of not less than five years, should be used as a basis for development of the wind rose to be shown on the airfield general site plan. Attachment 5 provides guidance for the research, assessment, and application of wind data.
     5. Runway and Helipad Separation. The lateral separation of a runway from a parallel runway, parallel taxiway, helipad, or hoverpoint is based on the type of aircraft the runway serves. Runway and helipad separation criteria are presented in Chapters 3 and 4 of this manual.
     6. Runway Instrumentation. Navigational aids require land areas of specific size, shape, and grade to function properly and remain clear of safety areas.
        1. Navigational Aids (NAVAIDS), Vault, and Buildings. NAVAIDS assist the pilot in flight and during landing. Technical guidance for flight control between airfields may be obtained from the U.S. Army Aeronautical Services Agency. The type of air navigational aids which are installed at an aviation facility are based on the instrumented runway studies, as previously discussed. A lighting equipment vault is provided for airfields and heliport facilities with navigational aids, and may be required at remote or stand-alone landing sites. A (NAVAID) building will be provided for airfields with navigational aids. Each type of NAVAID equipment is usually housed in a separate facility. Technical advice and guidance for air navigational aids should be obtained from the support and siting agencies listed in Attachment 17.

1. **Rotary-Wing Runways, Helipads, Landing Lanes, and Hover Points.**
   1. **Contents.** This chapter presents design standards and requirements for rotary-wing (helicopter) landing facilities: runways, helipads, helicopter landing lanes, and hoverpoints.
   2. **Landing and Take-off Layout Requirements.** The landing design requirements for rotary-wing landing facilities, which include rotary-wing runways, helipads, landing lanes, slide areas (autorotation lanes), and hoverpoints, are similar to the requirements for fixed-wing runways, as discussed in Chapter 3.
   3. **Rotary-Wing Runway.** The rotary-wing runway allows for a helicopter to quickly land and roll to a stop, compared to the hovering stop used during a vertical helipad approach.
      1. Orientation and Designation. Consider the strength, direction, and frequency of the local winds when orienting a runway to minimize cross winds. Follow the methods for fixed-wing runways presented in Chapter 3. Runways are identified by the whole number, nearest one-tenth (1/10), of the magnetic azimuth of the runway centerline when viewed from the direction of approach.
      2. Dimensions. Table 4.1 presents dimensional criteria for the layout and design of rotary-wing runways.
      3. Layout. Layout for rotary-wing runways, including clear zones, are illustrated in Figure 3.1 for VFR runways and Figures 3.2 and 3.3 for IFR runways.

**Table 3.1. - Rotary-Wing Runways**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Item**  Description | **Requirement** | **Remarks** |
| 1 | Basic Length | 490m | For Army and Air Force facilities, use basic length up to 1,220m in elevation above Mean Sea Level (MSL). Increase basic length to 610m when above 1,220m in elevation above MSL. For special mission or proficiency training such as autorotation operations, the length may be increased up to 300 m; in which case, make no additive corrections. |
|  |  | 137.2m | For facilities constructed prior to publication of this manual. |
| 2 | Width | 23m |  |
| 3 | Longitudinal Grade | Max 1.0% | Maximum longitudinal grade change is 0.167% per 30 linear meters of runway. Exceptions: 0.4% per 30 linear meters for edge of runways at runway intersections. |
| 4 | Transverse Grade | Min. 1.0%  Max. 1.5% | From centerline of runway. Runway may be crowned or uncrowned. |
| 5 | Paved Shoulders |  | See Table 3.4 |
| 6 | Runway Lateral Clearance zone (corresponds to half the width of primary surface area) | 45.72m | VFR operations. |
|  |  | 114.3m | IFR operations. |
|  |  | See Remarks | Measured perpendicularly from centerline of runway. This area is to be clear of fixed and mobile obstacles. In addition to the lateral clearance criterion, the vertical height restriction on structures and parked aircraft as a result of the transitional slope must be taken into account. (1) Fixed obstacles include manmade or natural features constituting possible hazards to moving aircraft. Navigational aids and meteorological equipment are possible exceptions. For Army and Air Force, siting exceptions for navigational aids and meteorological facilities are found in Attachment 14 of this manual. (2) Mobile obstacles include parked aircraft, parked and moving vehicles, railroad cars and similar equipment. (3) Taxiing aircraft are exempt from this restriction. However, parallel taxiways (exclusive of shoulder width) must be located in excess of the lateral clearance distance. |
| 7 | Grades within the Primary Surface Area in any direction | Max. 5.0% | Exclusive of pavement & shoulders. |
| 8 | Overrun |  | See Table 3.5 |
| 9 | Distance from the Centerline of a Fixed wing Runway to the Centerline of a Parallel Rotary Wing Runway, Helipad, or Landing Lane | Min. 213.36m | Simultaneous VFR operations for Class A Runway and Army Class B Runway. |
|  |  | Min. 304.80m | Simultaneous VFR operations for Class B Runway for Air Force, Navy and Marine Corps. |
|  |  | Min. 213.36m | Non-simultaneous operations. Distance may be reduced to 60.96m; however, waiver must be based on wake-turbulence and jet blast. In locating the helipad, consideration must be given to hold position marking. Rotary-wing aircraft must be located on the apron side of the hold position markings (away from the runway) during runway operations. |
|  |  | Min. 762.00m | Instrument Flight Rules (IFR) using simultaneous operations (Depart-Depart) (Depart-Approach). |
|  |  | Min. 1,310.64m | Instrument flight rules (IFR) using simultaneous approaches. |
| 10 | Distance Between Centerlines of: (a) Parallel Rotary-Wing Runways, Helipads, or Any Combina­tion Thereof. (b) Landing Lane and Parallel Rotary Wing Runway or Helipad | Min. 213.36m | Visual flight rules (VFR) without intervening parallel taxiway between centerlines. |

Figure 3.1 – Helicopter VFR Runway

Figure 3.2 – Helicopter IFR Runway

Figure 3.3 – IFR Airspace Imaginary Surfaces – IFR Helicopter Runway and Helipad.

* 1. Helipads allow for a helicopter hovering, landing, and take off. Except at facilities where helicopter runways are provided, helipads are the landing and take-off locations for helicopters. The Army and Air Force provide for three types of helipads: Standard Visual Flight Rules (VFR) Helipad, Limited Use Helipad, and Instrument Flight Rules (IFR) Helipad. The type of helipad depends on the following operational requirements:
     1. Standard VFR Helipad. VFR design standards are used when no requirement exists or will exist in the future for an IFR helipad. Criteria for this type of helipad permit the accommodation of most helipad lighting systems.
     2. Limited Use Helipad. This is a VFR facility used at sites where only occasional operations are conducted. These sites may be, but are not limited to, hospitals, headquarter areas, missile sites, and established airfields or heliports where the Limited-Use Helipad may be used to preclude mixing helicopters and fixed-wing traffic. Limited Use Helipads may also be used to separate light helicopter traffic (5,670 kg [12,500 lbs] or less) from medium and heavy helicopter traffic.
     3. IFR Helipad. IFR design standards are used when an instrument approach capability is essential to the mission and no other instrument landing facilities, either fixed-wing or rotary-wing, are located within an acceptable commuting distance to the site.
     4. Helipad Location. A helipad location should be selected with regard to mission requirements, overall facility development, approach-departure surfaces, and local wind conditions.
        1. Near Runways. When a helipad is to be located near fixed- and rotary-wing runways, its location should be based on type of operations, in accordance with criteria in Table 3.1.
        2. Above Ground Helipads. Construction of helipads on buildings or on any type of elevated structure above ground is not authorized for Air Force and Army. For these agencies, helipads will be constructed as a slab on grade.
        3. Parking Pads. At individual helipad sites where it is necessary to have one or more helicopters on standby, an area adjacent to the helipad, but clear of the landing approach and transitional surfaces, should be designated for standby parking. This area will be designed as a parking apron in conformance with the criteria presented in Chapter 6.
     5. Dimensional Criteria. Table 3.2 presents dimensional criteria for the layout and design of helipads.

**Table 3.2. Rotary-Wing Helipads and Hoverpoints.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Item Description** | **Requirement** | **Remarks** |
| 1 | Size | Min. 15m x 15m | Air Force and Army VFR limited use helipads. |
| Min.30m x 30m | Standard VFR and IFR helipad. |
| 2 | Grade | Min. 1.0%  Max. 1.5% | Grade helipad in one direction. Hoverpoints should be domed to a 150mm height at the center. |
| 3 | Paved Shoulders |  | See Table 3.4. |
| 4 | Size of Primary Surface (center primary surface on helipad) | 45.72m x 45.72m min. | Hoverpoints. Air Force and Army limited use VFR helipad. |
| 91.44m x 91.44m | Air Force and Army standard VFR helipad. |
| 472.44m x 228.60m | Standard IFR. Long dimension in direction of helicopter approach. |
| 228.60m x 228.60m | Army and Air Force IFR same direction ingress/egress. |
| 5 | Grades Within the Primary Surface Area in Any Direction | Min. of 2.0% prior to channelization.\* Max. 5.0% | Exclusive of pavement and shoulders. For IFR helipads, the grading requirements apply to a 91.44 m × 91.44 m (300 ft × 300 ft) area centered on the helipad. The balance of the area is to be clear of obstructions and rough graded to the extent necessary to reduce damage to aircraft in event of an emergency landing. For VFR helipads, the grade requirements apply to the entire primary surface. |
| 6 | Length of Clear Zone\*\* | 121.92m | Hoverpoints, VFR, and standard IFR helipads. Begins at the end of the primary surface. |
| 251.46m | Army and Air Force IFR same direction ingress/egress. |
| 7 | Width of Clear Zone\*\* |  | Corresponds to the width of the primary surface. Center Clear Zone width on extended center of the pad. |
| 45.72m | Air Force and Army VFR limited use helipads and hoverpoints. Navy and Marine Corps Standard VFR. |
| 91.44m | Air Force and Army standard VFR helipad and VFR helipad same direction ingress/egress. |
| 228.60m | Standard IFR helipad. |
| 8 | Grades of Clear Zone\*\* any direction | 5.0% max | Area to be free of obstructions. Rough grade and turf when required. |
| 9 | APZ I Length\*\*\* | 243.84m | Hoverpoints, VFR, and standard IFR. |
|  |  | 121.92m | Army and Air Force IFR same direction ingress/egress. |
| 10 | APZ I Width\*\*\* | 45.72m | Army and Air Force VFR limited use and hoverpoints. Navy and Marine Corps standard VFR. |
|  |  | 91.44m | Army and Air Force standard VFR. |
|  |  | 228.60m | Standard IFR. |
| 11 | Distance Between Centerline of Helipad and Fixed or Rotary Wing Runways |  | See Table 4.1. |

\* Bed of channel may be flat.

\*\* The clear zone area for helipads corresponds to the clear zone land use criteria for fixed-wing airfields as defined in DoD AICUZ standards. The remainder of the approach-departure zone corresponds to APZ I land use criteria similarly defined. APZ II criteria is not applicable for rotary-wing aircraft.

\*\*\* There are no grading requirements for APZ I.

* + 1. Layout Criteria. Layouts for standard, limited use, and IFR helipads, including clear zones, are illustrated in Figures 3.4 through 3.6.
  1. **Same Direction Ingress/Egress**. Helipads with same direction ingress/egress allow a helicopter pad to be located in a confined area where approach-departures are made from only one direction. The approach may be either VFR or IFR. For USAF, Single Direction Ingress/Egress VFR Limited use helipads are configured as shown in Figure 3.7 using the criteria given in Tables 3.2 and 3.7. Chapter 3
     1. Dimensions Criteria. Table 3.2 presents dimensional criteria for the VFR and IFR one direction ingress/egress helipads.
     2. Layout Criteria. Layout for VFR and IFR same direction ingress/egress are illustrated in Figures 3.7 and 3.8.
  2. **Hoverpoints:**
     1. General. A hoverpoint is a prepared and marked surface used as a reference or control point for air traffic control purposes by arriving or departing helicopters.
     2. Hoverpoint Location. A hoverpoint is located in a non-traffic area.
     3. Dimensions. Table 3.2 presents dimensional criteria for the layout and design of hoverpoints.
     4. Layout. Hoverpoint design standards are illustrated in Figure 3.9.
  3. Rotary Wing Landing Lanes. Except when used as an autorotation lane, these lanes permit efficient simultaneous use by a number of helicopters in a designated traffic pattern.

Figure 3.4. Standard VFR Helipad for Army and Air Force.

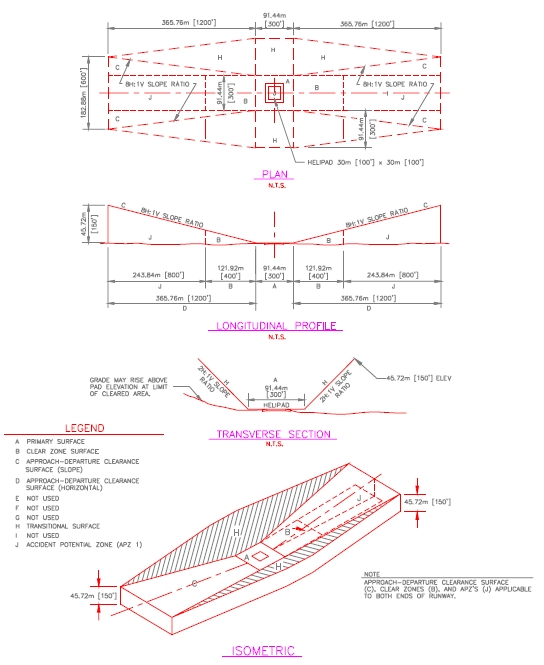


Figure 3.5. Standard VFR Helipad for Navy and Marine Corps and Limited Use VFR Helipad for Army and Air Force.

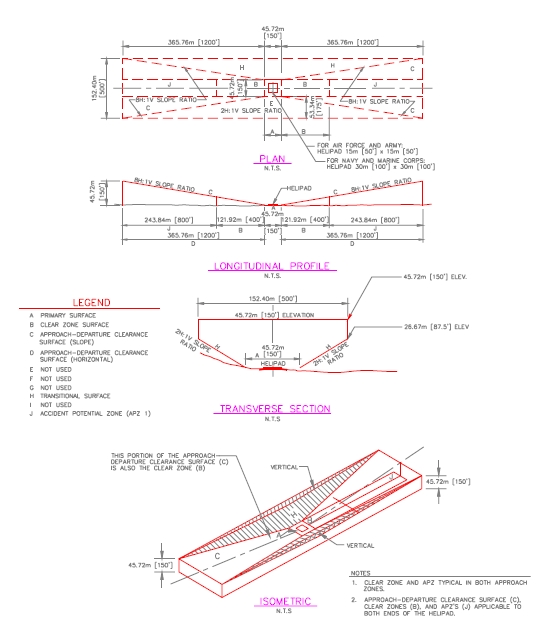


Figure 3.6. Standard IFR Helipad.

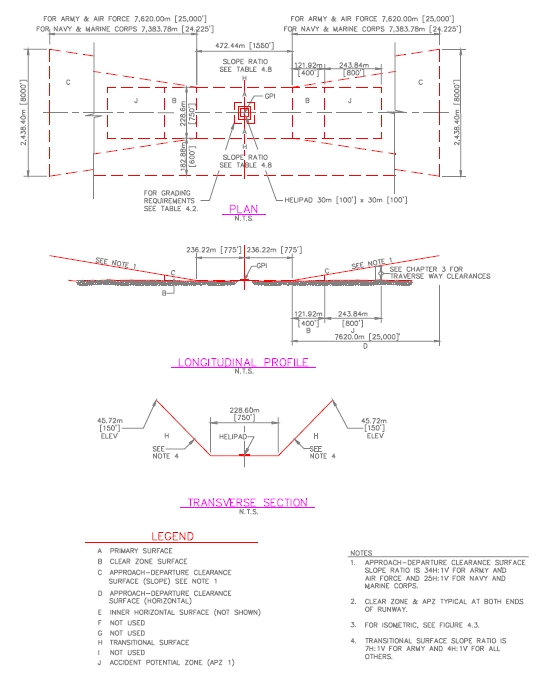


Figure 3.7. Army and Air Force VFR Helipad with Same Direction Ingress/Egress.

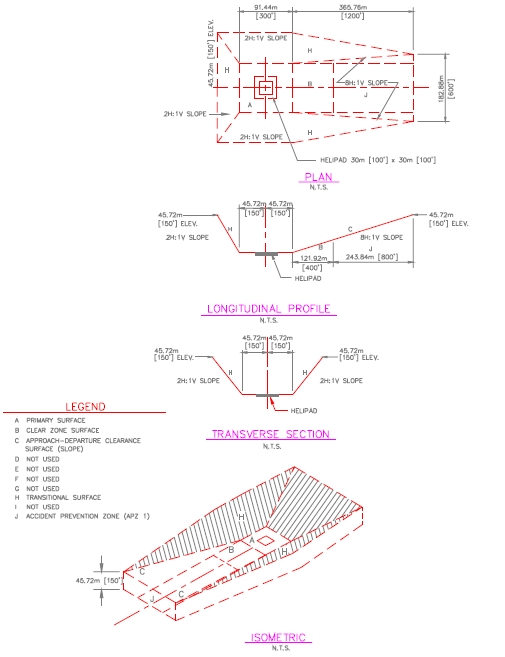


Figure 3.8. Army and Air Force IFR Helipad with Same Direction Ingress/Egress.

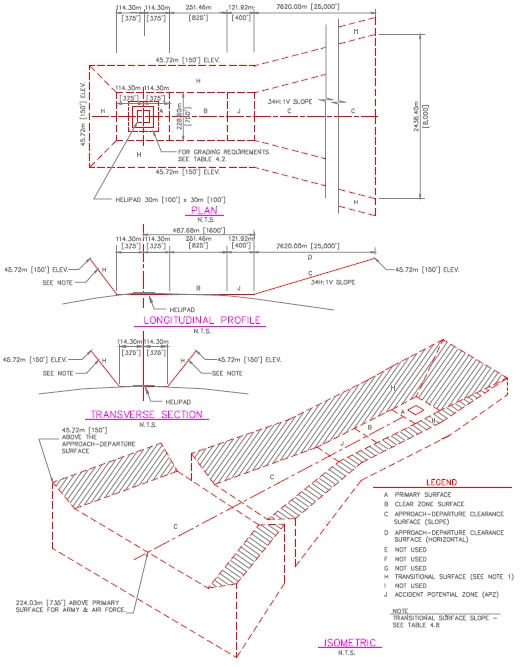
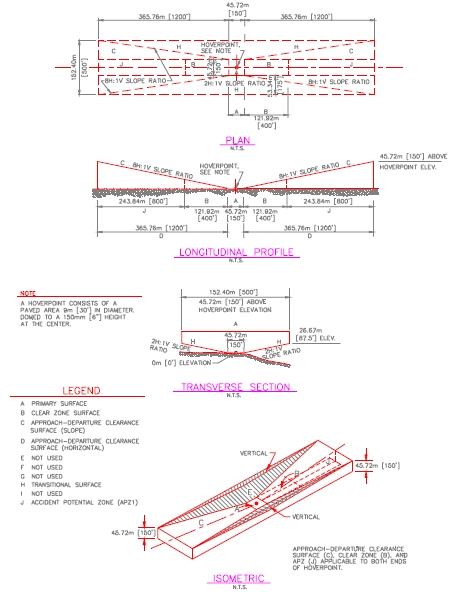


Figure 3.9. Helicopter Hoverpoint.



* + 1. Requirements for a Landing Lane. Occasionally there are situations at airfields or heliports when a high density of helicopters is parked on mass aprons. When this occurs, there is usually a requirement to provide landing and take-off facilities that permit more numerous rapid launch and recovery operations that otherwise could be provided by a single runway or helipad. Increased efficiency can be attained by providing one or more of, but not necessarily limited to, the following:
       1. Multiple helipads or hoverpoints.
       2. A rotary-wing runway of length in excess of the criteria in Table 3.1.
       3. Helicopter landing lanes.
    2. Landing Lane Location. Landing lanes are located in front of the paved apron on which the helicopters park, as shown in Figure 3.9.
    3. Touchdown Points. The location at which the helicopters are to touchdown on the landing lane is designated with numerical markings.
    4. Dimensions. Table 3.3 presents dimensional criteria for the layout and design of rotary-wing landing lanes.
    5. Layout. A layout for rotary-wing landing lanes is illustrated in Figure 3.10.
  1. **Air Force Helicopter Slide Areas or “Skid Pads.”** VFR helicopter runway criteria described in Table 3.1 and shown in Figures 3.1 and 3.3 (in terms of length, width, grade, and imaginary surfaces) are suitable for slide areas. The forces associated with helicopters landing at a small (but significant) rate of descent, and between 10 and 30 knots of forward velocity, require that slide area surfaces have both good drainage and some resistance to rutting. However, these landing surfaces need not be paved. Refer to AFJMAN 32-1014, Pavement Design for Airfields, for helicopter slide area structural criteria.
  2. **Shoulders for Rotary-Wing Facilities**. Unprotected areas adjacent to runways and overruns are susceptible to erosion caused by rotor wash. The shoulder width for rotary-wing runways, helipads and landing lanes, shown in Table 3.4, includes both paved and unpaved shoulders. Paved shoulders are required adjacent to all helicopter operational surfaces including runways, helipads, landing lanes and hoverpoints. The unpaved shoulder must be graded to prevent water from ponding on the adjacent paved area. The drop-off next to the paved area prevents turf, which may build up over the years from ponding water. Rotary-wing facility shoulders are illustrated in Figures 3.1 through 3.10.
  3. **Overruns for Rotary-Wing Runways and Landing Lanes**. Overruns are required at the end of all rotary-wing runways and landing lanes. Table 3.5 shows the dimensional requirements for overruns for rotary-wing runways and landing lanes. The pavement in the overrun is considered a paved shoulder. Rotary-wing overruns for runways and landing lanes are illustrated in Figures 3.1, 3.2 and 3.9.
  4. **Clear Zone and Accident Potential Zone (APZ).** The Clear Zone and APZ are areas on the ground, located under the Rotary-Wing Approach-Departure surface. The Clear Zone and APZ are required for Rotary-Wing runways, helipads, landing lanes and hoverpoints.

Table 3.3. Rotary-Wing Landing Lanes.

| **Item No.** | **Item Description** | **Requirement** | **Remarks** |
| --- | --- | --- | --- |
| 1 | Length | 480m to 600m | Landing Lane length based on the number of touchdown points. Evenly space touchdown points along the landing lane. |
| 2 | Distance Between Touchdown Points on Landing Lane, Center to Center | 120m min. | Provide a number of equally spaced “touchdown” or holding points with adequate separation. |
| 3 | Width | 23m |  |
| 4 | Paved Shoulders |  | See Table 3.4 |
| 5 | Distance Between Centerlines of Rotary-Wing Landing Lanes | 60.96m | For operations with an active operational air traffic control tower. |
| 91.44m | For operations without an active operational air traffic control tower |
| 6 | Landing Lane Lateral Clearance Zone (corresponds to half the width of primary surface area) | 45.72m | VFR facilities. Measured perpendicularly from centerline of runway to fixed or mobile obstacles. See Table 3.1, item 6 for obstacles definition. |
| 114.3m | IFR facilities. Measured perpendicularly from centerline of runway to fixed or mobile obstacles. See Table 3.1, item 6 for obstacles definition. |
| 7 | Grades Within the Primary Surface Area in Any Direction | Min 2.0%, Max 2.0% | Exclusive of pavement and shoulders. |
| 8 | Overrun | See Remarks | See Table 3.5 |
| 9 | Clear Zone\* | See Remarks | See Table 3.6 |
| 10 | APZ I\* | See Remarks | See Table 3.6 |
| 11 | Distance Between Centerline of a Fixed-Wing Runway and Landing Lane | See Table 3.1 |  |
| 213.36m min. |  |

\*The clear zone area for Landing Lanes corresponds to the clear zone land use criteria for fixed-wing airfields as defined in DoD AICUZ standards. The remainder of the approach-departure zone corresponds to APZ I land use criteria similarly defined. APZ II criteria are not applicable for rotary-wing aircraft.

Table 3.4 Shoulders for Rotary-Wing Facilities.

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Item Description** | **Requirement** | **Remarks** |
| 1 | Total Widthof Shoulders (Paved and Unpaved) Adjacent to All Operational Pavements | 7.5m | May be increased when necessaryto accommodate dual operations with fixed-wing aircraft. |
| 2 | Paved Shoulder Width Next to All Operational Pavements | 7.5m | For Army and Air Force |
| 3 | Longitudinal Grade | Variable | Conform to the longitudinal grade of the abutting primary pavement. |
| 4 | Transverse Grade | 2.0% min, 4.0% max | Slope downward from edge of pavement. |
| 5 | Grade (adjacent to paved shoulder) | 1. 40mm drop off at edge of paved shoulder | Slope downward from edge of shoulder. |
| 1. 5% slope first 3m. Primary Surface criteria apply beyond this point. | See Table 3.1, Item No. 7 and Table 4.3, Item No. 5. |

Figure 3.10. Rotary-Wing Landing Lane.



Table 3.5. Overruns for Rotary-Wing Runways and Landing Lanes.

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Item Description** | **Requirement** | **Remarks** |
| 1 | Total Length (paved and unpaved) | 23m |  |
| 2 | Paved Length of Overrun | 7.5m | Air Force and Army only |
| 3 | Width | 38m | Width of runway plus paved shoulders. A minimum width of 45 m for airfields which regularly accommodate H-53 aircraft (30m runway and 7.5 m shoulders). |
| 4 | Longitudinal Centerline Grade | Max. 10.0% | Changes in longitudinal grade in overrun or between overrun and runway should not exceed 0.167% per 30 linear meters. |
| 5 | Transverse Grade (paved and unpaved) | Min. 2.0%, Max. 3.0% | Warp to meet runway and shoulder grades. |

* + 1. **Clear Zone Land Use.** The Clear Zone for Rotary-Wing facilities must be free of obstructions, both natural and manmade, and rough-graded to minimize damage to an aircraft that runs off or lands short of the end of the landing surface. In addition, the Clear Zone permits recovery of aircraft that are aborted during take-off. The Clear Zone should be either owned or protected under a long term lease. Land use for the Clear Zone area for rotary-wing facilities corresponds to the Clear Zone land use criteria for fixed-wing airfields as defined for DoD AICUZ standards, and as discussed in Chapter 3 and Attachment 4.
    2. **Accident Potential Zone (APZ)**. Land use for the APZ area at rotary-wing facilities corresponds to the APZ land use criteria for fixed-wing airfields as defined in DoD AICUZ standards, and as discussed in Chapter 3 and Attachment 4. Ownership of the APZ is desirable but not required. If ownership is not possible, land use should be controlled through long-term lease agreements or local zoning ordinances.
    3. **Dimensions.** Table 4.6 shows the dimensional requirements for the Clear Zone and APZ. These dimensions apply to rotary-wing runways, helipads, landing lanes and hoverpoints, depending on whether they support VFR or IFR operations. Layout of the Clear Zone and APZ are shown in Figures 3.1, 3.2 and 3.4 through 3.9.
  1. **Imaginary Surfaces for Rotary-Wing Runways, Helipads, Landing Lanes and Hoverpoints.**

Rotary-wing runways, helipads, landing lanes, and hoverpoints have imaginary surfaces similar to the imaginary surfaces for fixed-wing facilities. The imaginary surfaces are defined planes in space which establish clearance requirements for helicopter operations. An object, either manmade or natural, which projects through an imaginary surface plane is an obstruction to air navigation. Layouts of the rotary-wing airspace imaginary surfaces are shown in Tables 3.7 and 3.8 and Figures 3.1 through 3.10. Rotary-wing airspace imaginary surfaces are defined in the glossary and summarized below:

* + 1. Primary Surface.
    2. Approach-Departure Clearance Surface (VFR).
    3. Approach-Departure Clearance Surface (VFR Limited Use Helipads).
    4. Approach-Departure Clearance Surface (IFR).
    5. Horizontal Surface (IFR).
    6. Transitional Surfaces.

Table 3.6. Rotary-Wing Runway and Landing Lane Clear Zone and Accident Potential (APZ). (See Notes 1 and 2.)

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Item Description** | **Requirement** | **Remarks** |
| 1 | Clear Zone Length | 121.92m | Clear Zone begins at the end of the primary surface. |
| 2 | Clear Zone Width (center width on extended runway/landing lane centerline) (corresponds to the width of the primary surface) | 91.44m | VFR rotary wing runways and landing lanes. See Note 2. |
| 228.6m | IFR rotary-wing runways and landing lanes. See Note 2. |
| 3 | Grades in Clear Zone in Any Direction | 2.0% Min. 5.0% Max. | Clear Zone only. Area to be free of obstructions. Rough grade and turf when required. |
| 4 | APZ I Length | 243.84m | See Notes 2 and 3. |
| 5 | APZ I Width | 91.44m | VFR rotary wing runways and landing lanes. See Notes 2 and 3 |
| 228.60m | IFR Rotary Wing Runways and Landing Lanes. |

Notes:

1. The clear zone area for rotary wing runways and landing lanes corresponds to the clear zone land use criteria for fixed wing airfields as defined in DoD AICUZ standards, and summarized in Attachment 4. The remainder of the approach departure zone corresponds to APZ I land use criteria similarly defined. APZ II criteria are not applicable for rotary-wing aircraft.
2. Exceptions to these widths are permissible based on individual service analysis of highest accident potential area for specific rotary-wing runway/landing lane use and acquisition constraints.
3. No grading requirements for APZ I.
4. Metric units apply to new airfield construction and where practical modification to existing airfields and heliports, as discussed in paragraph 1.4.4.
5. The criteria in this manual are based on aircraft specific requirements and are not direct conversions from English dimensions. Inch-pound units are included only as a reference to the previous standard.
6. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from English to SI units.

Table 3.7. Rotary-Wing Imaginary Surface for VFR Approaches.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item No.** | **Item Description** | **Legend in Figures** | **Helicopter Runway & Landing Lane** | **Helipad** | | **Remarks** |
|  |  |  |  | Air Force & Army VFR Standard | Air Force & Army VFR Limited Use | Army does not have VRR Rotary-Wing Runways or Landing Lanes |
| 1 | Primary Surface Width | A | 91.44m | 91.44m | 45.72m | Centered on the GPI |
| 2 | Primary Surface Length | A | Runway or landing lane length plus 22.86m at each end | 91.44m centered on facility | 45.72m centered on facility | Runway or landing lane length plus 30.48m at each end for Navy and Marine Corps facilities |
| 3 | Primary Surface Elevation | A | The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline or at the established elevation of the landing surface. | | |  |
| 4 | Clear Zone Surface | B | See Table 3.6 | See Table 3.2 | See Table 3.2 |  |
| 5 | Start of Approach Departure Surface | C | 22.86m from end of runway or landing lane | 45.72m from GPI | 22.86m from GPI |  |
| 6 | Length of Sloped Portion of Approach-Departure | C | 365.76m | 365.76m | 365.76m | Measured horizontally |
| 7 | Slope of Approach-Departure Surface | C | 8:1 | 8:1 | 8:1 | Slope ration is horizontal to vertical. 8:1 is 8 meters horizontal to 1m vertical. |
| 8 | Width of Sloped Portion of Approach-Departure Surface at start of sloped portion | C | 91.44m | 91.44m | 45.72m | Centered on the extended centerline, and is the same width as the primary surface |
| 9 | Width of Sloped Portion of Approach-Departure Surface at End of Sloped Portion | C | 182.88m | 182.88m | 152.40m | Centered on the extended centerline |
| 10 | Elevation of Approach-Departure Surface at Start of Sloped Portion | C | 0m | 0m | 0m | Above the established elevation of the landing surface. |
| 11 | Elevation of Approach-Departure Surface at End of Sloped Portion | C | 45.72m | 45.72m | 45.72m | Above the established elevation of the landing surface. |
| 12 | Length of Approach-Departure Zone | D | 365.76m | 365.76m | 365.76m | Measured horizontally from the end of the primary surface and is the same length as the Approach-Departure Clearance Surface length. |
| 13 | Start of Approach-Departure zone | D | 22.86m from end of runway | 45.72m from center of helipad | 22.86m from center of helipad | Starts at the end of the primary surface. |
| 14 | Transitional Surface Slope | H | 2H:1V See Remark 1 | 2H:1V See Remark 1 | 2H:1V See Remark 2 | 1. The transitional surface starts at the lateral edges of the primary surface and the approach-departure clearance surface. It continues outward and upward at the prescribed slope to an elevation of 45.72m above the established airfield elevation.(2) the transitional surface starts at the lateral edges of the primary surface and the approach-departure clearance surface. It continues outward and upward at the prescribed slope to an elevation of 26.67m.above the established airfield elevation. It then rises vertically to an elevation of 45.7m above the established airfield elevation. See figures 3.5 and 3.10 for shape of transitional surfaces. |
| 15 | Horizontal Surface | G | Not required | Not required | Not required |  |

NOTES:

1. Navy and Marine Corps do not have criteria for same direction ingress/egress.
2. Metric units apply to new airfield construction and where practical modification to existing airfields and heliports, as discussed in paragraph 1.4.4.
3. The criteria in this Requirement are based on aircraft specific requirements and are not direct conversions from English dimensions.
4. Airfield and heliport imaginary surfaces and safe wingtip clearance dimensions are shown as a direct conversion from English to SI units.

Table 3.8. Rotary-Wing Imaginary Surfaces for IFR Approaches.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item No.** | **Item Description** | **Legend in Figures** | **Helicopter Runway & Landing Lane** | **Helipad** | | **Remarks** |
|  |  |  |  | Standard | Air Force & Army same direction ingress/egress; See Remarks | Navy & Marine Corps do not have criteria for unidirectional ingress/egress. |
| 1 | Primary Surface Width | A | 228.60m | 228.60m | 228.60m | Centered on helipad |
| 2 | Primary Surface Length | A | The greater distance of runway length plus 60.96m at each end; or 472.44m | 472.44m centered on GPI | 114.3m centered on GPI |  |
| 3 | Primary Surface Elevation | A | The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway or landing lane centerline or established elevation of the helipad. | | |  |
| 4 | Clear Zone Surface | B | See Table 3.6 | See Table 3.2 | See Table 3.2 |  |
| 5 | Start of Approach-Departure Surface | C | Measured from the center of the runway, the greater distance of ½ runway length plus 60.96m or 236.22m | 236.22m from GPI | 487.68m from GPI | Army & Air Force facilities. |
|  |  | See remarks | See remarks | See remarks | Starts at the end of the primary surface |
| 6 | Length of Sloped Portion of Approach-Departure Surface | C | 7620.00m | 7620.00m | 7620.00m | For Army & Air Force facilities |
|  | See remarks | See remarks | See remarks | Measured Horizontally |
| 7 | Slope of Approach-Departure Surface | C | 34:1 | 34:1 | 34:1 | For Army & Air Force Facilities |
|  |  | Standard | Air Force & Army unidirectional ingress/egress; see remarks | Navy & Marine Corps do not have criteria for unidirectional ingress/egress |
|  | See remarks | See remarks | See remarks | Slope ratio is horizontal to vertical.34:1 is 34m horizontal to 1 m vertical. |
| 8 | Width of Approach-Departure Surface at Start of Sloped Portion | C | 228.60m | 228.60m | 228.60m | Army & Air Force facilities |
| See remarks | See remarks | See remarks | Centered on the extended centerline |
| 9 | Width of Approach-Departure Surface at End of Sloped Portion | C | 2,438.60m | 2,438.60m | 2,438.60m | Army & Air Force facilities |
| See remarks | See remarks | See remarks | Centered on the extended centerline. |
| 10 | Elevation of Approach-Departure Surface at Start of Sloped Portion | C | 0m | 0m | 0m | Army and Air Force facilities |
| See remarks | See remarks | See remarks | Above the established elevation of the landing surface. |
| 11 | Elevation of Approach-Departure Clearance Surface at End of Sloped Portion | C | 224.03m | 224.03m | 224.03m | Air Force & Army |
| See remarks | See remarks | See remarks | Above the established elevation of the landing surface. |
| 12 | Transitional Surface Slope | H | 7:1 | 7:1 | 7:1 | Army |
| See remarks | See remarks | See remarks | See figures 3.2, 3.6, 3.7, and 3.8 for shape of Transitional Surface. The Transitional Surface starts at the lateral edges of the primary surface and the approach-departure clearance surface. It continues outward and upward at the prescribed slope to 45.72m above the established airfield elevation. |
| 13 | Horizontal Surface Radius | E | 1,143m for 25:1 approach-departure surfaces | N/A | N/A | An imaginary surface located 45.72m above the established heliport elevation, formed by scribing an arc about the end of each runway or landing lane, and interconnecting these arcs with tangents. |
| 1,554.48m for 34:1 approach-departure surfaces | N/A | N/A |
| N/A | 1,402.08m | 1,402.08m | Circular in shape, located 45.72m above the established heliport or helipad elevation, defined by scribing an arc with a 1,402.08m radius about the center point of the helipad. |
| 14 | Elevation of Horizontal Surface | H | 45.72m | 45.72m | 45.72m |  |

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 manual are based on aircraft specific requirements and are not direct conversions from English dimensions.
3. Airfield and heliport imaginary surfaces and safe wintip clearance dimensions are shown as a direct conversion from English to SI units.

**Attachment 1 – Glossary of References and Supporting Information**

**DoD Publications**

DoD Manual 4270.1-M, Construction Criteria Manual

DoD Instruction 4165.57, Air Installation Compatible Use Zone Program

DoD Instruction 6050.1, Environmental Effects in the United States of DoD Actions

DoD Instruction 6050.7, Environmental Effects Abroad of Major Department of Defense Actions

DoD Standard 6055.9, Ammunition and Explosives Safety Standards

**Air Force Publications**

AFI 11-218, Aircraft Operation and Movement on the Ground

AFI 11-230, Instrument Procedures

AFI 13-203, Air Traffic Control

AFI 31-101, Installation Security Program

AFI 31-209, The Air Force Resource Protection Program

AFI 32-1024, Standard Facility Requirements

AFI 32-1042, Standards for Marking Airfields

AFI 32-1043, Managing Aircraft Arresting Systems

AFI 32-1044, Visual Air Navigation Systems

AFI 32-7061, Environmental Impact Analysis Process

AFI 32-7062, Air Force Comprehensive Planning

AFI 32-7063, Air Installation Compatible Use Zone Program

AFMAN (I) 11-226, United States Standard for Terminal Instrument Procedures (TERPS)

AFMAN 32-1076, Visual Air Navigation Facilities

AFMAN 91-201, Explosives Safety Standards

AFM 88-9CH3, Electrical Design, Lightning and Static Electricity Protection

AFM 88-11, Sanitary and Industrial Wastewater Collection Gravity Sewers and Appurtenances

AFJPAM 32-8013V2, Planning and Design of Roads, Airfields and Heliports in the Theater of Operations

AFP 88-71, Design Guide for Army and Air Force Airfields, Pavements, Railroads, Storm Drainage, and Earthwork

AFH 32-1084, Facility Requirements Handbook

AFH 32-7084, AICUZ Program Manager’s Guide

ETL 94-01, Standard Airfield Pavement Marking Schemes

ETL 01-10, Design and Construction of High-Capacity Trim Pad Anchoring Systems

T.O. 00-25-172, Ground Servicing of Aircraft and Static Grounding/Bonding MIL-HDBK-1008C, Fire Protection for Facilities Engineering Design and Construction

**Army Publications**

AR 50-51, Nuclear Weapons Security (Confidential)

AR 95-2, Air Traffic Control, Air Space, Airfield Flight Facilities and Navigational Aids

AR 115-10, Meteorological Support for the US Army

AR 190-11, Physical Security of Arms, Ammunition, and Explosives

AR 200-2, Environmental Effects of Army Actions

AR 210-20, Master Planning for Army Installations

AR 310-49, The Army Authorization Documents Systems (TAADS)

AR 385-64, Ammunition and Explosives Safety Standards

AR 750-1, Army Material Maintenance Policies and Retail Maintenance Operations TM 1-1500-250-23, General Tie-Down and Mooring on all Series Army Models AH-64, UH-60, CH-47, UH-1, AH-1, OH-58 Helicopters

TM 5-811-3, Electrical Design, Lightning, and Static Electricity Protection

TM 5-811-5, Army Aviation Lighting

TM 5-820-2, Drainage and Erosion Control Subsurface Drainage Facilities for Airfield Pavements

TM 5-823-4, Marking of Army Airfield-Heliport Operational and Maintenance Facilities

TM 5-825-1, General Provisions for Airfield/Heliport Pavement Design

TM 5-825-2, Flexible Pavement Design for Airfields

TM 5-825-3, Rigid Pavements for Airfields

TM 95-226, United States Standard for Terminal Instrument Procedures (TERPS)

FM 11-486-23, Telecommunications Engineering Air Traffic Control Facilities and Systems

FM 101-20, US Army Aviation Planning Manual

FM 5-430-00-2, Planning and Design of Roads, Airfields, and Heliports in the Theater of Operations

DG-1110-3-204, Design Guide for Army and Air Force Airfields, Pavements, Railroads, Storm Drainage, and Earthwork

DA PAM 190-51, Risk Analysis for Army Property

TB 95-1, US Army Air Traffic Control and NavAid Facility Standards

ETL 1110-3-394, Aircraft Characteristics

**Unified Facilities Criteria Documents**

UFC 3-260-02, Pavement Design for Airfields

UFC 3-260-02, Pavement Evaluation

UFC 3-240-01, Drainage

UFC 3-250-01, Pavement Design for Roads, Streets, Walks, and Open Storage Areas

UFC 3-250-02, Rigid Pavements

UFC 3-250-03, Flexible Pavements

UFC 3-250-04, Circulation and Parking Design

UFC 3-250-05, Soil Stabilization

**Federal Aviation Administration Advisory Circulars**

AC 70/7460-1, Obstruction Marking and Lighting

AC 90-230, Wake Turbulence

AC 97-1, Runway Visual Range

AC 150/5060-5, Airport Capacity and Delay

AC 150/5220-9, Aircraft Arresting Systems for Joint Civil/Military Airports

AC 150/5220-13, Runway Surface Condition Sensor Specification Guide

AC 150/5220-16, Automated Weather Observing Systems (AWOS) for Non-Federal Applications

AC 150/5300-13, Airport Design

AC 150/5320-5, Airport Drainage

AC 150/5320-6, Airport Pavement Design and Evaluation

AC 150/5340-1, Marking of Paved Areas on Airports

AC 150/5340-4, Installation Details for Runway Centerline Touchdown Zone Lighting Systems

AC 150/5340-14, Economy Approach Lighting Aids

AC 150/5340-17, Standby Power for Non-FAA Airport Lighting Systems

AC 150/5340-18, Standards for Airport Sign Systems

AC 150/5340-19, Taxiway Centerline Lighting Systems

AC 150/5340-21, Airport Miscellaneous Lighting Visual Aids

AC 150/5340-23, Supplemental Wind Cones

AC 150/5340-24, Runway and Taxiway Edge Lighting Systems

AC 150/5345-12, Specification for Airport and Heliport Beacon

AC 150/5345-27, Specification for Wind Cone Assemblies

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

AC 150/5345-43, Specification for Obstruction Lighting Equipment

AC 150/5345-44, Specification for Taxiway and Runway Signs

AC 150/5345-46, Specification for Runway and Taxiway Light Fixtures

AC 150/5390-2, Heliport Design

**Federal Aviation Regulations**

FAR Part 77, Objects Affecting Navigable Air Space

**Federal Aviation Orders**

6310.13, Airport Surveillance Radar (ASR) Site Construction

6480.4, Airport Traffic Control Tower Siting Criteria

6560.20, Siting Criteria for Automated Weather Observing System (AWOS)

6750.16, Siting Criteria for Instrument Landing Systems

6820.10, VOR, VOR/DME and VORTAC Siting Criteria

6850.11, Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR)

6850.2, Visual Guidance Lighting Systems

6850.8A, Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR)

6850.21, Omni-directional Approach lighting System (ODALS)

6850.24, Runway End Identifier Lighting System

6850.28, Precision Approach Path Indicator Project Implementation Plan

7031.2, Airway Planning Standard Number One Terminal Air Navigation Facilities and ATC Services 8260.38, Civil Utilization of Global Positioning System (GPS)

**National Fire Protection Association**

NFPA Standard 415, Aircraft Fueling Ramp Drainage

NFPA Standard 780, Standards for the Installation of Lightning Protection Systems

**Illuminating Engineering Society of North America**

IES-RP-14-1987, IES Recommended Practice for Airport Service Area Lighting

**Institute of Electrical and Electronic Engineers (IEEE) Standards**

IEEE Standard 142, Recommended Practice for Grounding of Industrial and Commercial Power Systems

**Abbreviations and Acronyms**

**AC**—advisory circular

**a.c.—**alternating current

**AFCEE—**Air Force Center for Environmental excellence

**AFCESA—**Air Force Civil Engineer Support Agency

**AFFSA—**Air Force Flight Standards Agency

**AFH—**Air Force Handbook

**AFI—**Air Force Instruction

**AFJMAN—**Air Force Joint Manual

**AFJPAM—**Air Force Joint Pamphlet

**AFM—**Air Force Manual

**AFMAN—**Air Force Manual

**AFPD—**Air Force Policy Directive

**AFR—**Air Force Regulation

**AICUZ—**Air Installation Compatibility Use Zone

**ALSF1—**High Intensity ALS with Sequenced Flashing Lights

**ALSF2—**High Intensity ALS with Sequenced Flashing Lights

**ALS—**Approach Lighting System

**AMSL—**above mean sea level

**ANG—**Air National Guard

**APOE—**Aerial Ports of Embarkation

**APOD—**Aerial Ports of Debarkation

**APZ I—**Accident Potential Zone I

**APZ II—**Accident Potential Zone II

**AR—**Army Regulation

**ASOS—**Automatic Surface Observation Station

**ASR—**Airport Surveillance Radar

**ASV—**Annual Service Volume

**ATC—**Air Traffic Control

**ATCALS—**Air Traffic Control and Landing Systems

**ATCT—**Air Traffic Control Tower

**AVGAS—**aviation gasoline

**AVIM—**Aviation Intermediate Maintenance

**AVUM—**Aviation Unit Maintenance

**AWOS—**Automated Weather Observation Station

**BAK—**Barrier, Arresting Kit A1-6

**CAT I ILS—**Category I Instrument Landing System

**CAT II ILS—**Category II Instrument Landing System

**CCP—**Compass Calibration Pad

**CoE—**Corps of Engineers

**COE TSMCX—**Corps of Engineers Transportation Systems Mandatory Center of Expertise

**CX—**categorical exclusion

**DA—**Department of the Army

**DA PAM—**Department of the Army Pamphlet

**d.c.—**direct current

**DH—**decision height

**DIA—**diameter

**DM—**Design Manual

**DME—**Distance Measuring Equipment

**DoD—**Department of Defense

**EA—**Environmental Assessment

**EED—**Electro-explosive Device

**EIS—**Environmental Impact Statement

**EMI—**electromagnetic interference

**ES—**explosive sites

**ETL—**Engineering Technical Letter

**FAA—**Federal Aviation Administration

**FM—**Field Manual (US Army)

**FONSI—**Finding of No Significant Impact

**FOD—**foreign object damage

**FSSZ—**Fuel Servicing Safety Zone

**GCA—**Ground Control Approach

**GPI—**Ground Point of Intercept

**GPS—**Global Positioning System

**HIRL—**High Intensity Runway Edge Lights

**HNM—**Helicopter Noise Model

**ICAO—**International Civil Aviation Organization

**ICUZ—**Installation Compatible Use Zone

**IEEE—**Institute of Electrical and Electronic Engineers **IES—**Illuminating Engineering Society of North America

**IFR—**Instrument Flight Rules

**ILS—**Instrument Landing System

**IM—**Inner Marker

**IMC—**Instrument Meteorological Conditions

**LANTDIV—**Atlantic Division of the Naval Facilities Engineering Command

**LDIN—**Leadin Lighting System

**MACOM—**Major Command (US Army)

**MAJCOM—**Major Command (USAF)

**MALS—**Medium Intensity Approach Lighting System

**MALSF—**Medium Approach Light System with Sequenced Flashers

**MALSR—**Medium Approach Light System with Runway Alignment Indicator Lights

**MATCT—**Mobile Air Traffic Control Tower

**max—**maximum

**MDA—**Minimum Descent Altitude

**METNAV—**Meteorological NAVAIDS Detachment

**MILHDBK—**Military Handbook

**min—**minimum

**MIRL—**Medium Intensity Runway Edge Lights

**MLS—**Microwave Landing System

**MM—**Middle Marker

**MMLS—**Mobile Microwave Landing System

**MSL—**mean sea level

**MTI—**Moving Target Indicator

**NA—**not applicable

**NAD83—**North American Datum of 1983

**NATO—**North Atlantic Treaty Organization

**NAVAID or NavAIDS—**Navigational Aids

**NAVAIR—**Naval Air Systems Command

**NAVFAC—**Naval Facilities Engineering Command

**NAVFACINST—**Naval Facilities Engineering Command Instruction

**NAVFAC P—**Naval Facilities Engineering Command Publication

**NAVFACENGCOM—**Naval Facilities Engineering Command

**NAVFIG—**Naval Flight Information Group

**NAVSEA OP—**Naval Sea Operations Command Operating Instruction

**NDB—**non directional beacon

**NEPA—**National Environmental Policy Act

**NFPA—**National Fire Protection Association

**NM—**nautical mile (1,852 m) (6,076 feet)

**NTS—**not to scale

**ODALS—**Omni-directional Approach Lighting System

**OLS—**Optical Landing System

**OM—**outer marker

**OPNAVINST—**Operations Naval Instruction

**PAPI—**Precision Approach Path Indicator

**PAR—**Precision Approach Radar

**PES—**Potential Explosive Site

**PI—**Point of Intersection

**Q-D—**Quantity-Distance

**RAIL—**Runway Alignment Indicator Lights

**RAPCON—**Radar Approach Control

**REIL—**Runway End Identifier Lights

**RF—**Radio Frequency

**ROD—**Record of Decision

**RSU—**Runway Supervisory Unit

**RSZ—**Refueling Safety Zone

**RVR—**Runway Visual Range

**RWOS—**Representative Weather Observation Station

**SALS—**Short Approach Lighting System

**SFA—**Support Facility Annexes

**SM—**statute mile (1,609 m) (5,280 feet)

**SOI—**Statement of Intent

**SPR—**Single Point Receptacle

**SSALR—**Simplified Short Approach Light System with Runway Alignment Indicator Lights

**STANAG—**Standardization Agreement

**TACAN—**Tactical Air Navigation

**TCH—**Threshold Crossing Height

**TERPS—**Terminal Instrument Procedures

**TM—**Technical Manual

**TOE—**Tables of Organization and Equipment

**TVOR—**Terminal Very High Frequency Omni-directional Range

**USAASA—**US Army Aeronautical Services Agency

**USAATCA—**US Army Air Traffic Control Activity

**USAF—**United States Air Force USASC**—**US Army Safety Center

**VASI—**Visual Approach Slope Indicator

**VIP—**Very Important Person

**VFR—**Visual Flight Rules

**VMC—**Visual Meteorological Conditions

**VOR—**Very High Frequency Omni-directional Range (Radio)

**VORTAC—**Very High Frequency Omni-directional Range (Radio) and Tactical Air Navigation

**VSTOL—**Vertical Short Takeoff and Landing

**VTOL—**Vertical Takeoff and Landing

**WGS84—**World Geodetic System 1984

**Terms**

**Aborted Takeoff—**An unsuccessful takeoff operation due to power or other mechanical failures.

**Accident Potential Zone I (APZ I)**—The area beyond the clear zone that possesses a significant potential for accidents.

**Accident Potential Zone II (APZ II)**—The area beyond APZ I that has a measurable potential for accidents.

**AICUZ (Air Installation Compatible Use Zone)**—A DoD program designed to promote compatible development around military airfields and to protect the integrity of the installation’s flying mission.

**Air Traffic**—Aircraft in operation anywhere in the airspace and within that area of an airfield or airport normally used for the movement of aircraft.

**Aircraft**—Fixed-wing (F/W) (Airplane) and rotary-wing (R/W) (helicopter).

**Aircraft, Class A**—Aircraft listed under Class A Runways in Table 3.1 of this manual.

**Aircraft, Class B**—Aircraft listed under Class B Runways in Table 3.1 of this manual.

**Aircraft Arresting Barrier—**A device, not dependent on an aircraft hook, used to engage and absorb the forward momentum of an emergency landing or an aborted takeoff.

**Aircraft Arresting Cable—**That part of an aircraft arresting system which spans the runway surface or flight deck landing area and is engaged by the aircraft arresting gear.

**Aircraft Arresting Complex—**An airfield layout comprised of one or more arresting systems.

**Aircraft Arresting Gear**—A device used to engage hook-equipped aircraft to absorb the forward momentum of a routine or emergency landing or aborted takeoff.

**Aircraft Arresting System**—A series of components used to engage and absorb the forward momentum of a routine or emergency landing or an aborted takeoff.

**Aircraft Movement Area**—For the purpose of this manual, the Aircraft Movement Area is defined as that area of the airfield encompassed by the Primary Surface and the Clear Zones, as well as all apron areas and taxiways, regardless of their location. See paragraph 3.15.1 for the specific use of this term.

**Aircraft Wash Area**—A specially designed paved area for washing and cleaning aircraft.

**Aircraft Wash Rack—**Paved areas provided at all facilities to clean aircraft in conjunction with periodic maintenance.

**Aircraft Rinse Facility—**Paved areas provided at facilities to clean aircraft returning from flight and en route to the parking area.

**Airfield**—An area prepared for the accommodation (including any buildings, installations, and equipment), of landing and takeoff of aircraft.

**Airfield Elevation**—The established elevation, in terms of the nearest 300 mm (one foot) above mean sea level, of the highest point of the usable landing area.

**Airfield Reference Point**—The designated geographical location of an airfield. It is given in terms of the nearest hundredth of a second of latitude and longitude. The position of the reference point must be as near to the geometric center of the landing area as possible, taking future development of the airfield into account.

**Airport**—Refers to a civil or municipal airfield.

**Airside Facilities**—Facilities associated with the movement and parking of aircraft. These include runways, taxiways, apron areas, associated navigational aids and imaginary surfaces.

**Airspace**—The space above ground or water areas which is or is not controlled, assigned, and/or designated.

**Alert Aircraft Parking—**An exclusive paved area for armed aircraft to park and have immediate, unimpeded access to a runway.

**Alert Pad—**Small paved areas provided for single alert aircraft parking.

**Approach Control**—A service established to control flights, operating under instrument flight rules (IFR), arriving at, departing from, and operating in the vicinity of airports by direct communication between approach control personnel and aircraft operating under their control.

**Approach-Departure Clearance Surface**—An inclined plane or combined inclined and horizontal planes arranged symmetrically about the runway centerline extended. The first segment or the beginning of the inclined plane is coincident with the ends and edges of the primary surface, and the elevation of the centerline at the runway end. This surface flares outward and upward from these points.

**Apron—**A defined area, on an airfield, intended to accommodate aircraft for the purposes of loading or unloading passengers or cargo, refueling, parking or maintenance.

**Apron, Aircraft Access**—See Apron, Hangar Access.

**Apron, Alert—**A designated area for multiple alert aircraft parking.

**Apron Edge—**See Edge of Apron.

**Apron, Hangar Access—**Hangar access aprons are paved areas connecting hangars with adjacent aircraft aprons.

**Apron, Holding (Engine Run up Area)—**A paved area adjacent to the taxiway near the runway ends where final preflight warmup and engine and instrument checks are performed.

**Apron, Parking—**A parking apron is a designated paved area on an airfield intended to accommodate fixed-and rotary-wing aircraft for parking.

**Arming and Disarming—**The loading and unloading of missiles, rockets, and ammunition in aircraft.

**Arrestment Capable Aircraft—**An aircraft whose flight manual specifies arrestment procedures.

**Autorotation Lane—**A helicopter landing lane or designated area on a runway used for practicing landings under simulated engine failure or certain other emergency conditions. Also known as a slide area when designed specifically for USAF skid-type helicopters.

**Aviation Facility—**The combination of land, airspace, pavements and buildings which are needed to support an aviation movement or action. An aviation facility can be an airfield, heliport, or helipad. The aviation facility includes “airside” and “landside” facilities.

**Aviation Intermediate Maintenance (AVIM)—**For Army, units that provide mobile, responsive "one-stop" maintenance and repair of equipment to return to user.

**Aviation Movement or Action—**An aviation movement or action includes but is not limited to: the landing and take-off of aircraft; readiness of aircraft; flight training of pilots; loading and unloading of aircraft; and the maintenance and fueling of aircraft.

**Aviation Unit Maintenance (AVUM)—**For Army, activities staffed and equipped to perform high frequency "on aircraft" maintenance tasks required to retain or return aircraft to a serviceable condition.

**Avigation Easement—**A legal right obtained from a property owner to operate aircraft over that property and to restrict the height of any construction or growth on that property.

**Beam Wind Component—**The wind velocities perpendicular to the axis of the runway centerline used to measure the degree by which a runway pattern covers incident wind.

**Blast Protective Area—**An area protected by pavement construction at the ends of runways and taxiways against jet blast erosion.

**Circling Approach Area—**The area in which aircraft circle to land under visual conditions.

**Clear Zone—**A surface on the ground or water beginning at the runway end and symmetrical about the runway centerline extended.

**Compass Calibration Pad—**An aircraft compass calibration pad is a paved area in an electromagnetically quiet zone where an aircraft's compass is calibrated.

**Compass Rose—**A graduated circle, usually marked in degrees, indicating directions and printed or inscribed on an appropriate medium.

**Conical Surface—**An imaginary surface that extends from the periphery of the inner horizontal surface outward and upward at a slope of 20 horizontal to one for a horizontal distance of 2,133.6 m (7,000 ft) to a height, 152.4 m (500 ft) above the established airfield elevation. The conical surface connects the inner horizontal surface with the outer horizontal surface. It applies to fixed-wing installations only.

**Controlling Obstacle—**The highest obstacle relative to a prescribed plane within a specified area. In precision and non-precision approach procedures where obstacles penetrate the approach surface, the controlling obstacle is the one which results in the requirement for the highest Decision Height (DH) or Minimum Descent Altitude (MDA).

**Crosswind Runway—**A secondary runway that is required when the primary runway orientation does not meet crosswind criteria (see Appendix D).

**Decision Height—**A height above the highest elevation in the touchdown zone, specified for a precision approach, at which a missed approach procedure must be initiated if the required visual reference has not been established.

**Displaced Threshold—**A runway threshold that is not at the beginning of the full-strength runway pavement.

**Edge of Apron—**The boundary of an apron, marked by painted stripe in accordance with pavement marking manual.

**Fixed-Wing Aircraft—**A powered aircraft that has wings attached to the fuselage so that they are either rigidly fixed or swing-wing, as distinguished from aircraft with rotating wings, like a helicopter.

**Flight Path—**The line connecting the successive positions occupied, or to be occupied, by an aircraft, missile, or space vehicle as it moves through air or space.

**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 fuel servicing safety zone is established and maintained during pressurization and movement of fuel.

**Full Stop Landing—**The touchdown, rollout, and complete stopping of an aircraft to zero speed on runway pavement.

**Grade—Also Gradient**—A slope expressed in percent. For example, a 0.5 percent grade means a 0.5 meter [foot] slope in 100 meters [feet].

**Ground Point of Intercept (GPI)—**A point in the vertical plane of the runway centerline or center of a helipad at which it is assumed that the straight line extension of the glide slope (flight path) intercepts the approach surface base line (TM 95-226).

**Hardstand—**See Apron.

**Helicopter—**An aircraft deriving primarily elements of aerodynamic lift, thrust and control from one or more power driven rotors rotating on a substantially vertical axis.

**Helicopter(Light)—** helicopters with a gross weight of 2,722 kg [6,000 pounds] or less.

**Helicopter(Medium)—** Helicopters with a gross weight of 2723 – 5,443 kg [6,001 – 12,000 pounds].

**Helicopter(Heavy)—** Helicopters with a gross weight over 5,443 kg [1,2000 pounds].

**Helicopter Parking Space, Type 1 (Army Only)—**In this configuration, rotary-wing aircraft are parked in a single lane, which is perpendicular to the taxilane.

**Helicopter Parking Space, Type 2 (Army Only)—**In this configuration, rotary-wing aircraft are parked in a double lane, which is parallel to the taxilane.

**Helicopter Runway—**A prepared surface used for the landing and takeoff of helicopters requiring a ground run.

**Helipad—**A prepared area designated and used for takeoff and landing of helicopters (includes touchdown and hoverpoint.).

**Helipad, IFR—**A helipad designed for Instrument Flight Rules. IFR design standards are used when an instrument approach capability is essential to the mission and no other instrument landing facilities, either fixed-wing or rotary-wing, are located within an acceptable commuting distance to the site.

**Helipad, Limited Use—**A VFR rotary wing facility for use by AH, OH, and UH helicopters. These type helipads support only occasional operations at special locations such as hospitals, headquarters facilities, missile sites, and other similar locations. They may also be located on airfields where one or more helipads are required to separate operations of helicopters such as OH, UH, and AH) from fixed-wing or other helicopter operations.

**Heliport—**A facility designed for the exclusive operating, basing, servicing and maintaining of rotary-wing aircraft (helicopters). The facility may contain a rotary-wing runway and/or helipads.

**Heliport or Helipad Elevation—**The established elevation, in terms of the nearest 300 mm (one foot) above mean sea level, based on the highest point of the usable landing area.

**High-Speed Taxiway Turnoff—**A taxiway leading from a runway at an angle which allows landing aircraft to leave a runway at a high speed.

**Holding Position—**A specified location on the airfield, close to the active runway and identified by visual means, at which the position of a taxiing aircraft is maintained in accordance with air traffic control instructions.

**Horizontal Surfaces, Fixed-Wing:**

**Inner Horizontal Surface**—An imaginary plane 45.72 m (150 ft) above the established airfield elevation. The inner boundary intersects with the approach-departure clearance surface and the transitional surface. The outer boundary is formed by scribing arcs with a radius 2,286.0 m (7,500 ft) from the centerline of each runway end, and interconnecting those arcs with tangents.

**Outer Horizontal Surface—**An imaginary plane 152.4 m (500 ft) above the established airfield elevation extending outward from the outer periphery of the conical surface for a horizontal distance of 9,144.0 m (30,000 ft).

**Horizontal Surface, Rotary-Wing—**An imaginary plane at 45.72 m (150 ft) above the established heliport or helipad elevation. The inner boundary intersects with the approach-departure clearance surface and the transitional surface. The outer boundary is formed by scribing an arc at the end of each runway, and connecting the arcs with tangents, or by scribing the arc about the center of the helipad. See Chapter 4 for dimensions.

**Hover—**A term applied to helicopter flight when the aircraft: (1) maintains a constant position over a selected point (1 m to 3 m [3 ft to 10 ft] above ground), and (2) is taxiing (airborne) (1 m to 3 m [3 ft to 10 ft] above ground) from one point to another.

**Hoverlane—**A designated aerial traffic lane for the directed movement of helicopters between a helipad or hoverpoint and the servicing and parking areas of the heliport or airfield.

**Hoverpoint—**A prepared and marked surface at a heliport or airfield used as a reference or central point for arriving or departing helicopters.

**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-departure clearance surface, the transitional surface, the inner horizontal surface, the conical surface (fixed-wing only), and the outer horizontal surface (fixed-wing only).

**Ingress/Egress, Same Direction—**One approach-departure route to and from the helipad exists. The direction from which the rotary-wing aircraft approaches the helipad (ingress) is the only direction which the rotary-wing aircraft departs (egress) from the helipad. Typically, the helipad is surrounded by obstacles on three sides which make approaches from other directions impossible. For example, if the rotary-wing aircraft approaches from the southwest, it must also depart to the southwest.

**Ingress/Egress, Two Direction—**Rotary-wing aircraft can approach and depart the helipad from two directions (one direction and the opposite direction). See also Ingress/Egress, Same Direction.

**Instrument Runway—**A runway equipped with electronic navigation aids for which a precision or non-precision approach procedure is approved.

**Instrument Flight Rules (IFR)—**Rules that govern the procedure for conducting instrument flight. Also see Instrument Meteorological Conditions.

**Instrument Landing System—**A system of ground equipment designed to provide an approach path for exact alignment and descent of an aircraft on final approach to a runway. The ground equipment consists of two highly directional transmitting systems and, along the approach, three (or fewer) marker beacons. The directional transmitters are known as the localizer and glide slope transmitters.

**Instrument Meteorological Conditions—**Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling; less than minimums specified for visual meteorological conditions.

**Intermediate Area—**The area between runways and between runways and taxiways that is graded or cleared for operational safety.

**Joint/Shared Use Airfield—**Those airports that are shared by a civilian DoD agency covered under the “Airports and Airway Improvement ACT of 1982 (Public LAW 97-248, Sep 3, 1982, 49 USC, APP 2201). Only those facilities (i.e., runways/taxiways) that are used by both civilian and DoD agencies are considered “Shared/Joint Use.” All other facilities (parking ramps, hangars, terminals, and so forth) are the sole property of the using agency. A US Air Force installation where agreements exist among the Air Force, civil, and host nation authorities for joint use of all or a portion of airfield facilities.

**Landing Area—**See Take-Off and Landing Area.

**Landing Field—**Any area of land consisting of one or more landing strips, including the intermediate area, that is designed for the safe takeoff and landing of aircraft.

**Landing Lane—**A defined lane on the airfield used for simultaneous takeoff and landings of multiple (up to four at one time) helicopters. Landing lanes are used at airfields or heliports when a high density of helicopters are parked on an apron, or in the process of takeoff and landings.

**Landing Rollout—**Distances covered in stopping the aircraft, when loaded to maximum landing weight, following touchdown using standard operation and braking procedures on a hard, dry-surfaced, level runway with no wind.

**Landing Strip—**That portion of an airfield that includes the landing area, the end zones, and the shoulder areas. Also known as a flight strip.

**Landside Facilities—**Landside facilities are facilities not associated with the movement and parking of aircraft but are required for the facilities' mission. These include aircraft maintenance areas, aviation support areas, fuel storage and dispensing, explosives and munitions areas and vehicular needs.

**Large Transport Aircraft—**A transport aircraft with a wing span of 33.5 m [110 ft] or greater.

**Light Bar—**A set of lights arranged in a row perpendicular to the light system centerline.

**Line Vehicle—**Any vehicle used on the landing strip, such as a crash fire truck or tow tractor.

**Localizer—**A directional radio beacon which provides to an aircraft an indication of its lateral position relative to a predetermined final approach course.

**Localizer Type Directional Aid (LDA)—**A NAVAID used for non-precision instrument approaches with utility and accuracy comparable to a localizer but which is not part of a complete ILS. The LDA is not aligned with the runway. The alignment is greater than 3 degrees (3°) and less than 30 degrees (30°) from the runway centerline.

**Magnetic North—**The direction indicated by the north-seeking pole of a freely suspended magnetic needle, influenced only by the earth's magnetic field.

**Magnetic Variation—**At a given place and time, the horizontal angle between the true north and magnetic north measured east or west according to whether magnetic north lies east or west of true north.

**Magnetically Quiet Zone—**A location where magnetic equipment, such as a compass, is only affected by the earth’s magnetic forces.

**Non-Precision Approach—**An approach flown by reference to electronic navigation aids in which glide slope information is not available.

**Non-Instrument Runway—**A runway intended for operating aircraft under visual flight rules.

**Obstacle—**An existing object, natural growth, or terrain, at a fixed geographical location, or which may be expected at a fixed location within a prescribed area, with reference to which vertical clearance is or must be provided during flight operations.

**Obstacle Clearance—**The vertical distance between the lowest authorized flight altitude and a prescribed surface within a specified area.

**Obstruction—**A natural or man-made object that violates airfield or heliport clearances, or projects into imaginary airspace surfaces. Navy and Marine Corps see NAVFAC P-80.3.

**Overrun Area—**An area the width of the runway plus paved shoulders extending from the end of the runway to the outer limit of the end zone. This portion is a prolongation of the runway which is the stabilized area.

**Parking, Aircraft Undergoing Maintenance—**Apron parking space is provided for parking aircraft which must undergo maintenance.

**Parking, Alert Aircraft—**Parking for aircraft that must be in flight upon short notice.

**Parking, Operational Aircraft**—Parking for operational aircraft assigned to a particular installation.

**Parking, Transient Aircraft—**Parking for transient aircraft (non-operational) at the installation, but not assigned there.

**Parking, Transport Aircraft—**Parking for transport aircraft carrying cargo and personnel which must be loaded and unloaded.

**Pavement (Paved Surface)—**A durable weather and abrasion resistant surface made from a prepared or manufactured material placed on an established base. General categories of pavements are flexible and rigid.

**Power Check—**The full power test of an aircraft engine while the aircraft is held stationary.

**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.

**Precision Approach—**An approach in which azimuth and glide slope information are provided to the pilot.

**Primary Surface (Fixed-Wing Runways)—**An imaginary surface symmetrically centered on the runway, extending 60.96 m (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.

**Runway—**A defined rectangular area of an airfield or heliport prepared for the landing and takeoff run of aircraft along its length.

**Runway (Class A)—**Class A runways are primarily intended for small light aircraft. Ordinarily, these runways have less than 10 percent of their operations involving aircraft in the Class B category. These runways are normally less than 2,440 m (8,000 ft).

**Runway (Class B)—**Class B runways are all fixed-wing runways that accommodate normal operations of Class B Aircraft.

**Runway End**—As used in this manual, the runway end is where the normal threshold is located. When the runway has a displaced threshold, the using service will evaluate each individual situation and, based on this evaluation, will determine the point of beginning for runway and airspace imaginary surfaces.

**Runway Exit**—A taxiway pavement provided for turnoffs from the runway to a taxiway either at normal or high speed.

**Runway, Parallel—**Two or more runways at the same airport whose centerlines are parallel. In addition to runway number, parallel runways are designated as L (left) and R (right) or, if three parallel runways exist, L (left), C (center), and R (right).

**Runway, Rotary-wing—** A runway for rolling landings and take-off of rotary-wing aircraft. The rotary-wing runway allows for a helicopter to quickly land and roll to a stop compared to the hovering stop used during a vertical helipad approach.

**Runway Threshold—**A line perpendicular to the runway centerline designating the beginning of that portion of a runway usable for landing.

**Runway Visual Range—**The maximum distance in the direction of take-off or landing from which the runway, or the specified lights or markers delineating it, can be seen from a position above a specified point on its centerline at a height corresponding to the average eye-level of pilots at touchdown.

**Service Point—**A receptacle, embedded in certain airfield pavements, containing outlets for utilities required to service aircraft.

**Shoulder—**A prepared (paved or unpaved) area adjacent to the edge of an operational pavement.

**Slide Area, Helicopter**—A specially prepared but usually unpaved area used for practicing helicopter landings under simulated engine failure or certain other emergency conditions. VFR Helicopter runway criteria apply to these type facilities (also known as Skid Pads).

**Slope Ratio—**A slope expressed in meters as a ratio of the horizontal to the vertical distance. For example, 50:1 means 50 meters horizontal to 1 meter vertical.

**Standard VFR Helipad—**A helipad designed to Visual Flight Rules (VFR). VFR design standards are used when no requirement exists or will exist in the future for an IFR helipad.

**Standby Parking Pad—**At individual helipad sites where it is necessary to have one or more helicopters on standby, an area adjacent to the helipad, but clear of the landing approach and transitional surfaces.

**Suppressed Power Check Pad—**A suppressed power check pad is an enclosed power check pad, referred to as a "hush house," where full power checks of jet engines are performed.

**Takeoff and Landing Area—**A specially prepared or selected surface of land, water, or deck designated or used for takeoff and landing of aircraft.

**Takeoff Safety Zone—**A clear graded area within the approach-departure zone of all VFR rotary-wing facilities. The land use of this area is comparable to the clear zone area applied to fixed-wing facilities.

**Taxilane—**A designated path marked through parking, maintenance or hangar aprons, or on the perimeter of such aprons to permit the safe ground movement of aircraft operating under their own power.

**Taxilane, Interior (secondary taxi routes)—**A taxilane which provides a secondary taxi route to individual parking positions or a hangar and is not intended or used as a primary taxi route for through traffic.

**Taxilane, Peripheral—** A taxilane located along the periphery of an apron that may be considered a primary or a secondary taxi route. Provide wing tip clearance commensurate with the intended use. See Taxilane, Interior, Taxilane, Through, and Table 6.1, Items 5 and 6.

**Taxilane, Through (primary taxi routes)—**A taxilane providing a route through or across an apron which is intended as a primary taxi route for access to other taxilanes, aprons, taxiways or the runway.

**Taxiway—**A specially prepared or designated path, on an airfield or heliport other than apron areas, on which aircraft move under their own power to and from landing, service and parking areas.

**Taxiway, Apron Entrance—**A taxiway which connects a parallel taxiway and an apron.

**Taxiway, End Turnoff (Entrance Taxiway) (Connecting Taxiway) (Crossover Taxiway)—**A taxiway located at the end of the runway that serves as both an access and departure location for aircraft at the runway thresholds.

**Taxiway, High-Speed Turnoff (High-Speed Exit) (Acute-angled Exit Taxiway)—**A taxiway located intermediate of the ends of the runway and "acute" to the runway centerline to enhance airport capacity by allowing aircraft to exit the runways at a faster speed than normal turnoff taxiways allow. Aircraft turning off runways at high speeds (maximum 100 kph [55 knots]) require sufficient length for a high-speed turnoff taxiway to decelerate to a full stop before reaching the parallel taxiway.

**Taxiway, Normal Turnoff (Ladder Taxiway) (Intermediate Taxiway) (Exit Taxiway)—**A taxiway located intermediate of the end of the runway, typically perpendicular to the runway centerline that allows landing aircraft to exit and clear runways as soon as possible.

**Taxiway, Parallel—**A taxiway which parallels the runway. The curved connections to the end of the runway permit aircraft ground movement to and from the runway and are considered part of the parallel taxiway when there are no other taxiway exits on the runway.

**Taxiway Turnoff—**A taxiway leading from a runway to allow landing aircraft to exit and clear the runway after completing their initial landing roll.

**Threshold Crossing Height—**The height of the straight line extension of the guide slope above the runway at the threshold.

**Tiedown Anchor—**A device, installed in certain airfield pavements, to which lines tying down an aircraft are secured. Grounding may be provided. This is not to be confused with the aircraft trim pad and thrust anchor shown in Attachment 16.

**Touchdown Point—**A designated location on a landing lane, taxiway, or runway for permitting more rapid launch or recovery of helicopters in a high density area.

**Towway—**A paved surface over which an aircraft is towed.

**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.

**Transitional Surfaces (Rotary-Wing)**—The imaginary plane which connect the primary surface and the approach-departure clearance surface to the horizontal surface, or extends to a prescribed horizontal distance beyond the limits of the horizontal surface. Each surface extends outward and upward at a specified slope measured perpendicular to the runway centerline or helipad longitudinal centerline (or centerlines) extended.

**True North**—The direction from an observer’s position to the geographic North Pole. The north direction of any geographic meridian.

**Unsuppressed Power Check Pad**—A power check pad without an enclosure or other type of noise suppressor. It is generally used as a back up or interim facility to a suppressed power check pad. The unsuppressed power check pad, in its simplest form, is a paved area on which full power engine diagnostic testing can be performed without noise or jet blast limitations.

**Visual Flight Rules (VFR)**—Rules that govern the procedures for conducting flight under visual conditions. Also see Visual Meteorological Conditions.

**Visual Meteorological Conditions (VMC)**—Weather conditions in which visual flight rules apply; expressed in terms of visibility, ceiling height, and aircraft clearance from clouds along the path of flight. When these criteria do not exist, instrument meteorological conditions prevail and instrument flight rules must be complied with. Also see Visual Flight Rules.

**Vertical Sight Distance—**The longitudinal distance visible from one location to another. Usually, a height above the pavement surface is also defined.

**V-STOL**—A tilt-rotor Vertical Take-Off and Landing Aircraft, that has the ability to operate as either a fixed- or rotary-wing aircraft.

**Wind Rose**—A diagram showing the relative frequency and strength of the wind in correlation with a runway configuration and in reference to true north. It provides a graphic analysis to obtain the total wind coverage for any runway direction.

**Wind Direction**—The direction from which the wind is blowing in reference to true north.

**Attachment 3 ARMY LAND USE AND FACILITY SPACE -- ALLOWANCES**

|  |  |
| --- | --- |
| Category Code | Item and Allowance |
| 110 AIRFIELD PAVEMENTS | |
| 111 Airfield Pavements – Runways. Pavements that are designed and constructed for the safe takeoff and landing operations of rotary- and fixed-wing aircraft. | |
| 11110 | **Fixed-Wing Runway, Surfaced**. A flexible or rigid paved airfield surface used for normal takeoffs and landings of fixed-wing aircraft. It can also accommodate rotary-wing aircraft. From an operational point of view, the runway includes the prepared landing surface, shoulders, overruns, plus various cleared areas and airspace. For inventory purposes, only the prepared runway surface is included. One Fixed-wing runway is allowed at an aviation facility. For Class A, basic dimensions are 30 m [100 ft] wide, and length as shown in Table 3.3. For Class B, width and length requirements are shown in Table 3.2. |
| 11111 | **Fixed-Wing Runway, Un-surfaced.** An unpaved, prepared surface for training, emergency, and other special takeoff and landing operations of fixed-wing aircraft. It can also accommodate rotary-wing aircraft. From an operational point of view, the runway includes the landing surface, shoulders, overruns, plus various cleared areas and airspace. For inventory purposes, only the prepared runway surface is included. |
| 11120 | **Rotary-Wing Runway, Surfaced.** A paved airfield or heliport surface provided for the exclusive use of rotary-wing takeoffs and landings. Marked surfaces used as reference or control points for arriving and departing aircraft (hoverpoints) are part of the runway. From an operational point of view, the runway includes the prepared landing surface, shoulders, overruns plus various cleared areas and airspace. For inventory purposes, only the prepared runway surface is included. Basic dimensions are 23 m [75 ft] wide, 490 m [1,600 ft] long. A runway may be provided when helicopter companies are authorized at heliports at Army airfields when air traffic density or other operational problems prohibit mixing of medium rotary- and fixed-wing aircraft. |
| 11121 | **Rotary-Wing Runway, Un-surfaced**. An unpaved, prepared surface used exclusively for training, emergency, and other special takeoff and landing operations of rotary-wing aircraft. From an operational point of view, the runway includes the prepared landing surface, shoulders, overruns, plus various cleared areas and airspace. For inventory purposes, only the prepared runway surface is included. |
| 11130 | **Rotary-Wing Landing Pads, Surfaced**. A paved surface for takeoffs and landings of rotary-wing aircraft. It is physically smaller than a rotary-wing runway and is normally located at a site that is remote from an airfield or heliport. From an operational point of view, the helipad includes the prepared landing surface and shoulders, plus various cleared areas and airspace. For inventory purposes, only the prepared surface is included. Helipads designed and constructed for vertical takeoff and landing of helicopters will be authorized for isolated sites, for support of infrequent operation requirements, for sites which cannot physically support limitartions of land and or airspace or economically justify airfield/heliport development, or at airfield/heliports with high air traffic density which require one or more helipads for establishment of safe aircraft traffic control patterns. Where several helipads are required to serve adjacent high density parking areas, they may be connected by airfield pavement for more rapid landing and takeoff operations. Helipads so connected may be referred to as “helicopter landing strips”, or “lanes”, not to be confused with helicopter runways. Helipad criteria is applicable to these type facilities. One helipad is allowed at Hospitals. Basic dimensions are 30m by 30m. Stabilized shoulders will be provided around helipads and along any connecting pavements. |
| 11131 | Rotary-Wing Landing Pads, Un-surfaced. An unpaved prepared surface which is, centered within a clear area, and used exclusively for training, emergency, and other special landing and takeoff operations of rotary-wing aircraft. From an operational point of view, the helipad includes the prepared landing surface and shoulders, plus various cleared areas and airspace. For inventory purposes, only the prepared surface is included. |
| 11140 | **Hoverpoint.** One or more lighted hoverpoints may be authorized at an airfield or heliport where air traffic density requires the constant separation of fixed-wing and rotary-wing traffic or the establishment of separate helicopter traffic patterns or when instrument approach procedures are not possible to a terminal (final) landing area. The hoverpoint is normally a nontraffic area used for air traffic control reference. It consists of a paved 9 m [30 ft] diameter identifier marker centered in a 45.72 m by 45.72 m [150 ft by 150 ft] clear area. Standard helipad approach-departure and transitional surfaces will be provided. The number and location of hoverpoints authorized are dependent upon the helicopter traffic pattern requirements at each particular facility. |
| 112. **Airfield Pavements – Taxiways**. An all weather surface designed and constructed for the safe and efficient powered ground movement of aircraft between runway systems and other paved aircraft operational, maintenance, and parking facilities. | |
| 11212 | **Fixed wing Taxiways, Surfaced**. Paved surfaces which serve as designated pathways on an airfield and are constructed for taxiing fixed-wing aircraft. From an operational point of view, a taxiway includes the prepared surface, markings, stabilized shoulders, lighting and lateral clearance zones. For inventory purposes, only the prepared surface is included. For Class A runways, paved surfaces are 15m and for Class B runways, paved surfaces are 23m wide. At Short Field and Training Assault Landing Zones, 15m is the standard width. Lengths and locations will be as shown on the Department of the Army approved Master Plan of the airfield/heliport. |
| 11213 | **Fixed-Wing Taxiway, Un-surfaced**. Unpaved prepared surfaces which serve as designated pathways on an airfield and are constructed for taxiing fixed-wing aircraft. From an operational point of view, a taxiway includes the prepared surface, stabilized shoulders and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| 11221 | **Fixed-Wing Taxiway, Surfaced**. Paved surfaces which serve as designated pathways on an airfield or heliport and are constructed for taxiing rotary-wing aircraft. From an operational point of view, a taxiway includes the prepared surface, markings, stabilized shoulders, lighting and lateral clearance zones. For inventory purposes, only the prepared surface is included At helicopter only facilities, a basic width of 15 m [50 ft] is authorized. When dual-use taxiways support Fixed-Wing operations, use appropriate Fixed-Wing taxiway criteria. |
| 11222 | **Rotary-Wing Taxiway, Un-surfaced**. Unpaved prepared surfaces which serve as designated pathways on an airfield or heliport and are constructed for taxiing rotary-wing aircraft. From an operational point of view, a taxiway includes the prepared surface, stabilized shoulders, and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| 113 **Airfield Pavements – Aprons**. Prepared surfaces, other than runways and taxiways, where aircraft are parked or moved about the airfield area. They are designed to support specific types of aircraft and to meet operational requirements such as maintenance and loading/unloading activities. The permanent peace time operation and maintenance of Army aircraft requires construction of apron areas to assure safe, efficient and economical accomplishment of the mission. For Fixed-Wing; rigid pavement areas with standard aircraft tiedowns spaced 6 m [20 ft] on centers throughout the usable parking apron area are authorized for parking, maintenance, and hangar access apron areas. Parking aprons should be designed to permit 85% of the authorized aircraft to park under their own power [75% operational parking and 10% maintenance operational checks (MOC)). The remaining 15% are parked in maintenance facility buildings. When an area is inadequate to permit this capability, operational parking capacity may be reduced to not less than 50% of the 85% with the balance of the 85% being provided surfaced manual parking area. Standard aircraft tiedowns conforming to criteria in Appendix K of this Manual should be used. These tiedowns also serve as the static grounding points. For Rotary-Wing; see Chapter 6 for additional information. The number of Army rotary-wing aircraft used to estimate apron area is 85% of the authorized aircraft. This assumes that 75% of the aircraft will be operational and 10% will be parked for MOCs. The remaining 15% of the authorized aircraft can be assumed to be in maintenance facilities. Any substantial difference to exceed this allowance should be authenticated and submitted as a request to the MACOM to exceed this allowance. | |
| 11310 | **Fixed-Wing Parking Apron, Surfaced**. A paved airfield surface used for fixed-wing aircraft parking. The area includes parking lanes, taxilanes, exits, and entrances. Aircraft move under their own power to the parking spaces, where they may be parked and secured with tiedowns. Parking designed to distribute aircraft, for the purpose of increased survivability (dispersed hardstands), is included in this category code. From an operational point of view, an apron includes the prepared surface, tiedowns, markings, stabilized shoulders, lighting, and lateral clearance zones. For inventory purposes, only the prepared surface is included. Parking aprons for Army fixed-wing aircraft will normally be based on the C-12 A-C (Huron) with a wingspan of 17 m [55 ft] and length of 18.25 m [60 ft]. However, mission requirements may require different aircraft dimensions. The width of the parking lane should be equal to the aircraft length. The length of a row will be equal to the number of aircraft times the aircraft wingspan plus the distance between parked aircraft wingtips, as shown in Table 6.1 of this Manual. The taxilane clear-width for Interior, through and peripheral taxilanes is shown in Table 6.1 of this Manual. Paved shoulders will be provided. When a taxilane is to be jointly used by Army fixed-wing and other types of aircraft, such as helicopters or Air Force aircraft, then this common taxilane width will be increased an appropriate amount to accommodate the critical use aircraft. At facilities such as flight training centers, where one type of aircraft predominates, the dimensions of the specific type will be used in lieu of the C-12. |
| 11311 | **Fixed-Wing Parking Apron, Un-surfaced**. An unpaved, prepared airfield surface used for fixed-wing aircraft parking. The area includes parking lanes, taxilanes, exits, and entrances. Aircraft move under their own power to the parking spaces, where they may be parked and secured with tiedowns. Parking designed to distribute aircraft, for the purpose of increased survivability (dispersed hardstands), is included in this category code. From an operational point of view, an apron includes the prepared surface, tiedowns, stabilized shoulders, and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| 11320 | **Rotary-Wing Parking Apron, Surfaced**. A paved airfield surface used for rotary-wing aircraft parking. The area includes parking lanes, taxilanes, exits, and entrances. Aircraft move under their own power to the parking spaces where they may be parked and secured with tiedowns. Parking designed to distribute aircraft for the purpose of increased survivability (dispersed hardstands) is included in this category code. From an operational point of view, an apron includes the prepared surface, tiedowns, markings, stabilized shoulders, lighting, and lateral clearance zones. For inventory purposes, only the prepared surface is included. Parking aprons for Army rotary-wing aircraft will be based on the type of rotary-wing aircraft and parking arrangement, as discussed in Chapter 6 of this Manual. Rotary-wing taxilane widths will be as shown in Table 6.2 of this Manual. Paved shoulders will be provided. |
| 11321 | **Rotary-Wing Parking Apron, Unsurfaced.** An unpaved, prepared airfield surface used for rotary-wing aircraft parking. The area includes parking lanes, taxilanes, exits, and entrances. Aircraft move under their own power to the parking spaces, where they may be parked and secured with tiedowns. Parking designed to distribute aircraft, for the purpose of increased survivability (dispersed hardstands) is included in this category code. From an operational point of view, an apron includes the prepared surface, tiedowns, stabilized shoulders, and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| 11330 | **Aircraft Maintenance Parking Apron, Surfaced.** A paved apron for parking fixed- or rotary-wing aircraft awaiting maintenance. Mass aircraft parking aprons are authorized for Aviation Intermediate Maintenance (AVIM) maintenance shop units which have a responsibility for maintenance of aircraft from other facilities or aviation units. For planning purposes, an apron area of up to 11,700 m2 [14,000 yd2] is normally sufficient to meet this requirement. Aircraft will be manually parked on this apron. Separate maintenance parking aprons are not authorized for aviation units which have their own AVIM maintenance capability. |
| 11331 | **Aircraft Maintenance Parking Apron, Unsurfaced.** An unpaved, prepared apron for parking fixed- or rotary-wing aircraft awaiting maintenance. |
| 11340 | **Hangar Access Apron, Surfaced.** A paved surface that connects an aircraft parking apron with a hangar. It is generally equipped with tiedowns and grounding devices. From an operational point of view, an apron includes the prepared surface, tiedowns, grounding devices, stabilized shoulders, lighting from the hangar, and lateral clearance zones. For inventory purposes, only the prepared surface is included. Hangar access aprons will be provided as a supporting item for each authorized hangar and will be sized for the type of hangar and aircraft to be accommodated and to meet the requirements of site development as shown on a Department of the Army approved general site plan. The access apron will be designed as rigid pavement. Access aprons should be as wide as the hangar doors. Hangar access aprons are further discussed in Chapter 6 of this Manual. |
| 11341 | **Hangar Access Apron, Un-surfaced**. An unpaved, prepared surface that connects an aircraft parking apron with a hangar. It is generally equipped with tiedowns and grounding devices. From an operational point of view, an apron includes the prepared surfaced, tiedowns, grounding devices, stabilized shoulders, lighting from the hangar, and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| 11350 | **Aircraft Runway Holding Apron, Surfaced**. A paved surface which provides an aircraft holding area that is accessible from a taxiway. It is located near the intersection of taxiways and at the ends of runways. It is provided for pre-takeoff engine and instrument checks. From an operational point of view, an apron includes the prepared surface, stabilized shoulders, lighting, and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| 11351 | **Aircraft Runway Holding apron, Un-surfaced**. An unpaved, prepared surface which provides an aircraft holding area that is accessible from a taxiway. It is located near the intersection of taxiways and at the ends of runways. It is provided for pre-takeoff engine and instrument checks. From an operational point of view, an apron includes the prepared surface, stabilized shoulders, and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| 11370 | **Aircraft Washing Apron, Surfaced**. A rigid pavement area for washing and cleaning aircraft. It normally includes electrical and water service, drainage, and waste water collection equipment. From an operational point of view, an apron includes the prepared surface, stabilized shoulders, lighting and lateral clearance zones. For inventory purposes, only the prepared surface is included. A washing apron is authorized for each aircraft maintenance hangar. Washing aprons will be sized and dimensioned according to the number and type of aircraft to be washed, local environmental conditions (i.e. soil and climate), and scheduling. See paragraph 6.14.2. The wash apron will be provided with 220 volt electrical service, 25mm water service and compressed air. The wash apron will be provided with drainage facilities to include a facility for wash-waste treatment, including at least a 11,400L capacity holding tank. The tank should be sized to the extent required for effluent to be suitable for discharge into a sanitary system. A collection area for P.O.L. waste and spillage should be provided, when required, in conjunction with the wash apron. |
| 11371 | **Aircraft Washing Apron, Un-surfaced**. An unpaved, prepared surface for washing and cleaning aircraft. It normally includes electrical and water service, drainage, and waste water collection equipment. From an operational point of view, an apron includes the prepared surface, stabilized shoulders, lighting and lateral clearance zones. For inventory purposes, only the prepared surface is included. |
| 11380 | Aircraft Loading Apron, Surfaced. A paved surface for loading cargo aircraft; loading personnel for medical evacuation, and transient aircraft operations; or providing an apron area for arming and disarming aircraft weapons, loading and unloading ammunition, special handling or decontamination of chemical, biological, radiological (CBR) warfare items, and for special security operations. An apron area in support of the airfield operations building, not to exceed 5,850m2, may be authorized for purposes of handling special loading and unloading of personnel, for medical evaluation flights and for transient aircraft operations. See Category 11382 for aprons requiring safety clearances and security facilities. |
| **11382** | **Aircraft Special Purpose Apron.** Special purpose aprons may be authorized for providing safe areas for arming and/or disarming aircraft weapons; loading and unloading ammunition; special handling and/or decontamination facilities for CBR warfare items; and for special security areas. Special-purpose aprons required to conduct defueling operations will be provided at Army aviation facilities. Design will be predicated on the largest aircraft and adequate space for fire support equipment and defueling vehicle and apparatus. Grounding points will be provided. The scope of the apron area and the type of supporting facilities for these special-purpose aprons will be individually justified on the basis of the mission requirements. Safety clearances, appropriate to the requirements of the apron, will be observed. Airfield maps and plans will identify the purpose of the apron and show the required safety clearance distances. Explosives clearances are discussed in Appendix I of this Manual. |
| **11383** | **Aircraft Loading Aprons, Unsurfaced.** An unpaved, prepared surface for loading cargo aircraft; loading personnel for medical evacuation and transient aircraft operations. An aircraft loading apron provides and area for arming and disarming aircraft weapons, loading and unloading ammunition, special handling or decontamination of chemical, biological radiological (CBR) warfare items, and for special security operations. |