Civil Aviation Rules

# Notice of Proposed Rule Making
# NPRM 25/16/139-36
# 19 November 2025

## Part 139
## Aerodromes –
## Certification and Operation

## Consequential Amendments
## Nil

## Docket 25/16/CAR139-36
## 2025 Rules Review

Proposed Applicable Date 19 November 2025

## Background to the Civil Aviation Rules

The Papua New Guinea (PNG) Civil Aviation Rules (CARs) establish the *minimum* regulatory safety standards and boundary for participants to gain entry into, operate within, and exit the PNG civil aviation system. The PNG Rules are divided into Parts and each Part contains a series of individual rules which relate to a particular aviation activity.

Advisory Circulars accompany many rule Parts and contain information about standards, practices and procedures that the Director has been established to be an '*Acceptable Means of Compliance*' (AMC) for the associated rule. An Advisory Circular may also contain Guidance Material (GMs) and Explanatory Material (EMs) to facilitate compliance with the rule requirements.

The objective of the Civil Aviation Rules system is to obtain a balance of responsibility between, on the one hand, the State and regulatory authority, the Civil Aviation Safety Authority of PNG (CASA PNG) and, on the other hand, those who provide services and exercise privileges in the civil aviation system. This balance must enable the State and regulatory authority to set standards for, and monitor performance of aviation participants whilst providing the maximum flexibility for the participants to develop compliance within the safety boundary.

Section 45 of the *Civil Aviation Act 2000* prescribes general requirements for participants in the civil aviation system and requires, amongst other things, participants to carry out their activities safely and in accordance with the relevant prescribed safety standards and practices. Section 69 of the Act allows the Minister to make ordinary rules for any of the following purposes:

(a) The implementation of Papua New Guinea's obligations under the Convention

(b) To provide for a safe, sustainable, effective and efficient aviation services

(c) The provision of aviation meteorological services, search and rescue services and civil aviation security programmers and services

(d) Assisting aviation safety and security, including but not limited to personal security

(e) Assisting economic development

(f) Improving access and mobility

(g) Protecting and promoting public health

(h) Ensuring environmental sustainability

(i) Any matter related or reasonably incidental to any of the following:

  (1) The Minister's functions and role under section 8 of the Act;

  (2) The Authority's general objects and functions under section 11 of the Act;

  (3) The Authority's functions in relation to safety under section 12 of the Act; and

  (4) The Director's functions and powers under section of 17 the Act

  (5) The Director's powers under section 52A, 53 and 54 of the Act

(j) Any other matter contemplated by any provision of the Act.

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# 1. Purpose of this NPRM

The purpose of this Notice of Proposed Rulemaking is to submit for consideration the proposed amendments to Civil Aviation Rule Part 139.

# 2. Background to the Proposal

## 2.1 General Summary

The last amendment to CAR Part 139 was amendment 8.

The proposed amendments to Part 139 contain a comprehensive update that aligns Papua New Guinea's aerodrome certification and operation standards that aligns with ICAO Annex 14, Vol I, and Amendment 18. Aerodrome operators have new obligations to safeguard digital infrastructure supporting communications, navigation, surveillance, and essential operational systems. This includes mandatory assessment and management of cyber threats, integrating robust cybersecurity measures into safety and security management systems, and coordinating with national frameworks to ensure resilience and trust in aviation's digital systems.

Additional proposed amendments relating to Runway Distance Remaining Signs (RDRS) are now mandated, offering pilots precise indications of remaining runway length for take-off, landing, and rejected take-offs, helping prevent overruns. The amendments also revise precision approach lighting requirements for CAT II operations, providing improved visual cues in low-visibility conditions to maintain compatibility with international standards. Visibility and identification of runway thresholds are enhanced, while standardised visual aids will clearly indicate closed runways and taxiways, maintaining safety during maintenance or contingency events.

The amendments introduce improvements to signage, lighting, and markings throughout the manoeuvring area, directly increasing situational awareness for pilots and reducing navigational errors with the goal of minimising incidents involving aircraft, equipment, and personnel. Apron management will now require embedded safety protocols for aircraft turnaround, stand allocation, and ground service coordination, protecting both aircraft and ground personnel.

Additional amendments include risk- and performance-based approach to obstacle management is implemented with requirements for Obstacle Free Surfaces (OFS) and Obstacle Evaluation Surfaces (OES), with requirements tailored to aircraft types, operational needs, and airspace use, thereby improving aerodrome planning and airspace protection. The land use planning and obstacle control framework is strengthened to better manage development and natural or man-made obstacles around aerodromes, supporting safer operations and compliance.

Greater operational efficiency and environmental benefits are delivered through improved obstacle clearance, mandatory RDRS, and optimised lighting, resulting in shorter runway occupancy, fewer missed approaches, and reduced fuel burn and emissions. Lastly, all non-binding notes are removed from Appendices A to J so that only enforceable requirements remain.

## 2.2 NPRM Development

As a signatory to the Convention on International Civil Aviation, Papua New Guinea is committed to aligning its regulations to ICAO SARPS, where practicable. NPRM development is triggered by several key factors. A primary trigger for NPRM is the amendments of various Annexes to the Convention. Additionally, NPRMs may be triggered when internal reviews, audits or accident and incident investigations reveal safety or

compliance gaps in existing regulations that could impact aviation safety. Evolving industry best practices and technological advancements play a significant role in driving the need for regulatory updates through NPRMs. The proposed amendments are developed in consultation with internal subject matter experts.

### 2.3 Key Stakeholders

The Civil Aviation Safety Authority identifies the following as key stakeholders for the proposed rule amendments contained in this NPRM:

(1) The Civil Aviation Safety Authority;
(2) The Ministry for Transport;
(3) The Minister for Civil Aviation;
(4) Aviation Document Holders and
(5) Other interested stakeholders

## 3. Consequential Amendments

There are no consequential amendments to any Rule Parts.

## 4. Exemptions

There are no current Exemptions against this Rule Part.

## 5. Impact Assessment

### 5.1 Safety

This amendment has a positive impact on improving overall safety of airport and aerodrome operations.

### 5.2 Compliance Cost

Additional compliance costs to the proposed amendments will only affect operators who intend to expand on the scope of external sling load operations to include carriage of persons. Cost related to purchasing appropriate equipment, amendment to procedures and training of all personnel required to be involved.

### 5.3 Security

This amendment has a positive impact on improving overall security of airport and aerodrome operations in compliance with ICAO Annex 17 requirements.

### 5.4 Environment

Negligible environmental impact.

### 5.5 Efficiency and capacity

Implementation will result in efficiency gains and overall positive impact.

### 5.8 Expected implementation time

Date of publication of final rule.

## 6. Summary of changes

The following proposed changes update PNG CAR Part 139 to align with ICAO Annex 14, Vol I, Amendment 18, incorporating updated international Standards and Recommended Practices (SARPs) to enhance aerodrome safety, operational efficiency, and resilience:

New requirements:

(a) 139.2 – Definitions

(b) 139.201(b) – Cybersecurity at Aerodromes

(c) 139.301. – Transition provisions of Appendix A.8, Appendix D and Appendix I.7

(d) 139.E.4.8 – Runway distance remaining signs

(e) 139.G.1.4 – Closed runway marking

(f) 139.G.4.3 – Unserviceability signs

(g) 139.G.4.4 – Unserviceability markers

(h) 139.H.2.4 – System Design

(i) 139.I.5.5 to 139.I.5.7and 139.I.5.12 to 139.I.5.14 – Apron management service

Amendments:

(a) 139.57 – Aerodrome emergency plan

(b) 139.103 – Aerodrome emergency plan-maintenance

(c) 139.105 – Rescue and firefighting – operational requirements

(d) 139.201 – Aerodrome security requirements

(e) 139.E.5.2 – Markings

(f) 139.E.5.3 – Lights

(g) 139.E.5.4 – Signs

(h) 139.G.1 – General

(i) 139.I.6 – Aircraft fueling – Safety considerations

(j) 139.J.5 – Visual aids

(k) Removal of “Notes” in Appendices A to J

Editorials:

(a) Deletes non-binding notes to ensure the appendices contain only enforceable requirements.

# 7. Legislative Analysis

## 7.1 Power to make rules

The Minister may make ordinary rules under sections 69, 70, 71 and 72 of the *Civil Aviation Act 2000*, for various purposes including implementing Papua New Guinea's obligations under the Convention, assisting aviation safety and security, and any matter contemplated under the Act.

These proposed rules are made pursuant to:

(a) Section 69(1)(a) which provides for the Minister to make rules for the implementation of Papua New Guinea's obligations under the Convention;

(b) Section 72(a) which provides for the Minister to make rule for the designation, classification and certification of-

(1) Air services;

(2) Aerodrome operators;

(3) Aviation security providers;

(4) Aviation training organizations;

(5) Aircraft design, manufacture, maintenance and supply organizations;

(6) Air traffic services;

(7) Aviation meteorological services;

(8) Aeronautical communication services; and

(9) Aeronautical procedures.

The proposed amendment of Part 139 complies with the requirements of the *Civil Aviation Act and does not contravene the Constitution, the Aerodrome (Business Concession) Act, Civil Aviation (Air Craft Operator Liability) Act, Aircraft Charges Act, Airport Departure Tax Act, the Explosive Act, Firearms Act, Customs Act, Plant and Disease Control Act* and the *Environmental Act.*

The proposed Rule has been checked for language and compliance with the legal conventions of Papua New Guinea.

## 7.2 Matters to be taken into account

# 8. Submissions on the NPRM

## 8.1 Submissions are invited

Interested persons are invited to participate in the making of the proposed rule amendment by submitting written data, views, or comments. All submissions will be considered before final action on the proposed rule amendment is taken. If there is a need to make any significant change to the rule requirements in the proposal as a result of the submissions received, then interested persons may be invited to make further submissions.

## 8.2 Examination of submissions

All submissions will be available in the rules docket for examination by interested persons both before and after the closing date for submissions. A consultation summary will be published with final rule.

Submissions may be examined by application to the Docket Clerk at the CASA PNG Head office between 8:30 am and 3:30 pm, on weekdays, except statutory holidays.

### 8.3 Disclosure

Submitters should note that any information attached to submissions will become part of the docket file and will be available to the public for examination at the Civil Aviation Safety Authority Headquarter.

Submitters should state clearly if there is any information in their submission that is commercially sensitive or for some other reason the submitter does not want the information to be released to other interested parties.

## 9. How to make submission

Submissions may be sent by the following methods:

By Mail: Docket Clerk (NPRM 25/16/139-36)
Civil Aviation Safety Authority of Papua New Guinea
PO Box 1941
Boroko
National Capital District

Delivered: Docket Clerk (NPRM 25/16/139-36)
Civil Aviation Safety Authority of Papua New Guinea
Morea-Tobo Road
Six Mile, Jacksons Airport
Port Moresby NCD

By Fax: Docket Clerk (NPRM 25/16/139-36)
3251789 / 325 1919

By Email: Docket Clerk (NPRM 25/16/139-36)
rules@casapng.gov.pg

### 9.1 Final date for submissions

Comments must be received before ***COB, 26th September 2025*.**

### 9.2 Availability of the NPRM

Any person may obtain a copy of this NPRM from-

CASA PNG web site: www.casapng.gov.pg

or at a cost from

Docket Clerk
Civil Aviation Safety Authority of PNG Headquarter
Building 1, Level 1
Morea-Tobo Road
Six Mile, Jacksons Airport
Port Moresby NCD.

## 9.3 Further information

For further information, contact:

Gloria Sikre (Ms)
Acting Manager – Legal Services
CASA PNG
gsikre@casapng.gov.pg

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# Part 139

# Aerodromes – Certification and Operation

## Subpart A — General

### 139.2 Definitions and Abbreviations

**(a) Definitions**

**Aircraft classification rating (ACR)** means a number expressing the relative effect of an aircraft on a pavement for a specified standard subgrade category.

**Certified aerodrome** means an aerodrome whose operator has been granted an aerodrome certificate.

**Contaminated runway** means the condition of the runway surface is contaminated when a significant portion of the runway surface area (whether in isolated areas or not) within the length and width being used is covered by one or more of the substances listed in the runway surface condition descriptors.

**Dry runway** means the condition of the runway surface is considered dry if its surface is free of visible moisture and not contaminated within the area intended to be used.

**Ground handling** means services necessary for an aircraft's arrival at, and departure from, an airport, other than air traffic services.

**Obstacle** means all fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

(a) are located on an area intended for the surface movement of aircraft; ~~or extend above a defined surface intended to protect aircraft in flight;~~ or

(b) ~~stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.~~extend above a defined surface intended to protect aircraft in flight; or

(c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

**Pavement classification rating (PCR)** means a number expressing the bearing strength of a pavement.

**Runway condition assessment matrix (RCAM)** means a matrix that correlates runway surface descriptions, pilot braking action reports and vehicle deceleration observations to assign a Runway Condition Code (RWYCC) to each third of the runway, enabling consistent and safety-focus performance assessments.

**Runway condition code (RWYCC)** means a number describing the runway surface condition to be used in the runway condition report.

**Runway condition report (RCR)** means a comprehensive standardized report relating to runway surface condition(s) and its effect on the aeroplane landing and take-off performance.

**Runway surface condition(s)** means a description of the condition(s) of the runway surface used in the runway condition report which establishes the basis for the determination of the runway condition

code for aeroplane performance purposes.

**Slippery wet runway** means a wet runway surface condition where the surface friction characteristics of a significant portion of the runway have been determined to be degraded.

**Standing water** means the condition of runway surface is covered by water of depth greater than 3mm.

**Wet runway** means the condition of the runway surface is covered by any visible dampness or water up to and including 3 mm deep within the intended area of use.

**(b) Abbreviations**

| | |
|---|---|
| ADG | means Aeroplane design group |
| GBAS | means ground-based augmentation system GHSP Ground Handling service provider GSE Ground support equipment |
| OES | means obstacles evaluation surfaces |
| OFS | means obstacle free surface |
| RDRS | means runway distance remaining sign |
| SBAS | means satellite-based augmentation system |
| ULD | means unit load device |
| $V_{at}$ | means indicated airspeed at threshold |
| Vso | means stalling speed or the minimum steady flight speed in the landing configuration |
| Vs1g | means stalling speed or the minimum steady flight speed in a specified configuration |

## Subpart B — Certification Requirements

### 139.57 Aerodrome emergency plan

~~(a)~~ An applicant for the grant of an aerodrome operating certificate must establish and maintain an aerodrome emergency plan that complies with the requirements specified in Appendix I.1.~~1~~, designed to minimise the possibility and extent of personal injury and property damage at, or in the vicinity of, their aerodrome in an emergency.

~~(b) The aerodrome emergency plan required by paragraph (a) must include: -~~

~~(1) details of the types of emergencies planned for; and~~

~~(2) procedures for prompt response to the emergencies planned for; and~~

~~(3) sufficient detail to provide adequate guidance to each person who must carry out the plan; and~~

~~(4) details of the agencies involved in the plan and the responsibility and role of each agency; and~~

~~(5) for an aerodrome serving international air transport operations, provision for an adequately equipped emergency operations centre and command post for each type of emergency; and~~

~~(6) a description of equipment that is available for implementing the emergency plan including medical equipment, and details of the location of the equipment; and~~

~~(7) Information on names and telephone numbers of offices and persons to be contacted in the case of a particular emergency; and~~

~~(8) a grid map of the aerodrome and its immediate vicinity; and~~

~~(9) procedures to maintain the aerodrome emergency plan in accordance with rule 139.103.~~

~~(c) The applicant must: -~~

~~(1) co-ordinate its aerodrome emergency plan with law enforcement agencies, security providers, rescue and firefighting agencies, medical personnel and organisations, the principal tenants of the aerodrome, and all other persons who have responsibilities in the plan; and~~

~~(2) to the extent practicable, provide for participation by all agencies and personnel specified in paragraph (c)(1) in the development of the aerodrome emergency plan.~~

139.73 Wildlife hazard management

(a) An applicant for the grant of an aerodrome operating certificate must, where any wildlife presents a hazard to aircraft operations at their aerodrome, establish an environment management programme to minimise or eliminate the wildlife hazard and comply with Appendix I.~~3~~4; and

## Subpart C — Operating Requirements

### 139.103 Aerodrome emergency plan – maintenance

A holder of an aerodrome operating certificate must~~:~~

~~(1) ensure that all aerodrome personnel having duties and aerodrome emergency responsibilities under the holder's aerodrome emergency plan required by rule 139.57 are familiar with their assignments and are properly trained; and~~

~~(2) test the aerodrome emergency plan required by rule 139.57 by conducting: -~~

~~(i) a full-scale aerodrome emergency exercise at intervals not exceeding 2 years; and~~

~~(ii) special emergency exercises in the intervening year to ensure that any deficiencies found during the full-scale aerodrome emergency exercise have been corrected; and~~

~~(iii) review the plan after each of the exercises specified in subparagraph (2) or after an actual~~

~~emergency, to correct any deficiency found; and co-ordinate its aerodrome emergency plan required by rule 139.57 with law enforcement agencies, security providers, rescue and firefighting agencies, medical personnel and organisations, the principal tenants of the aerodrome, and all other persons who have responsibilities in the plan.~~maintain an aerodrome emergency plan that complies with the requirements specified in Appendix I.1.12 and Appendix I.1.13.

**139.105 Rescue and firefighting – operational requirements**

(a) Except as provided in paragraph (c), the holder of an aerodrome operating certificate must provide on the aerodrome, during operations by aeroplanes having a certificated seating configuration of 20 passengers' seats or more, excluding any required flight crew member seat, that are engaged in ~~regular air operations~~ regular public transport for the carriage of passengers, the rescue and firefighting capability meeting the minimum requirements of rules 139.I.2.8 to 139.I.2.24 and 139.I.2.40.

…

(h) If the required response capability is not restored within 72 hours, the certificate holder must limit ~~regular air operations~~ regular public transport on the aerodrome to those aeroplanes compatible with the aerodrome category corresponding to the remaining operative rescue and firefighting vehicle or vehicles.

## Subpart D — Aerodrome Security

## 139.201 non-security designated aerodrome security requirements

The holder of an aerodrome operating certificate that is not a security designated aerodrome must, in addition to complying with the requirements of rule 139.71:

(a) …

(b) comply with the following rules

(1) designate an isolated aircraft parking position at their aerodrome that complies with appendix C.~~9~~14; and

(2) provide and maintain lighting, and emergency lighting in the event of failure of the normal lighting system, on any parking areas at their aerodrome used at night by aeroplanes having a certificated seating configuration of 20 seats or more passengers, excluding any required flight crew member seat, that are engaged in ~~scheduled air transport operations~~ regular public transport for the carriage of passengers; and

…

~~(4) ensure that personnel engaged, employed or contracted by the certificate holder undergo a security awareness programme, and that each person required to carry out specific security tasks is trained for those tasks; and~~

(~~5~~4) establish procedures for identifying, reporting to the Director, and dealing with, breaches of and deficiencies in, any security procedures established by the holder and any provisions of any enactment relating to security at the aerodrome; and

(~~6~~5) establish and facilitate a security awareness group in order to ensure sufficient

information is given to other organisations at the aerodrome to motivate security awareness on the part of all personnel; and

(~~7~~6) convene, chair, and minute meetings of the security awareness group established under paragraph (c) 201(b)(5) at regular intervals not exceeding 12 months.

(7) provide the following areas at their aerodrome for the screening of passengers and baggage:

(i) areas for the screening of passengers, crew, and their baggage, prior to aircraft boarding: and

(ii) sterile areas where passengers and crew subject to screening are prevented from having access to unauthorised articles or contact with unscreened persons: and

(iii) areas for the separation of arriving passengers and crew from departing passengers during deplaning to prevent arriving, transit, and transfer passengers and crew having contact with any person who has been subject to screening; and

(8) provide areas at their aerodrome for the screening and searching of persons, items, substances, and vehicles entering and remaining within security areas or enhanced security areas; and

(9) ensure that concession areas at their aerodrome that are situated in an area accessible to screened passengers are designed in such a way that they provide access control measures sufficient to prevent delivery to any screened person of:

(i) any unauthorised article; or

(ii) any firearm; or

(iii) any other dangerous or offensive weapon or instrument of any kind; or

(iv) any ammunition; or

(v) any explosive substance or device, or any injurious substance or device of any kind that could be used to endanger the safety of an aircraft or of the persons on an aircraft; and

(10) design all areas required by paragraph (b)(7), (8) and (9) in such a way that they provide access control measures sufficient to prevent any unauthorised persons from entering the area; and

(11) ensure that personnel engaged, employed or contracted by the certificate holder required to carry out specific security tasks undergo initial security awareness training and recurrent training at an interval of not more than 2 years; and(13) make provision for the security of services including, but not limited to, energy supplies, communications, sewerage and water supplies, in order to minimise the risk of such services being used to interfere unlawfully with aviation operations; and

(12) Each applicant for an aviation security service certificate must establish measures and procedures to ensure appropriate steps are taken to minimise cyber threats to civil aviation operations, including:

(i) identifying critical information and communications technology systems and data used for civil aviation purposes; and

(ii)measures to prevent, respond to and rectify cyber-attacks and corruption of information technology systems; and

(iii)developing and implementing appropriate measures to protect itself from unlawful interference in accordance with a risk assessment described in the national civil aviation security programme.

(13) affix signs at the perimeter of security areas or enhanced security areas within their aerodrome; and

(14) establish procedures to ensure that persons other than passengers, together with items carried, must be screened prior to entry into airport security restricted areas; and

(15) ensure that persons other than passengers, together with items carried prior to entry into a security area or an enhanced security area serving civil aviation operations are subject to;

i. screening and security controls;

ii. additional screening determined by a risk assessment carried out by the aerodrome operator; and

(16) ensure that vehicles being granted access to secure areas, or enhanced security areas, together with items contained within them, are subjected to screening or other appropriate security controls; and

(17) ensure the use of appropriate screening methods capable of detecting the presence of explosives and explosive devices carried by persons other than passengers on their persons or in their items carried. In addition, where these methods are not applied continuously, they must be used in an unpredictable manner.

## Subpart E — Transition Provisions

…

Transition provisions ~~detailed~~ referenced in Part 20 apply to this part.

## APPENDIX A. GENERAL

…

A.8 Aeroplane Design Group

A.8.1 An ADG must be determined for each runway in accordance with the characteristics of the critical aeroplane for which the runway is intended.

A.8.2 The ADG must be determined from Table A-2, by selecting the ADG corresponding to the

highest values of indicated airspeed at threshold and wingspan of the aeroplanes for which the runway is intended.

Table A-2. Aeroplane Design Group
(Refer rule A.8.2)

| Aeroplane Design Group | Indicated airspeed at threshold | | Wingspan |
|---|---|---|---|
| **I** | Less than 169 km/h (91 kt) | and | Up to but not including 24 m |
| **IIA** | Less than 169 km/h (91 kt) | and | 24 m up to but not including 36 m |
| **IIB** | Less than 169 km/h (91 kt) but not including 224 km/h (121 kt) | and | Up to but not including 36 m |
| **IIC** | 224 km/h (121 kt) up to but not including 307 km/h (166 kt) | and | Up to but not including 36 m |
| **III** | Less than 307 km/h (166 kt) | and | 36 m up to but not including 52 m |
| **IV** | Less than 307 km/h (166 kt) | and | 52 m up to but not including 65 m |
| **V** | Less than 307 km/h (166 kt) | and | 65 m up to but not including 80 m |

…

# APPENDIX C. PHYSICAL CHARACTERISTICS

…

C.12.9 The location of a runway-holding position established in accordance with C.12.3 must be such that a holding aircraft or vehicle will not infringe the inner approach surface, inner transitional surfaces, balked landing surface, approach surface, take-off climb surface or ILS/MLS critical/ sensitive area or interfere with the operation of radio navigation aids.

# APPENDIX D. OBSTACLE RESTRICTION AND REMOVAL

## D.1 General

D.1.1 The aerodrome operator must establish a process to prevent the growth of obstacles, both fixed and mobile, that may affect the safety or regularity of flight operations at an aerodrome.

## D.2 Obstacle free surfaces (OFS)

### *D.2.1 Approach surface*

D.2.1.1 Description. An inclined surface preceding the threshold.

D.2.1.2 Characteristics. The limits of the approach surface must comprise:

(a) an inner edge of specified length, horizontal and perpendicular to the extended centre line of the runway and located at a specified distance before the threshold;

(b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway; and

c) an outer edge parallel to the inner edge.

D.2.1.3 The surface mentioned in D.2.1.2 must be varied when lateral offset, angular offset or curved approaches are utilized; two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the lateral offset, angular offset or curved ground track.

D.2.1.4 The elevation of the inner edge must be equal to the elevation of the midpoint of the threshold.

D.2.1.5 The slope of the approach surface must be measured:

(a) when straight-in approaches are utilized — in the vertical plane containing the centre line of the runway and its extension; and

(b) when lateral offset, angular offset or curved approaches are utilized — along any straight part of the approach, in the vertical plane containing the centre line of the lateral offset, angular offset or curved ground track or, along any curved part of the approach, in the vertical plane tangent with the curved ground track.

D.2.1.6 Except where the approach surface is raised to comply with approach angles greater than 3.0°, the slope of the approach surface must not be greater than, and their other dimensions not less than, those specified in Table D-1 for non-instrument runways and Table D-2 for instrument runways.

D.2.1.7 The slope of the approach surface must not be increased to facilitate the growth of obstacles.

D.2.1.8 Where the approach angle is lower than 3.0°, the slope of the approach surface must be decreased.

D.2.1.9 Where the slope of the obstacle protection surface of a visual approach slope indicator system is lower than that indicated in Table D-1 and Table D-2, the slope of the approach surface must be decreased to match that of the obstacle protection surface.

D.2.1.10 Where the slope of the approach surface is reduced, corresponding adjustment in the length of the approach surface must be made to provide protection to a height equal to that reached with the slopes and lengths in Table D-1 and Table D-2.

D.2.1.11 On instrument approach runways, where the obstacle clearance height is higher than 150 m (500 ft) above the threshold, the length of the approach surface must not be less than:

(a) the value indicated in Table D-2; or

(b) that necessary to reach the obstacle clearance height; whichever is greater.

**Table D-1. Dimensions and slopes of approach surface — Non-instrument runways**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Distance from threshold | 30 m | 60 m | 60 m | 60 m | 60 m | 60 m |
| Length of inner edge | 60 m[a b] | 80 m[c d] | 100 m[d] | 125 m | 135 m | 150 m |
| Divergence | 10 % | 10 % | 10 % | 10 % | 10 % | 10 % |
| Length | 1 600 m[e] | 2 500 m[e] | 2 500 m[e] | 2 500 m[e] | 2 500 m[e] | 2 500 m[e] |
| Slope | 5 %[f] | 4 %[f] | 3.33 %[f] | 3.33 %[f] | 3.33 %[f] | 3.33 %[f] |

[a] Where runway width is above 23 m and up to 30 m, the length of inner edge is increased to 80 m.
[b] Where runway width is above 30 m, the length of inner edge is increased to 100 m.
[c] Where runway width is above 30 m and up to 45 m, the length of inner edge is increased to 100 m.
[d] Where runway width is above 45 m, the length of inner edge is increased to 110 m.
[e] See 4.2.1.10.
[f] See 4.2.1.8 and 4.2.1.9.

**Table D-2. Dimensions and slopes of approach surface — Instrument runways**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Distance from threshold | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m |
| Length of inner edge | 110 m[a] | 125 m[b] | 155 m[c] | 175 m | 185 m | 200 m |
| Divergence | 10% | 10% | 10% | 10 % | 10% | 10% |
| Length | 4 500 m[d] | 4 500 m[d] | 4 500 m[d] | 4 500 m[d] | 4 500 m[d] | 4 500 m[d] |
| Slope | 3.33%[e] | 3.33%[e] | 3.33%[e] | 3.33%[e] | 3.33%[e] | 3.33%[e] |

[a] When the runway width is above 30 m, the length of inner edge is increased to 125 m.
[b] When the runway width is above 30 m, the length of inner edge is increased to 140 m.
[c] When the runway width is 30 m or less, the length of inner edge is decreased to 140 m.
[d] See 4.2.1.10 and 4.2.1.11.
[e] See 4.2.1.8 and 4.2.1.9.

## D.2.2 Transitional surfaces

D.2.2.1Description.— Transitional surfaces. A complex surface along and at a specified distance from the runway centre line and part of the side of the approach surface that slopes upwards and outwards to a specified height.

D.2.2.2Characteristics.— The limits of a transitional surface must comprise:

(a) a lower edge beginning on the side of the approach surface at the elevation of the upper edge and extending down the side of the approach surface to the inner edge of the approach surface and from there along a line extending parallel to and at a specified distance from the runway centre line and its extension, to the end of the strip; and

(b) an upper edge located at 60 m above the elevation of the highest threshold of the runway.

D.2.2.3The elevation of a point on the lower edge must be:

(a) along the side of the approach surface — equal to the elevation of the approach surface at that point; and

(b) along the runway centre line and its extension after the threshold — equal to the elevation of the nearest point on the centre line of the runway or its extension.

D.2.2.4 The slope of the transitional surfaces must be measured in a vertical plane perpendicular to the vertical plane containing the runway centre line or its extension.

D.2.2.5 The slope of the transitional surface must not be greater than 20 per cent.

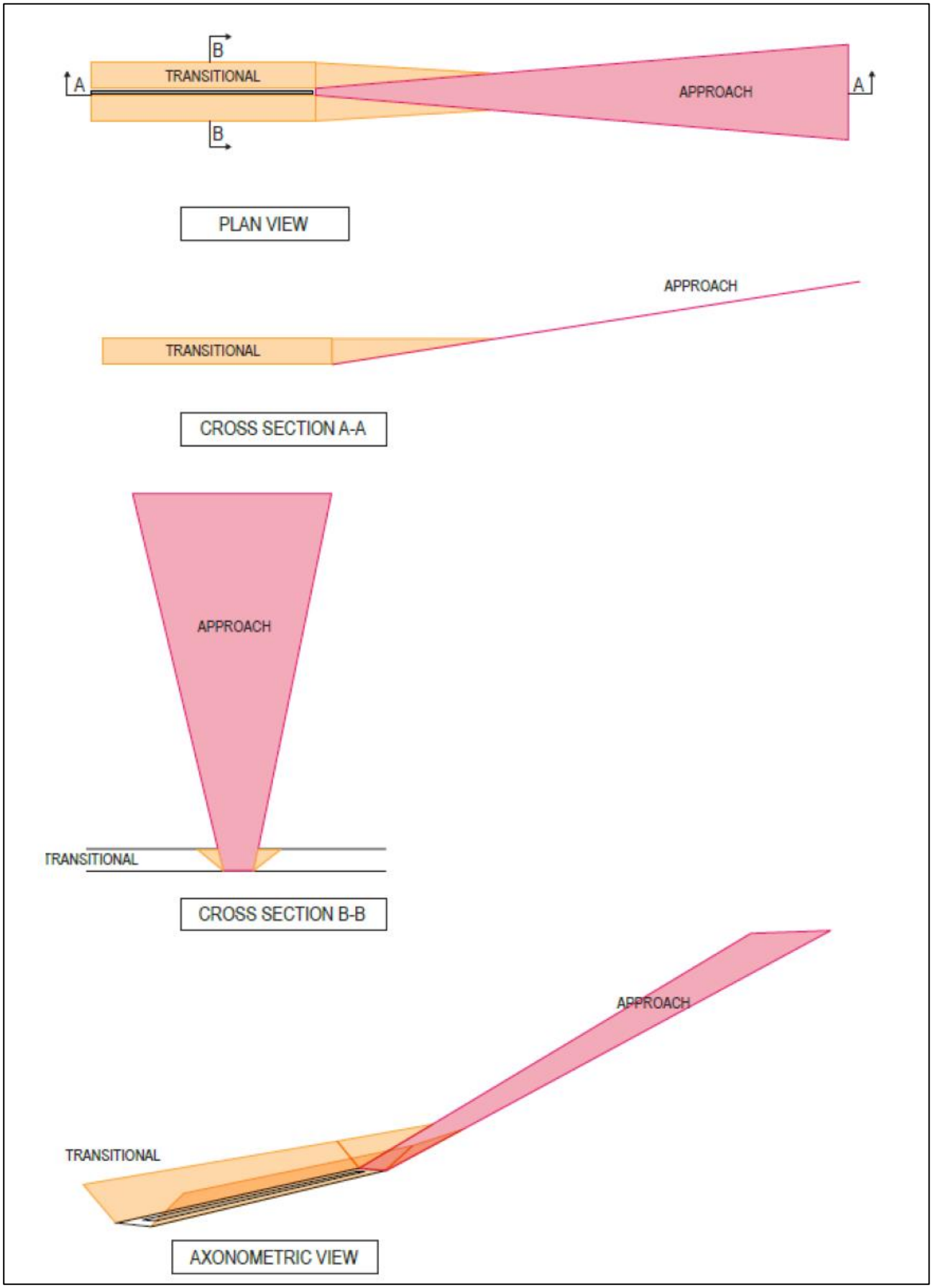



**Figure D-1. Approach surface and transitional surfaces**

## D.2.3 Inner approach surface

D.2.3.1 Description.— Inner approach surface. A rectangular portion of the approach surface immediately preceding the threshold.

D.2.3.2 Characteristics.— The limits of the inner approach surface must comprise:

(a) an inner edge coincident with the location of the inner edge of the approach surface but of its own specified length;

(b) two sides originating at the ends of the inner edge and extending parallel to the vertical plane containing the centre line of the runway; and

(c) an outer edge parallel to the inner edge.

D.2.3.3The surface mentioned in D.2.3.2 must be varied when lateral offset, angular offset or curved approaches are utilized; two sides originating at the ends of the inner edge and extending parallel to the extended centre line of the lateral offset, angular offset or curved ground track.

D.2.3.4The dimensions of the inner approach surface for non-instrument runway must not be less than those specified in Table D-3.

D.2.3.5The dimensions of the inner approach surface for non-precision approach runway must not be less than those specified in Table D-4.

D.2.3.6The dimensions of the inner approach surface for precision approach runway must not be less than those specified in Table D-5.

D.2.3.7If the slope of the approach surface is reduced, the length of the inner approach surface must be increased to provide protection to a height of 45 m (150 ft).

**Table D-3. Dimensions of inner approach surface — Non-instrument runways**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| **Length of inner edge** | 60 m | 80 m | 100 m | 110 m | 120 m | 120 m[a] |
| **Length** | 900 m[b] | 1 125 m[b] | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] |

[a] The length of inner edge is increased to 140 m on those aerodromes that accommodate a code letter F aeroplane that is not equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre.

[b] See D.2.3.7.

**Table D-4. Dimensions of inner approach surface — Non-precision approach runways**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Length of inner edge | 80 m | 80 m | 120 m | 120 m | 120 m | 120 m[a] |
| Length | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] |

[a] The length of inner edge is increased to 140 m on those aerodromes that accommodate a code letter F aeroplane that is not equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre.
[b] See D.2.3.7.

**Table D-5. Dimensions of inner approach surface — Precision approach runways**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Length of inner edge | 90 m | 90 m | 120 m | 120 m | 120 m | 120 m[a] |
| Length | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] | 1 350 m[b] |

[a] The length of inner edge is increased to 140 m on those aerodromes that accommodate a code letter F aeroplane that is not equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre.
[b] See D.2.3.7.

## D.2.4 Inner transitional surfaces

D.2.4.1 Description.— Inner transitional surfaces:

(a) Non-instrument and non-precision approach runways — A complex surface at a specified distance from the runway centre line consisting of two successive sections: a first section that rises vertically to a given height, followed by a second inclined section that slopes upwards and outwards to a specified height; and

(b) Precision approach runways — A surface similar to the transitional surface but closer to the runway.

D.2.4.2 Characteristics.— On non-instrument and non-precision approach runways:

(a) the limits of the vertical section of the inner transitional surface must comprise:

(1) a lower edge beginning on the side of the inner approach surface at a specified height above the inner edge of that surface, extending down the side of the inner approach surface to its inner edge, from there along a line parallel to and at a specified distance from the runway centre line, and its extension, to a specified length after the threshold and from there, vertically to a specific height; and

(2) an upper edge parallel to, and at a specified height above, the runway centre line;

(b) the limits of the inclined section of the inner transitional surface must comprise:

(1) a lower edge beginning at the end of the inner approach surface and extending down the side of the inner approach surface to the upper edge of the vertical section, from there along the upper edge of the vertical section; and

(2) an upper edge parallel to and at 60 m above the elevation of the highest threshold of the runway.

D.2.4.3Characteristics.— On precision approach runways, the limits of the inner transitional surface must comprise:

(a) a lower edge beginning at the end of the inner approach surface and extending down the side of the inner approach surface to the inner edge of that surface, from there along a line parallel to and at a specified distance from the runway centre line and its extension to the inner edge of the balked landing surface and from there up the side of the balked landing surface to the upper edge; and

(b) an upper edge located at 60 m above the elevation of the highest threshold of the runway.

D.2.4.4On non-instrument and non-precision approach runways, the elevation of a point must be:

(a) on the lower edge of the vertical section:

(1) along the side of the inner approach surface — equal to the elevation of the inner approach surface at that point; and

(2) after the inner edge of the inner approach surface — equal to the elevation of the nearest point on the centre line of the runway or its extension;

(b) on the upper edge of the vertical section — equal to a specific height above the nearest point on the centre line of the runway or its extension;

(c) on the lower edge of the inclined section:

(1) along the side of the inner approach surface — equal to the elevation of the inner approach surface at that point; and

(2) along the upper edge of the lower section — equal to the elevation of the upper edge of the lower section at that point.

D.2.4.5 On precision approach runways, the elevation of a point on the lower edge must be:

(a) along the side of the inner approach surface and balked landing surface — equal to the elevation of the particular surface at that point; and

(b) along the runway centre line and its extension — equal to the elevation of the nearest point on the centre line of the runway or its extension;

D.2.4.6The slope of the inner transitional surfaces must be measured:

(a) between the inner edges of the inner approach surface and balked landing surface: in a vertical plane perpendicular to the vertical plane containing the runway centre line and its extension;

(b) before the inner edge of the inner approach surface:

(1) where straight-in approaches are utilized: in a vertical plane perpendicular to the vertical plane containing the runway centre line and its extension; and

2) where lateral offset, angular offset or curved approaches are utilized: along any straight part of the approach, in a vertical plane perpendicular to the vertical plane containing the straight part of the approach or, along any curved part of the approach, in the vertical plane tangent with the curved ground track.

D.2.4.7 The slope of the inner transitional surfaces for non-instrument runway must not be greater than, and the height of the vertical section not lower than, that specified in Table D-6.

D.2.4.8 The slope of the inner transitional surfaces for non-precision approach runway must not be greater than, and the height of the vertical section not lower than, that specified in Table D-7.

D.2.4.9 The slope of the inner transitional surfaces for precision runway must not be greater than that specified in Table D-8.

**Table D-6. Dimensions of inner transitional surfaces — Non-instrument runways**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Height of the vertical section | 6 m | 6 m | 8.4 m | 10 m | 5 m | 5 m |
| Slope of the inclined section | 40 % | 40 % | 33.3% | 33.3% | 33.3% | 33.3% |
| Length | a | a | 1 800 m[b] | 1 800 m[b] | 1 800 m[b] | 1 800 m[b] |

[a] To the end of the strip.
[b] Or to the end of the runway, whichever is less.

**Table D-7. Dimensions of inner transitional surfaces — Non-precision approach runways**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Height of the vertical section | 6 m | 6 m | 5 m | 5 m | 5 m | 5 m |
| Slope of the inclined section | 40 % | 40 % | 33.3% | 33.3% | 33.3% | 33.3% |
| Length | a | a | 1 800 m[b] | 1 800 m[b] | 1 800 m[b] | 1 800 m[b] |

[a] To the end of the strip.
[b] Or to the end of the runway, whichever is less.

**Table D-8. Slopes of inner transitional surfaces — Precision approach runways**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Slope | 40 % | 40 % | 33.3% | 33.3% | 33.3% | 33.3% |
| Length | a | a | a | a | a | a |

[a] See 4.2.4.3.

## D.2.5 Balked landing surface

D.2.5.1 Description.— Balked landing surface. An inclined surface located at a specified distance after the threshold, extending between the inner transitional surfaces.

D.2.5.2 Characteristics.— The limits of the balked landing surface must comprise:

a) an inner edge horizontal and perpendicular to the centre line of the runway and located at a specified distance after the threshold;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the vertical plane containing the centre line of the runway; and

c) an outer edge parallel to the inner edge and located at 60 m above the elevation of the highest threshold of the runway.

D.2.5.3 The elevation of the inner edge must be equal to the elevation of the nearest point on the runway centre line.

D.2.5.4 The slope of the balked landing surface must be measured in the vertical plane containing the centre line of the runway and its extension;

D.2.5.5 The slope of the balked landing surface must not be greater than, and its other dimensions not less than, those specified in Table D-9.

**Table D-9. Dimensions and slopes of balked landing surface**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Distance from threshold | a | a | 1 800 m[b] | 1 800 m[b] | 1 800 m[b] | 1 800 m[b] |
| Length of inner edge | 90 m | 90 m | 120 m | 120 m | 120 m | 120 m[c] |
| Divergence (each side) | 10% | 10% | 10% | 10% | 10% | 10% |
| Slope | 5% | 4% | 3.33% | 3.33% | 3.33% | 3.33% |

a. End of the strip.
b. Or end of runway whichever is less.
c. The length of inner edge is increased to 140 m on those aerodromes that accommodate a code letter F aeroplane that is not equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre.

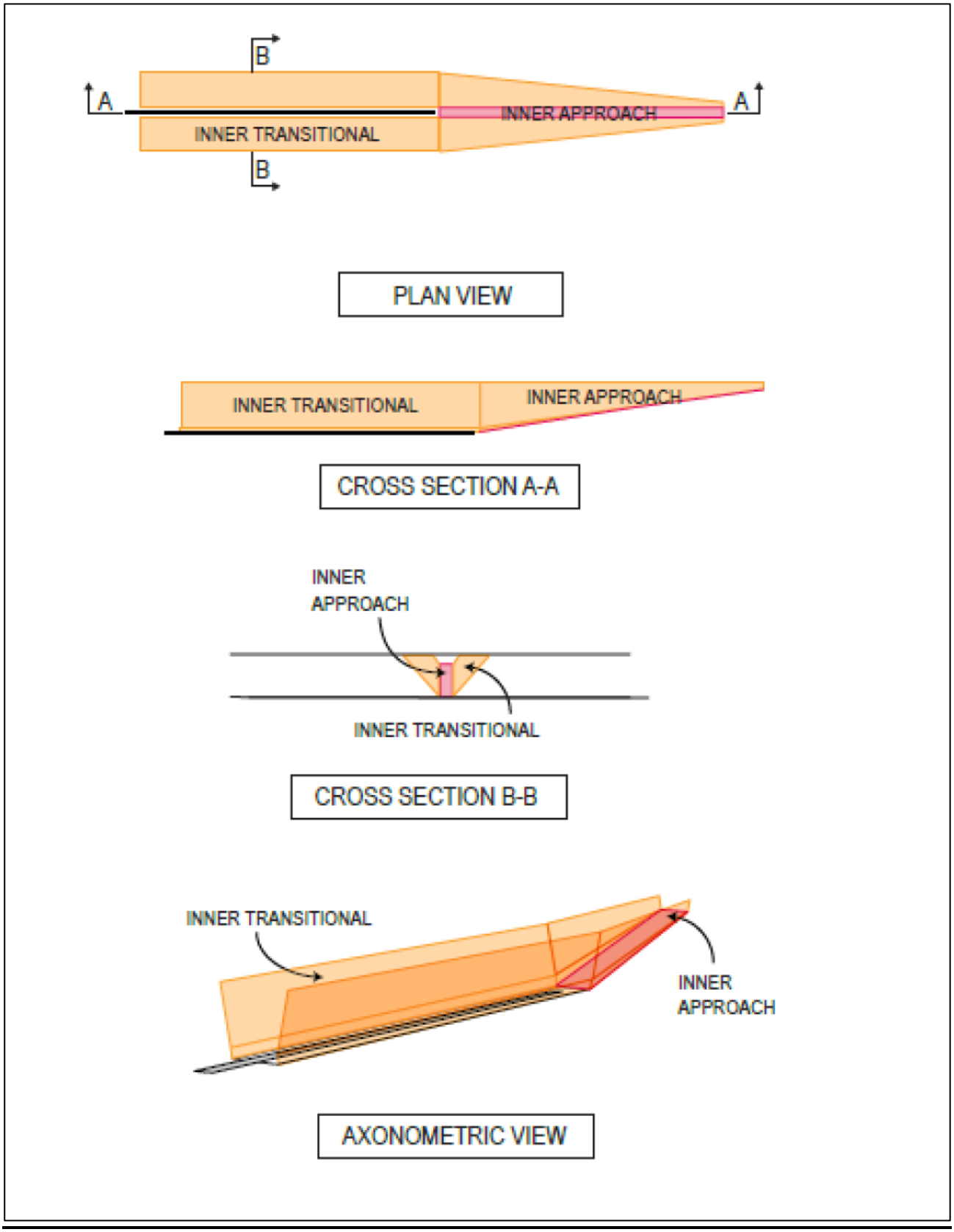



**Figure D-2 Inner approach and inner transitional surfaces on a non-precision approach runway**

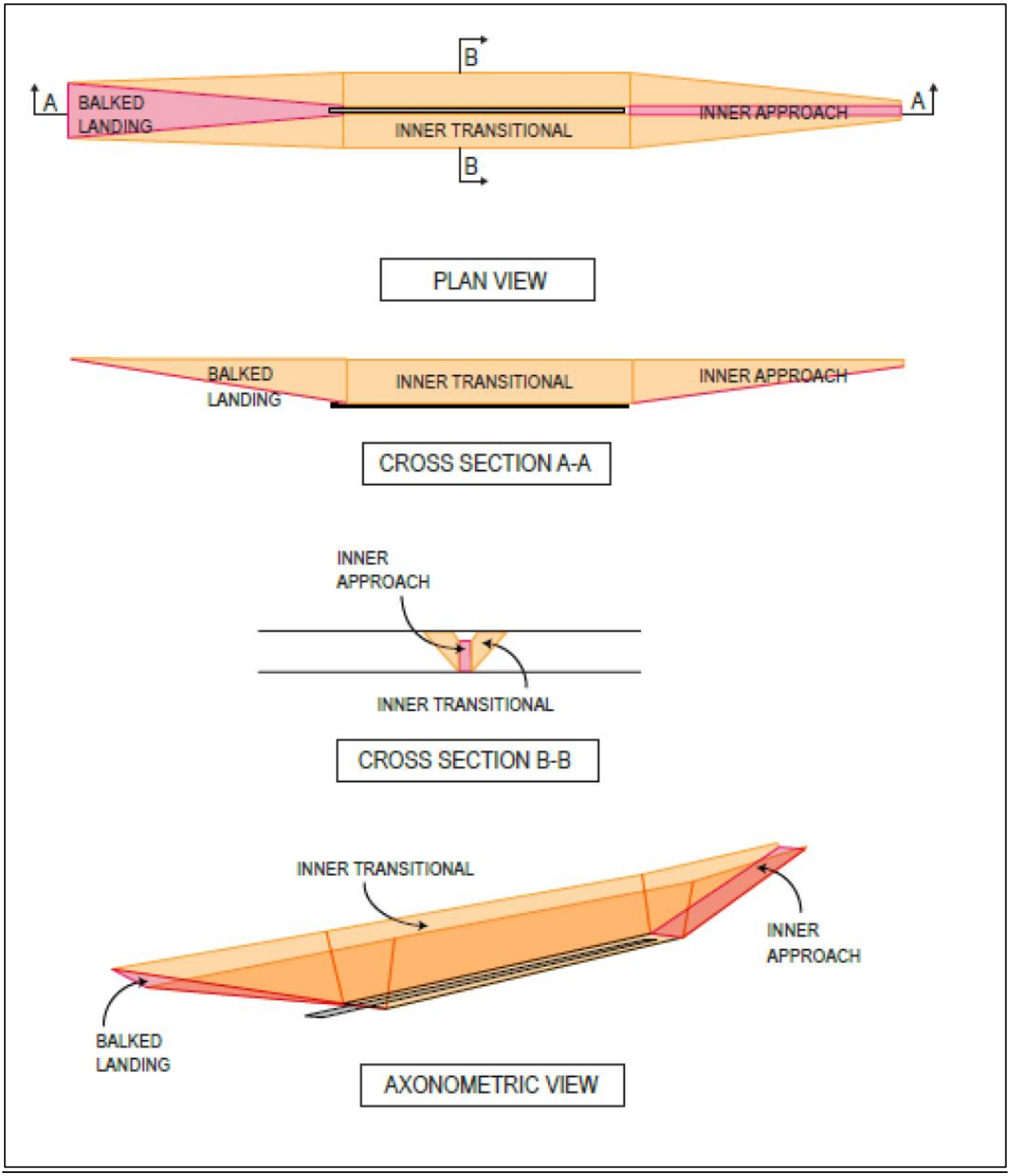



**Figure D-3 Obstacle free zone on a precision approach runway**

## D.3 Obstacle evaluation surfaces (OES)

### D.3.1 General

D.3.1.1 The holder of an aerodrome operating certificate must ensure that the obstacle evaluation surfaces specified in D.5.2 have been established to protect the existing and/or intended aeroplane operations at an aerodrome.

D.3.1.2 The characteristics and dimensions of the obstacle evaluation surfaces must be in accordance

with the provisions contained in D.3.2 to D.3.6.

D.3.1.3Where it is necessary to preserve the accessibility of an aerodrome to existing and planned operations, the provisions applicable to OFS contained in D.4.4 to D.4.8 must apply obstacle evaluation surface.

## D.3.2 Horizontal surface

D.3.2.1Description.— Horizontal surface. A surface, or a combination of surfaces, located in a horizontal plane, or in a series of horizontal planes, above an aerodrome and its environs.

D.3.2.2Characteristics.— The outer limits of the horizontal surface must be circular arcs centred on runway thresholds joined tangentially by straight lines.

D.3.2.3The height of the horizontal surface must be measured above the aerodrome elevation.

D.3.2.4A horizontal surface must have a radius of not less than, and a height of not greater than, those specified in Table D-10.

**Table D-10. Dimensions of horizontal surface**

| Aeroplane design group | I-IIA | IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Radius | 3 350 m | 5 350 m | 10 750 m | 10 750 m | 10 750 m | 10 750 m |
| Height | 45 m | 60 m | 90 m | 90 m | 90 m | 90 m |

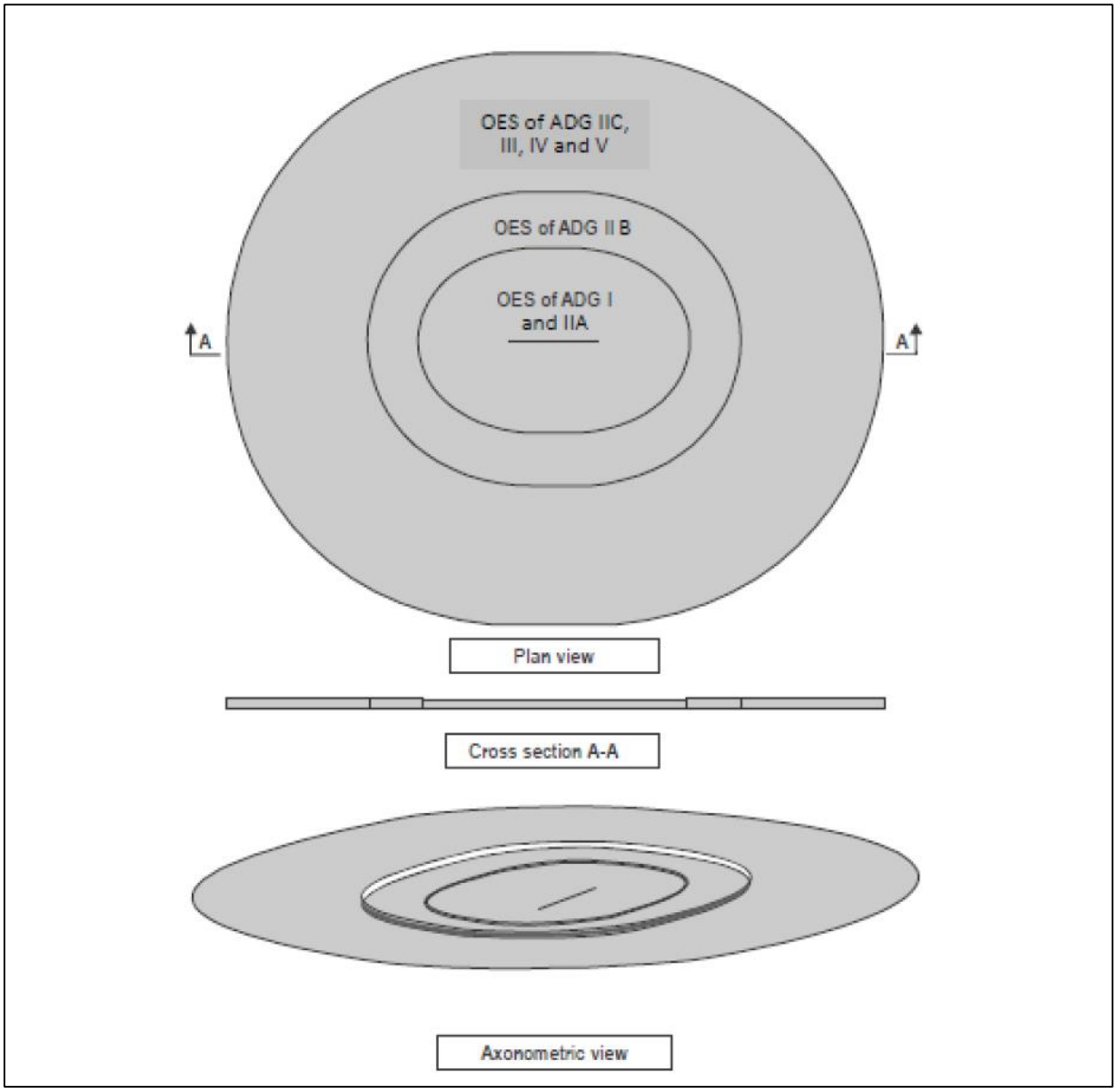



**Figure D-4. Horizontal surface**

## D.3.3 Surface for straight-in instrument approaches

D.3.3.1 Description.— Surface for straight-in instrument approaches. A combination of surfaces, located in a series of horizontal planes above an aerodrome and its environs.

D.3.3.2 Characteristics.— The surface for straight-in instrument approaches must consist of:

(a) a lower part corresponding to the horizontal surface applicable to ADG I;

(b) an upper part corresponding to that part of the horizontal surface applicable to ADG II and III extending beyond the lateral limit of the lower section and delineated by the rectangle of following sides:

(1) two shorter sides perpendicular to and centred on the runway centre line and its extension; and

(2) two longer sides extending parallel to the runway centre line and its extension from a given distance before and after the thresholds of the runway.

D.3.3.3 The heights of the lower section and upper section must be measured above the aerodrome elevation.

D.3.3.4 The heights of the surface for straight-in instrument approaches must not be greater than, and its other dimensions not less than, those specified in Table D-11.

**Table D-11. Dimensions of surface for straight-in instrument approaches**

| | Aeroplane design group | I to V |
|---|---|---|
| **Lower section** | **Height** | 45 m |
| | **Length** | Horizontal OES as per ADG I |
| **Upper section** | **Height** | 60 m |
| | **Length of shorter side** | 7 410 m |
| | **Length of longer side from the threshold or thresholds** | 5 350 m |

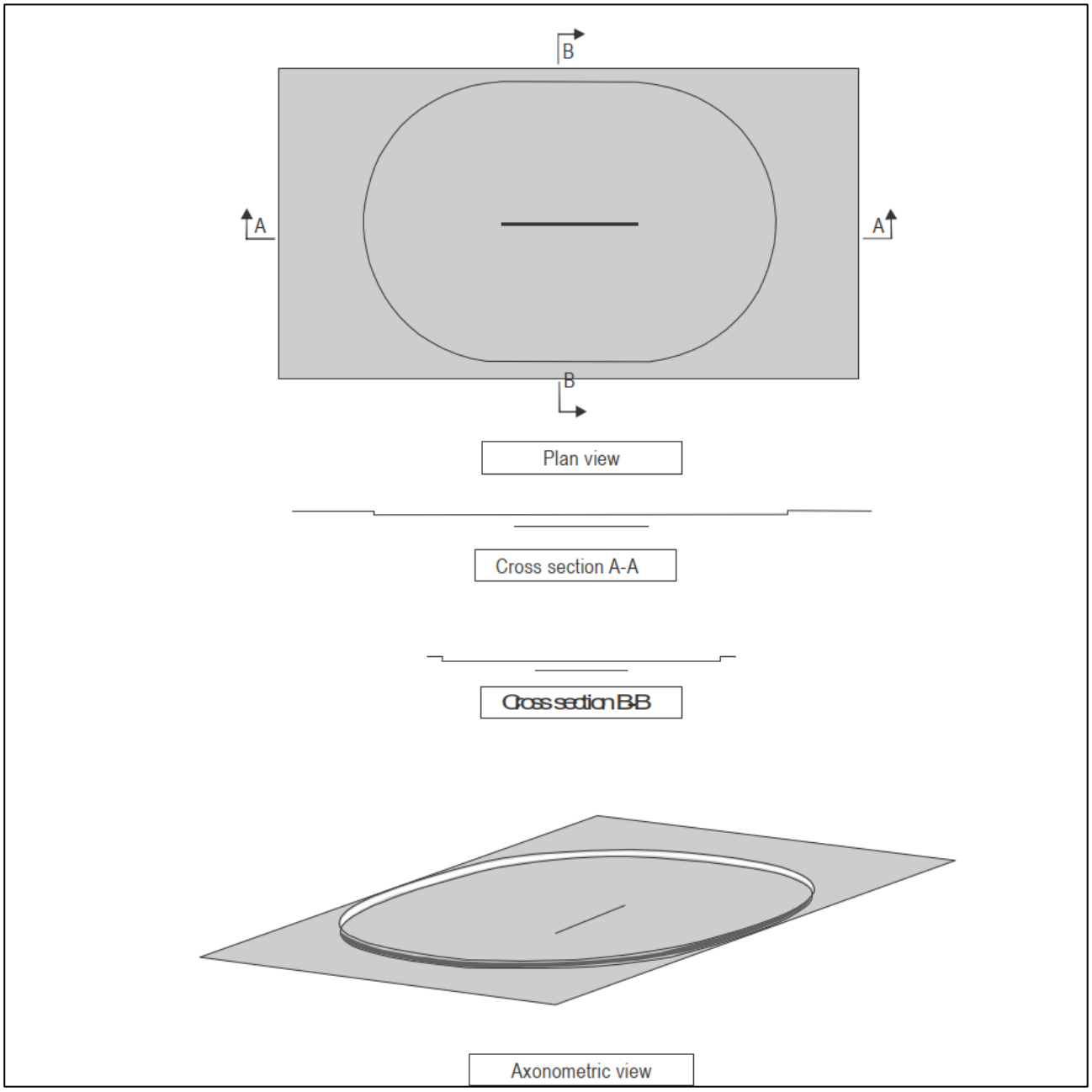



**Figure D-5. Surface for straight-in instrument approaches**

### D.3.4 Surface for precision approaches

D.3.4.1 Description.— Surface for precision approaches. A complex surface composed of:

(a) an approach component consisting of an inclined surface preceding the threshold;

(b) a missed approach component consisting of an inclined surface located at a specific distance after the threshold;

(c) transitional components consisting of complex surfaces at a specified distance from the runway centre line and along the approach component and missed approach component, that slopes upwards and outwards; and

(d) a lower component specified by a rectangular surface within the inner edges of the

above components.

D.3.4.2 Characteristics.— The limits of the approach component of the surface for precision approaches must comprise:

(a) an inner edge of specified length, horizontal and perpendicular to the extended centre line of the runway and located at a specified distance before the threshold;

(b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway to a specified distance and diverging uniformly thereafter at another specified rate for the remainder of the length of the approach component; and

(c) an outer edge parallel to the inner edge.

D.3.4.3 The elevation of the inner edge of the approach component must be equal to the elevation of the midpoint of the threshold.

D.3.4.4 The slope of the approach component must be measured in the vertical plane containing the centre line of the runway and its extension.

D.3.4.5 Characteristics.— The limits of the missed approach component of surface for precision approaches must comprise:

(a) an inner edge of specified length, horizontal and perpendicular to the extended centre line of the runway and located at a specified distance after the threshold;

(b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway to a specified distance and diverging uniformly thereafter at another specified rate for the remainder of the length of the missed approach component; and

(c) an outer edge parallel to the inner edge.

D.3.4.6 The elevation of the inner edge of the missed approach component must be equal to the elevation of the midpoint of the threshold.

D.3.4.7 The slope of the missed approach component must be measured in the centre line of the runway and its extension.

D.3.4.8 Characteristics.— The limits of the transitional component of the surface for precision approaches must comprise:

(a) a lower edge beginning on the side of the approach component at the elevation of the upper edge and extending down the side of the approach component to the inner edge of the approach component, from there along a line extending horizontally to the inner edge of the missed approach component, and from there extending up the side of the missed approach component to the upper edge; and

(b) an upper edge located at 300 m above the threshold elevation.

D.3.4.9 The elevation of a point on the lower edge of the transitional component must be:

(a) along the side of the approach component and missed approach component — equal to the elevation of the particular surface at that point; and

(b) between the inner edges of the approach component and missed approach component — equal to the elevation of the midpoint of the threshold.

D3.4.10 The slope of the transitional component must be measured in the vertical plane perpendicular to the centre line of the runway and its extension.

D.3.4.11 Characteristics.— The limits of the lower component of the surface for precision approaches must comprise:

(a) two shorter sides corresponding with the inner edge of the approach component and missed approach component; and

(b) two longer sides corresponding with the inner edges of the transitional components.

D.3.4.12 The elevation of a point on the lower component must be equal to the elevation of the midpoint of the threshold.

D.3.4.13 The slopes of the different components of the surface for precision approach runways must not be greater than, and their other dimensions not less than, those specified in Table D-12.

**Table D-12. Dimensions of surface for precision approaches**

| Aeroplane design group | | | I to V |
|---|---|---|---|
| Approach component | | Distance from threshold | 60 m |
| | | Length of inner edge | 300 m |
| | 1st section | Length | 3 000 m |
| | | Divergence (each side) | 15 % |
| | | Slope | 2 % |
| | 2nd section | Length | 9 600 m |
| | | Divergence (each side) | 15 % |
| | | Slope | 2.5 % |
| Missed approach component | | Distance after threshold | 900 m |
| | | Length of inner edge | 300 m |

| Aeroplane design group | | | I to V |
|---|---|---|---|
| | 1st section | Length | 1 800 m |
| | | Divergence (each side) | 17.48 % |
| | | Slope | 2.5 % |
| | 2nd section | Length | 10 200 m |
| | | Divergence (each side) | 25 % |
| | | Slope | 2.5 % |
| Transitional component | | Slope | 14.3 % |

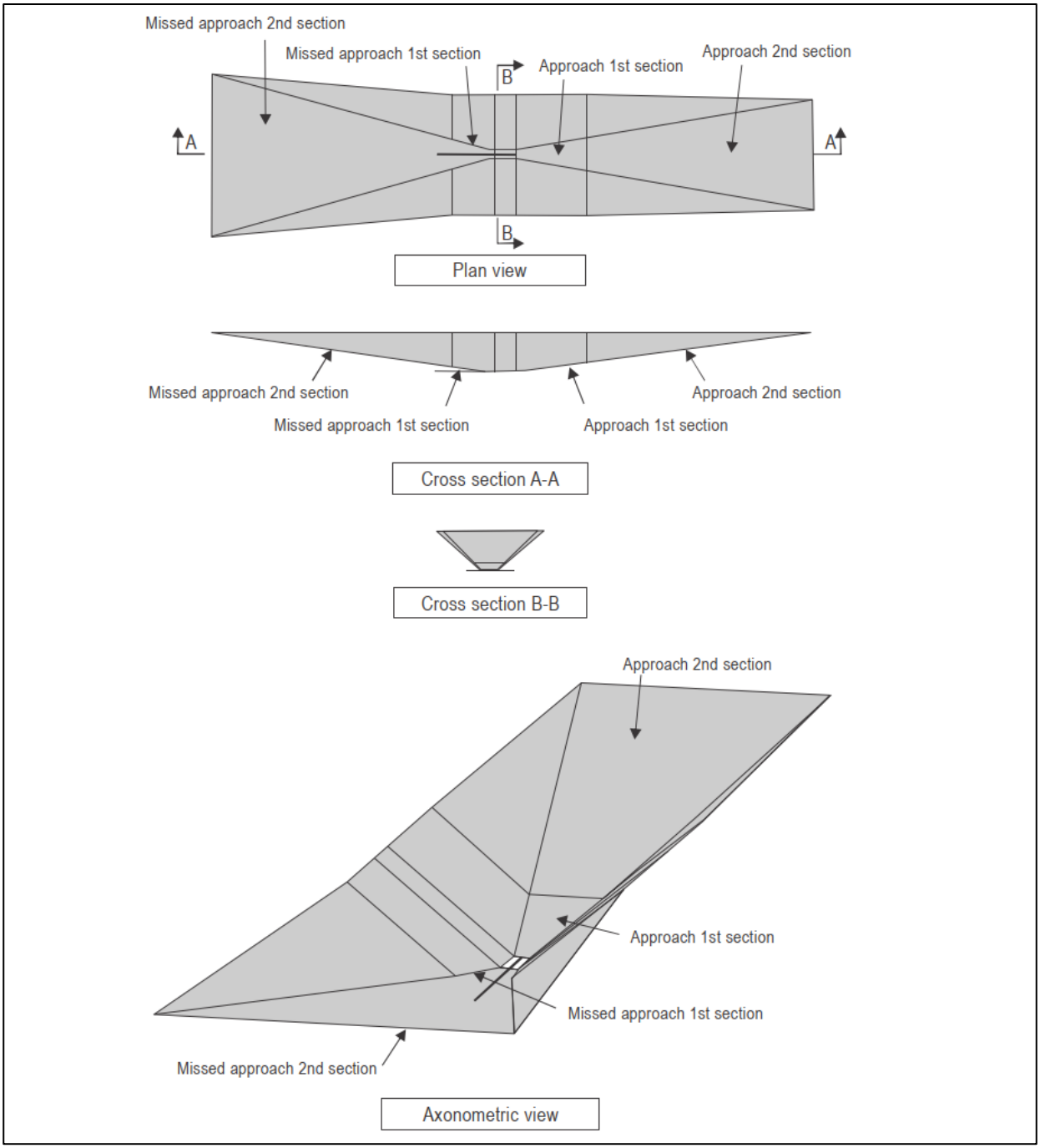



**Figure D-6. Surface for precision approaches**

## D.3.5 Instrument departure surface

D.3.5.1 Description.— Instrument departure surface. An inclined surface, along the runway centre line and its extension after the end of the take-off distance available.

D.3.5.2 Characteristics.— The limits of the instrument departure surface must comprise:

(a) an inner edge of specified length, horizontal and perpendicular to the centre line of the runway and located at the end of the take-off distance available;

(b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway to a specified distance and diverging uniformly thereafter at another specified rate for the remainder of the length of the instrument departure surface; and

(c) an outer edge parallel to the inner edge.

D.3.5.3 The elevation of the inner edge must be 5 m above the elevation of the runway centre line and its extension at the end of the take-off distance available.

D.3.5.4 The slope of the instrument departure surface must be measured in the vertical plane containing the centre line of the runway and its extension.

D.3.5.5 The slope of the instrument departure surface must not be greater than, and its other dimensions not less than, those specified in Table D-13.

**Table D-13. Dimensions of instrument departure surface**

| | | |
|---|---|---|
| | **Aeroplane design group** | **I to V** |
| | **Length of inner edge** | 300 m |
| | **Slope** | 2.5 % |
| **First section** | **Length** | 3 500 m |
| | **Divergence** | 26.8 % |
| **Second section** | **Length** | 8 300 m |
| | **Divergence** | 57.8 % |

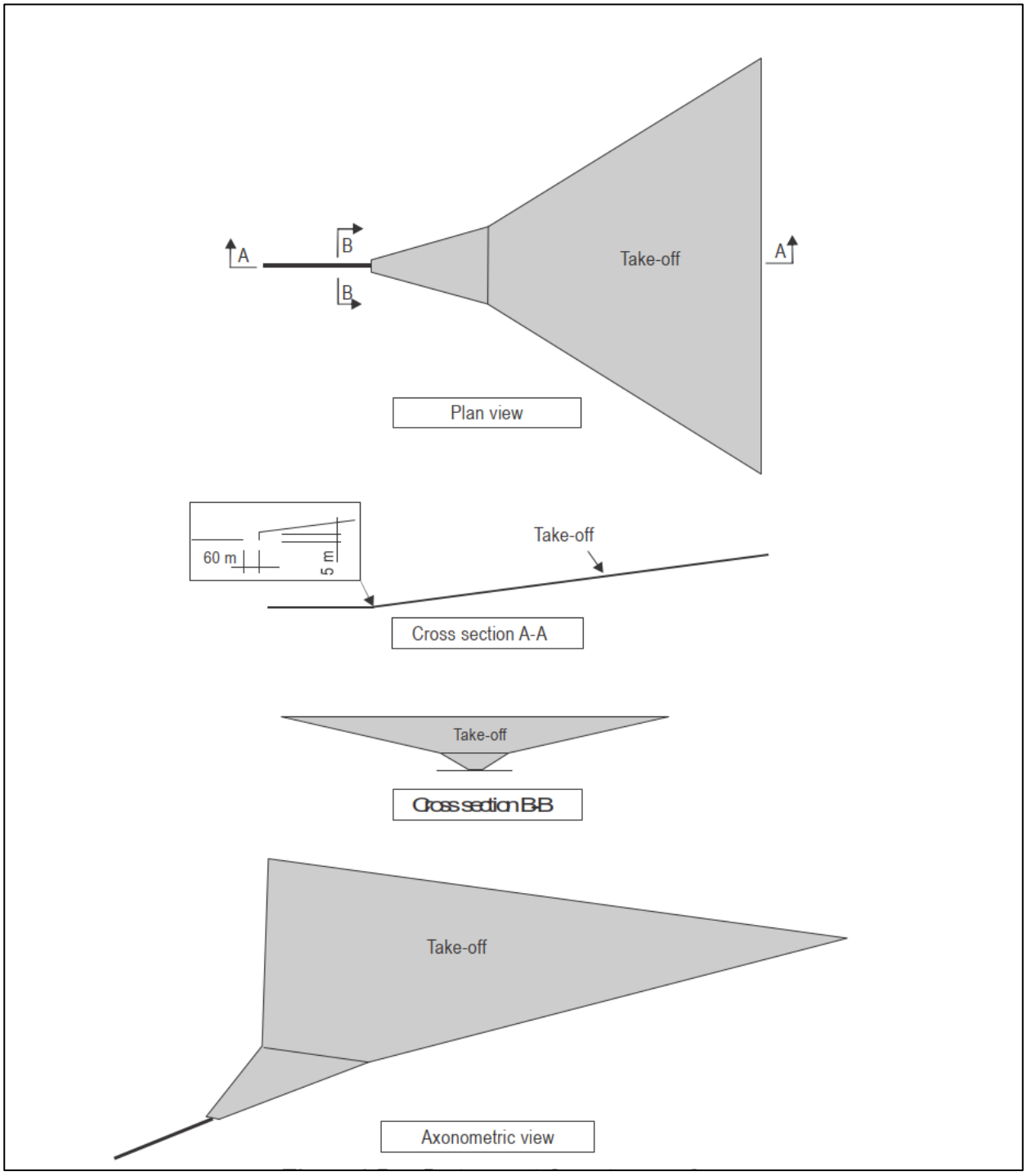



**Figure D-7. Instrument departure surface**

## D.3.6 Take-off climb surface

D.3.6.1 Description.— Take-off climb surface. An inclined surface beyond the end of the take-off distance available.

D.3.6.2 Characteristics.— The limits of the take-off climb surface must comprise:

(a) an inner edge horizontal and perpendicular to the centre line of the runway and located at a specified distance beyond the end of the runway or at the end of the take-off distance available;

(b) two sides originating at the ends of the inner edge, diverging uniformly at a specified rate from the take-off ground track to a specified final width and continuing thereafter at that width for the remainder of the length of the take-off climb surface; and

(c) an outer edge horizontal and perpendicular to the specified take-off track.

D.3.6.3 The above surface must vary when take-off flight paths involving turns are utilized; two sides originating at the end of the inner edge and diverging uniformly at a specified rate from the extended centre line of the take-off ground track to a specified final width, and extending thereafter parallel to the take-off ground track for the remainder of the length of the take-off climb surface.

D.3.6.4 The elevation of the inner edge must be equal to the highest point on the extended runway centre line between the end of the take-off run available and the inner edge of the take-off climb surface.

D.3.6.5 The slope of the take-off climb surface must be measured:

(a) in the vertical plane containing the centre line of the runway and its extension where straight take-off flight path are utilized;

(b) along any straight part of the take-off flight path, in the vertical plane containing the centre line of the take-off flight path or, along any curved part of the take-off flight path, in the vertical plane tangent with the take-off flight path where take-off flight paths involving turns are utilized.

D.3.6.6 On runways intended for operations of aeroplanes with a maximum certificated take-off mass up to 5 700 kg, the slope of the take-off climb surface must not be greater than, and its other dimensions not less than, those specified in Table D-14, except that:

(a) a lesser length must be adopted for the take-off climb surface where such lesser length would be consistent with procedural measures adopted to govern the outward flight of aeroplanes; and

(b) a higher slope must be adopted for the take-off climb surface where such slope would be consistent with the operational characteristics of the critical aeroplane operating out of the runway and the local conditions.

D.3.6.7 On runways intended for operations of aeroplanes with a maximum certificated take-off mass greater than 5 700 kg, the slope of the take-off climb surface must not be greater than, and its other dimensions not less than, those specified in Table 4-15, except that:

(a) a lesser length must be adopted for the take-off climb surface where such lesser length would be consistent with procedural measures adopted to govern the outward flight of aeroplanes; and

(b) a higher slope must be adopted for the take-off climb surface where such slope would be consistent with the operational characteristics of the critical aeroplane operating out

of the runway and the local conditions.

D.3.6.8 The slope of the take-off climb surface must not be increased to facilitate the growth of obstacles.

D.3.6.9 The operational characteristics of aeroplanes for which the runway is intended must be examined to see if it is desirable to reduce the slope specified in Table D-14 and Table D-15 to 1.6 per cent when critical operating conditions are to be catered to. If the specified slope is reduced, corresponding adjustment in the length of the take-off climb surface must be made so as to provide protection to a height equal to that reached with the slopes and lengths in Table D-14 and D-15.

**Table D-14. Dimensions of take-off climb surface – runways with operations of aeroplanes with a mass up to 5 700 kg**

| Aeroplane design group | I | IIA-IIB | IIC[a] | III[a] | IV[a] | V[a] |
|---|---|---|---|---|---|---|
| Distance from runway end[b] | 30 m | 60 m | - | - | - | - |
| Length of inner edge | 60 m | 80 m | - | - | - | - |
| Divergence (each side) | 10% | 10% | - | - | - | - |
| Final width | 380 m | 580 m | - | - | - | - |
| Length | 1 600 m | 2 500 m | - | - | - | - |
| Slope | 5% | 4% | - | - | - | - |

a. Aeroplanes with a mass up to but not including 5 700 kg generally belong to aeroplane design groups I, IIA and IIB.
b. The take-off climb surface starts at the end of the clearway if the clearway length exceeds the specified distance.

**Table D-15. Dimensions of take-off climb surface – runways with operations of aeroplanes with a mass above 5 700 kg**

| Aeroplane design group | I | IIA-IIB | IIC | III | IV | V |
|---|---|---|---|---|---|---|
| Distance from TODA | - | - | - | - | - | - |
| Length of inner edge | 144 m | 156 m | 156 m | 172 m | 180 m | 180 m |
| Divergence (each side) | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% |
| Final width | 1 800 m[a] | 1 800 m[a] | 1 800 m[a] | 1 800 m[a] | 1 800 m[a] | 1 800 m[a] |
| Length | 10 000 m | 10 000 m | 10 000 m | 10 000 m | 10 000 m | 10 000 m |
| Slope | 5% | 4% | 2% | 2% | 2% | 2% |

a Where given operational conditions and performances are met, the final width can be decreased. Specifications concerning this reduction are as acceptable to the Director.

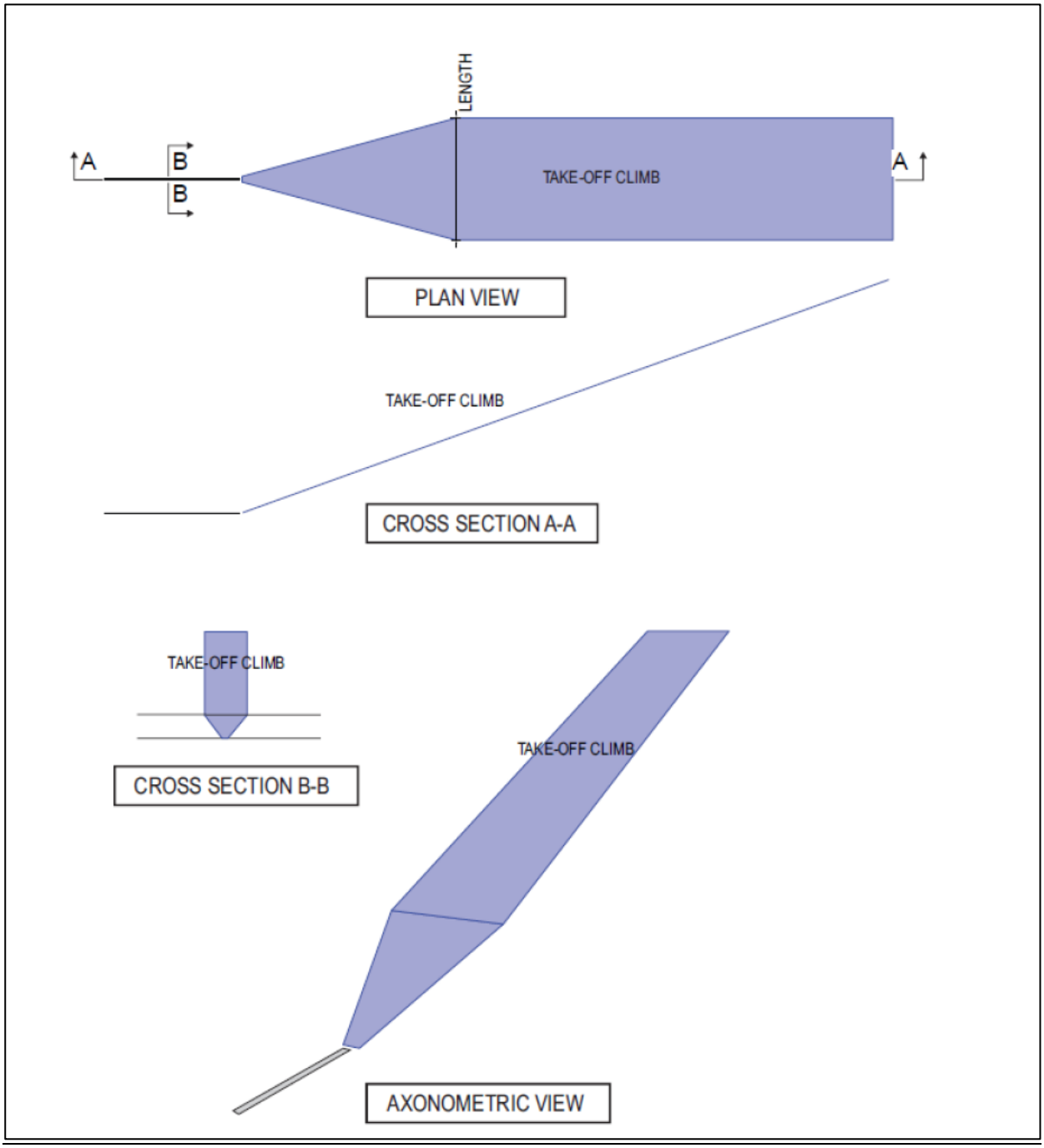



**Figure D-8 Take-off climb surface**

## D.4 Obstacle limitation requirements

***Obstacle free surfaces***

D.4.1 Fixed objects must not be permitted above the inner approach surface, inner transitional surfaces and balked landing surface and that complex surface extending between the lower edges of the inner transitional surfaces. Visual aids required for air navigation purposes or those objects required for aircraft safety purposes, and which must project into the airspace above the inner approach surface, inner transitional surfaces and balked landing surface or that complex surface extending between the lower edges of the inner transitional surfaces are permitted.

D.4.2 Visual aids required for air navigation purposes or those fixed objects required for aircraft safety purposes and which project into the airspace above the inner approach surface, inner transitional surfaces and balked landing surface or that complex surface extending between the lower edges of the inner transitional surfaces must be frangible and mounted as low as possible.

D.4.3 Mobile objects must not be permitted above the inner approach surface, inner transitional surfaces, balked landing surface and that complex surface extending between the lower edges of the inner transitional surfaces during the use of the runway for landing.

D.4.4 New objects or extensions of existing objects must not be permitted above the approach surface and transitional surfaces and the complex surface extending between the lower edges of the transitional surfaces. Equipment and installations required for air navigation or for aircraft safety purposes, and which must project into the airspace above the approach surface and transitional surfaces or that complex surface extending between the lower edges of the transitional surfaces are permitted.

D.4.5 Equipment and installations required for air navigation or for aircraft safety purposes and which must project into the airspace above the approach surface and transitional surfaces or that complex surface extending between the lower edges of the transitional surfaces must be frangible and mounted as low as possible.

D.4.6 Existing obstacles above the approach surface, and transitional surfaces or that complex surface extending between the lower edges of the transitional surfaces must as far as practicable be removed.

D.4.7 The holder of an aerodrome operating certificate must ensure that existing terrain and/or obstacles that cannot be removed and penetrate the approach surface and transitional surfaces or that complex surface extending between the lower edges of the transitional surfaces are only permitted when, after aeronautical study, it is determined that the obstacles do not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

***Obstacle evaluation surfaces***

D.4.8 The holder of an aerodrome operating certificate must ensure that obstacles penetrating the obstacle evaluation surfaces are only permitted when, after aeronautical study, it is determined that the obstacles do not adversely affect the safety or significantly affect the regularity of the existing and intended operations of aeroplanes.

## D.5 Obstacle limitation surfaces requirements

### D.5.1 Obstacle free surfaces

D.5.1.1The following obstacle free surfaces must be established for a non-instrument or non-precision approach runway:

(a) approach surface;

(b) transitional surfaces;

(c) inner approach surface; and

(d) inner transitional surfaces.

D.5.1.2The following obstacle free surfaces must be established for a precision approach runway:

(a) Approach surface;

(b) transitional surfaces;

(c) inner approach surface;

(d) inner transitional surfaces; and

(e) balked landing surface.

**D.5.2 Obstacle evaluation surfaces**

D.5.2.1 The following obstacle evaluation surfaces must be established:

(a) in case of circling approach and/or visual circuits — the horizontal surface specified in D.3.2 or a specific OES;

(b) in case of straight-in instrument approaches other than precision approaches, where the horizontal surface is not established — the surface for straight-in instrument approaches specified in D.3.3 or a specific OES;

(c) in case of precision approach procedure — the surface for precision approaches specified in D.3.4 or a specific OES;

(d) in case of instrument departure procedure — the instrument departure surface specified in D.3.5 or a specific OES;

(e) in case of take-off operations — the take-off climb surface specified in D.3.6 or a specific OES; and

(f) in case of operations different from the above — specific OES.

**D.6 Objects outside the obstacle free surfaces and obstacle evaluation surfaces**

D.6.1 In areas beyond the limits of the obstacle limitation surfaces, at least those objects which extend to a height of 100 m or more above ground elevation must be regarded as obstacles, unless an aeronautical study indicates that they do not constitute a hazard to the operations of intended aeroplane.

# APPENDIX I. AERODROME OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS

…

## I.7 Ground handling

I.7.1 The holder of an aerodrome operating certificate must regularly assess the impact of ground handling operations on aviation safety.

I.7.2 The holder of an aerodrome operating certificate must establish criteria for the safety oversight of ground handling as part of the State Safety Programme (SSP).

…

# APPENDIX A. GENERAL

## A.1 Applicability

A.1.2 The specifications, unless otherwise indicated in a particular context, must apply to all aerodromes open to public use in accordance with the requirements of Article 15 of the Chicago Convention. The specifications of Part 139 Appendix C, must apply only to land aerodromes. The specifications in this Part must apply, where appropriate, to heliports but must not apply to stolports.

~~Note. — Although there are at present no specifications relating to stolports, it is intended that specifications for these aerodromes will be included as they are developed. In the interim, guidance material on stolports is given in the Stolport Manual (Doc 9150).~~

A.1.3 Wherever a colour is referred to in this Part, the specifications for that colour ~~given in AC139-5.1 Visual Aids for Navigation – Indicators and Signalling Devices must apply~~ must be acceptable to the Director.

### A.2.1 Horizontal reference system

...

~~***Note.*** *Comprehensive guidance material concerning WGS-84 is contained in the* World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674).*~~

### A.2.2 Vertical reference system

…

~~***Note 1.*** *The geoid globally most closely approximates MSL. It is defined as the equipotential surface in the gravity field of the Earth which coincides with the undisturbed MSL extended continuously through the continents.*~~

~~***Note 2.*** *Gravity related heights (elevations) are also referred to as orthometric heights while distances of points above the ellipsoid are referred to as ellipsoidal heights.*~~

A.2.3.2 ...

~~***Note.*** *See PANS-AIM (Doc 10066), Appendix 2.*~~

A.3.1 ...

~~***Note 1.*** *A master plan represents the development plan of a specific aerodrome . It is developed by the aerodrome operator based on economic feasibility, traffic forecasts, and current and future requirements provided by, among others, aircraft operators (see A.3.3).*~~

~~***Note 2.*** *A master plan may be required when the lack of capacity at an airport, due to conditions such as, but not limited to expected traffic growth, changing weather and climatic conditions or major works to address safety or environmental concerns, would put the connectivity of a geographical area at risk or cause severe disruption to the air transport network.*~~

A.3.3 ...

~~***Note 1.*** *Provision of advanced planning data to facilitate the planning process includes future aircraft types, characteristics and numbers of aircraft expected to be used, anticipated growth of aircraft movements, and number of passengers and amount of cargo projected to be handled.*~~

~~***Note 2.*** *See Annex 9, Chapter 6 on the need for aircraft operators to inform aerodrome operators concerning the former's service, schedule and fleet plans to enable rational planning of facilities and services in relation to the traffic anticipated.*~~

~~***Note 3.*** *See* ICAO's Policies on Charges for Airports and Air Navigation Services *(Doc 9082), Section 1, regarding consultation with users concerning provision of advance planning data and protection of commercially sensitive data.*~~

A.3.5 ...

~~***Note.*** *Guidance on land-use planning and environmental control measures is contained in the* Airport Planning Manual *(Doc 9184), Part 2.*~~

## A.4 Aerodrome reference code

A.4.1 An aerodrome reference code — code number and letter — which is selected for aerodrome planning purposes ~~must~~must be determined in accordance with the characteristics of the aeroplane for which an aerodrome facility is intended.

A.4.2 The aerodrome reference code numbers and letters ~~must~~must have the meanings assigned to them in Table A-1.

A.4.3 The code number for element 1 ~~must~~must be determined from Table A-1 selecting the code number corresponding to the highest value of the aeroplane reference field lengths of the aeroplanes for which the runway is intended.

~~*Note 1. The determination of the aeroplane reference field length is solely for the selection of a code number and is not intended to influence the actual runway length provided.*~~

~~*Note 2. Guidance on determining the runway length is given in the CASA PNG Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

A.4.4 The code letter for element 2 ~~must~~must be determined from Table A-1 by selecting the code letter which corresponds to the greatest wingspan of the aeroplanes for which the facility is intended.

~~*Note. Guidance on determining the aerodrome reference code is given in the CASA PNG Advisory Circulars AC139-3.1 Physical Characteristics-Runways and AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays.*~~

~~*Note 1. Guidance on planning for aeroplanes with wingspans greater than 80m is given in the CASA PNG Advisory Circulars AC139-3.1 and AC139-3.2.*~~

~~*Note 2. Procedures on conducting an aerodrome compatibility study to accommodate aeroplanes with folding wing tips spanning two code letters are given in the PANS-Aerodromes (Doc 9981). Further guidance can be found in the manufacturer's manual on aircraft characteristics for airport planning.*~~

Table A-1. Aerodrome reference code

| Code element 1 | |
|---|---|
| Code number | Aeroplane reference field length |
| 1 | Less than 800 m |
| 2 | 800 m up to but not including 1 200 m |
| 3 | 1 200 m up to but not including 1 800 m |
| 4 | 1 800 m and over |
| **Code element 2** | |
| Code letter | Wingspan |
| A | Up to but not including 15 m |
| B | 15 m up to but not including 24 m |
| C | 24 m up to but not including 36 m |
| D | 36 m up to but not including 52 m |
| E | 52 m up to but not including 65 m |
| F | 65 m up to but not including 80 m |

## A.5 Specific procedures for aerodrome operations

A.5.1 When the aerodrome accommodates an aeroplane that exceeds the certificated characteristics of the aerodrome, the compatibility between the operation of the aeroplane and aerodrome infrastructure and operations ~~must~~must be assessed and appropriate measures developed and implemented in order to maintain an acceptable level of safety during operations.

~~***Note.** Procedures to assess the compatibility of the operation of a new aeroplane with an existing aerodrome can be found in the PANS-Aerodromes (Doc 9981).*~~

A.5.2 Information concerning alternative measures, operational procedures and operating restrictions implemented at an aerodrome arising from A.~~5~~7.1 ~~must~~must be promulgated.

~~***Note 1.** See PANS-AIM (Doc 10066), Appendix 2, AD 2.20, on the provision of a detailed description of local traffic regulations.*~~

~~***Note 2**. See PANS-Aerodromes (Doc 9981), Chapter 3, section 3.6, on promulgation of safety information.*~~

# APPENDIX B. AERODROME DATA

## B.1 Aeronautical data

B.1.1 Determination and reporting of aerodrome-related aeronautical data ~~must~~must be in accordance with the accuracy and integrity classification required to meet the needs of the end-users of aeronautical data.

~~*Note. — Specifications concerning the accuracy and integrity classification related to aerodrome-related aeronautical data are contained in CASA Advisory Circular AC139-2 Aerodrome Data.*~~

B.1.2 Aerodrome mapping data ~~may~~must be made available to the aeronautical information services for aerodromes deemed relevant where safety and/or performance-based operations suggest possible benefits.

~~*Note 1. — Aerodrome mapping databases related provisions are contained in CASA Advisory Circular AC139-2 Aerodrome Data.*~~

~~*Note 2. — Guidance material concerning the application of aerodrome mapping databases is provided in CASA Advisory Circular AC139-2 Aerodrome Data.*~~

B.1.3 Where made available in accordance with B.1.2, the selection of the aerodrome mapping data features to be collected ~~must~~must be made with consideration of the intended applications.

~~*Note 1. — It is intended that the selection of the features to be collected match a defined operational need.*~~

~~*Note 2. — Aerodrome mapping databases can be provided at one of two levels of quality — fine or medium. These levels and the corresponding numerical requirements are defined in RTCA Document DO-272B and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-99C — User Requirements for Aerodrome Mapping Information.*~~

B.1.4 Digital data error detection techniques ~~must~~must be used during the transmission and/or storage of aeronautical data and digital data sets.

~~*Note. — Detailed specifications concerning digital data error detection techniques are contained in CASA Advisory Circular AC139-2 Aerodrome Data.*~~

## B.3 Aerodrome and runway elevations

B.3.3 For precision approach runway, the elevation and geoid undulation of the threshold, the elevation of the runway end and the highest elevation of the touchdown zone ~~must~~must be measured to the accuracy of one-quarter metre or foot and reported to the aeronautical information services authority.

~~*Note. — Geoid undulation must be measured in accordance with the appropriate system of coordinates.*~~

## B.5 Aerodrome dimensions and related information

…

B.5.5 The geographical coordinates of obstacles in Area 2 (the part within the aerodrome boundary) and in Area 3 ~~must~~must be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and tenths of seconds. In addition, the top elevation, type, marking and lighting (if any) of obstacles ~~must~~must be reported to the aeronautical information services authority.

~~*Note. CASA Advisory Circular AC139-2 Aerodrome Data, provides requirements for obstacle data determination in Areas 2 and 3.*~~

## B.6 Strength of pavements.

…

B.6.2 The bearing strength of a pavement intended for aircraft of apron (ramp) mass greater than 5 700 kg ~~must~~must be made available using the aircraft classification rating-pavement classification rating (ACR-PCR) method by reporting all of the following information:

…

~~***Note.*** *Guidance on reporting and publishing of PCRs is contained in the CASA Advisory Circular AC139-3.3 Pavement Bearing Strength.*~~

B.6.3 The PCR reported ~~must~~must indicate that aircraft with an aircraft classification rating (ACR) equal to or less than the reported PCR may operate on the pavement subject to any limitation on the tire pressure or aircraft all-up mass for specified aircraft type(s).

~~***Note****. Different PCRs may be reported if the strength of the pavement is subject to significant seasonal variation.*~~

B.6.4 The ACR of an aircraft ~~must~~must be determined in accordance with the standard procedures associated with the ACR-PCR method.

~~***Note****. The standard procedures for determining the ACR of an aircraft are given in the CASA Advisory Circular AC139-3.3 Pavement Bearing Strength-3. For convenience, dedicated software is available on the ICAO website for computing any aircraft ACR at any mass on rigid and flexible pavements for the four standard subgrade strength categories detailed in B.6.6(b) below.*~~

…

B.6.6 Information on pavement type for ACR-PCR determination, subgrade strength category, maximum allowable tire pressure category and evaluation method ~~must~~must be reported using the following codes:

*(a) ...*

~~*Note. If the actual construction is composite or non-standard, include a note to that effect (see example 2 below).*~~

…

(c) ...

~~*Note. See Note 5 to J.2.1 where the pavement is used by aircraft with tire pressures in the upper categories.*~~

(d) ...

~~***Note**. The following examples illustrate how pavement strength data are reported under the ACR-PCR method. Further guidance on this topic is contained in the Aerodrome Design Manual (Doc 9157), Part 3.*~~

...

~~*Note. Composite construction.*~~

B.6.7 Criteria ~~must~~must be established to regulate the use of a pavement by an aircraft with an ACR higher than the PCR reported for that pavement in accordance with B.6.2 and B.6.3.

~~*Note. CASA Advisory Circular AC139-3.3 Pavement Bearing Strength, includes the descriptions of more detailed procedures for evaluation of pavements and their suitability for restricted overload operations.*~~

## B.7 Pre-flight altimeter check location

…

B.7.2 A pre-flight check location ~~must~~must be located on an apron.

~~*Note 1. Locating a pre-flight altimeter check location on an apron enables an altimeter check to be made prior to obtaining taxi clearance and eliminates the need for stopping for that purpose after leaving the apron.*~~

~~*Note 2. Normally an entire apron can serve as a satisfactory altimeter check location.*~~

## B.8 Declared distances

B.8 The following distances ~~must~~must be calculated to the nearest metre or foot for a runway intended for use by international or domestic commercial air transport:

…

~~*Note. Guidance on calculation of declared distances is given in CASA Advisory Circular AC139-3.1 Physical Characteristics - Runways.*~~

## B.9 Condition of the movement area and related facilities

B.9.1 Information on the condition of the movement area and the operational status of related facilities ~~must~~must be provided to the appropriate aeronautical information services units, and similar information of operational significance to the air traffic services units, to enable those units to provide the necessary information to arriving and departing aircraft. The information ~~must~~must be kept up to date and changes in conditions reported without delay.

~~*Note. — The nature, format and conditions of the information to be provided are specified in the PANS-AIM (Doc 10066) and the PANS-ATM (Doc 4444). Specific procedures pertaining to works in progress on the movement area and to the reporting of such works are included in the PANS-Aerodromes (Doc 9981).*~~

B.9.2 The condition of the movement area and the operational status of related facilities ~~must~~must be monitored, and reports on matters of operational significance affecting aircraft and aerodrome operations ~~must~~must be provided in order to take appropriate action, particularly in respect of the following:

…

~~*Note 1. — Other contaminants may include mud, dust, sand, volcanic ash, oil and rubber. Procedures for monitoring and reporting the conditions of the movement area are included in the PANS-Aerodromes (Doc 9981).*~~

~~*Note 2. — The Aeroplane Performance Manual (Doc 10064) provides guidance on aircraft performance calculation requirements regarding the description of runway surface conditions in B.9.2(c), (d) and (e).*~~

~~*Note 3. — Origin and evolution of data, assessment process and the procedures are prescribed in the PANS-Aerodromes (Doc 9981). These procedures are intended to fulfil the requirements to achieve the desired level of safety for aeroplane operations prescribed by Annex 6 and Annex 8 and to provide the information fulfilling the syntax requirements for dissemination specified in Annex 15, PANS-AIM (Doc 10066) and the PANS-ATM (Doc 4444).*~~

B.9.3 To facilitate compliance with B.9.1 and B.9.2, the following inspections ~~must~~must be carried out each day:

…

~~*Note 1. — Procedures on carrying out daily inspections of the movement area are given in the PANS-Aerodromes (Doc 9981). Further guidance is available in the CASA Advisory Circular AC139-9.6 Operational Services – Surface Movement Guidance and Control System.*~~

~~*Note 2. — The PANS-Aerodromes (Doc 9981) contains clarifications on the scope of a significant change in the runway surface conditions.*~~

B.9.4 Personnel assessing and reporting runway surface conditions required in B.9.2 and B.9.5 ~~must~~must be trained and competent to perform their duties.

~~*Note 1. — Guidance on training of personnel is given in Attachment A, Section 6.*~~

~~*Note 2. Information on training for personnel assessing and reporting runway surface conditions is available in the PANS-Aerodromes (Doc 9981).*~~

### *Runway surface condition(s) for use in the runway condition report*

B.9.5 The runway surface condition ~~must~~must be assessed and reported through a runway condition code (RWYCC) and a description using the following terms:

…

~~*Note 1. The runway surface conditions are those conditions for which, by means of the methods described in the PANS-Aerodromes (Doc 9981), the flight crew can derive appropriate aeroplane performance.*~~

~~*Note 2. The conditions, either singly or in combination with other observations, are criteria for which the effect on aeroplane performance is sufficiently deterministic to allow assignment of a specific runway condition code.*~~

~~*Note 3. The terms CHEMICALLY TREATED and LOOSE SAND do not appear in the aeroplane performance section but are used in the situational awareness section of the runway condition report.*~~

B.9.6 Whenever an operational runway is contaminated, an assessment of the contaminant depth and coverage over each third of the runway ~~must~~must be made and reported.

~~*Note. Procedures on depth and coverage reporting are found in the PANS-Aerodromes (Doc 9981).*~~

B.9.9 Information that a runway or portion thereof is slippery wet ~~must~~must be made available.

~~*Note 1. The surface friction characteristics of a runway or a portion thereof can be degraded due to rubber deposits, surface polishing, poor drainage or other factors. The determination that a runway or portion thereof is slippery wet stems from various methods used solely or in combination. These methods may be functional friction measurements, using a continuous friction measuring device, that fall below a minimum standard as acceptable to the Director, observations by aerodrome maintenance personnel, repeated reports by pilots and aircraft operators based on flight crew experience, or through analysis of aeroplane stopping performance that indicates a substandard surface. Supplementary tools to undertake this assessment are described in the PANS-Aerodromes (Doc 9981).*~~

~~*Note 2. See B.9.1 and B.13 concerning the provision of information to, and coordination between, appropriate authorities.*~~

B.9.10 Notification ~~must~~must be given to relevant aerodrome users when the friction level of a paved runway or portion thereof is less than the minimum friction level acceptable to the Director in accordance with J.2.3.

~~*Note 1. Guidance on determining and expressing the minimum friction level is provided*~~

~~*in Assessment, Measurement and Reporting of Runway Surface Conditions (Cir 355).*~~

~~*Note 2. — Procedures on conducting a runway surface friction characteristics evaluation programme are provided in the PANS-Aerodromes (Doc 9981).*~~

~~*Note 3. — Information to be promulgated in a NOTAM includes specifying which portion of the runway is below the minimum friction level and its location on the runway.*~~

## B.10 Disabled aircraft removal

~~*Note. — See I.3 for information on disabled aircraft removal services.*~~

B.10.1 The telephone/telex number(s) of the office of the aerodrome coordinator of operations for the removal of an aircraft disabled on or adjacent to the movement area ~~must~~must be made available, on request, to aircraft operators.

B.10.2 Information concerning the capability to remove an aircraft disabled on or adjacent to the movement area ~~must~~must be made available.

~~*Note. — The capability to remove a disabled aircraft may be expressed in terms of the largest type of aircraft which the aerodrome is equipped to remove.*~~

## B.11 Rescue and firefighting

~~*Note. — See I.2 for information on rescue and firefighting services.*~~

…

B.11.3 Changes in the level of protection normally available at an aerodrome for rescue and firefighting ~~must~~must be notified to the appropriate air traffic services units and aeronautical information services units to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been corrected, the above units ~~must~~must be advised accordingly.

~~*Note. — Changes in the level of protection from that normally available at the aerodrome could result from a change in the availability of extinguishing agents, equipment to deliver the agents or personnel to operate the equipment, etc.*~~

## B.13 Coordination between aeronautical information services and aerodrome authorities

…

B.13.3 Of a particular importance are changes to aeronautical information that affect charts and/or computer-based navigation systems which qualify to be notified by the aeronautical information regulation and control (AIRAC) system, ~~as specified in CASA Advisory Circular AC139-2 Aerodrome Data~~, as acceptable to the Director. The predetermined, internationally agreed AIRAC effective dates ~~must~~must be observed by the responsible aerodrome services when submitting the raw information/data to aeronautical information services.

~~*Note. — Detailed specifications concerning the AIRAC system are contained in CASA*~~

~~*Advisory Circular AC139-2 Aerodrome Data.*~~

B.13.4 The aerodrome services responsible for the provision of raw aeronautical information/data to the aeronautical information services ~~must~~must do that while taking into account accuracy and integrity requirements necessary to meet the needs of the end-user of aeronautical data.

~~*Note 1. — Specifications concerning the accuracy and integrity classification of aerodrome-related aeronautical data are contained in CASA Advisory Circular AC139-2 Aerodrome Data.*~~

~~*Note 2. — Specifications for the issue of NOTAM is contained in CASA Advisory Circular AC139-2 Aerodrome Data.*~~

~~*Note 3. — AIRAC information is distributed by the AIS at least 42 days in advance of the AIRAC effective dates with the objective of reaching recipients at least 28 days in advance of the effective date.*~~

~~*Note 4. — The schedule of the predetermined internationally agreed AIRAC common effective dates at intervals of 28 days and guidance for the AIRAC use are contained in the Aeronautical Information Services Manual (Doc 8126, Chapter 2).*~~

## C.1 Runways

### Number and orientation of runways

C.1.1 The number and orientation of runways ~~must~~must be such that the usability factor of the aerodrome is not less than 95 percent for the aeroplanes that the aerodrome is intended to serve.

C.1.2 The siting and orientation of runways ~~must~~must, where possible, be such that the arrival and departure tracks minimize interference with areas approved for residential use and other noise-sensitive areas close to the aerodrome in order to avoid future noise problems.

~~*Note. — Guidance on how to address noise problems is provided in the Airport Planning Manual (Doc 9184), Part 2, and in Guidance on the Balanced Approach to Aircraft Noise Management (Doc 9829).*~~

C.1.3 Choice of maximum permissible crosswind components

In the application of C.1.1 it ~~may~~must be assumed that landing or take-off of aeroplanes is, in normal circumstances, precluded when the crosswind component exceeds:

…

~~*Note. — In CASA Advisory Circular AC139-3.1 Physical Characteristics — Runways., guidance is given on factors affecting the calculation of the estimate of the usability factor and allowances which may have to be made to take account of the effect of unusual circumstances.*~~

C.1.4 Data to be used

The selection of data to be used for the calculation of the usability factor ~~must~~must be based on reliable wind distribution statistics that extend over as long a period as possible, preferably of not less than five years. The observations used ~~must~~must be made at least eight times daily and spaced at equal intervals of time.

~~*Note. These winds are mean winds. Reference to the need for some allowance for gusty conditions is made in CASA Advisory Circular AC139-3.1 Physical Characteristics – Runways.*~~

## *Location of threshold*

C.1.5 A threshold ~~must~~must be located at the extremity of a runway unless operational considerations justify the choice of another location.

~~*Note. Guidance on the siting of the threshold is given in CASA Advisory Circular AC139-3.1 Physical Characteristics – Runways.*~~

C.1.6 When it is necessary to displace a threshold either permanently or temporarily, from its normal location, account ~~must~~must be taken of the various factors which may have a bearing on the location of the threshold. Where this displacement is due to an unserviceable runway condition, a cleared and graded area of at least 60m in length ~~must~~must be available between the unserviceable area and the displaced threshold. Additional distance ~~must~~must also be provided to meet the requirements of the runway end safety area as appropriate.

~~*Note. Guidance on factors which may be considered in the determination of the location of a displaced threshold is given in CASA Advisory Circular AC139-3.1 Physical Characteristics – Runways.*~~

## *Actual length of runways*

C.1.7 Primary runway

Except as provided in C.1.9, the actual runway length to be provided for a primary runway ~~must~~must be adequate to meet the operational requirements of the aeroplanes for which the runway is intended and ~~must~~must be not less than the longest length determined by applying the corrections for local conditions to the operations and performance characteristics of the relevant aeroplanes.

~~*Note 1. This specification does not necessarily mean providing for operations by the critical aeroplane at its maximum mass.*~~

~~*Note 2. Both take-off and landing requirements need to be considered when determining the length of runway to be provided and the need for operations to be conducted in both directions of the runway.*~~

~~*Note 3. Local conditions that may need to be considered include elevation, temperature, runway slope, humidity and the runway surface characteristics.*~~

~~*Note 4. When performance data on aeroplanes for which the runway is intended are not known, guidance on the determination of the actual length of a primary runway by*~~

~~*application of general correction factors is given in the CASA PNG Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

C.1.9 Runways with stopway or clearways

Where a runway is associated with a stopway or clearway, an actual runway length less than that resulting from application of C.1.7 or C.1.8, as appropriate, ~~must~~must be considered satisfactory, but in such a case any combination of runway, stopway and clearway provided ~~must~~must permit compliance with the operational requirements for take-off and landing of the aeroplanes the runway is intended to serve.

~~*Note. — Guidance on use of stopways and clearways is given in CASA Advisory Circular AC139-3.1 Physical Characteristics — Runways.*~~

***Width of runways***

C.1.10 The width of a runway ~~must~~must be not less than the appropriate dimension specified in the following tabulation:

…

~~*Note 1. — The combinations of code numbers and OMGWS for which widths are specified have been developed for typical aeroplane characteristics.*~~

~~*Note 2. — Factors affecting runway width are given in the CASA PNG Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

~~*Note 3. — See 3.2 concerning the provision of runway shoulders, in particular for Code F aeroplanes with four (or more) engines.*~~

***Minimum distance between parallel runways***

C.1.11 Where parallel non-instrument runways are intended for simultaneous use, the minimum distance between their centre lines ~~must~~must be:

…

~~*Note. — Procedures for wake turbulence categorization of aircraft and wake turbulence separation minima are contained in the PANS-ATM (Doc 4444), Appendix D, D.9, and Appendix E, E.8, respectively.*~~

C.1.12 Where parallel instrument runways are intended for simultaneous use subject to conditions ~~specified in the PANS-ATM (Doc 4444) and the PANS-OPS (Doc 8168), Volume I~~ acceptable to the Director, the minimum distance between their centre lines ~~must~~must be:

…

~~*Note. — Procedures and facilities requirements for simultaneous operations on parallel or near-parallel instrument runways are contained in the PANS-ATM (Doc 4444), Chapter 6 and the PANS-OPS (Doc 8168), Volume I, Part III, Section 2, and*~~

~~*Volume II, Part I, Section 3; Part II, Section 1; and Part III, Section 3, and relevant guidance is contained in the Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR) (Doc 9643).*~~

C.1.15 Longitudinal slope changes

Where slope changes cannot be avoided, a slope change between two consecutive slopes ~~must~~must not exceed:

…

~~*Note. Guidance on slope changes before a runway is given in CASA Advisory Circular AC139-3.1 Physical Characteristics Runways.*~~

C.1.16 The transition from one slope to another ~~must~~must be accomplished by a curved surface with a rate of change not exceeding:

(a) 0.1 percent per 30m (minimum radius of curvature of 30000m) where the code number is 4;

…

C.1.17 Sight distance

Where slope changes cannot be avoided, they ~~must~~must be such that there will be an unobstructed line of sight from:

…

~~*Note. Consideration will have to be given to providing an unobstructed line of sight over the entire length of a single runway where a full-length parallel taxiway is not available. Where an aerodrome has intersecting runways, additional criteria on the line of sight of the intersection area would need to be considered for operational safety. See the CASA PNG Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

C.1.18 Distance between slope changes

Undulations or appreciable changes in slopes located close together along a runway ~~must~~must be avoided. The distance between the points of intersection of two successive curves ~~must~~must not be less than:

…

~~*Note. Guidance on implementing this specification is given in CASA Advisory Circular AC139-3.1 Physical Characteristics Runways.*~~

C.1.19 Transverse Slopes

To promote the most rapid drainage of water the runway surface ~~must~~must, if practicable, be cambered except where a single crossfall from high to low in the direction of the wind most

frequently associated with rain would ensure rapid drainage. The transverse slope ~~must~~must ideally be:

…

~~*Note. On wet runways with crosswind conditions the problem of aquaplaning from poor drainage is apt to be accentuated. Additional guidance is included in the CASA Advisory Circular AC139-3.1 Physical Characteristics – Runways and AC139-3.3 Pavement Bearing Strength.*~~

C.1.20 The transverse slope ~~must~~must be substantially the same throughout the length of a runway except at an intersection with another runway or a taxiway where an even transition ~~must~~must be provided taking account of the need for adequate drainage.

~~*Note. Guidance on transverse slope is given in the CASA Advisory Circular AC139-3.3 Pavement Bearing Strength.*~~

***Surface of runways***

C.1.22 The surface of a runway ~~must~~must be constructed without irregularities that would impair the runway surface friction characteristics or otherwise adversely affect the take-off or landing of an aeroplane.

~~*Note 1. Surface irregularities may adversely affect the take-off or landing of an aeroplane by causing excessive bouncing, pitching, vibration, or other difficulties in the control of an aeroplane.*~~

~~*Note 2. Guidance on design tolerances and other information is given in CASA Advisory Circular AC139-3.1 Physical Characteristics – Runways.. Additional guidance is included in the CASA Advisory Circular AC139-3.3 Pavement Bearing Strength.*~~

C.1.24 The surface of a paved runway ~~must~~must be evaluated when constructed or resurfaced to determine that the surface friction characteristics achieve the design objectives.

~~*Note. Additional guidance is included in the CASA Advisory Circular AC139-9.13 Operational Services – Pavement Surface Condition.*~~

C.1.25 Measurements of the surface friction characteristics of a new or resurfaced paved runway ~~must~~must be made with a continuous friction measuring device using self-wetting features.

~~*Note. Additional guidance is included in the CASA Advisory Circular AC139-9.13 Operational Services – Pavement Surface Condition.*~~

C.1.26 The average surface texture depth of a new surface ~~must~~must be not less than 1.0mm.

~~*Note 1. Macrotexture and microtexture are taken into consideration in order to provide the required surface friction characteristics. Guidance on surface design is given in Attachment A, Section 7.*~~

~~*Note 2. Guidance on methods used to measure surface texture is given in the CASA*~~

~~*Advisory Circular AC139-9.13 Operational Services – Pavement Surface Condition.*~~

~~*Note 3. Guidance on design and methods for improving surface texture is given in the Aerodrome Design Manual (Doc 9157), Part 3.*~~

C.1.27 When the surface is grooved or scored, the grooves or scorings ~~must~~must be either perpendicular to the runway centre line or parallel to non-perpendicular transverse joints, where applicable.

~~*Note. Guidance on methods for improving the runway surface texture is given in the CASA Advisory Circular AC139-3.3 Pavement Bearing Strength.*~~

## C.2 Runway shoulders

***General***

~~*Note. Guidance on characteristics and treatment of runway shoulders is given in Attachment A, Section 8, and in the CASA Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

***Strength of runway shoulders***

C.2.4 The portion of a runway shoulder between the runway edge and a distance of 30m from the runway centre line ~~must~~must be prepared or constructed so as to be capable, in the event of an aeroplane running off the runway, of supporting the aeroplane without inducing structural damage to the aeroplane and of supporting ground vehicles which may operate on the shoulder.

~~*Note. Guidance on characteristics and treatment of runway shoulders is given in Attachment A, Section 8, and in the CASA Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

***Surface of runway shoulders***

…

C.2.6 Runway shoulders for code letter F aeroplanes ~~must~~must be paved to a minimum overall width of runway and shoulder of not less than 60m.

~~*Note. Guidance on surface of runway shoulders is given in the Aerodrome Design Manual, (Doc 9157), Part 1.*~~

## C.3 Runway turn pads

***General***

…

C.3.2 Where the end of a runway is not served by a taxiway or a taxiway turnaround and where the code letter is D, E or F, a runway turn pad ~~must~~must be provided to facilitate a 180-degree

turn of aeroplanes. (See Figure C-1.)

~~*Note 1. Such areas may also be useful if provided along a runway to reduce taxiing time and distance for aeroplanes which may not require the full length of the runway.*~~

~~*Note 2. Guidance on the design of the runway turn pads is available in the CASA Advisory Circular AC139-3.1 Physical Characteristics-Runways. Guidance on taxiway turnaround as an alternate facility is available in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays.*~~

C.3.3 The runway turn pad ~~must~~must be located on either the left or right side of the runway and adjoining the runway pavement at both ends of the runway and at some intermediate locations where deemed necessary.

~~*Note. The initiation of the turn would be facilitated by locating the turn pad on the left side of the runway, since the left seat is the normal position of the pilot-in-command.*~~

C.3.6 The design of a runway turn pad ~~must~~must be such that, when the cockpit of the aeroplane for which the turn pad is intended remains over the turn pad marking, the clearance distance between any wheel of the aeroplane landing gear and the edge of the turn pad ~~must~~must be not less than that given by the following tabulation:

…

~~*Note. Wheel base means the distance from the nose gear to the geometric centre of the main gear.*~~

***Strength of runway turn pads***

C.3.8 The strength of a runway turn pad ~~must~~must be at least equal to that of the adjoining runway which it serves, due consideration being given to the fact that the turn pad will be subjected to slow-moving traffic making hard turns and consequent higher stresses on the pavement.

~~*Note. Where a runway turn pad is provided with flexible pavement, the surface would need to be capable of withstanding the horizontal shear forces exerted by the main landing gear tires during turning manoeuvres.*~~

***Shoulders for runway turn pads***

C.3.11 The runway turn pads ~~must~~must be provided with shoulders of such width as is necessary to prevent surface erosion by the jet blast of the most demanding aeroplane for which the turn pad is intended, and any possible foreign object damage to the aeroplane engines.

~~*Note. As a minimum, the width of the shoulders would need to cover the outer engine of the most demanding aeroplane and thus may be wider than the associated runway shoulders.*~~

C.4.5 A strip including a non-instrument runway ~~must~~must extend on each side of the centre line of the runway and its extended centre line throughout the length of the strip, to a distance of at least:

(a) 75m where the code number is ~~3 or~~ 4;

(b) ~~40m where the code number is 2; and~~55 m where the code number is 3;

(~~b~~c) 40m where the code number is 2; and

(~~c~~d) 30m where the code number is 1.

***Objects on runway strips***

~~*Note. See I.9 for information regarding siting of equipment and installations on runway strips.*~~

C.4.6 An object situated on a runway strip which may endanger aeroplanes ~~must~~must be regarded as an obstacle and ~~must~~must, as far as practicable, be removed.

~~*Note 1. Consideration will have to be given to the location and design of drains on a runway strip to prevent damage to an aeroplane accidentally running off a runway. Suitably designed drain covers may be required. For further guidance, see the CASA Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

~~*Note 2. Where open-air or covered storm water conveyances are installed, consideration will have to be given to ensure that their structure does not extend above the surrounding ground so as not to be considered an obstacle. See also Note 1 to C.4.16.*~~

~~*Note 3. Particular attention needs to be given to the design and maintenance of an open-air storm water conveyance in order to prevent wildlife attraction, notably birds. If needed, it can be covered by a net. Procedures on wildlife management are specified in the PANS-Aerodromes (Doc 9981). Further guidance can be found in the CASA Advisory Circular AC139-3.3 Pavement Bearing Strength.*~~

C.4.7 No fixed object, other than visual aids required for air navigation or those required for aircraft safety purposes and which ~~must~~must be sited on the runway strip, and satisfying the relevant frangibility requirement in Appendix E, ~~must~~must be permitted on any part of a runway strip of a precision approach runway delineated by the lower edges of the inner transitional surfaces. No mobile object ~~must~~must be permitted on this part of the runway strip during the use of the runway for landing or take-off.

~~*Note. See Appendix D, section D.1, for characteristics of inner transitional surfaces.*~~

***Grading of runway strips***

C.4.8 That portion of a strip of an instrument runway within a distance of at least:

(a) 75m where the code number is 3 or 4; and

(b) 40m where the code number is 1 or 2;

from the centre line of the runway and its extended centre line ~~must~~must provide a graded area for aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway.

~~*Note. Guidance on grading of a greater area of a strip including a precision approach runway where the code number is 3 or 4 is given in Attachment A, Section 8.*~~

C.4.9 That portion of a strip of a non-instrument runway within a distance of at least:

(a) 75 m where the code number is ~~3 or~~ 4;

(b) ~~40 m where the code number is 2~~55 m where the code number is 3; ~~and~~

(~~b~~c) 40 m where the code number is 2; and

(~~c~~d) 30 m where the code number is 1;

from the centre line of the runway and its extended centre line ~~must~~must provide a graded area for aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway.

C.4.11 That portion of a strip to at least 30m before the start of a runway ~~must~~must be prepared against blast erosion in order to protect a landing aeroplane from the danger of an exposed edge.

~~*Note 1. The area provided to reduce the erosive effects of jet blast and propeller wash may be referred to as a blast pad.*~~

~~*Note 2. Guidance on protection against aeroplane engine blast is available in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays.*~~

C.4.16 The transverse slopes of any portion of a strip beyond that to be graded ~~must~~must not exceed an upward slope of 5 percent as measured in the direction away from the runway.

~~*Note 1. Where deemed necessary for proper drainage, an open-air storm water conveyance may be allowed in the non-graded portion of a runway strip and would be placed as far as practicable from the runway.*~~

~~*Note 2. The aerodrome rescue and firefighting (RFF) procedure would need to take into account the location of openair water conveyances within the non-graded portion of a runway strip.*~~

***Strength of runway strips***

C.4.17 That portion of a strip of an instrument runway within a distance of at least:

(a) 75m where the code number is 3 or 4; and

(b) 40m where the code number is 1 or 2;

from the centre line of the runway and its extended centre line ~~must~~must be so prepared or constructed as to minimize hazards arising from differences in load-bearing capacity to aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway.

~~*Note. Guidance on preparation of runway strips is given in the CASA Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

C.4.18 That portion of a strip containing a non-instrument runway within a distance of at least:

(a) 75 m where the code number is ~~3 or~~ 4;

(b) ~~40 m where the code number is 2; and~~ 55 m where the code number is 3;

(~~b~~c) 40 m where the code number is 2; and

(~~c~~d) 30 m where the code number is 1;

from the centre line of the runway and its extended centre line ~~must~~must be so prepared or constructed as to minimize hazards arising from differences in load-bearing capacity to aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway.

## C.5 Runway end safety areas

***General***

C.5.1 A runway end safety area ~~must~~must be provided at each end of a runway strip where:

…

~~*Note. Guidance on runway end safety areas is given in Attachment A, Section 9.*~~

…

***Dimensions of runway end safety areas***

C.5.3 A runway end safety area ~~must~~must extend from the end of a runway strip to a distance of at least 90m where:

…

~~*Note. Guidance on arresting systems is given in CASA Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

C.5.6 The width of a runway end safety area ~~must~~must, wherever practicable, be equal to that of the graded portion of the associated runway strip.

**Objects on runway safety areas**

~~*Note. See I.9 for information regarding siting of equipment and installations on runway end safety areas.*~~

***Clearing and grading of runway end safety areas***

C.5.8 A runway end safety area ~~must~~must provide a cleared and graded area for aeroplanes which the runway is intended to serve in the event of an aeroplane undershooting or overrunning the runway.

~~*Note. The surface of the ground in the runway end safety area does not need to be prepared to the same quality as the runway strip. See, however, C.5.12.*~~

***Strength of runway end safety areas***

C.5.12 A runway end safety area ~~must~~must be so prepared or constructed as to reduce the risk of damage to an aeroplane undershooting or overrunning the runway, enhance aeroplane deceleration and facilitate the movement of rescue and firefighting vehicles as required in I.2.33 to I.2.35.

~~*Note. Guidance on the strength of a runway end safety area is given in the CASA Advisory Circular AC139-3.1 Physical Characteristics-Runways.*~~

## C.6 Clearways

~~*Note. The inclusion of detailed specifications for clearways in this section is not intended to imply that a clearway has to be provided. CASA Advisory Circular AC139-3.1 Physical Characteristics-Runways, provides information on the use of clearways.*~~

…

C.6.4 The ground in a clearway ~~must~~must not project above a plane having an upward slope of 1.25 percent, the lower limit of this plane being a horizontal line which:

…

~~***Note.*** *Because of transverse or longitudinal slopes on a runway, shoulder or strip, in certain cases the lower limit of the clearway plane specified above may be below the corresponding elevation of the runway, shoulder or strip. It is not intended that these surfaces be graded to conform with the lower limit of the clearway plane nor is it intended that terrain or objects which are above the clearway plane beyond the end of the strip but below the level of the strip be removed unless it is considered they may endanger aeroplanes.*~~

C.6.5 Abrupt upward changes in slope ~~must~~must be avoided when the slope on the ground in a clearway is relatively small or when the mean slope is upward. In such situations, in that portion of the clearway within a distance of 22.5m or half the runway width whichever is greater on each side of the extended centre line, the slopes, slope changes and the transition from runway to clearway ~~must~~must generally conform with those of the runway with which the clearway is associated.

**Objects on clearways**

~~*Note. See I.9 for information regarding siting of equipment and installations on clearways.*~~

…

## C.7 Stopways

~~*Note. The inclusion of detailed specifications for stopways in this section is not intended to imply that a stopway has to be provided. Attachment A, Section 2, provides information*~~

~~*on the use of stopways.*~~

…

***Strength of stopways***

C.7.3 A stopway ~~must~~must be prepared or constructed so as to be capable, in the event of an abandoned take-off, of supporting the aeroplane which the stopway is intended to serve without inducing structural damage to the aeroplane.

~~*Note. — Attachment A, Section 2, presents guidance relative to the support capability of a stopway.*~~

…

***Longitudinal slope changes***

C.8.4 On a radio altimeter operating area slope changes ~~must~~must be avoided or kept to a minimum. Where slope changes cannot be avoided, the slope changes must be as gradual as practicable and abrupt changes or sudden reversals of slopes avoided. The rate of change between two consecutive slopes ~~must~~must not exceed 2 percent per 30m.

~~*Note. — Guidance on radio altimeter operating area is given in CASA Advisory Circular AC139-3.1 Physical Characteristics-Runways and in the Manual of AllWeather Operations, (Doc 9365), Section 5.2. Guidance on the use of radio altimeter is given in the PANS-OPS, Volume II, Part II, Section 1.*~~

## C.9 Taxiways

~~*Note 1. — Unless otherwise indicated, the requirements in this section are applicable to all types of taxiways.*~~

~~*Note 2. — See section E.4.3 for a standardized scheme for the nomenclature of taxiways which may be used to improve situational awareness and as a part of an effective runway incursion prevention measure.*~~

~~*Note 3. — See Attachment A, Section 21, for specific taxiway design guidance which may assist in the prevention of runway incursions when developing a new taxiway or improving existing ones with known runway incursion safety risks.*~~

***General***

C.9.3 The design of a taxiway ~~must~~must be such that, when the cockpit of the aeroplane for which the taxiway is intended remains over the taxiway centre line markings, the clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway ~~must~~must be not less than that given by the following tabulation:

…

~~*Note. — Wheel base means the distance from the nose gear to the geometric centre of the main gear.*~~

***Width of taxiways***

C.9.4 A straight portion of a taxiway ~~must~~must have a width of not less than that given by the following tabulation:

…

~~*Note. Guidance on width of taxiways is given in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

***Taxiway curves***

C.9.5 Changes in direction of taxiways ~~must~~must be as few and small as possible. The radii of the curves ~~must~~must be compatible with the manoeuvring capability and normal taxiing speeds of the aeroplanes for which the taxiway is intended. The design of the curve ~~must~~must be such that, when the cockpit of the aeroplane remains over the taxiway centre line markings, the clearance distance between the outer main wheels of the aeroplane and the edge of the taxiway ~~must~~must not be less than those specified in C.9.3.

…

~~*Note 1. An example of widening taxiways to achieve the wheel clearance specified is illustrated in Figure C-2. Guidance on the values of suitable dimensions is given in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

~~*Note 2. The location of taxiway centre line markings and lights is specified in E.2.8.6 and E.3.17.12.*~~

~~*Note 3. Compound curves may reduce or eliminate the need for extra taxiway width.*~~

***Junctions and intersections***

C.9.6 To facilitate the movement of aeroplanes, fillets ~~must~~must be provided at junctions and intersections of taxiways with runways, aprons and other taxiways. The design of the fillets ~~must~~must ensure that the minimum wheel clearances specified in C.9.3 are maintained when aeroplanes are manoeuvring through the junctions or intersections.

~~*Note. Consideration will have to be given to the aeroplane datum length when designing fillets. Guidance on the design of fillets and the definition of the term aeroplane datum length are given in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

***Taxiway minimum separation distances***

C.9.7 The separation distance between the centre line of a taxiway and the centre line of a runway, the centre line of a parallel taxiway or an object ~~must~~must not be less than the appropriate dimension specified in Table C-1, except that it is permissible to operate with lower separation distances at an existing aerodrome if an aeronautical study indicates that such lower separation

distances do not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

~~*Note 1. Guidance on factors which may be considered in the aeronautical study is given in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

~~*Note 2. ILS and MLS installations may also influence the location of taxiways due to interferences to ILS and MLS signals by a taxiing or stopped aircraft. Information on critical and sensitive areas surrounding ILS and MLS installations is contained in Annex 10 Aeronautical Telecommunications, Volume I Radio Navigation Aids, Attachments C and G (respectively).*~~

~~*Note 3. The separation distances of Table C-1, column 10, do not necessarily provide the capability of making a normal turn from one taxiway to another parallel taxiway. Guidance for this condition is given in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

~~*Note 4. The separation distance between the centre line of an aircraft stand taxilane and an object shown in Table C-1, column 13, may need to be increased when jet exhaust wake velocity may cause hazardous conditions for ground servicing.*~~

C.9.9 Longitudinal slope changes

Where slope changes on a taxiway cannot be avoided, the transition from one slope to another slope, ~~must~~must be accomplished by a curved surface with a rate of change not exceeding:

…

**Table C-1. Taxiway minimum separation distances**

| Distance between taxiway centre line and runway centre line (metres) | | | | | | | | | Taxiway centre line to taxiway centre line (metres) | Taxiway, other than aircraft stand taxilane, centre line to object (metres) | Aircraft stand taxilane centre line to aircraft stand taxilane centre line (metres) | Aircraft stand taxilane centre line to object (meters) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Instrument runways Code number | | | | Non-instrument runways Code number | | | | | | | |
| Code letter | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 77.5 | 77.5 | - | - | 37.5 | 47.5 | - | - | 23 | 15.5 | 19.5 | 12 |
| B | 82 | 82 | 152 | - | 42 | 58 | ~~87~~ 67 | - | 32 | 20 | 28.5 | 16.5 |
| C | 88 | 88 | 158 | 158 | 48 | 58 | ~~93~~ 73 | 93 | 44 | 26 | 40.5 | 22.5 |
| D | - | - | 166 | 166 | - | - | ~~101~~ 81 | 101 | 63 | 37 | 59.5 | 33.5 |
| E | - | - | 172.5 | 172.5 | - | - | ~~107.5~~ 87.5 | 107.5 | 76 | 43.5 | 72.5 | 40 |
| F | - | - | 180 | 180 | - | - | ~~115~~ 95 | 115 | 91 | 51 | 87.5 | 47.5 |

~~*Note 1. The separation distances shown in columns (2) to (9) represent ordinary combinations of runways and taxiways. The basis for development of these distances is given in the CASA PNG Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

~~*Note 2. The distances in columns (2) to (9) do not guarantee sufficient clearance behind a holding aeroplane to permit the passing of another aeroplane on a parallel taxiway. See the CASA PNG Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays.*~~

C.9.11 Transverse Slopes

The transverse slopes of a taxiway ~~must~~must be sufficient to prevent the accumulation of water on the surface of the taxiway but ~~must~~must not exceed:

…

~~*Note. See C.13.4 regarding transverse slopes on an aircraft stand taxilane.*~~

***Strength of taxiways***

C.9.12 The strength of a taxiway ~~must~~must be at least equal to that of the runway it serves, due consideration being given to the fact that a taxiway will be subjected to a greater density of traffic and, as a result of slow moving and stationary aeroplanes, to higher stresses than the runway it serves.

~~*Note. Guidance on the relation of the strength of taxiways to the strength of runways is given in the CASA Advisory Circular AC139-3.3 Pavement Bearing Strength.*~~

C.9.14 The surface of a paved taxiway ~~must~~must be so constructed or resurfaced as to provide suitable surface friction characteristics.

~~*Note. Suitable surface friction characteristics are those surface properties required on taxiways that assure safe operation of aeroplanes.*~~

***Rapid exit taxiway***

~~*Note. The following specifications detail requirements particular to rapid exit taxiways. See Figure C-3. General requirements for taxiways also apply to this type of taxiway. Guidance on the provision, location and design of rapid exit taxiways is included in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

C.9.15 A rapid exit taxiway ~~must~~must be designed with a radius of turn-off curve of at least:

…

~~*Note. The locations of rapid exit taxiways along a runway are based on several criteria described in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays, in addition to different speed criteria.*~~

C.9.20 Access ~~must~~must be provided to allow rescue and firefighting vehicles to intervene in both directions within the specified response time to the largest aeroplane for which the taxiway bridge is intended.

~~*Note. If aeroplane engines overhang the bridge structure, protection of adjacent areas below the bridge from engine blast may be required.*~~

## C.10 Taxiway shoulders

~~*Note. Guidance on characteristics of taxiway shoulders and on shoulder treatment is given in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

…

## C.11 Taxiway strips

~~*Note. Guidance on characteristics of taxiway strips is given in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

…

***Width of taxiway strips***

…

***Objects on taxiway strips***

~~*Note. See I.9 for information regarding siting of equipment and installations on taxiway strips.*~~

C.11.3 The taxiway strip ~~must~~must provide an area clear of objects which may endanger taxiing

aeroplanes.

~~*Note 1. Consideration will have to be given to the location and design of drains on a taxiway strip to prevent damage to an aeroplane accidentally running off a taxiway. Suitably designed drain covers may be required. For further guidance, see the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

~~*Note 2. Where open-air or covered storm water conveyances are installed, consideration will have to be given to ensure that their structure does not extend above the surrounding ground so as not to be considered an obstacle. See also Note 1 to C.11.6.*~~

~~*Note 3. Particular attention needs to be given to the design and maintenance of an open-air storm water conveyance in order to prevent wildlife attraction, notably birds. If needed, it can be covered by a net. Guidance on wildlife control and reduction can be found in the CASA Advisory Circular AC139-3.3 Pavement Bearing Strength*~~

C.11.4 The centre portion of a taxiway strip ~~must~~must provide a graded area to a distance from the centre line of the taxiway of not less than that given by the following tabulation:

(a) 10.25 m where the OMGWS is up to but not including 4.5 m;

(b) 11 m where the OMGWS is 4.5 m up to but not including 6 m;

(c) 12.50 m where the OMGWS is 6 m up to but not including 9 m;

(d) ~~18.50~~ 17 m where the OMGWS is 9 m up to but not including 15 m, where the code letter is D;

(e) 19 m where the OMGWS is 9 m up to but not including 15 m, where the code letter is E;

(f) 22 m where the OMGWS is 9 m up to but not including 15 m, where the code letter is F.

~~*Note. Guidance on width of the graded portion of a taxiway is given in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

***Slopes on taxiway strips***

…

C.11.6 The transverse slopes on any portion of a taxiway strip beyond that to be graded ~~must~~must not exceed an upward or downward slope of 5 percent as measured in the direction away from the taxiway.

~~*Note 1. Where deemed necessary for proper drainage, an open-air storm water conveyance may be allowed in the non-graded portion of a taxiway strip and would be placed as far as practicable from the taxiway.*~~

~~*Note 2. The aerodrome RFF procedure would need to take into account the location of*~~

~~*open-air storm water conveyances within the non-graded portion of a taxiway strip.*~~

## C.12 Holding bays, runway positions, intermediate holding positions and road-holding positions

***General***

…

C.12.6 The distance between a holding bay, runway-holding position established at a taxiway/runway intersection or road-holding position and the centre line of a runway ~~must~~must be in accordance with Table C-2 and, in the case of a precision approach runway, such that a holding aircraft or vehicle will not interfere with the operation of radio navigation aids or penetrate the inner transitional surface.

~~*Note. Guidance for the positioning of runway-holding positions is given in the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

**Table C-2. Minimum distance from the runway centre line to a holding bay, runway-holding position or road-holding position**

| | Code Number | | | |
|---|---|---|---|---|
| Type of runway | 1 | 2 | 3 | 4 |
| Non-instrument | 30 m | 40 m | ~~75m~~ 55m | 75 m |
| Non-precision approach | 40 m | 40 m | 75 m | 75 m |
| Precision approach category I | 60 mb | 60 m[b] | 90 m[a,b] | 90 m[a,b] |
| Precision approach categories II and III | - | - | 90 m[a,b] | 90 m[a,b] |
| Take-off runway | 30 m | 40 m | ~~75m~~ 55m | 75 m |

a. If a holding bay, runway-holding position or road-holding position is at a lower elevation compared to the threshold, the distance may be decreased 5m for every metre the bay or holding position is lower than the threshold, contingent upon not infringing the inner transitional surface.

b. This distance may need to be increased to avoid interference with radio navigation aids, particularly the glide path and localizer facilities. Information on critical and sensitive areas of ILS and MLS is contained in Annex 10, Volume I, Attachments C and G, respectively (see also C.12.6).

~~*Note 1. The distance of 90m for code number 3 or 4 is based on an aircraft with a tail height of 20m, a distance from the nose to the highest part of the tail of 52.7m and a nose height of 10m holding at an angle of 45° or more with respect to the runway centre line, being clear of the obstacle free zone and not accountable for the calculation of OCA/H.*~~

~~*Note 2. The distance of 60m for code number 2 is based on an aircraft with a tail height of 8m, a distance from the nose to the highest part of the tail of 24.6m and a nose height of 5.2m holding at an angle of 45° or more with respect to the runway centre line, being clear of the obstacle free zone.*~~

~~*Note 3. For code number 4 where the width of the inner edge of the inner approach surface is more than 120m, a distance greater than 90m may be necessary to ensure that a holding aircraft is clear of the obstacle free zone. For example, a distance of 100m is based on an aircraft with a tail height of 24m, a distance from the nose to the highest part of the tail of*~~

~~*62.2m and a nose height of 10m holding at an angle of 45° or more with respect to the runway centre line, being clear of the obstacle free zone.*~~

## C.13 Aprons

…

C.13.2 ~~The total apron area must be adequate to permit expeditious handling of the aerodrome traffic at its maximum anticipated density.~~ The design of aprons must take into consideration criteria for safe ground handling, including:

(a) sufficient space between aircraft stands to enable personnel and equipment to move safely and efficiently;

(b) adequate apron markings, apron signs and apron floodlighting;

(c) adequate staging and storage areas for ground support equipment (GSE);

(d) positioning of fixed ground services;

(e) storage areas for unit load devices (ULD);

(f) adequate access and egress routes for fuel, GSE and emergency vehicles;

(g) clearly delineated and visible access and egress routes for passengers;

(h) new technologies (electric charging points, autonomous vehicles, etc.);

(i) avoidance of rear of aircraft stand service roads wherever practicable; and

(j) appropriate protection for persons, equipment and infrastructure from jet blast and propeller wash.

***Size of aprons***

C.13.~~2~~3 The total apron area ~~must~~must be adequate to permit safe and expeditious handling of the aerodrome traffic at its maximum anticipated density.

***Strength of aprons***

C.13.~~3~~4 Each part of an apron ~~must~~must be capable of withstanding the traffic of the aircraft it is intended to serve, due consideration being given to the fact that some portions of the apron will be subjected to a higher density of traffic and, as a result of slow moving or stationary aircraft, to higher stresses than a runway.

***Slopes on aprons***

C.13.~~4~~5 Slopes on an apron, including those on an aircraft stand taxilane, ~~must~~must be sufficient to prevent accumulation of water on the surface of the apron but ~~must~~must be kept as level as drainage requirements permit.

C.13.~~5~~6 On an aircraft stand the maximum slope ~~must~~must not exceed 1 percent.

***Clearance distances on aircraft stands***

C.13.~~6~~7 An aircraft stand ~~must~~must provide the following minimum clearances between an aircraft entering or exiting the stand and any adjacent building, aircraft on another stand and other objects:

| Code letter | Clearance |
|---|---|
| *A* | *3 m* |
| *B* | *3 m* |
| *C* | *4.5 m* |
| *D* | *7.5 m* |
| *E* | *7.5 m* |
| *F* | *7.5 m* |

When special circumstances so warrant, these clearances ~~may~~must be reduced at a nose-in aircraft stand, where the code letter is D, E or F:

(a) between the terminal, including any fixed passenger boarding bridge, and the nose of an aircraft; and

…

~~*Note. On aprons, consideration also has to be given to the provision of service roads and to manoeuvring and storage area for ground equipment (see the CASA Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays, for guidance on storage of ground equipment).*~~

# APPENDIX D. OBSTACLE RESTRICTION AND REMOVAL

(Applicable until 20 November 2030)

~~*Note 1. The objectives of the specifications in this appendix are to define the airspace around aerodromes to be maintained free from obstacles so as to permit the intended aeroplane operations at the aerodromes to be conducted safely and to prevent the aerodromes from becoming unusable by the growth of obstacles around the aerodromes. This is achieved by establishing a series of obstacle limitation surfaces that define the limits to which objects may project into the airspace.*~~

~~*Note 2. Objects which penetrate the obstacle limitation surfaces contained in this appendix may in certain circumstances cause an increase in the obstacle clearance altitude/height for an instrument approach procedure or any associated visual circling procedure or have other operational impact on flight procedure design. Criteria for flight procedure design are contained in the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168).*~~

~~*Note 3. The establishment of, and requirements for, an obstacle protection surface for visual approach slope indicator systems are specified in E.3.5.42 to E.3.5.46.*~~

## D.1 Obstacle limitation surfaces

~~*Note. See Figure D-1.*~~

***Outer horizontal surface***

~~*Note. Guidance on the need to provide an outer horizontal surface and its characteristics is contained in the CASA Advisory Circular AC139-4 Obstacle Restriction and Removal.*~~

D.1.5 Characteristics.— The radius or outer limits of the inner horizontal surface ~~must~~must be measured from a reference point or points established for such purpose.

~~*Note. The shape of the inner horizontal surface need not necessarily be circular. Guidance on determining the extent of the inner horizontal surface is contained in the CASA Advisory Circular AC139-4 Obstacle Restriction and Removal*~~

D.1.6 The height of the inner horizontal surface ~~must~~must be measured above an elevation datum established for such purpose.

~~*Note. Guidance on determining the elevation datum is contained in the CASA Advisory Circular AC139-4 Obstacle Restriction and Removal*~~

***Approach surface***

…

D.1.10 The slope(s) of the approach surface ~~must~~must be measured in the vertical plane containing the centre line of the runway and ~~must~~must continue containing the centre line of any lateral offset or curved ground track.

~~*Note. See Figure D-2*~~

D.1.15 The elevation of a point on the lower edge ~~must~~must be:

(a) along the side of the approach surface — equal to the elevation of the approach surface at that point; and

…

~~*Note. As a result of b) the transitional surface along the strip will be curved if the runway profile is curved, or a plane if the runway profile is a straight line. The intersection of the transitional surface with the inner horizontal surface will also be a curved or a straight line depending on the runway profile.*~~

D.1.16 The slope of the transitional surface ~~must~~must be measured in a vertical plane at right angles to the centre line of the runway.

***Inner transitional surface***

~~*Note. It is intended that the inner transitional surface be the controlling obstacle limitation surface for navigation aids, aircraft and other vehicles that must be near the runway and which is not to be penetrated except for frangible objects. The transitional surface described in 4.1.13 is intended to remain as the controlling obstacle limitation surface for buildings, etc.*~~

D.1.19 The elevation of a point on the lower edge ~~must~~must be:

(a) along the side of the inner approach surface and balked landing surface — equal to the elevation of the particular surface at that point; and

~~*Note. — As a result of (b) the inner transitional surface along the strip will be curved if the runway profile is curved or a plane if the runway profile is a straight line. The intersection of the inner transitional surface with the inner horizontal surface will also be a curved or straight line depending on the runway profile.*~~

***Balked landing surface***

D.1.22 Characteristics.— The limits of the balked landing surface ~~must~~must comprise:

~~(c)~~(a) an inner edge horizontal and perpendicular to the centre line of the runway and located at a specified distance after the threshold;

~~(d)~~(b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the vertical plane containing the centre line of the runway; and

~~(e)~~(c) an outer edge parallel to the inner edge and located in the plane of the inner horizontal surface.

…

## D.2 Obstacle limitation requirements

~~*Note. — The requirements for obstacle limitation surfaces are specified on the basis of the intended use of a runway, i.e. take-off or landing and type of approach, and are intended to be applied when such use is made of the runway. In cases where operations are conducted to or from both directions of a runway, then the function of certain surfaces may be nullified because of more stringent requirements of another lower surface.*~~

D.2.3 New objects or extensions of existing objects ~~must~~must not be permitted above an approach or transitional surface except when, in the opinion of the Director, the new object or extension would be shielded by an existing immovable object.

~~*Note. — Circumstances in which the shielding principle may reasonably be applied are described in the CASA Advisory Circular AC139-4 Obstacle Restriction and Removal*~~

D.2.5 Existing objects above any of the surfaces required by D.2.1 ~~must~~must as far as practicable be removed except when, in the opinion of the Director, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

~~*Note. — Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered they may endanger aeroplanes.*~~

**Table D-1. Dimensions and slopes of obstacle limitation surfaces-Approach runways**

| CLASSIFICATION | RUNWAY<br>Precision approach category | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Non-instrument<br><br>Code number | | | Non-precision approach<br><br>Code number | | | I<br><br>Code number | | II or III<br><br>Code number |
| Surface and dimensions[a] | 1 | 2 | 3 | 4 | 1,2 | 3 | 4 | 1,2 | 3,4 | 3,4 |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| CONICAL | | | | | | | | | | |
| Slope | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% |
| Height | 35m | 55m | 75m | 100m | 60 m | 75m | 100m | 60 m | 100 m | 100m |
| INNER HORIZONTAL | | | | | | | | | | |
| Height | 45m | 45m | 45m | 45m | 45 m<br><br>45 m | 45m | 45m | 45 m | 45m | 45m |
| Radius | 2000m | 2500m | 4000m | 4000m | 3500 m | 4000 m | 4000m | 3500 m | 4000 m | 4000 m |
| INNER APPROACH | | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Width | — | — | — | — | — | — | — | 90 m | 120 m[e] | 120m[e] |
| Distance from threshold | — | — | — | — | — | — | — | 60 m | 60m | 60m |
| Length | — | — | — | — | — | — | — | 900m | 900 m | 900m |
| Slope | | | | | | | | 2.5 % | 2% | 2% |
| APPROACH | | | | | | | | | | |
| Length of inner edge | 60m | 80m | ~~150~~ 110 m | 150m | 140m | 280 m | 280m | 140m | 280 m | 280m |
| Distance from threshold | 30m | 60m | 60m | 60m | 60 m | 60m | 60m | 60 m | 60m | 60m |
| Divergence (each side) | 10% | 10% | 10% | 10% | 15 % | 15% | 15% | 15 % | 15% | 15% |
| First section | | | | | | | | | | |
| Length | 1600m | 2500m | 3000m | 3000m | 2500 m | 3000 m | 3000m | 3000 m | 3000 m | 3000 m |
| Slope | 5% | 4% | 3.33 % | 2.5% | 3.33% | 2% | 2% | 2.5 % | 2% | 2% |
| Second section | | | | | | | | | | |
| Length | — | — | — | — | — | 3600 m[b] | 3600m[b] | 12000m | 3600 m[b] | 3600 m[b] |
| Slope | — | — | — | — | — | 2.5% | 2.5% | 3% | 2.5 % | 2.5% |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Horizontal section | | | | | | | | | | |
| Length | — | — | — | — | — | 8400 m[b] | 8400m [b] | — | 8400 m[b] | 8400 m[b] |
| Total length | — | — | — | — | — | 15000m | 15000 m | 15000m | 15000m | 15000m |
| TRANSITIONAL | | | | | | | | | | |
| Slope | 20% | 20% | 14.3 % | 14.3% | 20 % | 14.3 % | 14.3% | 14.3% | 14.3 % | 14.3 % |
| INNER TRANSITIONAL | | | | | | | | | | |
| Slope | — | — | — | — | — | — | — | 40 % | 33.3 % | 33.3 % |
| BALKED LANDING SURFACE | | | | | | | | | | |
| Length of inner edge | — | — | — | — | — | — | — | 90 m | 120 m[e] | 120m [e] |
| Distance from threshold | — | — | — | — | — | — | — | c | 1800 m[d] | 1800 m[d] |
| Divergence (each side) | — | — | — | — | — | — | — | 10 % | 10% | 10% |
| Slope | — | — | — | — | — | — | — | 4% | 3.33 % | 3.33 % |

All dimensions are measured horizontally unless specified otherwise.

Where the code letter is F (Table A-1), the width is increased to 140m except for those

| | |
|---|---|
| Variable length (see D.2.9 or D.2.17).<br><br>Distance to the end of strip.<br><br>Or end of runway whichever is less. | aerodromes that accommodate a code letter F aeroplane equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre. |

D.2.10 New objects or extensions of existing objects ~~must~~must not be permitted above an approach surface within 3000m of the inner edge or above a transitional surface except when, in the opinion of the Director, the new object or extension would be shielded by an existing immovable object.

~~*Note. Circumstances in which the shielding principle may reasonably be applied are described in the CASA Advisory Circular AC139-4 Obstacle Restriction and Removal*~~

D.2.12 Existing objects above any of the surfaces required by D.2.7 ~~must~~must as far as practicable be removed except when, in the opinion of the Director, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

~~*Note. Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered they may endanger aeroplanes.*~~

***Precision approach runways***

~~*Note 1. See I.9 for information regarding siting of equipment and installations on operational areas.*~~

~~*Note 2. Guidance on obstacle limitation surfaces for precision approach runways is given in the CASA Advisory Circular AC139-4 Obstacle Restriction and Removal*~~

D.2.19 New objects or extensions of existing objects ~~must~~must not be permitted above an approach surface or a transitional surface except when, in the opinion of the Director, the new object or extension would be shielded by an existing immovable object.

~~*Note. Circumstances in which the shielding principle may reasonably be applied are described in the CASA Advisory Circular AC139-4 Obstacle Restriction and Removal*~~

D.2.21 Existing objects above an approach surface, a transitional surface, the conical surface and inner horizontal surface ~~must~~must as far as practicable be removed except when, in the opinion of the Director, an object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

~~*Note. Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered they may endanger aeroplanes.*~~

D.2.24 The operational characteristics of aeroplanes for which the runway is intended ~~must~~must be examined to see if it is desirable to reduce the slope specified in Table D-2 when critical operating conditions are to be catered to. If the specified slope is reduced, corresponding adjustment in the length of the take-off climb surface ~~must~~must be made so as to provide protection to a height of 300m.

~~*Note. When local conditions differ widely from sea level standard atmospheric conditions, it may be advisable for the slope specified in Table 4-2 to be reduced. The degree of this reduction depends on the divergence between local conditions and sea level standard atmospheric conditions, and on the performance characteristics and operational requirements of the aeroplanes for which the runway is intended.*~~

D.2.25 New objects or extensions of existing objects ~~must~~must not be permitted above a take-off climb surface except when, in the opinion of the Director, the new object or extension would be shielded by an existing immovable object.

~~*Note. Circumstances in which the shielding principle may reasonably be applied are described in the CASA Advisory Circular AC139-4 Obstacle Restriction and Removal.*~~

…

D.2.27 Existing objects that extend above a take-off climb surface ~~must~~must as far as practicable be removed except when, in the opinion of the Director, an object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

~~*Note. Because of transverse slopes on a strip or clearway, in certain cases portions of the inner edge of the take-off climb surface may be below the corresponding elevation of the strip or clearway. It is not intended that the strip or clearway be graded to conform with the inner edge of the take-off climb surface, nor is it intended that terrain or objects which are above the take-off climb surface beyond the end of the strip or clearway, but below the level of the strip or clearway, be removed unless it is considered they may endanger aeroplanes. Similar considerations apply at the junction of a clearway and strip where differences in transverse slopes exist.*~~

## D.3 Objects outside the obstacle limitation surfaces

…

D.3.2 In areas beyond the limits of the obstacle limitation surfaces at least those objects which extend to a height of 150m or more above ground elevation ~~must~~must be regarded as obstacles, unless a special aeronautical study indicates that they do not constitute a hazard to

aeroplanes.

~~*Note. This study may have regard to the nature of operations concerned and may distinguish between day and night operations.*~~

**D.4 Other objects**

…

D.4.2 Anything which may, in the opinion of the Director after aeronautical study, endanger aeroplanes on the movement area or in the air within the limits of the inner horizontal and conical surfaces ~~must~~must be regarded as an obstacle and ~~must~~must be removed in so far as practicable.

~~*Note. In certain circumstances, objects that do not project above any of the surfaces enumerated in 4.1 may constitute a hazard to aeroplanes as, for example, where there are one or more isolated objects in the vicinity of an aerodrome.*~~

## APPENDIX E. VISUAL AIDS FOR NAVIGATION

**E.1 Indicators and signaling devices**

…

**E.1.4 Signal panels and signal area**

~~*Note. The inclusion of detailed specifications for a signal area in this section is not intended to imply that one has to be provided. Attachment A, Section 16, provides guidance on the need to provide ground signals. Annex 2, Appendix 1, specifies the shape, colour and use of visual ground signals. The CASA Advisory Circular AC139-5.1 Visual Aids for navigation - Indicators & Signalling Devices, provides guidance on their design.*~~

E.2.1.3 At an intersection of a runway and taxiway the markings of the runway ~~must~~must be displayed and the markings of the taxiway interrupted, except that runway side stripe markings may be interrupted.

~~*Note. See E.2.8.7 regarding the manner of connecting runway and taxiway centre line markings.*~~

***Colour and conspicuity***

E.2.1.4 Runway markings ~~must~~must be white.

~~*Note 1. It has been found that, on runway surfaces of light colour, the conspicuity of white markings can be improved by outlining them in black.*~~

~~*Note 2. It is preferable that the risk of uneven friction characteristics on markings be reduced in so far as practicable by the use of a suitable kind of paint.*~~

~~*Note 3. Markings may consist of solid areas or a series of longitudinal stripes providing an effect equivalent to the solid areas.*~~

E.2.1.7 …

~~*Note. Guidance on reflective materials is given in the CASA Advisory Circular AC139-5.1 Visual Aids for navigation – Indicators & Signalling Devices.*~~

***Location***

E.2.2.3 A runway designation marking ~~must~~must be located at a threshold as shown in Figure E-2 as appropriate.

~~*Note. If the runway threshold is displaced from the extremity of the runway, a sign showing the designation of the runway may be provided for aeroplanes taking off.*~~

**E.2 Markings**

…

**E.2.4 Threshold marking**

***Application***

E.2.4.1 A threshold marking ~~must~~must be provided at the threshold of a paved ~~instrument~~ runway~~,~~ ~~and of a paved non-instrument runway where the code number is 3 or 4 and the runway is intended for use by international commercial air transport~~.

~~E.2.4.2 A threshold marking must be provided at the threshold of a paved non-instrument runway where the code number is 3 or 4, and the runway is intended for use by other than international commercial air transport.~~

E.2.4.3 A threshold marking ~~must~~must be provided, so far as practicable, at the thresholds of an unpaved runway.

~~*Note. The CASA Advisory Circular AC139-5.2 Visual Aids for navigation – Markings, shows a form of marking which has been found satisfactory for the marking of downward slopes immediately before the threshold.*~~

…

***Arrows***

…

E.2.4.10 When a runway threshold is temporarily displaced from the normal position, it ~~must~~must be marked as shown in Figure E-4 (A) or E-4 (B) and all markings prior to the displaced threshold ~~must~~must be obscured except the runway centre line marking, which ~~must~~must be converted to arrows.

~~*Note 1. In the case where a threshold is temporarily displaced for only a short period of time, it has been found satisfactory to use markers in the form and colour of a displaced*~~

~~*threshold marking rather than attempting to paint this marking on the runway.*~~

~~*Note 2. When the runway before a displaced threshold is unfit for the surface movement of aircraft, closed markings, as described in G.1.4, are required to be provided.*~~

…

### E.2.8 Taxiway centre line marking

***Application***

E.2.8.4 Where it is necessary to denote the proximity of a runway-holding position, enhanced taxiway centre line marking ~~must~~must be provided.

~~*Note. The provision of enhanced taxiway centre line marking may form part of runway incursion prevention measures.*~~

E.2.8.6 On a straight section of a taxiway, the taxiway centre line marking ~~must~~must be located along the taxiway centre line. On a taxiway curve, the marking ~~must~~must continue from the straight portion of the taxiway at a constant distance from the outside edge of the curve.

~~*Note. See C.9.5 and Figure C-2.*~~

### E.2.9 Runway turn pad marking

…

E.2.9.6 …

~~*Note. For ease of manoeuvring, consideration may be given to providing a larger wheel-to-edge clearance for codes E and F aeroplanes.*~~

E.2.10.1 ...

~~*Note. See E.4.2 concerning the provision of signs at runway-holding positions.*~~

E.2.10.7 ...

~~*Note. An increased conspicuity of the runway-holding position can be required, notably to avoid incursion risks.*~~

~~*Note. Patterns A1 and B1 are no longer valid after 2026.*~~

### E.2.12 VOR aerodrome checkpoint marking

***Application***

E.2.12.1 ...

~~*Note. See E.4.4 for VOR aerodrome checkpoint sign.*~~

E.2.12.2 ...

~~*Note. Guidance on the selection of sites for VOR aerodrome checkpoints is given in Annex 10, Volume I, Attachment E (AC 171-1 Aeronautical Telecommunications Service Organization Certification).*~~

E.2.12.6 ...

~~*Note. To provide contrast, markings may be bordered with black.*~~

E.2.13 ...

~~*Note. Guidance on the layout of aircraft stand markings is contained in the CASA Advisory Circular AC139-5.2 Visual Aids for navigation Markings*~~

E.2.13.5 ...

~~*Note. Example: 2A-B747, 2B-F28.*~~

E.2.13.9 ...

~~*Note. The distances to be maintained between the turn bar and the lead-in line may vary according to different aircraft types, taking into account the pilot's field of view.*~~

E.2.13.12 ...

~~*Note. The distances to be maintained between the stop line and the lead-in line may vary according to different aircraft types, taking into account the pilot's field of view.*~~

## E.2.14 Apron safety lines

~~*Note. Guidance on apron safety lines is contained in the CASA Advisory Circular AC139-5.2 Visual Aids for navigation Markings*~~

…

## E.2.16 Mandatory instruction marking

…

***Location***

E.2.16.3 The mandatory instruction marking on taxiways where the ~~code letter is A, B, C or D~~ OMGWS is up to but not including 9 m ~~must~~must be located across the taxiway equally placed about the taxiway centre line and on the holding side of the runway-holding position marking as shown in Figure E-10 (A). The distance between the nearest edge of the marking and the runway-holding position marking or the taxiway centre line marking ~~must~~must be not less than 1 m.

…

D.2.16.4 The mandatory instruction marking on taxiways where the ~~code letter is E or F~~ OMGWS from 9 m up to but not including 15 m must be located on both sides of the taxiway centre line marking and on the holding side of the runway-holding position marking as shown in

Figure E-10 (B). The distance between the nearest edge of the marking and the runway-holding position marking or the taxiway centre line marking must be not less than 1 m.

…

***Characteristics***

E.2.16.9 The character height must be 4 m for inscriptions where the code letter is C, D, E or F OMGWS is from 6 m up to but not including 15 m, and 2 m where the code letter is A or B OMGWS is up to but not including 6 m. The inscriptions must be in the form and proportions shown in CASA Advisory Circular AC139-5.2 Visual Aids for navigation – Markings. acceptable to the Director.

…

~~*Note. Guidance on mandatory instruction marking is given in the CASA Advisory Circular AC139-5.2 Visual Aids for navigation Markings*~~

E.2.17 ...

**E.3 Lights**

~~*Note. Guidance on information marking is contained in the CASA Advisory Circular AC139-5.2 Visual Aids for navigation Markings.*~~

E.3.1.2 ...

~~*Note 1. Figures E-11, E-12 and E-13 may be used to determine the exposure levels and distances that adequately protect flight operations.*~~

~~*Note 2. The restrictions on the use of laser beams in the three protected flight zones, LFFZ, LCFZ and LSFZ, refer to visible laser beams only. Laser emitters operated by the authorities in a manner compatible with flight safety are excluded. In all navigable airspace, the irradiance level of any laser beam, visible or invisible, is expected to be less than or equal to the maximum permissible exposure (MPE) unless such emission has been notified to the authority and permission obtained.*~~

~~*Note 3. The protected flight zones are established in order to mitigate the risk of operating laser emitters in the vicinity of aerodromes.*~~

~~*Note 4. Further guidance on how to protect flight operations from the hazardous effects of laser emitters is contained in the Manual on Laser Emitters and Flight Safety (Doc 9815).*~~

~~*Note 5. See also Annex 11 Air Traffic Services, Chapter 2 (CAR Part 172).*~~

***Lights which may cause confusion***

E.3.1.3 ...

~~***Aeronautical ground lights which may cause confusion to mariners***~~

~~*Note. In the case of aeronautical ground lights near navigable waters, consideration needs to be given to ensuring that the lights do not cause confusion to mariners.*~~

~~***Light fixtures and supporting structures***~~

~~*Note. See I.9 for information regarding siting of equipment and installations on operational areas, and the CASA Advisory Circular AC139-9.7 Operational Services – Siting of Installations and Frangibility, for guidance on frangibility of light fixtures and supporting structures.*~~

E.3.1.8 ...

~~*Note. Guidance on measuring the temperature of inset lights is given in the CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights.*~~

~~***Light intensity and control***~~

~~*Note. In dusk or poor visibility conditions by day, lighting can be more effective than marking. For lights to be effective in such conditions or in poor visibility by night, they must be of adequate intensity. To obtain the required intensity, it will usually be necessary to make the light directional, in which case the arcs over which the light shows will have to be adequate and so orientated as to meet the operational requirements. The runway lighting system will have to be considered as a whole, to ensure that the relative light intensities are suitably matched to the same end. (See CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights).*~~

E.3.1.9 ...

~~*Note. While the lights of an approach lighting system may be of higher intensity than the runway lighting, it is good practice to avoid abrupt changes in intensity as these could give a pilot a false impression that the visibility is changing during approach.*~~

E.3.2.1 ...

~~*Note. Emergency lighting may also be useful to mark obstacles or delineate taxiways and apron areas.*~~

E.3.3.7 ...

~~*Note. At locations where a high ambient background lighting level cannot be avoided, the effective intensity of the flash may be required to be increased by a factor up to a value of 10.*~~

E.3.3.11 ...

~~*Note. At locations where a high ambient background lighting level cannot be avoided, the effective intensity of the flash may be required to be increased by a factor up to a value of 10.*~~

E.3.4.1 ...

~~*Note. A simple approach lighting system can also provide visual guidance by day.*~~

~~*Note. It is advisable to give consideration to the installation of a precision approach category I lighting system or to the addition of a runway lead-in lighting system.*~~

E.3.4.3 ...

~~*Note 1. Spacings for the crossbar lights between 1m and 4m are in use. Gaps on each side of the centre line may improve directional guidance when approaches are made witha lateral error, and facilitate the movement of rescue and firefighting vehicles.*~~

~~*Note 2. See Attachment A, Section 11(CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights), for guidance on installation tolerances.*~~

E.3.4.7 ...

~~*Note 1. When the barrette as in (b) is composed of lights approximating to point sources, a spacing of 1.5m between adjacent lights in the barrette has been found satisfactory.*~~

~~*Note 2. It may be advisable to use barrettes 4m in length if it is anticipated that the simple approach lighting system will be developed into a precision approach lighting system.*~~

~~*Note 3. At locations where identification of the simple approach lighting system is difficult at night due to surrounding lights, sequence flashing lights installed in the outer portion of the system may resolve this problem.*~~

E.3.4.10 ...

~~*Note. The installation of an approach lighting system of less than 900m in length may result in operational limitations on the use of the runway. See Attachment A, Section 11.*~~

E.3.4.11 ...

~~*Note 1. Spacings for the crossbar lights between 1m and 4m are in use. Gaps on each side of the centre line may improve directional guidance when approaches are made with a lateral error, and facilitate the movement of rescue and firefighting vehicles.*~~

~~*Note 2. See Attachment A, Section 11 (CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights), for guidance on installation tolerances.*~~

E.3.4.19 ...

~~*Note. See Attachment A, Section 11 (CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights), for detailed configuration.*~~

E.3.4.21 ...

~~*Note. The flight path envelopes used in the design of these lights are given in Attachment A, Figure A-6 (CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights).*~~

E.3.4.22 ...

~~*Note. The length of 900m is based on providing guidance for operations under category I, II and III conditions. Reduced lengths may support category II and III operations but may impose limitations on category I operations.*~~

E.3.4.39 ...

~~*Note. The flight path envelopes used in the design of these lights are given in Attachment A, Figure A-6 (CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights).*~~

E.3.5.1 ...

~~*Note. Guidance on the priority of installation of visual approach slope indicator systems is contained in Attachment A, Section 12 (CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights).*~~

E.3.5.10 ...

~~*Note. The siting of T-VASIS will provide, for a 3° slope and a nominal eye height over the threshold of 15m (see E.3.5.7 and E.3.5.20), a pilot's eye height over threshold of 13m to 17m when only the wing bar lights are visible. If increased eye height at the threshold is required (to provide adequate wheel clearance), then the approaches may be flown with one or more fly-down lights visible. The pilot's eye height over the threshold is then of the following order:*~~

~~*Wing bar lights and one fly-down light visible 17m to 22m*~~

~~*Wing bar lights and two fly-down lights visible 22m to 28m*~~

~~*Wing bar lights and three fly-down lights visible 28m to 54m.*~~

E.3.5.23 ...

~~*Note. See E.3.5.42 to E.3.5.46 concerning the related obstacle protection surface.*~~

E.3.5.24 ...

~~*Note. Where a runway is used by aircraft requiring visual roll guidance which is not provided by other external means, then a second wing bar may be provided on the opposite side of the runway.*~~

E.3.5.32 ...

~~*Note. See the CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights, for additional guidance on the characteristics of light units.*~~

E.3.5.40 ...

~~*Note. See E.3.5.42 to E.3.5.46 concerning the related obstacle protection surface.*~~

E.3.5.41 ...

~~***Obstacle protection surface***~~

~~*Note. The following specifications apply to T-VASIS, AT-VASIS, PAPI and APAPI.*~~

E.3.5.44 ...

~~*Note. Circumstances in which the shielding principle may reasonably be applied are described in the CASA Advisory Circular AC139-4 Obstacle Restriction and Removal.*~~

E.3.5.46 ...

~~*Note 1. Guidance on this issue is contained in the CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights*~~

~~*Note 2. The displacement of the system upwind of the threshold reduces the operational landing distance.*~~

E.3.6.3 ...

~~*Note. Guidance on installation of circling guidance lights is given in the CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights*~~

E.3.7.1 ...

~~*Note. Guidance on providing lead-in lighting systems is given in the CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights*~~

E.3.7.2 ...

~~*Note. Runway lead-in lighting systems may be curved, straight or a combination thereof.*~~

E.3.11.1 ...

~~*Note. When the threshold is at the runway extremity, fittings serving as threshold lights may be used as runway end lights.*~~

E.3.12.5 Runway centre line lights must be located along the centre line of the runway, except that the lights may be uniformly offset to the same side of the runway centre line by not more than 60 cm where it is not practicable to locate them along the centre line. The lights must be located from the threshold to the end at longitudinal spacing of approximately 15 m. Where the serviceability level of the runway centre line lights specified as maintenance objectives in J.5.7 or J.5.11, as appropriate, can be demonstrated and the runway is intended for use in runway visual range conditions of ~~350~~ 300 m or greater, the longitudinal spacing may be approximately 30 m.

~~*Note. Existing centre line lighting where lights are spaced at 7.5m need not be*~~

~~replaced.~~

***Characteristics***

E.3.12.7 Runway centre line lights must be fixed lights showing variable white from the threshold to the point 900m from the runway end; alternate red and variable white from 900m to 300m from the runway end; and red from 300m to the runway end, except that for runways less than 1800m in length, the alternate red and variable white lights must extend from the midpoint of the runway usable for landing to 300m from the runway end.

~~*Note. Care is required in the design of the electrical system to ensure that failure of part of the electrical system will not result in a false indication of the runway distance remaining.*~~

…

***Location***

E.3.13.2 Touchdown zone lights ~~must~~must extend from the threshold for a longitudinal distance of 900m, except that, on runways less than 1800m in length, the system ~~must~~must be shortened so that it does not extend beyond the midpoint of the runway. The pattern ~~must~~must be formed by pairs of barrettes symmetrically located about the runway centre line. The lateral spacing between the innermost lights of a pair of barrettes ~~must~~must be equal to the lateral spacing selected for the touchdown zone marking. The longitudinal spacing between pairs of barrettes ~~must~~must be either 30m or 60m.

~~*Note. To allow for operations at lower visibility minima, it may be advisable to use a 30m longitudinal spacing between barrettes.*~~

…

**E.3.14 Simple touchdown zone lights**

~~*Note. The purpose of simple touchdown zone lights is to provide pilots with enhanced situational awareness in all visibility conditions and to help enable pilots to decide whether to commence a go-around if the aircraft has not landed by a certain point on the runway. It is essential that pilots operating at aerodromes with simple touchdown zone lights be familiar with the purpose of these lights.*~~

***Location***

E.3.14.2 Simple touchdown zone lights ~~must~~must be a pair of lights located on each side of the runway centre line 0.3m beyond the upwind edge of the final touchdown zone marking. The lateral spacing between the inner lights of the two pairs of lights ~~must~~must be equal to the lateral spacing selected for the touchdown zone marking. The spacing between the lights of the same pair ~~must~~must not be more than 1.5m or half the width of the touchdown zone marking, whichever is greater. (See Figure E-24.)

~~*Note. Where there may be a need to delineate the edges of a taxiway, e.g. on a rapid exit taxiway, or narrow taxiway, this may be done with taxiway edge lights or markers.*~~

***Characteristics***

…

E.3.14.5 Simple touchdown zone lights ~~must~~must be in accordance with the specifications acceptable to the Director.

~~*Note. As a good operating practice, simple touchdown zone lights are supplied with power on a separate circuit to other runway lighting so that they may be used when other lighting is switched off.*~~

## E.3.15 Rapid exit taxiway indicator lights

~~*Note. The purpose of rapid exit taxiway indicator lights (RETILs) is to provide pilots with distance-to-go information to the nearest rapid exit taxiway on the runway, to enhance situational awareness in low visibility conditions and enable pilots to apply braking action for more efficient roll-out and runway exit speeds. It is essential that pilots operating at aerodromes with runway(s) displaying rapid exit taxiway indicator lights be familiar with the purpose of these lights.*~~

***Application***

E.3.15.1 Rapid exit taxiway indicator lights ~~must~~must be provided on a runway intended for use in runway visual range conditions less than a value of ~~350~~300 m and/or where the traffic density is heavy.

~~*Note. See Attachment A, Section 14 (CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights).*~~

…

## E.3.17 Taxiway centre line lights

***Application***

E.3.17.1 Taxiway centre line lights ~~must~~must be provided on an exit taxiway, taxiway, de-icing/anti-icing facility and apron intended for use in runway visual range conditions less than a value of ~~350m~~300m in such a manner as to provide continuous guidance between the runway centre line and aircraft stands,

except that these lights need not be provided where the traffic density is light and taxiway edge lights and centre line marking provide adequate guidance.

E.3.17.2 Taxiway centre line lights ~~may~~must be provided on a taxiway intended for use at night in runway visual range conditions of ~~350~~300m or greater, and particularly on complex taxiway intersections and exit taxiways, except that these lights need not be provided where the traffic density is light and taxiway edge lights and centre line marking provide adequate guidance.

…

E.3.17.4 Taxiway centre line lights ~~must~~must be provided on a runway forming part of a standard taxi-route and intended for taxiing in runway visual range conditions less than a value of ~~350~~ 300 m, except that these lights need not be provided where the traffic density is light and taxiway edge lights and centre line marking provide adequate guidance.

~~*Note. — See H.2.3 for provisions concerning the interlocking of runway and taxiway lighting systems.*~~

…

***Characteristics***

…

E.3.17.7 Taxiway centre line lights on an exit taxiway ~~must~~must be fixed lights. Alternate taxiway centre line lights ~~must~~must show green and yellow from their beginning near the runway centre line to the perimeter of the ILS/MLS critical/sensitive area or the lower edge of the inner transitional surface, whichever is farthest from the runway; and thereafter all lights ~~must~~must show green (Figure E-26). The first light in the exit centre line ~~must~~must always show green, and the light nearest to the perimeter ~~must~~must always show yellow.

~~*Note 1. — Care is necessary to limit the light distribution of green lights on or near a runway so as to avoid possible confusion with threshold lights.*~~

~~*Note 2. — For yellow filter characteristics see Appendix 1, 2.2.*~~

~~*Note 3. — The size of the ILS/MLS critical/sensitive area depends on the characteristics of the associated ILS/MLS and other factors. Guidance is provided in Annex 10, Volume I, Attachments C and G.*~~

~~*Note 4. — See E.4.3 for specifications on runway vacated signs.*~~

E.3.17.8 Where it is necessary to denote the proximity to a runway, taxiway centre line lights ~~must~~must be fixed lights showing alternating green and yellow from the perimeter of the ILS/MLS critical/sensitive area or the lower edge of the inner transitional surface, whichever is farthest from the runway, to the runway and continue alternating green and yellow until:

…

~~*Note 1. — Care is necessary to limit the light distribution of green lights on or near a runway so as to avoid possible confusion with threshold lights.*~~

~~*Note 2. The provisions of E.3.17.8 can form part of effective runway incursion prevention measures.*~~

…

E.3.17.10 Where higher intensities are required from an operational point of view, taxiway centre line lights on rapid exit taxiways intended for use in runway visual range conditions less than a value of ~~350~~300m ~~must~~must be in accordance with the specifications acceptable to the Director. The number of levels of brilliancy settings for these lights ~~must~~must be the same as that for the runway centre line lights.

…

E.3.17.11 Where taxiway centre line lights are specified as components of an advanced surface movement guidance and control system and where, from an operational point of view, higher intensities are required to maintain ground movements at a certain speed in very low visibilities or in bright daytime conditions, taxiway centre line lights ~~must~~must be in accordance with the specifications acceptable to the Director.

~~*Note. High intensity centre line lights must only be used in case of an absolute necessity and following a specific study.*~~

…

***Taxiway centre line lights on taxiways***

***Location***

E.3.17.13 Taxiway centre line lights on a straight section of a taxiway ~~must~~must be spaced at longitudinal intervals of not more than 30m, except that:

(a) larger intervals not exceeding 60m ~~must~~must be used where, because of the prevailing meteorological conditions, adequate guidance is provided by such spacing;

(b) intervals less than 30m ~~must~~must be provided on short straight sections; and

(c) on a taxiway intended for use in RVR conditions of less than a value of 350300m, the longitudinal spacing ~~must~~must not exceed 15m.

…

E.3.17.15 On a taxiway intended for use in RVR conditions of less than a value of ~~350~~300m, the lights on a curve ~~must~~must not exceed a spacing of 15m, and on a curve of less than 400m radius the lights ~~must~~must be spaced at intervals of not greater than 7.5m. This spacing ~~must~~must extend for 60m before and after the curve.

~~*Note 1. Spacings on curves that have been found suitable for a taxiway intended for use in RVR conditions of 350m or greater are:*~~

| Curve radius | Light spacing |
|---|---|
| ~~*up to 400 m*~~ | ~~*7.5 m*~~ |
| *401 m to 899 m* | *15 m* |
| *900 m or greater* | *30 m.* |

~~*Note 2. See C.9.5 and Figure C-2.*~~

***Taxiway centre line lights on runways***

***Location***

E.3.17.20 Taxiway centre line lights on a runway forming part of a standard taxi-route and intended for taxiing in runway visual range conditions less than a value of ~~350~~300m ~~must~~must be spaced at longitudinal intervals not exceeding 15m.

**E.3.18 Taxiway edge lights**

**Application**

E.3.18.1 Taxiway edge lights ~~must~~must be provided at the edges of a runway turn pad, holding bay, apron, etc., intended for use at night and on a taxiway not provided with taxiway centre line lights and intended for use at night, except that taxiway edge lights need not be provided where, considering the nature of the operations, adequate guidance can be achieved by surface illumination or other means.

~~*Note. See E.5.5 for taxiway edge markers.*~~

E.3.18.2 Taxiway edge lights ~~must~~must be provided on a runway forming part of a standard taxi-route and intended for taxiing at night where the runway is not provided with taxiway centre line lights.

~~*Note. See H.2.3 for provisions concerning the interlocking of runway and taxiway lighting systems.*~~

E.3.18.3 Taxiway edge lights on a straight section of a taxiway and on a runway forming part of a standard taxi-route, ~~must~~must be spaced at uniform longitudinal intervals of not more than 60m. The lights on a curve ~~must~~must be spaced at intervals less than 60m so that a clear indication of the curve is provided.

~~*Note. Guidance on the spacing of taxiway edge lights on curves is given in the CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights.*~~

…

**E.3.19 Runway turn pad lights**

***Application***

E.3.19.1 Runway turn pad lights ~~must~~must be provided for continuous guidance on a runway turn pad intended for use in runway visual range conditions less than a value of ~~350~~300m, to enable an aeroplane to complete a 180-degree turn and align with the runway centre line.

…

**E.3.20 Stop bars**

***Application***

~~*Note 1. A stop bar is intended to be controlled either manually or automatically by air traffic services.*~~

~~*Note 2. Runway incursions may take place in all visibility or weather conditions. The provision of stop bars at runway holding positions and their use at night and in visibility conditions greater than 550m runway visual range can form part of effective runway incursion prevention measures.*~~

…

***Characteristics***

E.3.20.5 Stop bars ~~must~~must consist of lights spaced at uniform intervals of no more than 3m across the taxiway, showing red in the intended direction(s) of approach to the intersection or runway-holding position.

~~*Note. Where necessary to enhance conspicuity of an existing stop bar, extra lights are installed uniformly.*~~

…

E.3.20.10 Where stop bars are specified as components of an advanced surface movement guidance and control system and where, from an operational point of view, higher intensities are required to maintain ground movements at a certain speed in very low visibilities or in bright daytime conditions, the intensity in red light and beam spreads of stop bar lights ~~must~~must be in accordance with the specifications acceptable to the Director.

~~*Note. High-intensity stop bars must only be used in case of an absolute necessity and following a specific study.*~~

…

E.3.20.12 The lighting circuit ~~must~~must be designed so that:

…

(c) when a stop bar is illuminated, any taxiway centre line lights installed beyond the stop bar ~~must~~must be extinguished for a distance of at least 90m; and

…

~~*Note. Care is required in the design of the electrical system to ensure that all of the lights of a stop bar will not fail at the same time. Guidance on this issue is given in the CASA Advisory Circular AC139-8 Electrical Systems.*~~

### E.3.21 Intermediate holding position lights

~~*Note. See E.2.11 for specifications on intermediate holding position marking.*~~

***Application***

E.3.21.1 Except where a stop bar has been installed, intermediate holding position lights ~~must~~must be provided at an intermediate holding position intended for use in runway visual range conditions less than a value of ~~350~~300m.

…

### E.3.23 Runway guard lights

~~*Note. Runway incursions may take place in all visibility or weather conditions. The use of runway guard lights at runway-holding positions can form part of effective runway incursion prevention measures. Runway guard lights warn pilots and drivers of vehicles, when operating on taxiways, that they are about to enter a runway. There are two standard configurations of runway guard lights as illustrated in Figure E-29.*~~

***Application***

E.3.23.1 Runway guard lights, Configuration A, ~~must~~must be provided at each taxiway/runway intersection associated with a runway intended for use in:

…

~~*Note 1. Runway guard lights, Configuration B, may supplement runway guard lights, Configuration A, when deemed necessary.*~~

~~*Note 2. Guidance on the design, operation and location of runway guard lights, Configuration B, is given in the CASA Advisory Circular AC139-5.3 Visual Aids for navigation Lights.*~~

…

***Characteristics***

E.3.23.8 Where there is a need to enhance the contrast between the on and off state of runway guard lights, Configuration A, intended for use during the day, a visor of sufficient size to prevent sunlight from entering the lens without interfering with the function of the fixture ~~must~~must be located above each lamp.

~~*Note. Some other device or design, e.g. specially designed optics, may be used in lieu of the visor.*~~

…

E.3.23.10 The light beam ~~must~~must be unidirectional and ~~must~~must show yellow in the direction of approach to the runway-holding position.

~~*Note. For guidance on orientation and aiming of runway guard lights, see the CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights.*~~

…

E.3.23.13 Where runway guard lights are specified as components of an advanced surface movement guidance and control system where higher light intensities are required, the intensity in yellow light and beam spreads of lights of Configuration A ~~must~~must be in accordance with the specifications acceptable to the Director.

~~*Note. Higher light intensities may be required to maintain ground movement at a certain speed in low visibilities.*~~

…

E.3.23.19 The lights ~~must~~must be illuminated between 30 and 60 cycles per minute and the light suppression and illumination periods ~~must~~must be equal and opposite in each light.

~~*Note. The optimum flash rate is dependent on the rise and fall times of the lamps used. Runway guard lights, Configuration A, installed on 6.6 ampere series circuits have been found to look best when operated at 45 to 50 flashes per minute per lamp. Runway guard lights, Configuration B, installed on 6.6 ampere series circuits have been found to look best when operated at 30 to 32 flashes per minute per lamp.*~~

**E.3.24 Apron floodlighting**

(~~see also~~ refer to rules E.3.17.1 and E.3.18.1)

***Application***

E.3.24.1 Apron floodlighting ~~must~~must be provided on an apron and on a designated isolated aircraft parking position intended to be used at night.

~~*Note 1. The designation of an isolated aircraft parking position is specified in C.14.*~~

~~*Note 2. Guidance on apron floodlighting is given in the CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights.*~~

…

**E.3.25 Visual docking guidance system**

***Application***

E.3.25.1 A visual docking guidance system ~~must~~must be provided when it is intended to indicate, by a visual aid, the precise positioning of an aircraft on an aircraft stand and other alternative means, such as marmusters, are not practicable.

~~*Note. The factors to be considered in evaluating the need for a visual docking guidance system are in particular: the number and type(s) of aircraft using the aircraft stand, weather conditions, space available on the apron and the precision required for manoeuvring into the parking position due to aircraft servicing installation, passenger loading bridges, etc. See the CASA Advisory Circular AC139-5 Series (Visual Aids for navigation) – Visual Aids for guidance on the selection of suitable systems.*~~

***Characteristics***

…

E.3.25.3 The azimuth guidance unit and the stopping position indicator ~~must~~must be adequate for use in all weather, visibility, background lighting and pavement conditions for which the system is intended, both by day and night, but ~~must~~must not dazzle the pilot.

~~*Note. Care is required in both the design and on-site installation of the system to ensure that reflection of sunlight, or other light in the vicinity, does not degrade the clarity and conspicuity of the visual cues provided by the system.*~~

…

E.3.25.6 The accuracy of the system ~~must~~must be adequate for the type of ~~loading~~ passenger boarding bridge and fixed aircraft servicing installations with which it is to be used.

…

**E.3.26 Advanced visual docking guidance system**

***Application***

~~*Note 1. Advanced visual docking guidance systems (A-VDGS) include those systems that, in addition to basic and passive azimuth and stop position information, provide pilots with active (usually sensor based) guidance information, such as aircraft type indication (in accordance with Doc 8643 – Aircraft Type Designators), distance-to-go information and closing speed. Docking guidance information is usually provided on a single display unit.*~~

~~*Note 2. An A-VDGS may provide docking guidance information in three stages: the acquisition of the aircraft by the system, the azimuth alignment of the aircraft, and the stopping position information.*~~

…

E.3.26.3 The A-VDGS ~~must~~must be used only in conditions in which its operational performance is specified.

~~*Note 1. The use of the A-VDGS in conditions such as weather, visibility and background lighting, both by day and night, would need to be specified.*~~

~~*Note 2. Care is required in both the design and on-site installation of the system to ensure that glare, reflection of sunlight, or other light in the vicinity, does not degrade the clarity and conspicuity of the visual cues provided by the system.*~~

…

***Location***

E.3.26.5 The A-VDGS ~~must~~must be located such that unobstructed and unambiguous guidance is provided to the person responsible for, and persons assisting, the docking of the aircraft throughout the docking manoeuvre.

~~*Note. Usually the pilot-in-command is responsible for the docking of the aircraft. However, in some circumstances, another person could be responsible and this person may be the driver of a vehicle that is towing the aircraft.*~~

***Characteristics***

…

E.3.26.7 The A-VDGS ~~must~~must be capable of providing docking guidance information for all aircraft taxi speeds encountered during the docking manoeuvre

~~*Note. See the CASA Advisory Circular AC139-5.3 Visual Aids for navigation – Lights, for an indication of the maximum aircraft speeds relative to distance to the stopping position.*~~

…

E.3.26.10 Symbols and graphics used to depict guidance information ~~must~~must be intuitively representative of the type of information provided.

~~*Note. The use of colour would need to be appropriate and need to follow signal convention, i.e. red, yellow and green mean hazard, caution and normal/correct conditions, respectively. The effects of colour contrasts would also need to be considered.*~~

E.3.26.11 Information on the lateral displacement of the aircraft relative to the stand centre line ~~must~~must be provided at least 25m prior to the stop position.

~~*Note. The indication of the distance of the aircraft from the stop position may be colour-coded and presented at a rate and distance proportional to the actual closure rate and distance of the aircraft approaching the stop point.*~~

…

**E.3.28 Road-holding position light**

***Application***

E.3.28.1 A road-holding position light ~~must~~must be provided at each road-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions less than a value of ~~350~~300m.

E.3.28.2 A road-holding position light ~~may~~must be provided at each road-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions of values between ~~350~~300m and 550m.

***Location***

E.3.28.3 A road-holding position light ~~must~~must be located adjacent to the holding position marking 1.5m (±0.5m) from one edge of the road, i.e. left or right as appropriate to the local traffic regulations.

~~*Note. See I.9 for the mass and height limitations and frangibility requirements of navigation aids located on runway strips.*~~

***Characteristics***

E.3.28.4 The road-holding position light ~~must~~must comprise:

…

~~*Note. It is intended that the lights specified in sub-paragraph a) be controlled by the air traffic services.*~~

…

E.3.28.6 The intensity of the light beam ~~must~~must be adequate for the conditions of visibility and ambient light in which the use of the holding position is intended, but ~~must~~must not dazzle the driver.

~~*Note. The commonly used traffic lights are likely to meet the requirements in E.3.28.5 and E.3.28.6.*~~

…

**E.3.29 No-entry bar**

~~*Note. Runway incursions may take place in all visibility or weather conditions. The use of no-entry bars can form part of effective runway incursion prevention measures.*~~

…

***Characteristics***

E.3.29.4 A no-entry bar ~~must~~must consist of unidirectional lights spaced at uniform intervals of no more than 3m showing red in the intended direction(s) of approach to the runway

~~*Note. Where necessary to enhance conspicuity, extra lights are installed uniformly.*~~

…

E.3.29.7 Where no-entry bars are specified as components of an advanced surface movement guidance and control system and where, from an operational point of view, higher intensities are required to maintain ground movements at a certain speed in very low visibilities or in bright daytime conditions, the intensity in red light and beam spreads of no-entry bar lights ~~must~~must be in accordance with the specifications acceptable to the Director.

~~*Note. High intensity no-entry bars are typically used only in case of an absolute necessity and following a specific study.*~~

…

**E.3.30 Runway status lights**

***Location***

E.3.30.1 Where provided, RELs ~~must~~must be offset 0.6m from the taxiway centre line on the opposite side to the taxiway centre line lights and begin 0.6m before the runway-holding position extending to the edge of the runway. An additional single light ~~must~~must be placed on the runway 0.6m from the runway centre line and aligned with the last two taxiway RELs

~~*Note. Where two or more runway holding positions are provided, the runway holding position referred is that closest to the runway.*~~

…

E.3.30.3 Where provided, THLs ~~must~~must be offset 1.8m on each side of the runway centre line lights and extend, in pairs, starting at a point 115m from the beginning of the runway and, thereafter, every 30m for at least 450m.

~~*Note. Additional THLs may be similarly provided at the starting point of the take-off roll.*~~

***Characteristics***

…

E.3.30.6 Intensity and beam spread of RELs ~~must~~must be in accordance with the specifications acceptable to the Director.

~~*Note. Consideration for reduced beam width may be required for some REL lights at acute angled runway/taxiway intersections to ensure the RELs are not visible to aircraft on the runway.*~~

…

**E.4 Signs**

**E.4.1 General**

~~*Note. Signs must be either fixed message signs or variable message signs. Guidance on signs is contained in the CASA Advisory Circular AC139-5.4 Visual Aids for navigation – Signs.*~~

***Application***

E.4.1.1 Signs ~~must~~must be provided to convey a mandatory instruction, information on a specific location or destination on a movement area or to provide other information to meet the requirements of I.8.1.

~~*Note. See E.2.17 for specifications on information marking.*~~

…

### *Characteristics*

E.4.1.3 Signs ~~must~~must be frangible. Those located near a runway or taxiway ~~must~~must be sufficiently low to preserve clearance for propellers and the engine pods of jet aircraft. The installed height of the sign must not exceed the dimension shown in the appropriate column of Table E-5~~.~~, except for runway distance remaining signs (see E.4.8).

E.4.1.4 ~~Signs~~ Mandatory instruction signs and information signs ~~must~~must be rectangular, as shown in Figures E-30 and E-31 with the longer side horizontal.

…

## E.4.2 Mandatory instruction signs

~~*Note. — See Figure E-30 for pictorial representation of mandatory instruction signs and Figure E-32 for examples of locating signs at taxiway/runway intersections.*~~

***Application***

…

E.4.2.2 Mandatory instruction signs ~~must~~must include runway designation signs, category I, II or III holding position signs, runway-holding position signs, road-holding position signs and NO ENTRY signs.

~~*Note. — See E.4.7 for specifications on road-holding position signs.*~~

…

E.4.2.5 A pattern "A" runway-holding position marking at a runway-holding position established in accordance with C.12.3 ~~must~~must be supplemented with a runway-holding position sign.

~~*Note. — See E.2.10 for specifications on runway-holding position marking.*~~

E.4.2.6 …

~~*Note. — See E.4.3 for characteristics of location signs.*~~

E.4.2.7 A NO ENTRY sign ~~must~~must be provided when entry into an area is prohibited.

~~*Note. — Distance X is established in accordance with Table C-2. Distance Y is established at the edge of the ILS/MLS critical/sensitive area.*~~

…

## E.4.3 Information signs

~~*Note. — See Figure E-31 for pictorial representations of information signs.*~~

***Application***

…

E.4.3.4 A runway vacated sign ~~must~~must be provided where the exit taxiway is not provided with taxiway centre line lights and there is a need to indicate to a pilot leaving a runway the perimeter of the ILS/MLS critical/sensitive area or the lower edge of the inner transitional surface, whichever is farther from the runway centre line.

~~*Note. — See E.3.17 for specifications on colour coding taxiway centre line lights.*~~

***Location***

E.4.3.15 At a taxiway intersection, information signs ~~must~~must be located prior to the intersection and in line with the intermediate holding position marking. Where there is no intermediate holding position marking, the signs ~~must~~must be installed at least 60m from the centre line of the intersecting taxiway where the code number is 3 or 4, and at least 40m where the code number is 1 or 2.

~~*Note. — A location sign installed beyond a taxiway intersection may be installed on either side of a taxiway.*~~

**E.4.4 VOR aerodrome checkpoint sign**

***Application***

E.4.4.1 When a VOR aerodrome checkpoint is established, it ~~must~~must be indicated by a VOR aerodrome checkpoint marking and sign.

~~*Note. — See E.2.12 for VOR aerodrome checkpoint marking.*~~

…

***Characteristics***

E.4.4.4 The inscriptions on a VOR checkpoint sign ~~must~~must be in accordance with one of the alternatives shown in Figure E-33 in which:

…

(c) 147° is an example of the VOR bearing, to the nearest degree, which ~~must~~must be indicated at the VOR checkpoint; and

…

~~Note. — Tolerances for the bearing value shown on the sign are given in Annex 10, Volume I, Attachment E. It will be noted that a checkpoint can only be used operationally when periodic checks show it to be consistently within ±2 degrees of the stated bearing.~~

…

## E.4.7 Road-holding position sign

…

***Characteristics***

…

E.4.7.4 The inscription on a road-holding position sign ~~must~~must be in the national language, be in conformity with the local traffic regulations and include the following:

…

~~*Note. — Examples of road-holding position signs are contained in the CASA Advisory Circular AC139-5.4 Visual Aids for navigation — Signs.*~~

…

**E.4.8 Runway distance remaining signs**

E.4.8.1 Where provided, runway distance remaining signs (RDRS) must be placed along the full length of the runway at longitudinal spacing of approximately 300 m, parallel and equidistant from the runway centre line.

E.4.8.2 Runway distance remaining signs must be placed outside the edges of the runway at a distance shown in Table E-6.

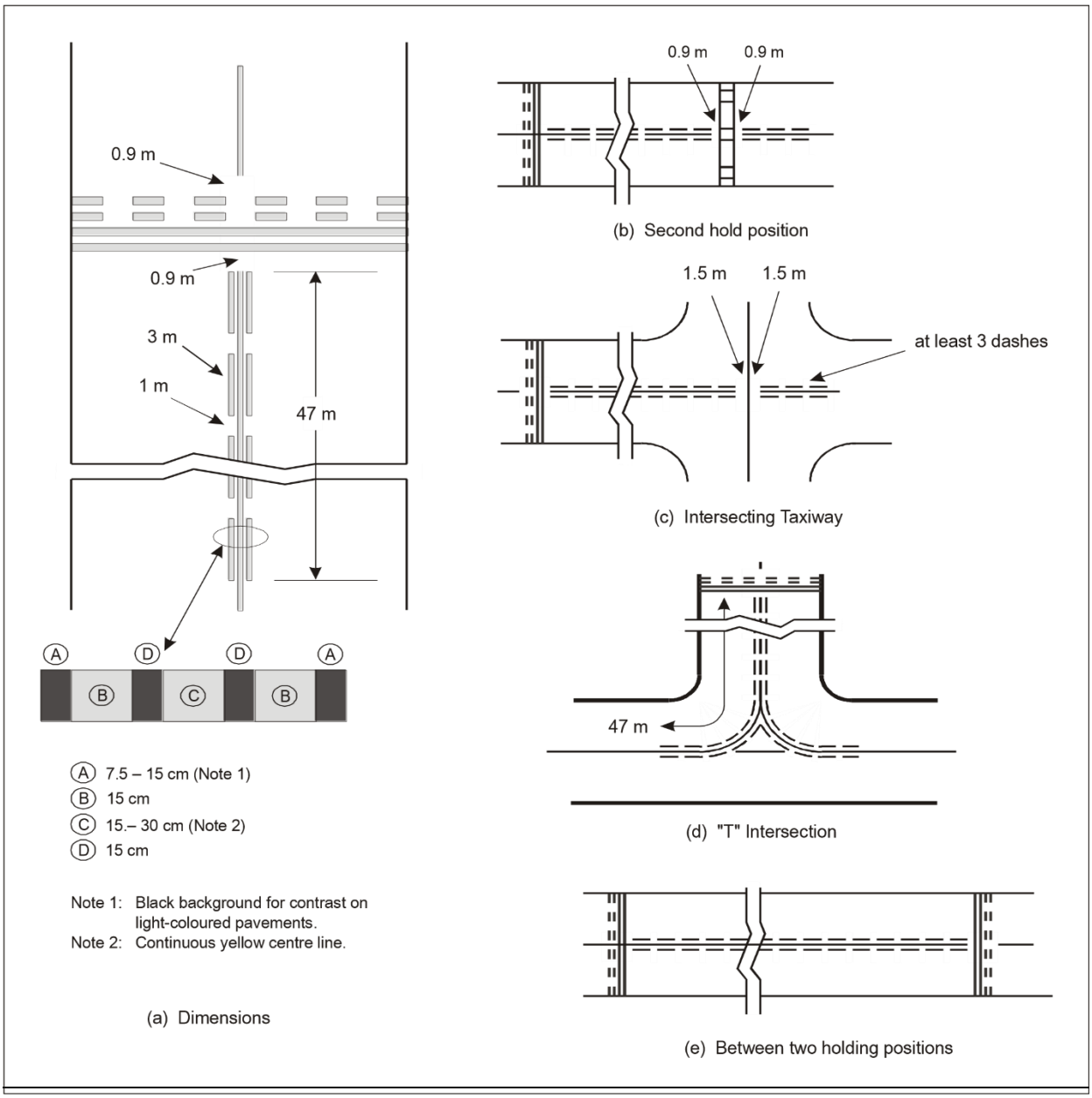
***Characteristics***

E.4.8.3 Where provided, an RDRS must consist of an inscription in white on a black background.

E.4.8.4 The installed height of the RDRS must not exceed the dimension shown in the appropriate column of Table E-6. All RDRSs on one runway must be the same size.

**Table E-6. Location distances for runway distance remaining signs**

| Sign height (mm) | | | | Perpendicular distance from defined runway pavement edge to near side of sign |
|---|---|---|---|---|
| Code number | Legend | Face (min.) | Installed (max.) | |
| 1 or 2 | 640 | 760 | 1070 | 6 – 10.5 m |
| 3 or 4 | 1000 | 1200 | 1520 | 15 – 22.5 m |
| 3 or 4 | 1200 | 1500 | 1600 | 25 m or more |


0.9 m
0.9 m
3 m
1 m
47 m
A
D
D
A
B
C
B
A 7.5 – 15 cm (Note 1)
B 15 cm
C 15.– 30 cm (Note 2)
D 15 cm
Note 1: Black background for contrast on light-coloured pavements.
Note 2: Continuous yellow centre line.
(a) Dimensions
0.9 m
0.9 m
(b) Second hold position
1.5 m
1.5 m
at least 3 dashes
(c) Intersecting Taxiway
47 m
(d) "T" Intersection
(e) Between two holding positions

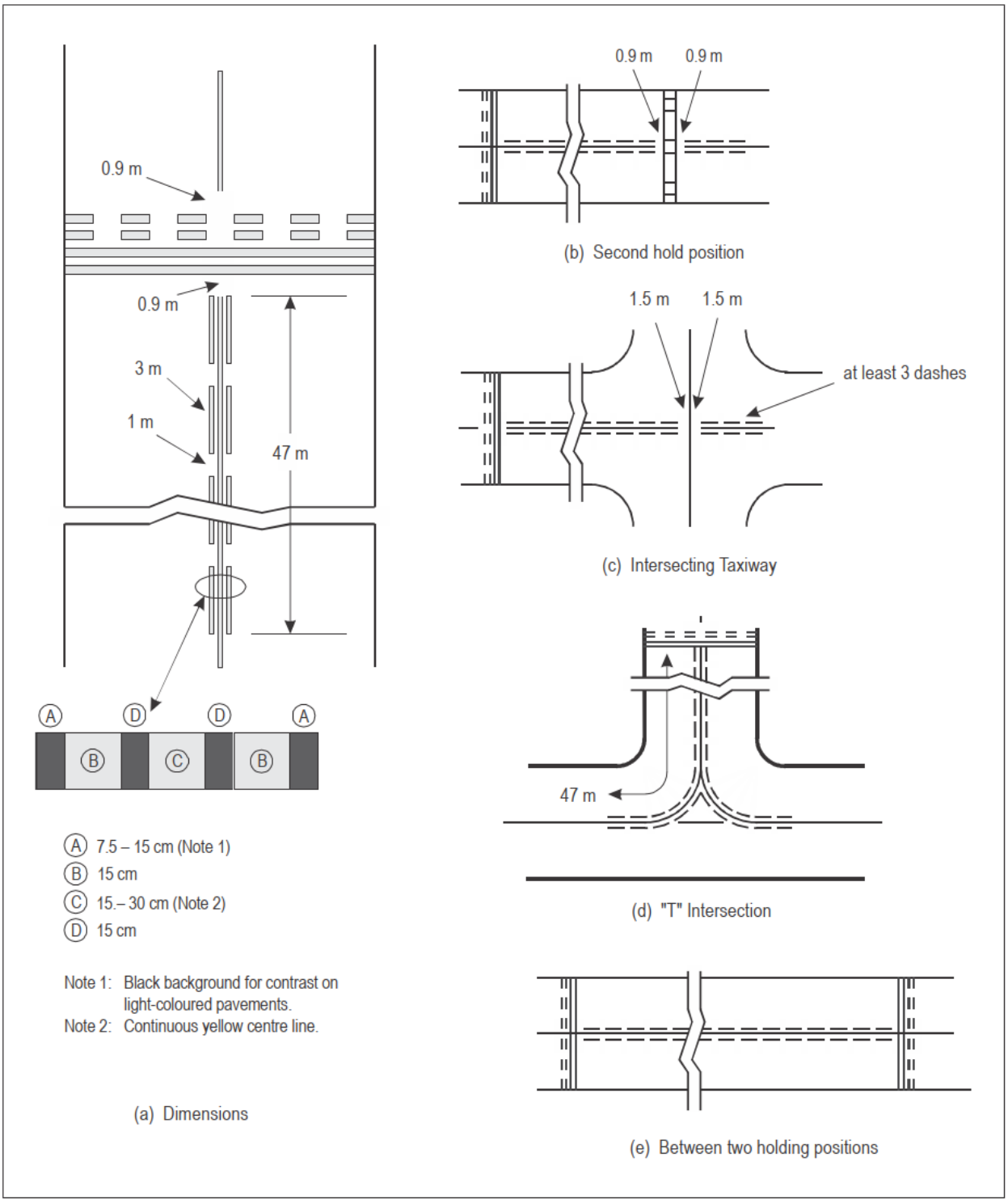
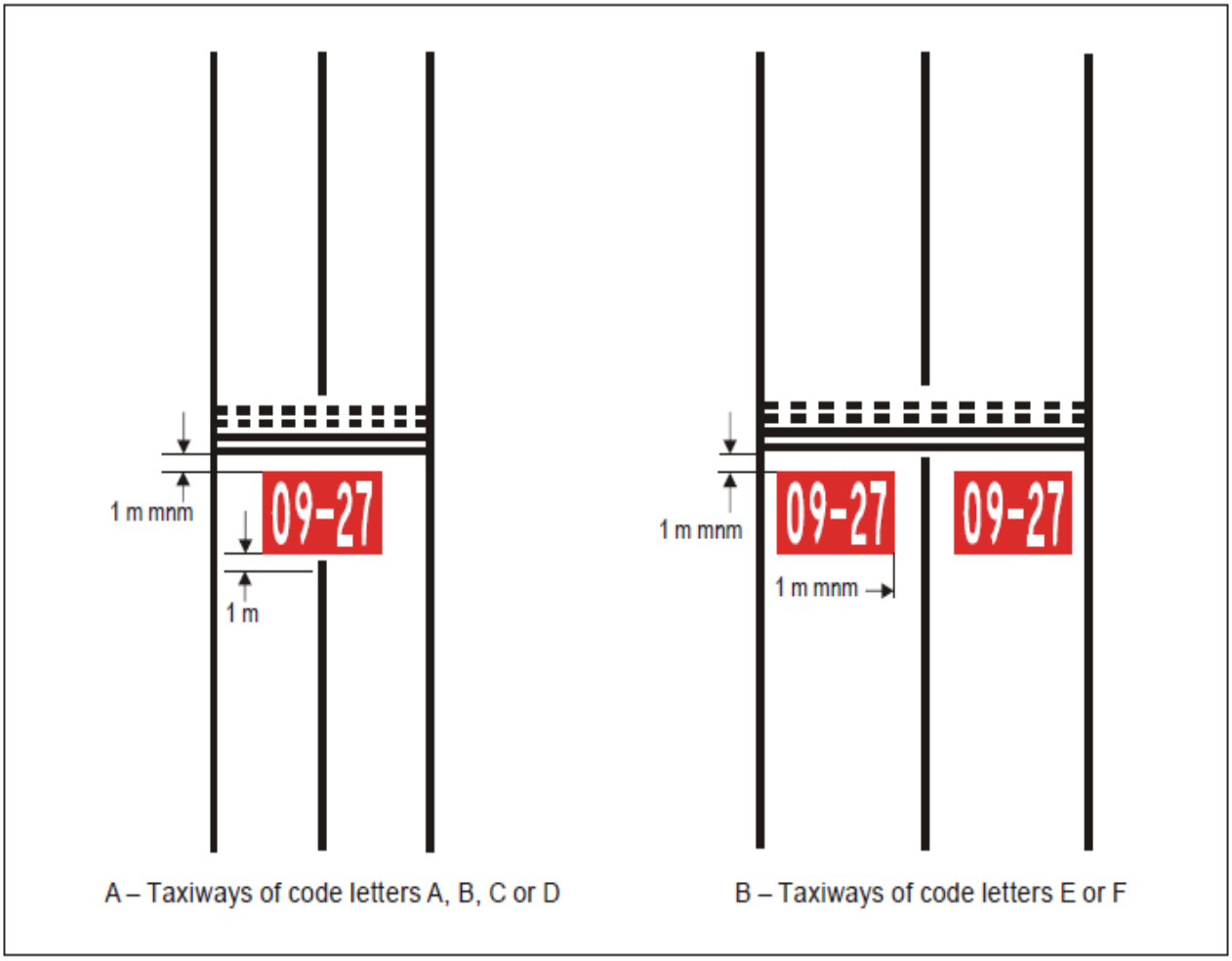



**Figure E-7. Enhanced taxiway centre line marking**


1 m mnm
09-27
1 m
A – Taxiways of code letters A, B, C or D
1 m mnm
09-27
09-27
1 m mnm
B – Taxiways of code letters E or F

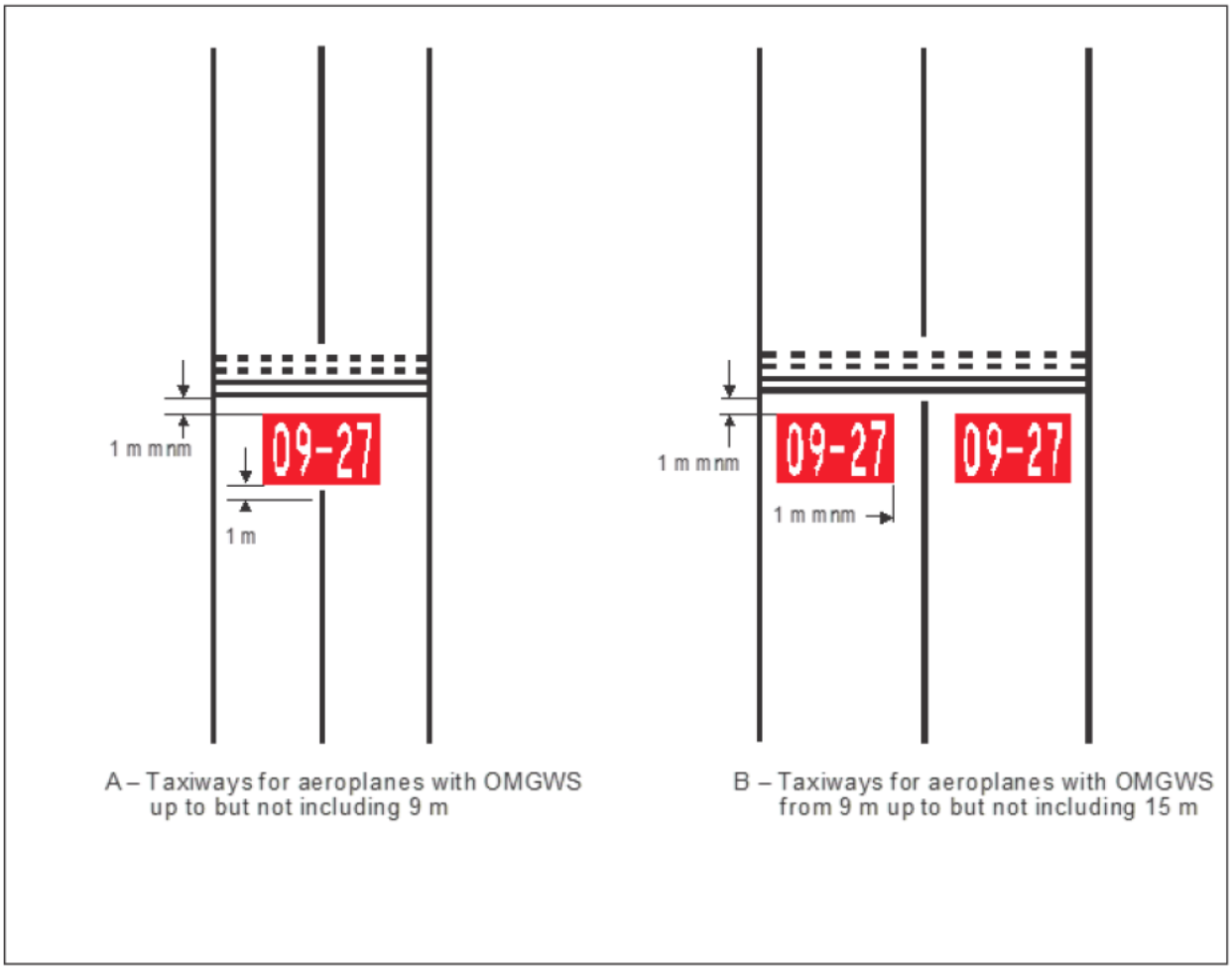



**Figure E-10. Mandatory instruction marking**

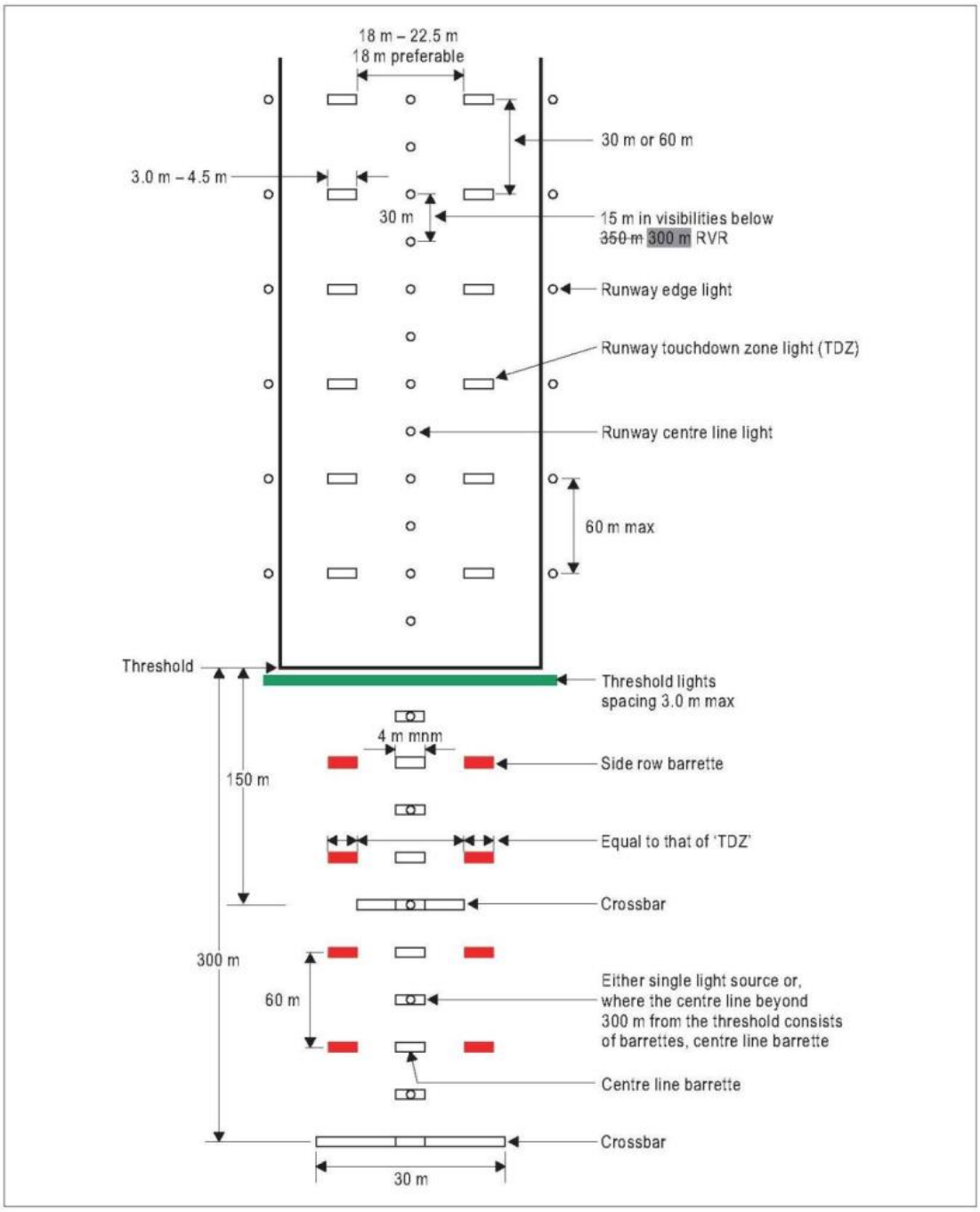



**Figure E-15. Inner 300 m approach and runway lighting for precision approach runways, categories II and III, where the serviceability levels of the lights specified as maintenance objectives in Appendix 10 can be demonstrated.**

## E.5 Markers

### E.5.1 General

Markers ~~must~~must be frangible. Those located near a runway or taxiway ~~must~~must be sufficiently low to preserve clearance for propellers and for the engine pods of jet aircraft.

~~*Note 1. Anchors or chains, to prevent markers which have broken from their mounting from blowing away, are sometimes used.*~~

~~*Note 2. Guidance on frangibility of markers is given in the CASA Advisory Circular AC139-9.7 Operational Services – Siting of Installations and Frangibility.*~~

…

### E.5.3 Stopway edge markers

…

***Characteristics***

E.5.3.2 The stopway edge markers ~~must~~must be sufficiently different from any runway edge markers used to ensure that the two types of markers cannot be confused.

~~*Note. Markers consisting of small vertical boards camouflaged on the reverse side, as viewed from the runway, have proved operationally acceptable.*~~

…

### E.5.6 Taxiway centre line markers

***Location***

E.5.6.3 Taxiway centre line markers ~~must~~must be installed at least at the same location as would taxiway centre line lights had they been used.

~~*Note. See E.3.17.12 for the spacing of taxiway centre line lights.*~~

…

## APPENDIX F. VISUAL AIDS FOR DENOTING OBSTACLES

## F.1 Objects to be marked and/or lighted

~~*Note 1. The marking and/or lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of the obstacles. It does not necessarily reduce operating limitations which may be imposed by an obstacle.*~~

~~*Note 2. An autonomous aircraft detection system may be installed on or near an obstacle (or group of obstacles such as wind farms), designed to operate the lighting only when the system detects an aircraft approaching the obstacle, in order to reduce light exposure to local residents. Guidance on the design and installation of an autonomous aircraft detection system is available in the CASA Advisory Circular AC139-6 Visual Aids for Denoting Obstacles. The availability of such guidance is not intended to imply that such a system has to be provided.*~~

## F.1.1 Objects within the lateral boundaries of the obstacle limitation surfaces

…

F.1.1.8 A fixed object that extends above an obstacle protection surface ~~must~~must be marked and, if the runway is used at night, lighted.

*~~Note. — See 5.3.5 for information on the obstacle protection surface.~~*

F.1.1.9 Other objects inside the obstacle limitation surfaces ~~must~~must be marked and/or lighted if an aeronautical study indicates that the object could constitute a hazard to aircraft (this includes objects adjacent to visual routes e.g. waterway or highway).

*~~Note. — See note accompanying D.4.2.~~*

…

**F.2 Marking and/or lighting of objects**

**…**

**F.2.2 Mobile objects**

…

***Marking by flags***

…

F.2.2.4 Flags used to mark mobile objects ~~must~~must not be less than 0.9m on each side and ~~must~~must consist of a chequered pattern, each square having sides of not less than 0.3m. The colours of the pattern ~~must~~must contrast each with the other and with the background against which they will be seen. Orange and white or alternatively red and white ~~must~~must be used, except where such colours merge with the background.

*~~Note. — This table does not include recommended horizontal beam spreads. F.2.1.3 requires 360° coverage around an obstacle. Therefore, the number of lights needed to meet this requirement will depend on the horizontal beam spreads of each light as well as the shape of the obstacle. Thus, with narrower beam spreads, more lights will be required…~~*

*~~Note. — This table does not include recommended horizontal beam spreads. F.2.1.3 requires 360° coverage around an obstacle. Therefore, the number of lights needed to meet this requirement will depend on the horizontal beam spreads of each light as well as the shape of the obstacle. Thus, with narrower beam spreads, more lights will be required…~~*

*~~Note. — An extended beam spread may be necessary under specific configuration and justified by an aeronautical study.~~*

***Lighting***

F.2.2.5 Low-intensity obstacle lights, Type C, ~~must~~must be displayed on vehicles and other mobile objects excluding aircraft

*~~Note. — See Annex 2 for lights to be displayed by aircraft.~~*

…

F.2.2.8 Low-intensity obstacle lights on objects with limited mobility such as passenger boarding ~~aero~~bridges ~~must~~must be fixed-red, and as a minimum be in accordance with the specifications for low-intensity obstacle lights, Type A, in Table F-1. The intensity of the lights ~~must~~must be sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general levels of illumination against which they would normally be viewed.

## F.2.3 Fixed objects

~~*Note. The fixed objects of wind turbines are addressed separately in F.2.4 and the fixed objects of overhead wires, cables, etc., and supporting towers are addressed separately in F.2.5.*~~

***Marking by colour***

…

F.2.3.3 An object ~~must~~must be coloured to show alternating contrasting bands if:

…

The bands ~~must~~must be perpendicular to the longest dimension and have a width approximately 1/7 of the longest dimension or 30m, whichever is less. The colours of the bands ~~must~~must contrast with the background against which they will be seen. Orange and white ~~must~~must be used, except where such colours are not conspicuous when viewed against the background. The bands on the extremities of the object ~~must~~must be of the darker colour. (See Figures F-1 and F-2.)

~~*Note. Table F-4 shows a formula for determining band widths and for having an odd number of bands, thus permitting both the top and bottom bands to be of the darker colour.*~~

F.2.3.4 An object ~~must~~must be coloured in a single conspicuous colour if its projection on any vertical plane has both dimensions less than 1.5m. Orange or red ~~must~~must be used, except where such colours merge with the background.

~~*Note. Against some backgrounds it may be found necessary to use a different colour from orange or red to obtain sufficient contrast.*~~

***Lighting***

F.2.3.10 In the case of an object to be lighted, one or more low-, medium- or high-intensity obstacle lights ~~must~~must be located as close as practicable to the top of the object.

~~*Note. Recommendations on how a combination of low-, medium- and/or high-intensity lights on obstacles must be displayed, are given in Appendix 5(CASA Advisory Circular AC139-6 Visual Aids for Denoting Obstacles).*~~

…

F.2.3.17 The installation setting angles for high-intensity obstacle lights, Type A, ~~must~~must be in accordance with Table F-5.

~~*Note. High-intensity obstacle lights are intended for day use as well as night use. Care is needed to ensure that these lights do not create disconcerting dazzle. Guidance on the design, location and operation of high-intensity obstacle lights is given in the CASA Advisory Circular AC139-6 Visual Aids for Denoting Obstacles.*~~

…

***Lighting of objects with a height less than 45m above ground level***

…

F.2.3.22 Medium-intensity obstacle lights, Type A, B or C, ~~must~~must be used where the object is an extensive one. Medium-intensity obstacle lights, Types A and C, ~~must~~must be used alone, whereas medium-intensity obstacle lights, Type B, ~~must~~must be used either alone or in combination with low-intensity obstacle lights, Type B.

~~*Note. A group of buildings is regarded as an extensive object.*~~

…

## F.2.4 Wind turbines

F.2.4.1 A wind turbine ~~must~~must be marked and/or lighted if it is determined to be an obstacle.

~~*Note 1. Additional lighting or markings may be provided where such lighting or markings are deemed necessary.*~~

~~*Note 2. See D.3.1 and D.3.2*~~

…

***Lighting***

F.2.4.3 When lighting is deemed necessary, in the case of a wind farm, i.e. a group of two or more wind turbines, the wind farm ~~must~~must be regarded as an extensive object and the lights ~~must~~ must be installed:

…

(e) at locations prescribed in (a), (b) and (d), respecting the following criteria:

(1) for wind turbines of less than 150m in overall height (hub height plus vertical blade height), medium-intensity lighting on the nacelle ~~must~~ must be provided;

(2) for wind turbines from 150m to 315m in overall height, in addition to the medium-intensity light installed on the nacelle, a second light serving as an alternate ~~must~~must be provided in case of failure of the operating light. The lights ~~must~~must be installed to assure that the output of either light is not blocked by the other; and

(3) in addition, for wind turbines from 150m to 315m in overall height, an intermediate level at half the nacelle height of at least three low-intensity Type E lights, as specified in F.2.1.3, ~~must~~must be provided. If an aeronautical study shows that low-intensity Type E lights are not suitable, low-intensity Type A or B lights ~~must~~must be used.

~~*Note. The above F.2.4.3(c) does not address wind turbines of more than 315m of overall height. For such wind turbines, additional marking and lighting must be required as determined by an aeronautical study.*~~

…

***Lighting***

F.2.5.9 Where high-intensity obstacle lights, Type B, are used, they ~~must~~must be located at three levels:

…

~~*Note. In some cases, this may require locating the lights off the tower.*~~

F.2.5.10 High-intensity obstacle lights, Type B, indicating the presence of a tower supporting overhead wires, cables, etc., ~~must~~must flash sequentially; first the middle light, second the top light and last, the bottom light. The intervals between flashes of the lights ~~must~~must approximate the following ratios:

…

~~*Note. High-intensity obstacle lights are intended for day use as well as night use. Care is needed to ensure that these lights do not create disconcerting dazzle. Guidance on the design, operation and the location of high-intensity obstacle lights is given in the CASA Advisory Circular AC139-6 Visual Aids for Denoting Obstacles.*~~

…

# APPENDIX G. VISUAL AIDS FOR DENOTING RESTRICTED USE AREAS

## G.1 Closed runways and taxiways or parts thereof

### G.1.1 General

~~G.1.5~~G.1.1.1 When a runway or taxiway or portion thereof is permanently closed, all normal runway and taxiway markings ~~must~~must be obliterated.

~~G.1.6~~G.1.1.2 Lighting on systems provided for a closed runway or taxiway or portion thereof ~~must~~must not be operated, except as required for maintenance purposes.

~~G.1.7~~G.1.1.3 In addition to closed markings, as specified in G.1.2 and G.1.3, when the a closed runway or taxiway or portion thereof is intercepted by a~~usable~~ runway or taxiway which is can be used at night, unserviceability lights ~~must~~must be placed across the entrance to the closed area at intervals not exceeding 3 m (~~see~~refer to rule G.4.~~4.~~2).

### G.1.2 Closed runway marking

~~G.1.1~~G.1.2.1 A closed runway marking ~~must~~must be displayed on a runway ~~or taxiway~~ or portion thereof which is permanently closed to the use of all aircraft.

~~G.1.2~~G.1.2.2 A closed runway marking ~~must~~must be displayed on a temporarily closed runway ~~or taxiway~~ or portion thereof, except that such marking may be omitted when the closing is of short duration and adequate warning by air traffic services is provided.

~~G.1.3~~G.1.2.3 ~~On a runway a~~ A closed runway marking ~~must~~must be placed at each~~end~~ extremity of the runway, or portion thereof, declared closed, and additional markings ~~must~~must be so placed that the maximum interval between markings does not exceed 300 m. ~~On a taxiway a closed marking must be placed at each end of the taxiway or portion thereof closed.~~

~~G.1.4~~G.1.2.4 The closed runway marking ~~must~~must be white and of the form and proportions as detailed in Figure G-1, Illustration a)~~, when displayed on a runway, and must be of the form and proportions as detailed in Figure G-1, Illustration b), when displayed on a taxiway. The marking must be white when displayed on a runway and must be yellow when displayed on a taxiway~~.

***Application***

~~G.1.1~~G.1.3.1 A closed taxiway marking ~~must~~must be displayed on a ~~runway or~~ taxiway or portion thereof which is permanently closed to the use of all aircraft.

~~G.1.2~~G.1.3.2 A closed taxiway marking ~~must~~must be displayed on a temporarily closed ~~runway or~~ taxiway or portion thereof, except that such marking may be omitted when the closing is of short duration and adequate warning by air traffic services is provided.

***Location***

~~G.1.3~~G.1.3.3 ~~On a runway a closed marking must be placed at each end of the runway, or portion thereof, declared closed, and additional markings must be so placed that the maximum interval between markings does not exceed 300 m. On a~~ A closed taxiway ~~a closed~~ marking ~~must~~must be placed at least at each ~~end~~ extremity of the taxiway or portion thereof closed.

***Characteristics***

~~G.1.4~~G.1.3.4 The closed taxiway marking ~~must~~must be yellow and of the form and proportions as detailed in Figure G-1, Illustration ~~a~~b)~~, when displayed on a taxiway. The marking must be white when displayed on a runway and must be yellow when displayed on a taxiway~~.

~~*Note 1. — When an area is temporarily closed, frangible barriers or markings utilizing materials other than paint or other suitable means may be used to identify the closed area.*~~

~~*Note 2. — Procedures pertaining to the planning, coordination, monitoring and safety management of works in progress on the movement area are specified in the PANS Aerodromes (Doc 9981).*~~

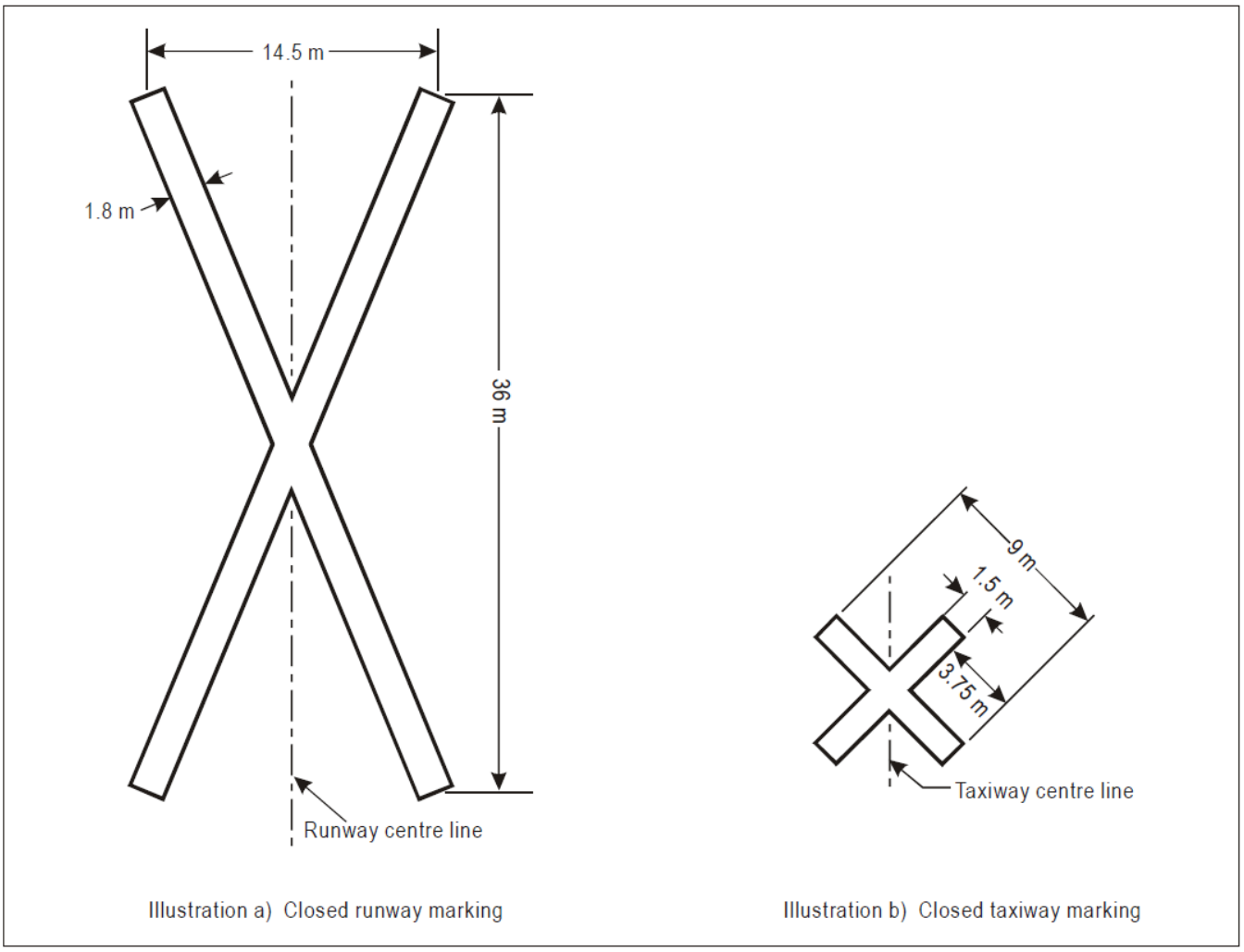



**Figure G-1. Closed runway and taxiway markings**

## G.1.4 Closed runway lighting

***Application***

G.1.4.1 Where operationally desirable, at an aerodrome provided with runway lighting, closed runway lighting must be provided on runway (s) that are temporarily closed or temporarily restricted for take-off.

***Location***

G.1.4.2 A closed runway lighting must be placed on the centre line near each extremity of the runway temporarily declared closed.

***Characteristics***

G.1.4.3 The closed runway lighting as viewed by the pilot must be of the equivalent elevated form and proportions as detailed in Figure G-2, showing a minimum of five lights uniformly spaced on each branch, with a minimum interval as specified by Table G-1.

**Table G-1. Minimum interval between closed runway lights centres**

| Number of lights per branch | Minimum interval between lights centres | Number of lights per branch | Minimum interval between lights centres |
|---|---|---|---|
| 5 | 1.5 m | 5 | 1.5 m |
| 7 | 1.0 m | 7 | 1.0 m |
| 9 | 0.8 m | 9 | 0.8 m |

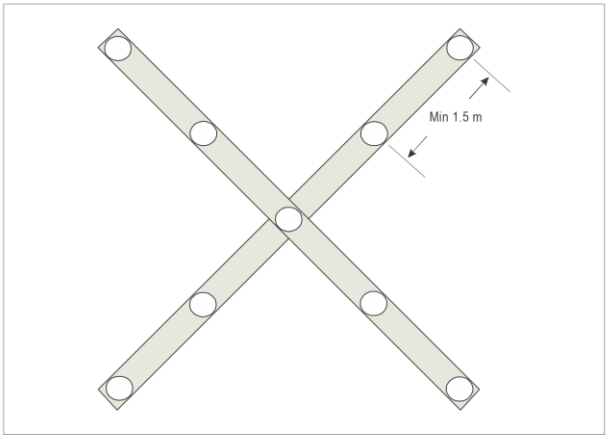



**Figure G-2. Example of equivalent elevated closed runway lighting with five lights per branch**

G.1.4.4 Closed runway lights must show flashing variable white in the direction of approach to the runway, at a rate of one second on and one second off.

G.1.4.5 Closed runway lights must automatically revert to fixed lights in the event of the flashing system failure.

G.1.4.6 Closed runway lights must be in accordance with the specifications in Figure G-3.

## *G.2 Non-load-bearing surfaces*

### *Application*

G.2.1 Shoulders for taxiways, runway turn pads, holding bays and aprons and other non-load-bearing surfaces which cannot readily be distinguished from load-bearing surfaces and which, if used by aircraft, might result in damage to the aircraft ~~must~~must have the boundary between such areas and the load-bearing surface marked by a taxi side stripe marking.

~~*Note. The marking of runway sides is specified in E.2.7.*~~

### *Characteristics*

…

G.2.3 A taxi side stripe marking ~~must~~must consist of a pair of solid lines, each 15 cm wide and spaced 15cm apart and the same colour as the taxiway centre line marking.

~~*Note. Guidance on providing additional transverse stripes at an intersection or a small area on the apron is given in the CASA Advisory Circular AC139-7 Visual Aids for Denoting Restricted Use Areas.*~~

## G.4 Unserviceable areas

### G.4.1 Unserviceability markings

***Application***

G.4.1.1 Where operationally required, unserviceability signs must be supplemented by unserviceability markings on the surface of the pavement.

G.4.1.2 Where it is impracticable to install an unserviceability sign in accordance with G.4.3.1, an unserviceability marking must be provided on the surface of the pavement.

***Location***

G.4.1.3 Unserviceability markings must be displayed across the surface of the taxiway or apron where necessary and positioned so as to be legible from the cockpit of an approaching aircraft.

***Characteristics***

G.4.1.4 Unserviceability markings must consist of an inscription in black upon an orange background.

G.4.1.5 The inscriptions must be in the form and proportions acceptable to the Director.

G.4.1.6 The background must be rectangular and extend a minimum of 0.5 m laterally and vertically beyond the extremities of the inscription.

~~**G.4 Unserviceable areas**~~

### G.4.2 Unserviceability lights

***Application***

~~G.4.1~~ G.4.2.1 Unserviceability ~~markers~~ lights ~~must~~must be~~displayed~~ provided on a movement area used at night, wherever any portion of~~a taxiway, apron or holding bay~~ the movement area is unfit for the movement of aircraft but it is still possible for aircraft to bypass the area safely. ~~On a movement area used at night, unserviceability lights must be used.~~

***Location***

~~G.4.2~~ G.4.2.2 Unserviceability ~~markers and~~ lights ~~must~~must be placed at intervals sufficiently close so as to delineate the unserviceable area.

~~*Note. Guidance on the location of unserviceability lights is given in CASA Advisory Circular Ac139-7 Visual Aids for Denoting Restricted Use Areas.*~~

~~***Characteristics of unserviceability markers***~~

~~G.4.3 Unserviceability markers must consist of conspicuous upstanding devices such as flags, cones or marker boards.~~

***Characteristics ~~of unserviceability lights~~***

~~G.4.4~~G.4.2.3 An unserviceability light ~~must~~must consist of a red fixed light. The light ~~must~~must have an intensity sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general level of illumination against which it would normally be viewed. In no case ~~must~~must the intensity be less than 10 cd of red light.

## G.4.3 Unserviceability signs

***Application***

G.4.3.1 Unserviceability signs must be provided where there is an operational need to indicate temporary changes to runway declared distances.

G.4.3.2 Unserviceability signs must be provided where there is an operational need to indicate temporary changes to taxiways and aprons.

G.4.3.3 Existing signs must be removed or obscured at an aerodrome if they provide inadequate or misleading information regarding unserviceability areas.

G.4.3.4 The information provided by unserviceability signs must not be in conflict with the information provided by the appropriate aeronautical information services.

***Location***

G.4.3.5 Unserviceability signs must be located where operationally needed on the movement area. The location distances on the manoeuvring area must be as per taxiing guidance signs in Table E-5.

G.4.3.6 The location of unserviceability signs must not visually obscure or provide conflicting information with existing operationally required visual aids.

***Characteristics***

G.4.3.7 Unserviceability signs must be frangible. Those located near a runway or taxiway must be sufficiently low to preserve clearance for propellers and the engine pods of jet aircraft. The installed height of unserviceability signs must not exceed the dimension for taxiing guidance signs shown in Table E-5.

G.4.3.8 Unserviceability signs must be rectangular, as shown in Figure G-3, with the longer side horizontal.

G.4.3.9 The inscriptions on an unserviceability sign must be in accordance with provisions acceptable to the Director.

G.4.3.10 Unserviceability signs must consist of an inscription in black on an orange background. Unserviceability signs must be supplemented by a black outline measuring 10 mm in width for runways where the code number is 1 or 2, and 20 mm in width for runways where the code number is 3 or 4.

G.4.3.11 The inscription on an unserviceability sign must consist of a legible, clear and simple message, only providing the useful and necessary information for the safety of the operation.

G.4.3.12 Unserviceability signs must be retroreflective in accordance with provisions acceptable to the Director.

G.4.3.13 Where there is a need to enhance the conspicuity of unserviceability signs, they must be supplemented by two red or yellow simultaneously flashing lights. The intensity and the

beam spread of these lights must be in accordance with specifications acceptable to the Director.

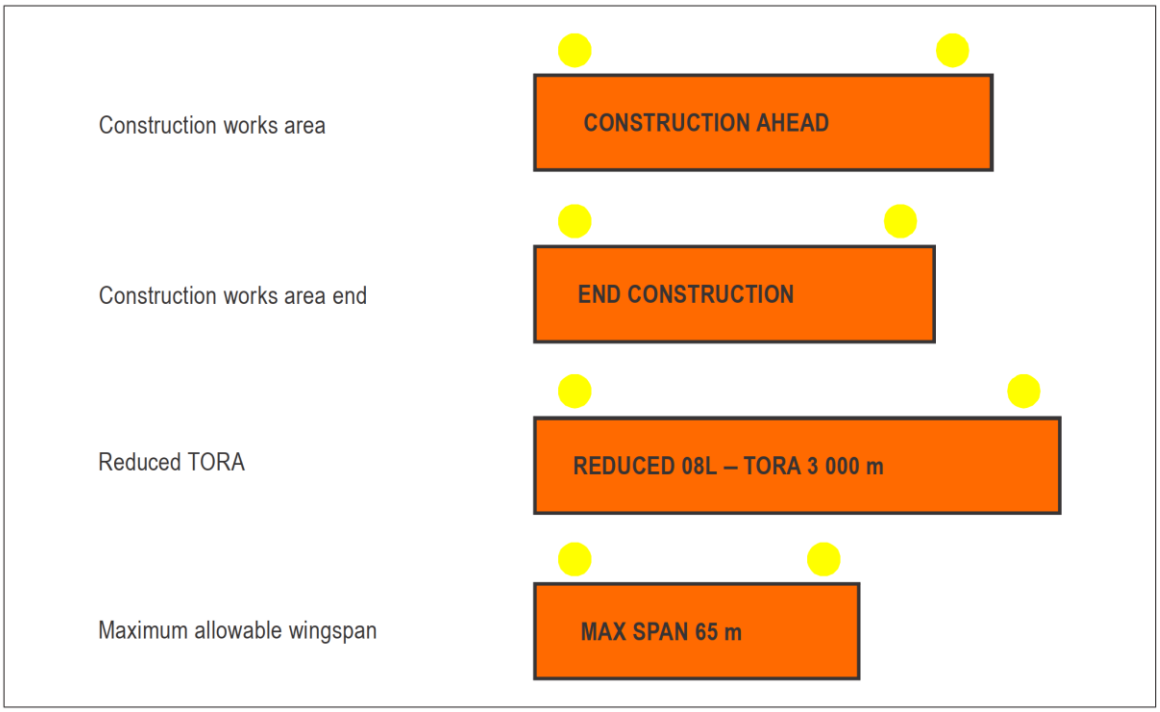



**Figure G-3. Examples of unserviceability signs**

## G.4.4 Unserviceability markers

***Application***

G.4.4.1 Unserviceability markers must be displayed wherever any portion of a taxiway, apron or holding bay is unfit for the movement of aircraft but it is still possible for aircraft to bypass the area safely.

***Location***

G.4.4.2 Unserviceability markers must be placed at intervals sufficiently close, so as to delineate the unserviceable area.

***Characteristics***

G.4.4.3 Unserviceability markers must consist of conspicuous upstanding devices such as flags, cones or marker boards.

~~**Characteristics of unserviceability cones**~~

~~G.4.5~~G.4.4.4 An unserviceability cone ~~must~~must be at least 0.5 m in height and red, orange or yellow or any one of these colours in combination with white.

~~**Characteristics of unserviceability flags**~~

~~G.4.6~~G.4.4.5 An unserviceability flag ~~must~~must be at least 0.5 m square and red, orange or yellow or any one of these colours in combination with white.

~~**Characteristics of unserviceability marker boards**~~

~~G.4.7~~G.4.4.6 An unserviceability marker board ~~must~~must be at least 0.5 m in height and 0.9 m in length, with alternate red and white or orange and white vertical stripes.

# APPENDIX H. ELECTRICAL SYSTEMS

## H.1 Electrical power supply systems for air navigation facilities

…

H.1.2 The design and provision of electrical power systems for aerodrome visual and radio navigation aids ~~must~~must be such that an equipment failure will not leave the pilot with inadequate visual and non-visual guidance or misleading information.

~~*Note. The design and installation of the electrical systems need to take into consideration factors that can lead to malfunction, such as electromagnetic disturbances, line losses, power quality, etc. Additional guidance is given in the CASA Advisory Circular AC139-8 Electrical Systems.*~~

…

H.1.4 The time interval between failure of the primary source of power and the complete restoration of the services required by H.1.10 ~~must~~must be as short as practicable, except that for visual aids associated with non-precision, precision approach or take-off runways the requirements of Table H-1 for maximum switch-over times ~~must~~must apply.

~~*Note. A definition of switch-over time is given in 139.2.*~~

***Visual aids***

***Application***

. . .

H.1.10 The following aerodrome facilities ~~must~~must be provided with a secondary power supply capable of supplying power when there is a failure of the primary power supply:

. . .

~~*Note. The requirement for minimum lighting may be met by other than electrical means.*~~

. . .

(c) approach, runway and taxiway lighting as specified in~~H.1.6 to~~ H.1.9;

(d) closed runway lighting, if provided in accordance with G.1.4.1 and connected to the primary power supply;

(~~d~~e) meteorological equipment;

(~~e~~f) essential security lighting, if provided in accordance with I.11;

(~~f~~g) essential equipment and facilities for the aerodrome responding emergency agencies;

(~~g~~h) floodlighting on a designated isolated aircraft parking position if provided in accordance with E.3.24.1; and

(~~h~~i) illumination of apron areas over which passengers may walk.

~~*Note. Specifications for secondary power supply for radio navigation aids and ground elements of communications systems are given in CAR Part 171.*~~

H.1.11 Requirements for a secondary power supply ~~must~~must be met by either of the following:

…

~~*Note. Guidance on electrical systems is included in the CASA Advisory Circular AC139-8 Electrical Systems.*~~

. . .

**H.2 System design**

H.2.1 For a runway meant for use in runway visual range conditions less than a value of 550m, the electrical systems for the power supply, lighting and control of the lighting systems included in Table H-1 ~~must~~must be so designed that an equipment failure will not leave the pilot with inadequate visual guidance or misleading information.

~~*Note. Guidance on means of providing this protection is given in the CASA Advisory Circular AC139-8 Electrical Systems.*~~

. . .

H.2.4 The electrical systems for the power supply and the control of the closed runway lighting must be so designed that the closed runway lighting system is operated independently of runway lighting systems.

**H.3 Monitoring**

~~*Note. Guidance on this subject is given in the CASA Advisory Circular AC139-8 Electrical Systems.*~~

…

H.3.5 For a runway meant for use in runway visual range conditions less than a value of 550m, the lighting systems detailed in Table H-1 ~~must~~must be monitored automatically to provide an indication when the serviceability level of any element falls below the minimum level specified by the Director below which operations ~~must~~must not continue. This information ~~must~~must be automatically relayed to the air traffic services unit and displayed in a prominent position.

~~*Note. Guidance on air traffic control interface and visual aids monitoring is included in the CASA Advisory Circular AC139-8 Electrical Systems*~~

# APPENDIX I. AERODROME OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS

## I.1 Aerodrome emergency planning

***General***

…

I.1.2 The aerodrome emergency plan ~~must~~must provide for the coordination of the actions to be taken in an emergency occurring at an aerodrome or in its vicinity.

~~*Note 1. Examples of emergencies are: aircraft emergencies, sabotage including bomb threats, unlawfully seized aircraft, dangerous goods occurrences, building fires, natural disaster and public health emergencies.*~~

~~*Note 2. Examples of public health emergencies are increased risk of travelers' or cargo spreading a serious communicable disease internationally through air transport and severe outbreak of a communicable disease potentially affecting a large proportion of aerodrome staff.*~~

I.1.3 The plan ~~must~~must coordinate the response or participation of all existing agencies which, in the opinion of the Director, could be of assistance in responding to an emergency.

~~*Note 1. Examples of agencies are:*~~

~~*(a) on the aerodrome: air traffic control units, rescue and firefighting services, aerodrome administration, medical and ambulance services, aircraft operators, security services, and police;*~~

~~*(b) off the aerodrome: fire departments, police, health authorities (including medical, ambulance, hospital and public health services), military, and harbour patrol or coast guard.*~~

~~*Note 2. Public health services include planning to minimize adverse effects to the community from health-related events and deal with population health issues rather than provision of health services to individuals.*~~

…

I.1.6 The plan ~~must~~must observe human factors principles to ensure optimum response by all existing agencies participating in emergency operations.

~~*Note 1. Guidance material on human factors principles can be found in the Human Factors Training Manual (Doc 9683).*~~

~~*Note 2. General principles and procedures on the training of aerodrome personnel, including training programmes and competence checks, are specified in the PANS Aerodromes (Doc 9981).*~~

…

***Aerodrome emergency exercise***

I.1.12 The plan ~~must~~must contain procedures for periodic testing of the adequacy of the plan and for reviewing the results in order to improve its effectiveness.

~~*Note. The plan includes all participating agencies and associated equipment.*~~

I.1.13 The plan ~~must~~must be tested by conducting:

…

~~*Note 1. The purpose of a full-scale exercise is to ensure the adequacy of the plan to cope with different types of emergencies. The purpose of a partial exercise is to ensure the adequacy of the response to individual participating agencies and components of the plan, such as the communications system. The purpose of modular tests is to enable concentrated effort on specific components of established emergency plans.*~~

~~*Note 2. Guidance material on airport emergency planning is available in the CASA Advisory Circular AC139-9.1 Operational Services-Emergency Planning.*~~

***Emergencies in difficult environments***

I.1.16 An assessment of the approach and departure areas within 1000m of the runway threshold ~~must~~must be carried out to determine the options available for intervention.

~~*Note. Guidance material on assessing approach and departure areas within 1000m of runway thresholds can be found in CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

I.2.1 Rescue and firefighting equipment and services ~~must~~must be provided at an aerodrome when serving regular public transport.

~~*Note. Public or private organizations, suitably located and equipped, may be designated to provide the rescue and firefighting service. It is intended that the fire station housing these organizations be normally located on the aerodrome, although an off-aerodrome location is not precluded provided the response time can be met.*~~

I.2.2 Where an aerodrome is located close to water/swampy areas, or difficult terrain, and where a significant portion of approach or departure operations takes place over these areas, specialist rescue services and firefighting equipment appropriate to the hazard and risk ~~must~~must be available.

~~*Note 1. Special firefighting equipment need not be provided for water areas; this does not prevent the provision of such equipment if it would be of practical use, such as when the areas concerned include reefs or islands.*~~

~~*Note 2. The objective is to plan and deploy the necessary life-saving flotation equipment as expeditiously as possible in a number commensurate with the largest aeroplane normally using the aerodrome.*~~

~~*Note 3. Additional guidance is available in CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

***Level of protection to be provided***

I.2.3 The level of protection provided at an aerodrome for rescue and firefighting ~~must~~must be appropriate to the aerodrome category determined using the principles in I.2.5 and I.2.6,

except that, where the number of movements of the aeroplanes in the highest category normally using the aerodrome is less than 700 in the busiest consecutive three months, the level of protection provided ~~must~~must be not less than one category below the determined category.

~~*Note. Either a take-off or a landing constitutes a movement.*~~

…

I.2.5 The aerodrome category ~~must~~must be determined from Table I-1 and ~~must~~must be based on the longest aeroplanes normally using the aerodrome and their fuselage width.

~~*Note. To categorize the aeroplanes using the aerodrome, first evaluate their overall length and second, their fuselage width.*~~

I.2.6 If, after selecting the category appropriate to the longest aeroplane's overall length, that aeroplane's fuselage width is greater than the maximum width in Table I-1, column 3, for that category, then the category for that aeroplane ~~must~~must actually be one category higher.

~~*Note 1. See guidance in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting, for categorizing aerodromes, including those for all-cargo aircraft operations, for rescue and firefighting purposes.*~~

~~*Note 2. Principles and procedures on training, including training programmes and competence checks, are specified in the PANS-Aerodromes (Doc 9981). Further guidance on the training of personnel, rescue equipment for difficult environments, and other facilities and services for rescue and firefighting is given in CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

***Extinguishing agents***

I.2.8 Both principal and complementary agents ~~must~~must ~~normally~~ be provided at an aerodrome.

~~*Note. Descriptions of the agents may be found in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

I.2.9 The principal extinguishing agent ~~must~~must be:

…

~~*Note. Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level A, B or C rating is given in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

I.2.10 The complementary extinguishing agent ~~must~~must be a dry chemical powder suitable for extinguishing hydrocarbon fires.

~~*Note 1. When selecting dry chemical powders for use with foam, care must be exercised to ensure compatibility.*~~

~~*Note 2. Alternate complementary agents having equivalent firefighting capability may be utilized. Additional information on extinguishing agents is given in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

I.2.11 The amounts of water for foam production and the complementary agents to be provided on the rescue and firefighting vehicles ~~must~~must be in accordance with the aerodrome category determined under I.2.3, I.2.4, I.2.5, I.2.6 and Table I-2, except that for aerodrome categories 1 and 2 up to 100 percent of the water may be substituted with complementary agent.

For the purpose of agent substitution, 1 kg of complementary agent ~~must~~must be taken as equivalent to 1.0 L of water for production of a foam meeting performance level A.

~~*Note 1. The amounts of water specified for foam production are predicated on an application rate of 8.2 L/min/m2 for a foam meeting performance level A, 5.5 L/min/m2 for a foam meeting performance level B and 3.75 L/min/m2 for a foam meeting performance level C.*~~

~~*Note 2. When any other complementary agent is used, the substitution ratios need to be checked.*~~

I.2.12 At aerodromes where operations by aeroplanes larger than the average size in a given category are planned, the quantities of water ~~must~~must be recalculated and the amount of water for foam production and the discharge rates for foam solution ~~must~~must be increased accordingly.

…

~~*Note. Guidance on the determination of quantities of water and discharge rates based on the largest overall length of aeroplane in a given category is available in CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

I.2.20 Dry chemical powders ~~may~~must only be substituted with an agent that has equivalent or better firefighting capabilities for all types of fires where complementary agent is expected to be used.

~~*Note. Guidance on the use of complementary agents can be found in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

I.2.21 A reserve supply of foam concentrate, equivalent to 200 percent of the quantities identified in Table I-2, ~~must~~must be maintained on the aerodrome for vehicle replenishment purposes.

~~*Note. Guidance on the use of complementary agents can be found in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

…

I.2.24 Where a major delay in the replenishment of the supplies is anticipated, the amount of reserve supply in I.2.21, I.2.22 and I.2.23 ~~may~~must be increased as determined by a risk assessment.

~~*Note. See the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting for guidance on the conduct of a risk analysis to determine the quantities of reserve extinguishing agents.*~~

***Rescue equipment***

I.2.25 Rescue equipment commensurate with the level of aircraft operations ~~must~~must be provided on the rescue and firefighting vehicle(s).

…

~~*Note. Guidance on the rescue equipment to be provided at an aerodrome is given in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

***Response time***

…

I.2.28 The operational objective of the rescue and firefighting service ~~must~~must be to achieve a response time not exceeding three minutes to any other part of the movement area, in optimum visibility and surface conditions.

~~*Note 1. Response time is considered to be the time between the initial call to the rescue and firefighting service, and the time when the first responding vehicle(s) is (are) in position to apply foam at a rate of at least 50 percent of the discharge rate specified in Table I-2.*~~

~~*Note 2. Optimum visibility and surface conditions are defined as daytime, good visibility, no precipitation with normal response route free of surface contamination, e.g. water.*~~

I.2.29 To meet the operational objective as nearly as possible in less than optimum conditions of visibility, especially during low visibility operations, suitable guidance, equipment and/or procedures for rescue and firefighting services ~~must~~must be provided.

…

~~*Note. Additional guidance is available in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

*Emergency access roads*

I.2.33 Emergency access roads ~~must~~must be provided on an aerodrome where terrain conditions permit their construction, so as to facilitate achieving minimum response times. Particular attention ~~must~~must be given to the provision of ready access to approach areas up to 1000m from the threshold, or at least within the aerodrome boundary. Where a fence is provided, the need for convenient access to outside areas must be taken into account.

~~*Note. Aerodrome service roads may serve as emergency access roads when they are suitably located and constructed.*~~

…

I.2.40 The minimum number of rescue and firefighting vehicles provided at an aerodrome ~~must~~must be in accordance with the following tabulation:

…

~~*Note. Guidance on minimum characteristics of rescue and firefighting vehicles is given in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

***Personnel***

I.2.41 All rescue and firefighting personnel ~~must~~must be properly trained to perform their duties in an efficient manner and ~~must~~must participate in live fire drills commensurate with the types of aircraft and type of rescue and firefighting equipment in use at the aerodrome, including pressure-fed fuel fires.

~~*Note 1. Guidance to assist the appropriate authority in providing proper training is given in CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

~~*Note 2. Fires associated with fuel discharged under very high pressure from a ruptured fuel tank are known as "pressure-fed fuel fires".*~~

I.2.42 The rescue and firefighting personnel training programme ~~must~~must include training in human performance, including team coordination.

~~*Note. Guidance material to design training programmes on human performance and team coordination can be found in the Human Factors Training Manual (Doc 9683).*~~

I.2.44 In determining the minimum number of rescue and firefighting personnel required, a task resource analysis ~~must~~must be completed and the level of staffing documented in the Aerodrome Manual.

~~*Note. Guidance on the use of a task resource analysis can be found in the CASA Advisory Circular AC139-9.2 Operational Services-Rescue and Firefighting.*~~

…

## I.3 Disabled aircraft removal

~~*Note. Guidance on removal of a disabled aircraft, including recovery equipment, is given in the CASA Advisory Circular AC139-9.3 Operational Services-Disabled Aircraft Removal. See also CAR Part 12 Accidents, Incidents and statistics. Investigation concerning protection of evidence, custody and removal of aircraft.*~~

…

## I.4 Wildlife strike hazard reduction

~~*Note. The presence of wildlife (birds and other animals) on, or in the vicinity of anaerodrome poses a serious threat to aircraft operational safety.*~~

I.4.1 The wildlife strike hazard on, or in the vicinity of, an aerodrome ~~must~~must be assessed through:

…

~~*Note. See CAR Part 175.*~~

I.4.2 Wildlife strike reports ~~must~~must be collected and forwarded to ICAO for inclusion in the ICAO Bird Strike Information System (IBIS) database.

~~*Note. — The IBIS is designed to collect and disseminate information on wildlife strikes to aircraft. Information on the system is included in the Manual on the ICAO Bird Strike Information System (IBIS) (Doc 9332) (forthcoming).*~~

I.4.3 Action ~~must~~must be taken to decrease the risk to aircraft operations by adopting measures to minimize the likelihood of collisions between wildlife and aircraft.

~~*Note. — Procedures on the management of wildlife hazards on and in the vicinity of an aerodrome, including the establishment of a wildlife hazard management programme (WHMP), wildlife risk assessment, land use management and personnel training, are specified in the PANS-Aerodromes (Doc 9981), Part II, Chapters 1 and 6. Further guidance is given in the CASA Advisory Circular AC139-9.3 Operational Services-Wildlife Strike Hazard Reduction.*~~

. . .

## I.5 Apron management service

. . .

I.5.2 When the aerodrome control tower does not participate in the apron management service, procedures ~~must~~must be established to facilitate the orderly transition of aircraft between the apron management unit and the aerodrome control tower.

~~*Note. — Procedures on apron safety are specified in the PANS-Aerodromes (Doc 9981). Guidance on an apron management service is given in the CASA Advisory Circular AC139-9.5 Operational Services-Apron Safety and Vehicle Control, and in CASA Advisory Circular AC139-9.6 Operational Services-Surface Movement Guidance and Control System (SMGCS).*~~

I.5.4 Where low visibility procedures are in effect, persons and vehicles operating on an apron ~~must~~must be restricted to the essential minimum.

~~*Note. — Guidance on related special procedures is given in the CASA Advisory Circular AC139-9.6 Operational Services-Surface Movement Guidance and Control System (SMGCS).*~~

I.5.5 Aircraft must be allocated to an aircraft stand or apron area appropriate to the aircraft characteristics.

I.5.6 A risk assessment must be carried out if there is a need to allocate aircraft parking to areas other than aircraft stands or apron areas.

I.5.7 When allocating an aircraft to an aircraft stand, the following parameters must be considered:

(a) parking aids;

(b) facilities serving the aircraft stand;

(c) proximity of infrastructure;

(d) other parked aircraft in the neighbouring aircraft stands;

(e) aircraft stand dependencies; and

(f) jet blast and propeller wash related protection.

~~*Note. Procedures on the training of operational personnel, and on apron safety and operations, are specified in the PANS-Aerodromes (Doc 9981), Part II, Chapters 1 and 7.*~~

**Apron Safety**

I.5.~~5~~8 An emergency vehicle responding to an emergency ~~must~~must be given priority over all other surface movement traffic.

I.5.~~6~~9 A vehicle operating on an apron ~~must~~must:

…

I.5.10 Aircraft must be guided while arriving on or departing from the aircraft stand.

I.5.~~7~~11 An aircraft stand must be visually monitored in- person or remotely to ensure that the recommended clearance distances are ~~provided to an aircraft using the stand~~ maintained.

I.5.12 Emergency stop procedures must be in place to stop an aircraft when entering the stand if the aircraft stand is compromised.

I.5.13 Personnel, other than those required to assist the initial arrival and departure of the aircraft, must not be allowed to approach the aircraft when anti-collision lights are turned on and engines are running.

I.5.14 Parked aircraft must be appropriately secured to prevent any unintended movement.

## I.6 ~~Ground servicing of aircraft~~ Aircraft fuelling – Safety considerations

I.6.1 Fire extinguishing equipment suitable for at least initial intervention in the event of a fuel fire and personnel trained in its use ~~must~~must be readily available during the ground servicing of an aircraft fuelling operations, and there must be a means of quickly summoning the rescue and firefighting service in the event or major fuel spill.

…

## I.7 Aerodrome vehicle operations

~~*Note 1. Procedures on the establishment of an airside driver permit scheme and vehicle/equipment safety requirements, including detailed personnel training, are specified in the PANS-Aerodromes (Doc 9981), Part II, Chapter 9.*~~

~~*Note 2. Guidance on aerodrome vehicle operations is contained in Attachment A, Section 18, and on traffic rules and regulations for vehicles in the CASA Advisory Circular AC139-9.6 Operational Services-Surface Movement Guidance and Control System (SMGCS).*~~

~~*Note 3. It is intended that roads located on the movement area be restricted to the exclusive use of aerodrome personnel and other authorized persons, and that access to the public buildings by an unauthorized person will not require use of such roads.*~~

…

### *Application*

I.8.1 A surface movement guidance and control system (SMGCS) ~~must~~must be provided at an aerodrome.

~~*Note. Guidance on surface movement guidance and control systems is contained in the CASA Advisory Circular AC139-9.6 Operational Services-Surface Movement Guidance and Control System (SMGCS).*~~

### *Characteristics*

…

I.8.5 The system ~~must~~must be designed to assist in the prevention of collisions between aircraft, and between aircraft and vehicles or objects, on any part of the movement area.

~~*Note. Guidance on control of stop bars through induction loops and on a visual taxiing guidance and control system is contained in the CASA Advisory Circular AC139-9.6 Operational Services-Surface Movement Guidance and Control System (SMGCS).*~~

I.8.6 Where an SMGCS is provided by selective switching of stop bars and taxiway centre line lights, the following requirements ~~must~~must be met:

(a) taxiway routes which are indicated by illuminated taxiway centre line lights ~~must~~must be capable of being terminated by an illuminated stop bar;

(b) the control circuits ~~must~~must be so arranged that when a stop bar located ahead of an aircraft is illuminated, the appropriate section of taxiway centre line lights beyond it is suppressed; and

…

~~*Note 1. See Sections E.3.17 and E.3.20 for specifications on taxiway centre line lights and stop bars, respectively.*~~

~~*Note 2. Guidance on installation of stop bars and taxiway centre line lights in SMGCSs is given in the CASA Advisory Circular AC139-9.6 Operational Services-Surface Movement Guidance and Control System (SMGCS).*~~

I.8.7 Surface movement radar for the manoeuvring area ~~may~~must be provided at an aerodrome intended for use in runway visual range conditions less than a value of ~~350~~300m.

I.8.8 Surface movement radar for the manoeuvring area ~~may~~must be provided at an aerodrome other than that in I.8.7 when traffic density and operating conditions are such that regularity of traffic flow cannot be maintained by alternative procedures and facilities.

~~*Note. Guidance on the use of surface movement radar is given in the CASA Advisory Circular AC139-9.6 Operational Services-Surface Movement Guidance and Control System (SMGCS)and in the Air Traffic Services Planning Manual (Doc 9426).*~~

## I.9 Siting of equipment and installations on operational areas

~~*Note 1. Requirements for obstacle limitation surfaces are specified in D.2.*~~

~~*Note 2. The design of light fixtures and their supporting structures, light units of visual approach slope indicators, signs, and markers, is specified in E.3.1, E.3.5, E.4.1 and E.5.1, respectively. Guidance on the frangible design of visual and non-visual aids for navigation is given in the CASA Advisory Circular AC139-9.7 Operational Services-Siting of Installations and Frangibility.*~~

…

I.9.3 Any equipment or installation required for air navigation or for aircraft safety purposes which may be located on the non-graded portion of a runway strip ~~must~~must be regarded as an obstacle and ~~must~~must be frangible and mounted as low as possible.

~~*Note. Guidance on the siting of navigation aids is contained in the CASA Advisory Circular AC139-9.7 Operational Services-Siting of Installations and Frangibility.*~~

…

## I.10 Fencing

***Application***

…

I.10.2 A fence or other suitable barrier ~~must~~must be provided on an aerodrome to deter the inadvertent or premeditated access of an unauthorized person onto a non-public area of the aerodrome.

~~*Note 1. This is intended to include the barring of sewers, ducts, tunnels, etc., where necessary to prevent access.*~~

~~*Note 2. Special measures may be required to prevent the access of an unauthorized person to runways or taxiways which overpass public roads.*~~

…

## I.12 Autonomous runway incursion warning system (ARIWS)

~~*Note 1. The inclusion of detailed specifications for an autonomous runway incursion warning system (ARIWS) in this section is not intended to imply that an ARIWS has to be provided at an aerodrome.*~~

~~*Note 2. The implementation of an ARIWS is a complex issue deserving careful consideration by aerodrome operators, air traffic services and the appropriate authority, and in coordination with the aircraft operators.*~~

~~*Note 3. CASA Advisory Circular AC139-9.9 Operational Services-Autonomous Runway Incursion Warning System (ARIWS), provides a description of an ARIWS and information on its use.*~~

***Characteristics***

I.12.1 Where an ARIWS is installed at an aerodrome:

(a) it ~~must~~must provide autonomous detection of a potential incursion or of the occupancy of an active runway and a direct warning to a flight crew or vehicle operator;

(b) it ~~must~~must function and be controlled independently of any other visual system on the aerodrome;

(c) its visual aid components, i.e. lights, ~~must~~must be designed to conform with the relevant specifications in E.3; and

(d) failure of part or all of it ~~must~~must not interfere with normal aerodrome operations. To this end, provision must be made to allow the ATC unit to partially or entirely shut down the system.

~~*Note 1. An ARIWS may be installed in conjunction with enhanced taxiway centre line markings, stop bars or runway guard lights.*~~

~~*Note 2. It is intended that the system(s) be operational under all weather conditions, including low visibility.*~~

~~*Note 3. An ARIWS may share common sensory components of an SMGCS or A-SMGCS, however, it operates independently of either system.*~~

I.12.2 Where an ARIWS is installed at an aerodrome, information on its characteristics and status ~~must~~must be provided to the appropriate aeronautical information services for promulgation in the AIP with the description of the aerodrome surface movement guidance and control system and markings as specified in CAR Part 175.

~~*Note. Detailed specifications concerning the AIP are contained in PANS-AIM (Doc 10066).*~~

# APPENDIX J. AERODROME MAINTENANCE

## J.1 General

J.1.1 A maintenance programme, including preventive maintenance where appropriate, ~~must~~must be established at an aerodrome to maintain facilities in a condition which does not impair the safety, regularity or efficiency of air navigation.

~~*Note 1. Preventive maintenance is programmed maintenance work done in order to prevent a failure or degradation of facilities.*~~

~~*Note 2. "Facilities" are intended to include such items as pavements, visual aids, fencing, drainage systems, electrical systems and buildings.*~~

J.1.2 The design and application of the maintenance programme ~~must~~must observe human factors principles.

~~*Note 1. Guidance material on human factors principles can be found in the Human Factors Training Manual (Doc 9683) and in the CASA Advisory Circular AC139-9.1 Operational Services-Emergency Planning.*~~

~~*Note 2. General principles and procedures on the training of aerodrome personnel, including training programmes and competence checks, are specified in the PANS Aerodromes (Doc 9981).*~~

## J.2 Pavement

J.2.1 The surfaces of all movement areas including pavements (runways, taxiways and aprons) and adjacent areas ~~must~~must be inspected and their conditions monitored regularly as part of an aerodrome preventive and corrective maintenance programme with the objective of avoiding and eliminating any foreign object debris (FOD) that might cause damage to aircraft or impair the operation of aircraft systems.

~~*Note 1. See B.9.3 for inspections of movement areas.*~~

~~*Note 2. Procedures on carrying out daily inspections of the movement area and control of FOD are given in the CASA Advisory Circular AC139-9.6 Operational Services-Surface Movement Guidance and Control System (SMGCS).*~~

~~*Note 3. Additional guidance on sweeping/cleaning of surfaces is contained in the CASA Advisory Circular AC139-10.1 Maintenance-Pavements.*~~

~~*Note 4. Guidance on precautions to be taken in regard to the surface of shoulders is given in Attachment A, Section 8, and the CASA PNG Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

~~*Note 5. Where the pavement is used by large aircraft or aircraft with tire pressures in the upper categories referred to in B.6.6(c), particular attention must be given to the integrity of light fittings in the pavement and pavement joints.*~~

J.2.2 The surface of a runway ~~must~~must be maintained in a condition such as to prevent formation of harmful irregularities.

~~*Note. See CASA Advisory Circular AC139-3.1 Runways.*~~

J.2.3 A paved runway ~~must~~must be maintained in a condition so as to provide surface friction characteristics at or above the minimum friction level specified by the Director.

~~*Note. CASA Advisory Circular AC139-9.13 Operational Services – Pavement Surface contains further information on this subject.*~~

J.2.4 Runway surface friction characteristics for maintenance purposes ~~must~~must be periodically measured with a continuous friction measuring device using self-wetting features and documented. The frequency of these measurements ~~must~~must be sufficient to determine the trend of the surface friction characteristics of the runway.

~~*Note 1. Guidance on evaluating the runway surface friction characteristics is provided in CASA Advisory Circular AC139-9.13 Operational Services – Pavement Surface.*~~

~~*Note 2. The objective of J.2.3 to J.2.8 is to ensure that the surface friction characteristics for the entire runway remain at or above a minimum friction level acceptable to the Director.*~~

…

J.2.7 Corrective maintenance action ~~must~~must be taken to prevent the runway surface friction characteristics for either the entire runway or a portion thereof from falling below a minimum friction level acceptable to the Director.

~~*Note. A portion of runway in the order of 100m long may be considered significant for maintenance or reporting action.*~~

…

J.2.9 When a taxiway is used by turbine-engined aeroplanes, the surface of the taxiway shoulders ~~must~~must be maintained so as to be free of any loose stones or other objects that could be ingested by the aeroplane engines.

~~*Note. Guidance on this subject is given in the CASA PNG Advisory Circular AC139-3.2 Physical Characteristics-Taxiway, Apron, Holding Bays*~~

## J.3 Removal of contaminants

J.3.1 Standing water, mud, dust, sand, oil, rubber deposits and other contaminants ~~must~~must be removed from the surface of runways in use as rapidly and completely as possible to minimize accumulation.

~~*Note. Information on the use of chemicals for aerodrome pavements is given in the PANS-Aerodromes (Doc 9981).*~~

…

### J.4 Runway pavement overlays

~~*Note. The following specifications are intended for runway pavement overlay projects when the runway is to be returned temporarily to an operational status before resurfacing is complete. This may necessitate a temporary ramp between the new and old runway surfaces. Guidance on overlaying pavements and assessing their operational status is given in the CASA Advisory Circular AC139-10.3 Maintenance-Runway Pavement Overlays.*~~

…

### J.5 Visual aids

~~*Note 1. These specifications are intended to define the maintenance performance level objectives. They are not intended to define whether the lighting system is operationally out of service.*~~

~~*Note 2. The energy savings of light emitting diodes (LEDs) are due in large part to the fact that they do not produce the infra-red heat signature of incandescent lamps.*~~

~~*Note 3. Enhanced vision systems (EVS) technology relies on the infra-red heat signature provided by incandescent lighting. CAR Part 175 protocols provide an appropriate means of notifying aerodrome users of EVS when lighting systems are converted to LED.*~~

J.5.1 A light ~~must~~must be deemed to be unserviceable when the main beam average intensity is less than 50 per cent of the value acceptable to the Director. ~~For light units where the designed main beam average intensity is above the value acceptable to the Director, the 50 percent value must be related to that design value.~~ For light units where the main beam average intensity is required to be higher than that value, a light ~~must~~must be deemed to be unserviceable when the main beam average intensity is less than 50 per cent of the required higher value.

J.5.2 A system of preventive maintenance of visual aids ~~must~~must be employed to ensure lighting and marking system reliability.

~~*Note. Guidance on preventive maintenance of visual aids is given in the CASA Advisory*~~

~~*Circular AC139-10.6 Maintenance-Visual Aids.*~~

…

J.5.7 The system of preventive maintenance employed for a precision approach runway category II or III ~~must~~must have as its objective that, during any period of category II or III operations, all approach and runway lights are serviceable and that, in any event, at least:

…

In order to provide continuity of guidance, the allowable percentage of unserviceable lights ~~must~~must not be permitted in such a way as to alter the basic pattern of the lighting system. Additionally, an unserviceable light ~~must~~must not be permitted adjacent to another unserviceable light, except in a barrette or a crossbar where two adjacent unserviceable lights may be permitted.

~~*Note. With respect to barrettes, crossbars and runway edge lights, lights are considered to be adjacent if located consecutively and:*~~

~~*(a) laterally: in the same barrette or crossbar; or*~~

~~*(b) longitudinally: in the same row of edge lights or barrettes.*~~

J.5.8 The system of preventive maintenance employed for a stop bar provided at a runway-holding position used in conjunction with a runway intended for operations in runway visual range conditions less than a value of ~~350~~ 300 m ~~must~~must have the following objectives:

…

J.5.9 The system of preventive maintenance employed for a taxiway intended for use in runway visual range conditions less than a value of ~~350~~ 300 m ~~must~~must have as its objective that no two adjacent taxiway centre line lights be unserviceable.

J.5.10 The system of preventive maintenance employed for a precision approach runway category I

~~must~~must have as its objective that, during any period of category I operations, all approach and runway lights are serviceable and that, in any event, at least 85 percent of the lights are serviceable in each of the following:

…

~~*Note.— In barrettes and crossbars, guidance is not lost by having two adjacent unserviceable lights.*~~

…