

PHYSICAL CHARACTERISTICS AND CHALLENGES OF AERODROME CERTIFICATION

JOINT ICAO-ESAF/CASSOA AERODROME
CERTIFICATION WORKSHOP

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ICAO



Outline

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Introduction

Regulations on physical characteristics of an aerodrome are developed in order:

- ❖ To ensure that components of the aerodrome movement area are designed and maintained by taking in account the characteristics and performance of the aircraft using that aerodrome.
- ❖ To ensure compliance with compliance aerodrome certification requirements.

References

- ICAO Annex 14 Volume 1- Aerodrome design and operation
- ICAO Annex 4: Volume 4- Aeronautical Charts
- ICAO Annex 15 - Aeronautical Information Services
- ICAO Annex 19 - Safety Management
- ICAO Doc 9981 - PANS Aerodromes
- ICAO Doc 10066 - PANS AIM (with the data catalogues)
- ICAO Doc 9774 - Aerodrome Certification Manual

References

- ICAO Doc 9137 – Airport Services Manual
- Doc 9734 - Safety Oversight Manual
- ICAO Doc 9157 - Aerodrome Design Manual

Aerodrome Reference Code

- ❖ The intent of the reference code is to provide a simple method for interrelating the numerous specifications concerning the characteristics of aerodromes so as to provide a series of aerodrome facilities that are suitable for the aeroplanes that are intended to operate at the aerodrome.

Aerodrome Reference Code

- ❖ The code is composed of two elements which are related to the aeroplane performance characteristics and dimensions. Element 1 is a number based on the aeroplane reference field length and element 2 is a letter based on the aeroplane wingspan. The code letter or number within an element selected for design purposes is related to the critical aeroplane characteristics for which the facility is provided.

Specific provisions

Table 1-1. Aerodrome reference code
(see 1.6.2 to 1.6.4)

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

Specific provisions

AGA regulations related to the physical characteristics of aerodromes are customized from the ICAO Annex 14, Volume I and concern the following items:

- Runways
- Runway shoulders
- Runway turn pads
- Runway strips
- Runway end safety area
- Clearways

Specific provisions

- Radio altimeter operating area
- Taxiways
- Taxiways
- Taxiway Shoulders
- Taxiways
- Holding bays, runway holding bays, intermediate holding and roads-holding positions
- Apron
- Isolated aircraft parking position

General Runway Design considerations

- RP 3.1.1 The number and orientation of a runways should be such that the usability of an aerodrome is not less 95% for the aeroplanes it is intended to serve.
- RP 3.1.2 The siting and orientation of runways should, where possible, be such that and the arrival and departure tracks minimize interference with areas approved for residential use and other noise sensitive areas.

General Runway Design considerations

- RP 3.1.3 In the application of 3.1.1 it should be assumed that the landing or take off is normal circumstances, precludes when the cross-wind component exceeds:
 - 37 km/h (20 kt) in the case of aeroplanes whose reference field length is 1 500 m or over, except that when poor runway braking action owing to an insufficient longitudinal coefficient of friction is experienced with some frequency, a crosswind not

General Runway Design considerations

exceeding 24 km/h (13 kt) should be assumed;

- 24 km/h (13 kt) in the case of aeroplanes whose reference field length is 1 200 m or up to but not including 1 500 m; and
- 19 km/h (10 kt) in the case of aeroplanes whose reference field length is less than 1 200 m.

Primary runway

RP 3.1.7 The runway length to be provided for a primary runway should be adequate to meet the operational requirements of the aeroplanes for which the runway is intended and should 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.

Runway width

RP 3.1.10 The width of a runway should be not less than the appropriate dimension specified in the following tabulation:

Code number	Outer Main Gear Wheel Span (OMGWS)			
	Up to but not including 4.5 m	4.5 m up to but not including 6 m	6 m up to but not including 9 m	9 m up to but not including 15 m
1 ^a	18 m	18 m	23 m	—
2 ^a	23 m	23 m	30 m	—
3	30 m	30 m	30 m	45 m
4	—	—	45 m	45 m

a. The width of a precision approach runway should be not less than 30 m where the code number is 1 or 2.

Runway shoulder

RP 3.2.1 Runway shoulders should be provided for a runway where the code letter is D, E or F.

RP 3.2.2 For aeroplanes with Outer Main Geer Span (OMGWS) from 9 m up to but not including 15 m, the runway shoulders should extend symmetrically on each side of the runway so that the overall width of the runway and its shoulders is not less than:

- 60 m where the code is E or D

Width Runway shoulder

- 60 m where the code letter is F with two- or three-engined aeroplanes; and
- 75 m where the code letter is F with four (or more)-engined aeroplanes

Slope on runway shoulders

RP 3.2.3 The surface of the shoulder that abuts the runway should be flush with the surface of the runway and its transverse slope should not exceed 2.5 per cent.

Surface of runway shoulders

RP 3.2.4 The portion of a runway shoulder between the runway edge and a distance of 30 m from the runway centre line should 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.

Strength of runway shoulders

RP 3.2.4 The portion of a runway shoulder between the runway edge and a distance of 30 m from the runway centre line should 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.

Runway turn pads

STD 3.3.1 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 shall be provided to facilitate a 180-degree turn of aeroplanes.

RP 3.3.2 Where the end of a runway is not served by a taxiway or a taxiway turnaround and where the code letter is A, B or C, a runway turn pad should be provided to facilitate a 180-degree turn of aeroplanes.

Runway turn pads

RP 3.3.3 The runway turn pad may 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.

RP 3.3.4 The intersection angle of the runway turn pad with the runway should not exceed 30 degrees.

RP 3.3.5 The nose wheel steering angle to be used in the design of the runway turn pad should not exceed 45 degrees.

Runway turn pads

STD 3.3.6 The design of a runway turn pad shall 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 shall be not less than that given by the following tabulation:

OMGWS				
	Up to but not including 4.5 m	4.5 m up to but not including 6 m	6 m up to but not including 9 m	9 m up to but not including 15 m
Clearance	1.50 m	2.25 m	3 m ^a or 4 m ^b	4 m
^{a.} If the turn pad is intended to be used by aeroplanes with a wheel base less than 18 m.				
^{b.} If the turn pad is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.				

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

Slopes on runway turn pads

RP 3.3.7 The longitudinal and transverse slopes on a runway turn pad should be sufficient to prevent the accumulation of water on the surface and facilitate rapid drainage of surface water. The slopes should be the same as those on the adjacent runway pavement surface.

Surface of runway turn pads

RP 3.3.8 The strength of a runway turn pad should 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.

STD 3.3.9 The surface of a runway turn pad shall not have surface irregularities that may cause damage to an aeroplane using the turn pad.

Surface of runway turn pads

RP 3.3.10 The surface of a runway turn pad should be so constructed or resurfaced as to provide surface friction characteristics at least equal to that of the adjoining runway.

Shoulders for runway turn pads

RP 3.3.11 The runway turn pads should 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.

RP 3.3.12 The strength of runway turn pad shoulders should be capable of withstanding the occasional passage of the aeroplane it is designed to serve without inducing structural damage to the aeroplane and to the supporting ground vehicles that may operate on the shoulder.

Regulatory's duties and responsibilities on aerodrome certification

- ❖ Responsibility for safety and order at all aerodromes open for public use
- ❖ Provide to the aerodrome operator all guidance materials
- ❖ Periodic inspections
- ❖ Evaluation of Aerodrome Manual
- ❖ Aerodrome compliance with standards and practices
- ❖ Enforcement
- ❖ Ensure that the service providers have appropriate safety measures in place (including SMS)

Regulatory's duties and responsibilities on aerodrome certification

- ❖ Establish procedures and parameters for the conduct of aeronautical procedures and parameters for the conduct of aeronautical studies
- ❖ Approval/accept aeronautical studies
- ❖ Use aeronautical studies to evaluate and grant exemptions

Duties and responsibilities of an aerodrome operator

- ❖ Comply with any conditions that may be endorsed on license or certificate
- ❖ Ensure that there is an adequate number of qualified and skilled personnel to perform activities relevant to aerodrome operation and maintenance
- ❖ Subject to any directives the Authority may issue, operate and maintain an aerodrome in accordance with procedures set out in the aerodrome manual

Duties and responsibilities of an aerodrome operator

- ❖ Have a safety management system that complies with the standards specified in the aerodrome manual and in the third schedule to these regulations
- ❖ Maintain the aerodrome in a serviceable condition
- ❖ Keep the aerodrome free of unauthorized person, vehicles and animals which are not under proper control and free and free of any other obstructions
- ❖ Mark all obstructions in accordance with the prescribed guideliness

Duties and responsibilities of an aerodrome operator

- ❖ Inform the Authority of any alteration of obstructions or works on the aerodrome
- ❖ Install wind direction indicators to show the surface direction of the wind and ensure that the wind direction indicators function satisfactory
- ❖ Maintain the prescribed markings in conspicuous condition and ensure that they are readily visible to aircraft in the air or manoeuvring on the ground

Duties and responsibilities of an aerodrome operator

- ❖ Avail facilities and ensure that they are serviceable condition and that all apparatus installed function efficiently
- ❖ Appropriately mark the areas on the landing terrain which are unserviceable
- ❖ Inform the Authority where the aerodrome becomes unserviceable through any cause or where any portion of the landing area deteriorates to such an extent that the safe operation of aircraft may be endangered

Duties and responsibilities of an aerodrome operator

- ❖ Submit to the Authority reports on the condition of the aerodrome as may be required by the Authority, and
- ❖ Report all incidents and accidents on an aerodrome to the Authority

Runway strips

Length of runway strips

STD 3.4.2 A strip shall extend before the threshold and beyond the end of the runway or stopway for a distance of at least:

- 60 m where the code number is 2, 3 or 4;
- 60 m where the code number is 1 and the runway is an instrument one; and
- 30 m where the code number is 1 and the runway is a non-instrument one.

Runway strips

Width of runway strips

STD 3.4.3 A strip including a precision approach runway shall, wherever practicable, extend laterally to a distance of at least:

- 140 m where the code number is 3 or 4; and
- 70 m where the code number is 1 or 2;

on each side of the centre line of the runway and its extended centre line throughout the length of the strip

Runway end safety areas (RESA)

Dimensions of runway end safety areas

STD 3.5.3 A runway end safety area shall extend from the end of a runway strip to a distance of at least 90 m where:

- the code number is 3 or 4; and
- the code number is 1 or 2 and the runway is an instrument one.

If an arresting system is installed, the above length may be reduced, based on the design specification of the system, subject to acceptance by the State.

Runway end safety areas (RESA)

RP 3.5.4 A runway end safety area should, as far as practicable, extend from the end of a runway strip to a distance of at least:

- 240 m where the code number is 3 or 4; or a reduced length when an arresting system is installed;
- 120 m where the code number is 1 or 2 and the runway is an instrument one; or a reduced length when an arresting system is installed; and
- 30 m where the code number is 1 or 2 and the runway is a non-instrument one.

Runway end safety areas (RESA)

STD 3.5.5 The width of a runway end safety area shall be at least twice that of the associated runway.

Clearways

Location of clearways

RP 3.6.1 The origin of a clearway should be at the end of the take-off run available.

Length of clearways

RP 3.6.2 Recommendation.— The length of a clearway should not exceed half the length of the take-off run available.

Clearways

Width of clearways

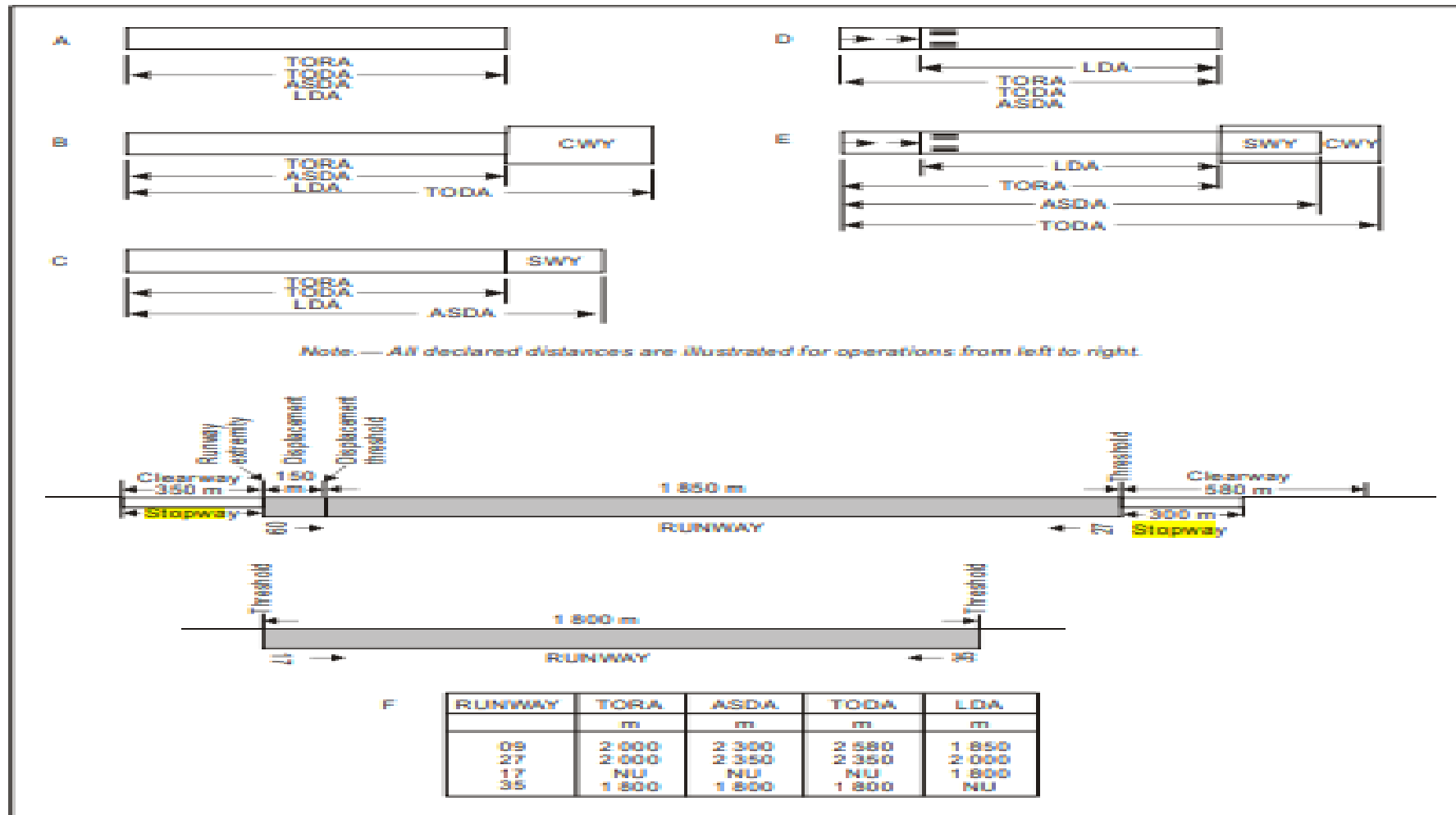
RP 3.6.3 A clearway should extend laterally on each side of the extended centre line of the runway, to a distance of at least:

- a) 75 m for instrument runways; and
- b) half of the width of the runway strip for non-instrument runways.

Stopways

STD 3.7.1 A stopway shall have the same width as the runway with which it is associated.

Clearways and Stopways



Challenges CE by CE

CE	Challenges from the USOAP and ICVM
CE-1	Inconveniences in implementation of the procedure of amending the primary Low
CE-2	Unflexible procedure to amend civil aviation regulations due to the long process for signature (adoption)
CE-3	Lack of having an appropriate structure of the office in charge of the oversight
CE-4	Unavailability of an approved training programme
CE-5	Need of a procedure showing how the aerodrome services providers are provided with tools from inspectorates
CE-6	PQs under CE-6 still being unsatisfactory as long as PQs under CE-3 and CE4 are not closed

Recommendations

- ❖ BCAA require the operator of Melchior NDADAYE International Airport to:
 - Establish a formal training program for technical staff
 - Establish a formal maintenance program for the movement area
- ❖ AGA inspectorate performs inspections of the physical characteristics of the movement area for ensuring the safety of the movement area of the airport.
- ❖ BCAA establish in coordination with the aerodrome operator a certification schedule for Melchior NDANDAYE international airport and request assistance from CASSOA or the Regional Office where the need arises

Thank you!