CIVIL AVIATION DIRECTIVE – 1408

STOLPORT

CIVIL AVIATION AUTHORITY OF MALAYSIA

ISSUE 01
REVISION 00 – 15TH MAY 2022

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Introduction

In exercise of the powers conferred by section 24O of the Civil Aviation Act 1969 (Act 3), the Chief Executive Officer makes this Civil Aviation Directive 1408 (“CAD 1408") – STOLport, pursuant to Regulation(s) 12-15, 17, 19, 20, 22, 23, 32, 35, 36, 38-45, 47-54, 63, 64 and 65 of the Civil Aviation (Aerodrome Operations) Regulations 2016 (CAR (AO) 2016)

This CAD contains the standards and requirements pertaining to standards for STOLport and is compliant with Civil Aviation (Aerodrome Operation) Regulations 2016 (CAR(AO) 2016). This Civil Aviation Directives 1408 – Standards for Water Aerodromes is published by the Chief Executive Officer under Section 24O of the Civil Aviation Act 1969 [Act 3] and come into operation on 15th May 2022.

Non-compliance with this CAD

Any person who contravenes any provision in this Directive commits an offence and shall on conviction be liable to the punishment under section 24O (2) of the Civil Aviation Act 1969 (Act 3) and/or under Civil Aviation (Aerodrome Operation) Regulations 2016.

(Datuk Captain Chester Voo Chee Soon)
Chief Executive Officer
Civil Aviation Authority of Malaysia

Civil Aviation Directive components and Editorial practices

This Civil Aviation Directive is made up of the following components and are defined as follows:

Standards: Usually preceded by words such as *"shall"* or *"must"*, are any specification for physical characteristics, configuration, performance, personnel or procedure, where uniform application is necessary for the safety or regularity of air navigation and to which Operators must conform. In the event of impossibility of compliance, notification to the CAAM is compulsory.

Recommended Practices: Usually preceded by the words such as "*should"* or "*may*", are any specification for physical characteristics, configuration, performance, personnel or procedure, where the uniform application is desirable in the interest of safety, regularity or efficiency of air navigation, and to which Operators will endeavour to conform.

Appendices: Material grouped separately for convenience but forms part of the Standards and Recommended Practices stipulated by the CAAM.

Definitions: Terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

Notes: Included in the text, where appropriate, Notes give factual information or references bearing on the Standards or Recommended Practices in question but not constituting part of the Standards or Recommended Practices;

It is to be noted that some Standards in this Civil Aviation Directive incorporates, by reference, other specifications having the status of Recommended Practices. In such cases, the text of the Recommended Practice becomes part of the Standard.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in CAD 5. Where CAD 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Throughout this Civil Aviation Directive, the use of the male gender should be understood to include male and female persons

Record of Revisions

Revisions to this CAD shall be made by authorised personnel only. After inserting the revision, enter the required data in the revision sheet below. The *'Initials'* has to be signed off by the personnel responsible for the change.

Rev No.	Revision Date	Revision Details	Initials

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Summary of Changes

ISS/REV no.	Item no.	Revision Details

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1 General

1.1 Introduction

1.1.1 This Directive provides specifications that prescribe the physical characteristics, obstacle limitation surfaces, facilities and technical services that shall be provided at STOLport.

1.1.2 This Directive is not intended to limit or regulate the operation of aircraft.

1.2 Citation

1.2.1 These Directives are the Civil Aviation Directives 1408 – Standards for STOLport (CAD 1408), Issue 01/Revision 00, and comes into operation on 15th May 2022.

1.2.2 This CAD 1408, Issue 01/Revision 00 will remain current until withdrawn or superseded.

1.3 Applicability

1.3.1 The specifications in this directive shall apply to day VMC operations of non-international aerodrome code number 1 or 2 used for non-instrument runways.

1.3.2 CAD 1405 – Certification and Surveillance of Aerodrome provides certification requirements and processes for STOLport.

1.4 Revocation

1.4.1 This CAD, revokes Airport Standards Directives 901 (ASD 901) Standards for Airstrips dated 1st September 2005.

1.5 Definition

1.5.1 For the definitions of this CAD, refer to CAD 14 Vol. I – Aerodrome Design & Operations accordingly.

1.6 Abbreviations and Symbols

1.6.1 Abbreviations

CAAM	Civil Aviation Authority of Malaysia
CAD	Civil Aviation Directive
CAGM	Civil Aviation Guidance Material
cd	Candela
cm	Centimetre
ft	Foot

IMC	Instrument meteorological conditions
K	Degree Kelvin
km	Kilometre
km/h	Kilometre per hour
L	Litre
m	Metre
max	Maximum
OMGWS	Outer main gear wheel span
PAPI	Precision approach path indicator
VMC	Visual meteorological conditions

1.6.2 Symbols

°	Degree
=	Equals
‘	Minute of arc
μ	Friction coefficient
>	Greater than
<	Less than
%	Percentage
±	Plus or minus

2 Stolport Data

2.1 CAD 14 Vol. I, Chapter 2 sets a details of aerodrome data to be determined about aerodromes and reported to the appropriate aeronautical information service. Where applicable, these requirements shall be met for a STOLport.

2.2 Determination and reporting of STOLport related aeronautical data shall be in accordance with the accuracy and integrity classification required to meet the needs of the end-users of aeronautical data.

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3 Physical Characteristics

3.1 Runway

Length of runways

3.1.1 The length of the runway should be based on take-off and landing data obtained from the aeroplane flight manual of the relevant aeroplane and shall be considered together with the following factors:

a) Whether the approaches are open or restricted;

b) Longitudinal slope of the proposed runway;

c) Elevation of the site;

d) Temperature and humidity of the site; and

e) Nature of the runway surface.

3.1.2 The length of a runway does not necessarily have to provide for operations by the relevant aeroplane at its maximum mass. Rather, the aeroplane mass selected should be the mass required to carry out its allocated task and different take-off and landing masses may be determined for each site serve by the relevant aeroplane.

3.1.3 Where the runway is associated with a stopway or clearway, an actual runway length less than that resulting from application of 3.1.1 may be considered satisfactory. But in such a case any combination of runway, stopway and clearway shall permit compliance with the operational requirements of the aeroplanes for which the runway is intended to serve.

Width of runways

3.1.4 The width of a runway shall be not less than the appropriate dimension specified as follows:

Outer Main Gear Wheel Span (OMGWS)			
Code number	Up to but not including 4.5m	4.5m up to but not including 6m	6 m up to but not including 9 m
1	18 m	18 m	23 m
2	23 m	23 m	30 m

Slopes on runways

3.1.5 Longitudinal slopes

The slope computed by dividing the difference between the maximum and minimum elevation along the runway centre line by the runway length shall not exceed 2 per cent.

3.1.6 Along no portion of a runway shall the longitudinal slope exceed 2 per cent.

3.1.7 Longitudinal slope changes

Where slope changes cannot be avoided, a slope change between two consecutive slopes shall not exceed 2 per cent.

3.1.8 The transition from one slope to another shall be accomplished by a curved surface with a rate of change not exceeding 0.4 per cent per 30 m (minimum radius of curvature of 7 500 m).

3.1.9 Sight distance

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

a) any point 3 m above a runway to all other points 3 m above the runway within a distance of at least half the length of the runway where the code letter is C;

b) any point 2 m above a runway to all other points 2 m above the runway within a distance of at least half the length of the runway where the code letter is B; and

c) any point 1.5 m above a runway to all other points 1.5 m above the runway within a distance of at least half the length of the runway where the code letter is A.

3.1.10 Distance between slope changes

Undulations or appreciable changes in slopes located close together along a runway shall be avoided. The distance between the points of intersection of two successive curves shall not be less than the sum of the absolute numerical values of the corresponding slope changes multiplied by the 5 000 m or 45 m.

3.1.11 Transverse slopes

To promote the most rapid drainage of water, the runway surface shall, 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 shall ideally be:

a) 1.5 per cent when the code letter is C; and

b) 2 per cent when the code letter is A or B;

For a cambered surface the transverse slope on each side of the centre line shall be symmetrical.

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

Strength of runways

3.1.13 A runway shall be capable of withstanding the traffic of aeroplanes the runway is intended to serve.

Surface of runway

3.1.14 The surface of a runway shall be constructed without irregularities that would affect aeroplane performance during take-off or landing.

3.1.15 A paved runway shall be so constructed or resurfaced as to provide good friction characteristics at or above the minimum friction level specified Table 10-1 in CAD 14 Vol I – Aerodrome Design and Operations.

3.1.16 The surface of a paved runway shall be evaluated when constructed or resurfaced to determine that the surface friction characteristics achieve the design objectives.

3.1.17 Measurements of the surface friction characteristics of a new or resurfaced paved runway shall be conducted using methods specified in Aerodrome Service Manual (Doc 9137), Part 2.

3.1.18 The average surface texture depth of a new surface should be not less than 1.0 mm.

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

Table 3-1 *RESERVED*

3.2 Runway strips

General

3.2.1 A runway and any associated stopways shall be included in a strip.

Length of runway strips

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

a) 60 m where the code number is 2; and

b) 30 m where the code number is 1.

Width of runway strips

3.2.3 A strip a non-instrument runway shall 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) 40 m where the code number is 2; and

b) 30 m where the code number is 1.

Objects on runway strips

3.2.4 An object situated on a runway strip which may endanger aeroplanes shall be regarded as an obstacle and shall be removed.

3.2.5 No fixed object, other than visual aids required for air navigation purposes and satisfying the relevant frangibility requirement, shall be permitted on a runway strip. No mobile object shall be permitted on this part of the runway strip during the use of the runway for landing or take-off.

Grading of runway strips

3.2.6 That portion of a strip of a non-instrument runway within a distance of at least:

a) 40 m where the code number is 2; and

b) 30 m where the code number is 1.

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

3.2.7 The surface of that portion of a strip that abuts a runway or stopway shall be flush with the surface of the runway or stopway.

Slopes on runway strips

3.2.8 Longitudinal slopes

A longitudinal slope along that portion of a strip to be graded should not exceed 2 per cent.

3.2.9 Longitudinal slope changes

Slope changes on that portion of a strip to be graded should be as gradual as practicable and abrupt changes or sudden reversals of slopes avoided.

3.2.10 Transverse slopes

Transverse slopes of the graded strip should be adequate to prevent accumulation of water on the surface but shall not exceed 3 per cent except that to facilitate drainage the slope for the first 3 m outward from the runway or stopway edge shall be negative as measured in the direction away from the runway and may be as great as 5 per cent.

3.2.11 The transverse slopes of any portion of a strip beyond that to be graded should not exceed an upward slope of 5 per cent as measured in the direction away from the runway.

Strength of runway strips

3.2.12 That portion of a strip within a distance of at least:

a) 40 m where the code number is 2; and

b) 30 m where the code number is 1.

from the centre line of the runway and its extended centre line shall be so prepared or constructed as to minimise 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.

3.3 Clearways

Note. — The inclusion of detailed specifications for clearways in this section is not intended to imply that a clearway has to be provided. CAD 14 Vol I, Attachment A, Section 2, provides information on the use of clearways.

Location of clearways

3.3.1 Where a clearway is provided, the origin of a clearway shall be at the end of the take-off run available.

Length of clearways

3.3.2 The length of a clearway shall not exceed half the length of the take-off run available.

Width of clearways

3.3.3 A clearway shall extend laterally on each side of the extended centre line of the runway, to a distance of at least half of the width of the runway strip.

Slopes on clearways

3.3.4 The ground in a clearway shall not project above a plane having an upward slope of 1.25 per cent, the lower limit of this plane being a horizontal line which:

a) is perpendicular to the vertical plane containing the runway centre line; and

b) passes through a point located on the runway centre line at the end of the take-off run available.

3.3.5 Abrupt upward changes in slope shall 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 22.5 m 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 shall generally conform with those of the runway with which the clearway is associated.

Objects on clearways

3.3.6 An object situated on a clearway which may endanger aeroplanes in the air shall be regarded as an obstacle and shall be removed.

3.4 Stopways

Note. — The inclusion of detailed specifications for stopways in this section is not intended to imply that a stopway has to be provided. CAD 14 Vol I, Attachment A, Section 2, provides information on the use of stopways.

Width of stopways

3.4.1 Where a stopway is provided, a stopway shall have the same width as the runway with which it is associated.

Slopes on stopways

3.4.2 Slopes and changes in slope on a stopway, and the transition from a runway to a stopway, shall generally conform with those of the runway with which the stopway is associated.

Strength of stopways

3.4.3 A stopway shall 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.

Surface of stopways

3.4.4 The surface of a paved stopway shall be so constructed or resurfaced as to provide surface friction characteristics at or above those of the associated runway.

3.5 Taxiways

General

3.5.1 The design of a taxiway shall 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 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
Clearance	1.50 m	2.25 m	3 m[a,b] or 4 m[c]

a On straight portions.
b On curved portions if the taxiway is intended to be used by aeroplanes with a wheel base of less than 18 m.
c On curved portions if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.

Width of taxiways

3.5.2 A straight portion of a taxiway shall have a width of 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
Taxiway width	7.5 m	10.5 m	15 m

Taxiway curves

3.5.3 Changes in direction of taxiways shall be as few and small as possible. The radii of the curve shall be compatible with the manoeuvring capability and normal taxiing speeds of the aeroplanes for which the taxiway is intended.

Taxiway minimum separation distances

3.5.4 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 shall not be less than the appropriate dimension specified in Table 3-2, except that it may be permissible to operate with lower separation distances at an existing STOLport if an aeronautical study indicates that such lower separation distances would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

	Distance between taxiway centre line and runway centre line		Taxiway centre line to taxiway centre line	Taxiway, other than aircraft stand taxilane, centre line to object	Aircraft stand taxilane centre line to aircraft stand taxilane centre line	Aircraft stand taxilane centre line to object
	(metres)		(metres)	(metres)	(metres)	(metres)
Code letter	Code Number 1	2				
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A	37.5	47.5	23	15.5	19.5	12
B	42	52	32	20	28.5	16.5
C	48	58	44	26	40.5	22.5

Table 3-2. Taxiway minimum separation distances

Slopes on taxiways

3.5.5 Longitudinal slopes

The longitudinal slope of a taxiway shall not exceed:

— 1.5 per cent where the code letter is C; and
— 3 per cent where the code letter is A or B.

3.5.6 Longitudinal slope changes

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

a) 1 per cent per 30 m (minimum radius of curvature of 3 000 m) where the code letter is C; and

b) 1 per cent per 25 m (minimum radius of curvature of 2 500 m) where the code letter is A or B.

3.5.7 Sight distance

Where a change in slope on a taxiway cannot be avoided, the change shall be such that, from any point:

a) 3 m above the taxiway, it will be possible to see the whole surface of the taxiway for a distance of at least 300 m from that point, where the code letter is C;

b) 2 m above the taxiway, it will be possible to see the whole surface of the taxiway for a distance of at least 200 m from that point, where the code letter is B; and

c) 1.5 m above the taxiway, it will be possible to see the whole surface of the taxiway for a distance of at least 150 m from that point, where the code letter is A.

3.5.8 Transverse slopes

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

a) 1.5 per cent where the code letter is C; and

b) 2 per cent where the code letter is A or B.

Strength of taxiways

3.5.9 The strength of a taxiway shall be at least equal to that of the runway it serves.

3.5.10 The surface of a taxiway shall not have irregularities that cause damage to aeroplane structures.

3.5.11 If a taxiway is paved, it shall be so constructed or resurfaced as to provide suitable surface friction characteristics as determined in the ICAO Aerodrome Design Manual Doc 9157 Part 3.

3.6 Taxiway strips

General

3.6.1 A taxiway, other than an aircraft stand taxilane, shall be included in a strip.

Width of taxiway strips

3.6.2 A taxiway strip shall extend symmetrically on each side of the centre line of the taxiway throughout the length of the taxiway to at least the distance from the centre line given in Table 3-2, column 5.

Objects on taxiway strips

3.6.3 The taxiway strip shall provide an area clear of objects which may endanger taxiing aeroplanes.

Grading of taxiway strips

3.6.4 The centre portion of a taxiway strip should 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.

Slopes on taxiway strips

3.6.5 The surface of the strip shall be flush at the edge of the taxiway or shoulder, if provided, and the graded portion should not have an upward transverse slope exceeding:

a) 2.5 per cent for strips where the code letter is C; and

b) 3 per cent for strips of taxiways where the code letter is A or B;

the upward slope being measured with reference to the transverse slope of the adjacent taxiway surface and not the horizontal. The downward transverse slope should not exceed 5 per cent measured with reference to the horizontal.

3.6.6 The transverse slopes on any portion of a taxiway strip beyond that to be graded should not exceed an upward or downward slope of 5 per cent as measured in the direction away from the taxiway.

3.7 Runway holding positions and road-holding positions

General

3.7.1 A runway-holding position shall be established on the taxiway, at the intersection of a taxiway and a runway.

3.7.2 A runway-holding position shall be established on a taxiway if the location or alignment of the taxiway is such that a taxiing aircraft or vehicle can infringe an obstacle limitation surface.

3.7.3 A road-holding position shall be established at an intersection of a road with a runway.

Location

3.7.4 The distance between a runway-holding position established at a taxiway-runway intersection and the centre line of a runway shall be at least 30 m for code 1 runway and at least 40 m for code 2 runway.

3.8 Aprons

General

3.8.1 Aprons shall be provided where necessary to permit the on- and off-loading of passengers, cargo or mail as well as the servicing of aircraft without interfering with the aerodrome traffic.

Size of aprons

3.8.2 The total apron area should be adequate to permit expeditious handling of the aerodrome traffic at its maximum anticipated density.

Strength of aprons

3.8.3 Each part of an apron shall 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.

Slopes on aprons

3.8.4 Slopes on an apron, including those on an aircraft stand taxilane, shall be sufficient to prevent accumulation of water on the surface of the apron but shall be kept as level as drainage requirements permit.

3.8.5 On an aircraft stand the maximum slope should not exceed 1 per cent.

Clearance distances on aircraft stands

3.8.6 An aircraft stand shall 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

3.8.7 On aprons, consideration should also have to be given to the provision of service roads and to manoeuvring and storage area for ground equipment.

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4 Obstacle Limitation Surfaces

4.1 General

4.1.1 Obstacle limitation surfaces are established to define the airspace over and around an STOLport that shall be kept free of obstacles. The limitation surface sets out the limits above which objects shall not extend.

4.2 Obstacle limitation requirements

4.2.1 Obstacle limitation requirements shall be in accordance with CAD 14, Vol. I, Chapter 4.

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5 Visual Aids for Navigation

5.1 Indicators and signalling devices

5.1.1 Wind direction indicator

Application

5.1.1.1 A STOLport shall be equipped with at least one wind direction indicator.

Location

5.1.1.2 A wind direction indicator shall be located so as to be visible from aircraft in flight or on the movement area and in such a way as to be free from the effects of air disturbances caused by nearby objects.

Characteristics

5.1.1.3 The wind direction indicator should be in the form of a truncated cone made of fabric and shall have a length of not less than 3.6 m and a diameter, at the larger end, of not less than 0.9 m. It should be constructed so that it gives a clear indication of the direction of the surface wind and a general indication of the wind speed.

5.1.1.4 The colour or colours shall be so selected as to make the wind direction indicator clearly visible and understandable from a height of at least 300 m, having regard to background. Where practicable, a single colour, preferably white or orange, should be used. Where a combination of two colours is required to give adequate conspicuity against changing backgrounds, they should preferably be orange and white, red and white, or black and white, and shall be arranged in five alternate bands, the first and last bands being the darker colour.

5.1.1.5 The location of at least one wind direction indicator should be marked by a circular band 15 m in diameter and 1.2 m wide. The band should be centred about the wind direction indicator support and should be in a colour chosen to give adequate conspicuity, preferably white.

5.1.2 Aerodrome beacon

Application

5.1.3 Where operationally necessary, an aerodrome beacon or an identification beacon should be provided at STOLport.

5.1.4 CAD 14, Vol. I, Chapter 5, provides useful guidance on specifications for aerodrome beacon.

5.1.5 Visual approach slope indicator systems

Application

5.1.5.1 Visual approach slope indicator system (PAPI or APAPI) should be provided when one or more of the following conditions exist:

a) pilot difficult to judge the approach due to:

1) inadequate visual guidance when conducting approach over water or featureless terrain by day or in the absence of extraneous lights in the approach area by night; or

2) misleading information such as is produced by deceptive surrounding terrain or runway slopes.

b) the presence of objects in the approach area may involve serious hazard if an aeroplane descends below the normal approach path, particularly if there are no non-visual aids or other visual aids to give warning of such objects;

c) physical conditions at either end of the runway present a serious hazard in the event of an aeroplane undershooting or overrunning the runway; and

d) terrain or prevalent meteorological conditions are such that the aeroplane may be subjected to unusual turbulence during approach.

5.1.5.2 CAD 14, Vol. I, Chapter 5, provides useful guidance on specifications for visual approach slope indicator systems.

5.2 Markings

5.2.1 General

5.2.1.1 Markings shall be conspicuous and provide the maximum possible contrast under various conditions.

5.2.1.2 Runway markings shall be white; taxiway and aircraft stand markings shall be yellow.

5.2.2 Runway designation marking

Application

5.2.2.1 A runway designation marking shall be provided at the thresholds of a paved runway.

5.2.2.2 A runway designation marking shall be provided, so far as practicable, at the thresholds of an unpaved runway.

Location

5.2.2.3 A runway designation marking of a paved runway shall be located at a threshold as shown in Figure 5-1A.

5.2.2.4 For an unpaved runway, where the threshold is marked by solid white band, a runway designation marking shall be located at 6 m succeeding the band as shown in Figure 5-1B.

Characteristics

5.2.2.5 A runway designation marking shall consist of a two-digit number. The two digit-number shall be the whole number nearest to one-tenth of the magnetic North when viewed from the direction of approach. When the above rule would give a single digit number, it shall be preceded by a zero.

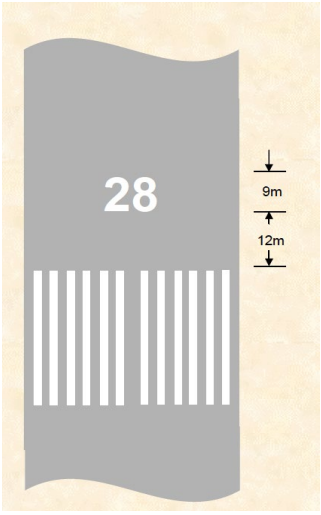

Figure 5-1A. Runway designation and threshold markings for paved runway

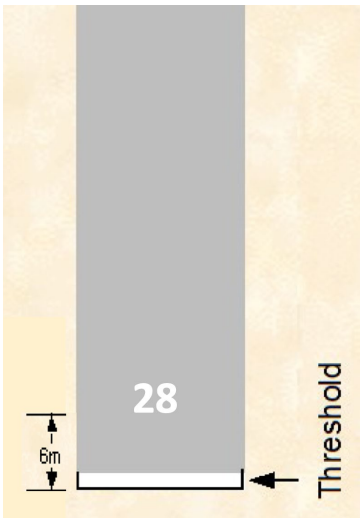

Figure 5-1B. Runway designation and transverse stripe for unpaved runway

5.2.2.6 The numbers, and letters where applicable, shall be in the form and proportion shown in Figure 5-2.

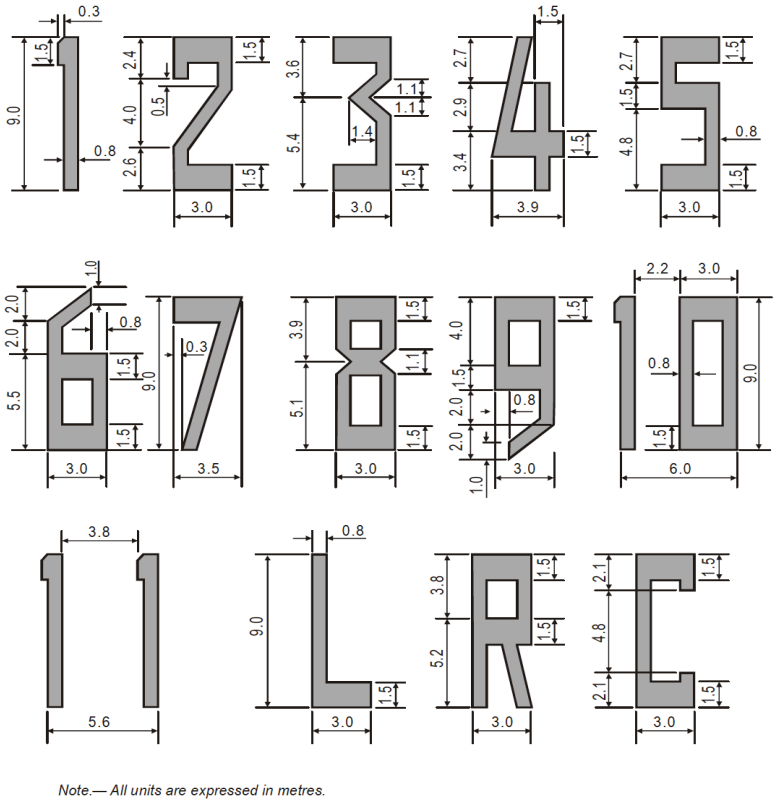

Figure 5-2. Form and proportions of numbers and letters for runway designation marking

5.2.3 Runway centre line marking.

Application

5.2.3.1 A runway centre line marking shall be provided on a paved runway.

Location

5.2.3.2 A runway centre line marking shall be located along the centre line of the runway between the runway designation markings as shown in Figure 5-3.

Characteristics

5.2.3.3 A runway centre line marking shall consist of a line of uniformly spaced stripes and gaps. The length of a stripe (*S*) plus a gap (*G*) shall be not less than 50 m or more than 75 m. The length of each stripe shall be at least equal to the length of the gap or 30 m, whichever is greater.

5.2.3.4 The width (*W*) of the stripes shall be not less than 0.30 m.

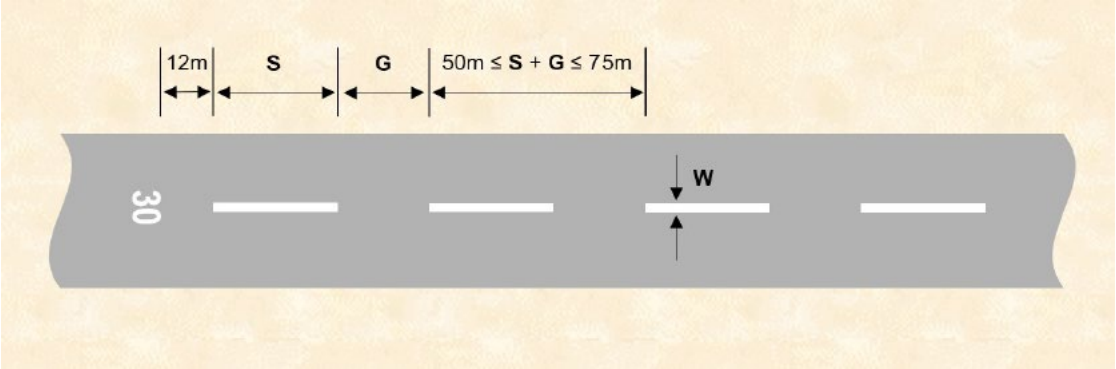

Figure 5-3. Runway centre line markings

5.2.4 Threshold marking

Application

5.2.4.1 A threshold marking shall be provided at the threshold of a paved runway.

5.2.4.2 For unpaved runways, where the threshold is not marked with stripes, a transverse stripe of a solid white band 1.8 m wide shall extend across the full width of the runway.

Location

5.2.4.3 The stripes of the threshold marking shall commence 6 m from the threshold.

Characteristics

5.2.4.4 A runway threshold marking shall consist of a pattern of longitudinal stripes of uniform dimensions disposed symmetrically about the centre line of a runway as shown in Figure 5-1A. The number of stripes shall be in accordance with the runway width as follows:

Runway width	*Number of stripes*
18 m	4
23 m	6
30 m	8

5.2.4.5 The stripes shall extend laterally to within 3 m of the edge of a runway. The stripes shall be at least 30 m long and approximately 1.8 m wide with spacing of approximately 1.8 m between them. A double spacing shall be used to separate the two stripes nearest the centre line of the runway.

Transverse stripe

5.2.4.6 Where the threshold is displaced from the extremity of the runway, the beginning of the runway shall be marked with a transverse stripe not less than 1.8 m wide extend across the full width of the runway.

5.2.5 Taxiway centre line marking

Application

5.2.5.1 Taxiway centre line marking shall be provided on paved taxiway in such way to provide continuous guidance between the runway centre line and aircraft stands.

5.2.5.2 CAD 14, Vol. I, Chapter 5, provides useful guidance on specifications for a Taxiway centre line marking

5.2.6 Runway-holding position markings

Application and location

5.2.6.1 A runway-holding position marking shall be displayed along a taxiway where established.

5.2.6.2 A runway-holding position marking shall be as shown in Figure 5-6.

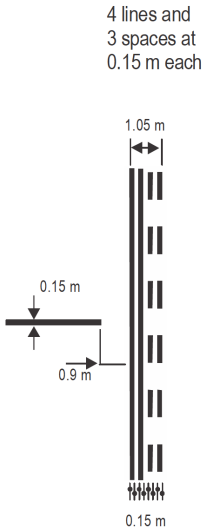

Figure 5-6. Runway-holding position markings

5.2.7 Aircraft stand markings

Application

5.2.7.1 Aircraft stand markings shall be provided for designated parking positions on a paved apron.

Location

5.2.7.2 Aircraft stand markings shall be located so as to provide the clearances specified in 3.8.6, when the nosewheel follows the stand markings.

Characteristics

5.2.7.3 Aircraft stand markings shall include stand identification, lead-in line, turn bar, turning line, alignment bar, stop line and lead-out line, as are required by the parking configuration.

5.2.7.4 Aircraft stand identification shall be included in the lead-in line a short distance after the beginning of the lead-in line.

5.2.7.5 Where two sets of aircraft stand markings are superimposed, in order to permit more flexible use of the apron and it is difficult to identify which stand marking should be followed, or safety would be impaired if the wrong marking was followed, then the identification of the aircraft type should be added to the stand identification.

5.2.7.6 Lead-in, turning and lead-out lines shall be continuous in length and have a width of not less than 15 cm. Where one or more sets of stand markings are superimposed on a stand marking, the lines shall be continuous for the most demanding aircraft and broken for other aircraft.

5.2.7.7 The curved portion of lead-in line, turning line, and lead-out line shall have a radii appropriate to the most demanding aircraft type for which the markings are intended.

5.2.7.8 Where it is intended that an aircraft proceed in one direction only, arrows pointing in the direction to be followed shall be added as part of the lead-in and lead-out lines.

5.2.7.9 A turn bar shall be located at right angles to the lead-in line, abeam the left pilot position at the point of initiation of any intended turn. It shall have a length and width of not less than 6 m and 15 cm, respectively, and include an arrowhead to indicate the direction of turn.

5.2.7.10 An alignment bar shall be placed so as to be coincident with the extended centre line of the aircraft in the specified parking position and visible to the pilot during the final part of the parking manoeuvre. It shall have a width of not less than 15 cm.

5.2.7.11 A stop line shall be located at right angles to the alignment bar, abeam the left pilot position at the intended point of stop. It shall have a length and width of not less than 6 m and 15 cm, respectively.

Note1. — 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.

Note2. — See the Civil Aviation Guidance Material 1403 (CAGM 1403) for Apron Markings and Signs

5.3 Markers

5.3.1 General

5.3.1.1 Markers shall be lightweight and frangibly mounted. Those located near a runway or taxiway shall be sufficiently low to preserve clearance with any overhanging part of the critical aeroplane.

Note. — Guidance on the frangibility of markers is given in the ICAO Aerodrome Design Manual, Part 4.

5.3.1.2 Markers are to be used on unpaved areas in lieu of markings. They are to be either cones, gables or rectangular flat concrete.

5.3.1.3 Makers shall be secured against prop wash and jet blast, in a manner that does not cause damage to an aircraft.

Characteristics

5.3.1.4 Cones shall have a height (h) of 0.5m and a base diameter (w) of 0.75m as shown in Figure 5.7.

Figure 5-7. Cone markers

5.3.1.5 Gables shall be 3m long, 1m wide at the base and 0.5m high, as shown in Figure 5.8.

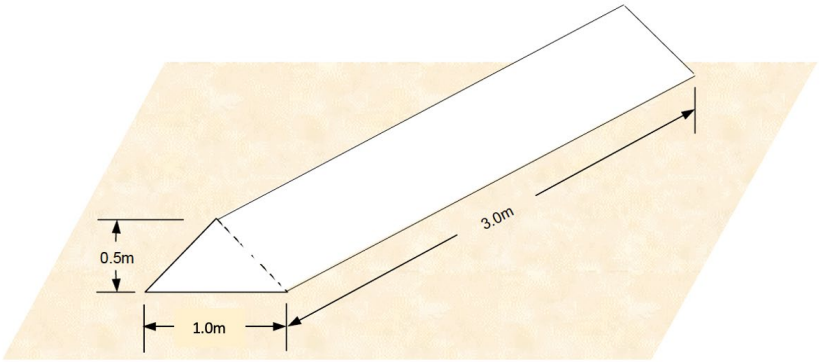

Figure 5-8. Gable markers

5.3.1.6 If rectangular flat concrete markers are used, they shall measure at least 1 m wide by 3 m long and flushed with the surface of the runway.

5.3.2 Unpaved runway edge markers

Application and location

5.3.2.1 Unpaved runway edge markers shall be provided along both sides of the runway where there is a lack of contrast between the runway and runway strip.

Characteristics

5.3.2.2 Unpaved runway edge markers shall be painted in a white of colours and provided in pairs every 90 m along both long sides of the runway.

5.3.3 Unpaved runway end markers

Application and location

5.3.3.1 On unpaved runway end markers shall be an L shaped group of 3 white cone markers or 2 white gables/ flat concrete rectangular markers located at each runway end corner.

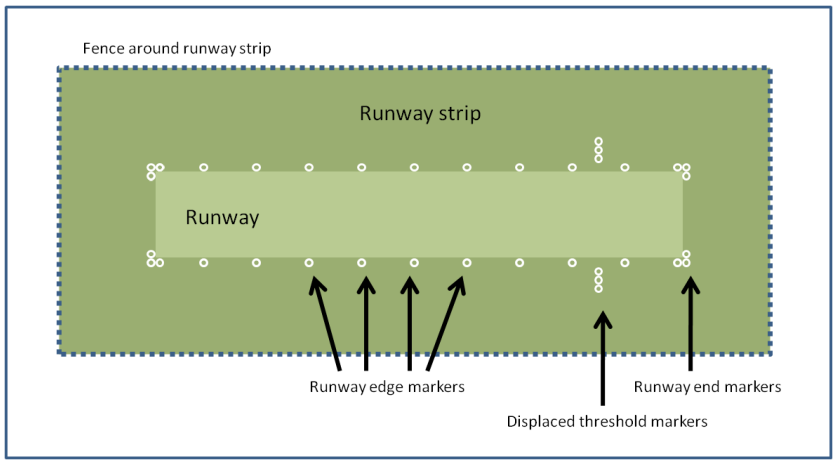

Figure 5.9. Example runway markers on unpaved runway

5.3.4 Unpaved taxiway edge markers

Application and location

5.3.4.1 Where the edges of unpaved taxiways or graded taxiway strips might not be visually clear, taxiway edge markers shall be provided to show pilots the edge of trafficable taxiways.

Characteristics

5.3.4.2 The taxiway markers shall be yellow and shall be equally spaced to enable pilots to clearly delineate the edge of the unpaved taxiway.

5.3.4.3 Taxiway commencement markers shall consist of 3 yellow cones or 2 white gables/ flat concrete rectangular markers, shaped in a small L. The taxiway commencement markers will assist pilots to locate the taxiway coming off the runway, and also when leaving the aircraft parking bay for the runway.

5.3.5 Unpaved apron markers

Application and location

5.3.5.1 Where the edges of unpaved aprons might not be visually clear to pilots, apron edge markers shall be provided.

Characteristics

5.3.5.2 Where provided, the apron edge markers shall be yellow and shall be equally spaced to enable pilots to clearly delineate the edge of the unpaved apron area.

5.4 Signs

5.4.1 General

5.4.1.1 Where operationally necessary, signs should be provided at a STOLport to give information or instructions. The guidance on the sizes of signs, their inscriptions, location, abbreviations commonly used and frangibility of signs given in the CAD 14 Vol. I and ICAO Aerodrome Design Manual, Part 4, is applicable to signs at STOLports.

6 Visual Aids for Denoting Obstacles

6.1 Objects to be marked and lighted

6.1.1 The marking and lighting of objects is intended to reduce hazards to aircraft by indicating the presence of obstacles. It does not necessarily reduce operating limitations that may be imposed by an obstacle.

6.1.2 Mobile equipment and vehicles, other than aircraft, on the movement area of a STOLport are obstacles and shall be marked and lighted.

6.1.3 Obstacle lights shall not be installed on the signs in the movement area.

6.1.4 All obstacles within the distance specified in Table 3-2, column 5 or 6, from the centre line of a taxiway, an apron taxiway or aircraft stand taxilane shall be marked.

6.2 Marking and lighting of objects

6.2.1 Objects shall be marked in accordance with CAD 14, Vol. I, Chapter 6, 6.2 as applicable.

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7 Visual Aids for Denoting Restricted Use Areas

7.1 Closed runway and taxiway marking

7.1.1 Markings denoting a closed runway shall be placed at each end of the runway and along the runway at intervals of not more than 300 m.

7.1.2 Markings denoting a closed taxiway shall be placed at each end of the taxiway or part of the taxiway that is closed.

7.1.3 Closed runway and taxiway markings shall be painted on the surface if permanent but may be made of other materials if the closing is temporary. The marking shall be in the form of an "X", each arm of which shall be at least 6 m long and 0.9 m wide as shown in Figure 7-1, as described in CAD 14 Vol I – Aerodrome Design and Operations.

7.2 Unserviceable-area marking

7.2.1 Unserviceable portions of a manoeuvring area shall be conspicuously marked with devices like cones, flags or marker boards placed at intervals that clearly mark the unserviceable area. Characteristics of unserviceable-area marking devices are:

a) a cone shall be at least 0.5 m high;

b) a flag shall be at least 0.5 m square;

c) a marker board shall be at least 0.5 m high and 0.9 m long; and

d) the foregoing devices shall be red, orange or yellow or one of these colours in combination with white.

7.3 Movement area unserviceability lighting

7.3.1 Closed runways, taxiways and unserviceable areas shall be marked with steady fixed red lights. The runway or taxiway lights of closed portions shall be turned off and, when the closed portion intersects a usable runway or taxiway, unserviceability lights shall be placed at intervals of not more than 3 m across entrances to the closed area. Unserviceable area lights shall be placed at intervals that will clearly delineate the unserviceable area.

7.4 Pre-threshold area

7.4.1 Where the surface leading to the runway threshold is paved but is not suitable for normal use by aircraft and exceeds 60 m in length, the entire pre-threshold shall be marked with yellow chevron markings.

7.4.2 The chevrons shall be formed of yellow stripes 0.9 m and shall be set at an angle of 45º to the extended runway centre line (see Figure 7.1).

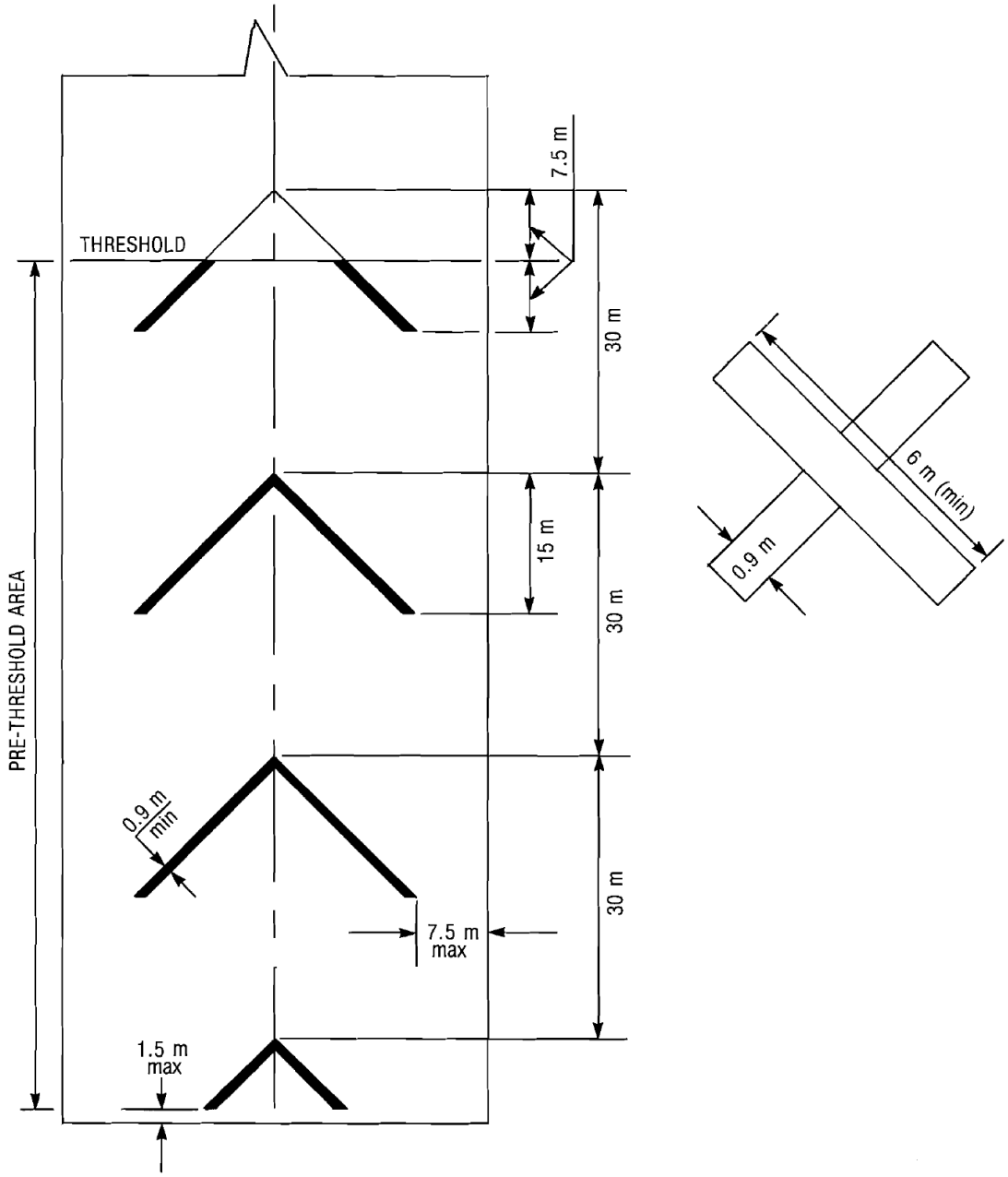

Figure 7-1. Pre-threshold area and closed runway markings

7.5 Non-Load -Bearing Surfaces

7.5.1 Shoulders and other non-loading bearing surfaces that are and not obvious should have the boundaries between such areas and the taxiway, holding bay or apron marked by solid white lines 15 cm wide so that the outer edge of the line indicates the edge of the load-bearing surface.

8 Equipment and Installations

8.1 Fencing

8.1.1 A fence or other suitable barrier shall be provided on a STOLport to prevent the entrance to the movement area of animals large enough to be a hazard to aircraft and deter the inadvertent or premeditated access of an unauthorised person onto a non-public area of the STOLport.

8.1.2 Ground installations and facilities essential to aviation safety located off a STOLport shall be protected against unauthorised access.

8.1.3 The fence or barrier should be located so as to separate the movement area and other facilities or zones on the STOLport vital to the safe operation of aircraft from areas open to public access.

8.2 Siting and Construction of Equipment and Installations on Operational Areas

8.2.1 No equipment or installation should be:

a) on a runway strip, a taxiway strip or within the distances specified in Table 3-2, column 5, if it would endanger an aircraft; or

b) on a clearway if it would endanger an aircraft in the air.

8.3 STOLport Vehicle Operator

8.3.1 The driver of a vehicle on the movement area shall comply with all mandatory instructions conveyed by markings and signs.

8.3.2 The driver of a vehicle on the movement area shall be appropriately trained.

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9 Emergency and Other Services

9.1 STOLport Emergency Planning (SEP)

Note. — STOLport emergency planning is the process of preparing a STOLport to cope with an emergency occurring at the STOLport or in its vicinity. The objective of STOLport emergency planning is to minimise the effects of an emergency, particularly in respect of saving lives and maintaining aircraft operations. The STOLport emergency plan sets forth the procedures for coordinating the response of different STOLport agencies (or services) and of those agencies in the surrounding community that could be of assistance in responding to the emergency. Guidance material to assist the STOLport operator in establishing STOLport emergency planning is given in the Airport Services Manual (Doc 9137), Part 7.

9.1.1 A STOLport emergency plan shall be established at a STOLport and provide the coordination of the actions to be taken in an emergency occurring at an aerodrome or in its vicinity.

9.1.2 The plan shall coordinate the response or participation of all existing agencies which, in the opinion of the appropriate authority, could be of assistance in responding to an emergency.

9.1.3 Adequate communication systems and equipment at the mobile command post shall be provided in accordance with the plan and is responsible for the overall coordination and general direction of the response to an emergency.

Note. – For STOLports that have appropriate facilities, an Emergency Operations Centre (EOC) may be responsible for the overall coordination and general direction of the response in an emergency.

9.1.4 The plan shall contain procedures for periodic testing of the adequacy of the plan and for reviewing the results in order to improve its effectiveness.

9.1.5 Emergency exercise shall be carried out at least once every three years.

9.1.6 The plan shall include coordination with, appropriate specialist rescue services to be able to respond to emergencies where an aerodrome is located close to water and/or swampy areas and where a significant portion of approach or departure operations takes place over these areas.

9.2 Rescue and fire fighting

Note. — The principal objective of rescue and firefighting is to save lives in the event of an aircraft accident or fire at the STOLport. The rescue and firefighting service is provided to create and maintain survivable conditions, to provide egress routes for occupants and to initiate the rescue of those occupants unable to make their escape without direct aid. The rescue may require the use of equipment and personnel other than those assessed primarily for rescue and firefighting purposes. The most important factors bearing on effective rescue in a survivable aircraft accident are: the training received, the effectiveness of the equipment and the speed with which

personnel and equipment designated for rescue and firefighting purposes can be put into use.

Application

9.2.1 Rescue and firefighting or auxiliary personnel services and equipment shall be provided at a STOLport.

Note. — Auxiliary personnel are persons provided for RFF duties that are fully trained in their performance of their duties.

9.2.2 Where a STOLport 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 should be provided by agencies in accordance with the STOLport emergency plan.

Level of protection to be provided

9.2.3 The level of protection provided at a STOLport for rescue and firefighting shall be accordance with CAD 14 Vol. I and appropriate to the STOLport category except that, where the number of movements of the aircraft in the highest category normally using the STOLport is less than 700 in the busiest consecutive three months, the level of protection provided shall be not less than one category below the determined category.

9.2.4 The STOLport category shall be determined from Table 9-1 and shall be based on the longest aircraft normally using the STOLport and their fuselage width. Categorisation is based firstly by evaluation of their overall length and secondly, their fuselage width.

STOLport Category (1)	Aeroplane Overall Length (2)	Maximum Fuselage Width (3)
1	0 m up to but not including 9 m	2 m
2	9 m up to but not including 12 m	2 m
3	12 m up to but not including 18 m	3 m
4	18 m up to but not including 24 m	4 m

Table 9-1. STOLport category for rescue and firefighting

Extinguishing agents

9.2.5 Principal and complementary agents shall be provided at a STOLport.

9.2.6 The amounts of principal agents to be provided on the rescue and firefighting vehicles shall be in accordance with the STOLport category determined as in Table 9.2, CAD 14 Vol. I. For STOLport Categories 1 and 2 up to 100 percent of the water may be substituted with complementary agent.

Rescue equipment

9.2.7 Rescue equipment commensurate with the level of aircraft operations shall be provided on the rescue and firefighting vehicle.

Response time

9.2.8 The operational objective of the rescue and firefighting service shall be to achieve a response time not exceeding three minutes to any point of each operational runway, in optimum visibility and surface conditions.

Emergency access roads

9.2.9 The rescue fire fighting vehicle shall be housed in a location which access into the runway area is direct and clear.

9.2.10 Rescue and firefighting personnel shall be in full alertness once an aircraft movement occurs.

Number of vehicles

9.2.11 At least one vehicle shall be provided.

Note. — The primary purposes of a fire vehicle include transporting firefighters and extinguishing agents to an incident or accident area as well as carrying equipment for firefighting operation at a time as in 9.2.7.

Training

9.2.12 All rescue and firefighting personnel shall be properly trained and provided with appropriate Personal Protective Equipment (PPE) to perform their duties in an efficient manner.

9.3 Disabled Aircraft Removal

9.3.1 A plan for the removal of an aircraft disabled on, or adjacent to, the movement area shall be established for a STOLport, and a coordinator designated to implement the plan, when necessary.

9.3.2 Guidance on removal of a disabled aircraft is given in the Civil Aviation Guidance Material 1401 - Aerodrome Disabled Aircraft Removal Plan (CAGM 1401).

9.4 Maintenance

9.4.1 A maintenance programme, including preventive maintenance shall be established at a STOLport to maintain facilities in a condition that does not impair safety, regularity or efficiency of air operations.

9.4.2 Where appropriate, a maintenance programme shall be developed in accordance with CAD 14, Vol. I, Chapter 10.

9.5 Wildlife Hazard Control

9.5.1 A STOLport operator shall institute a method of controlling wildlife that constitute a hazard to aircraft operations commensurate with aircraft operations and other activities.

9.5.2 Guidance on bird hazard control is given in the Civil Aviation Guidance Material 1400 (CAGM – 1400) - Wildlife Hazard Management Programme.