INTERNATIONAL CIVIL AVIATION ORGANIZATION

THE FIRST MEETING OF THE APANPIRG AERODROMES OPERATIONS AND PLANNING – WORKING GROUP (AOP/WG/1)

Bangkok, Thailand, 21 – 23 May 2013

Agenda Item 4: Provision of AOP in the Asia/Pacific Region

AMENDMENT 11 TO ANNEX 14, VOLUME I — AERODROME DESIGN AND OPERATIONS

(Presented by Secretariat)

SUMMARY

This paper provides information on the new Amendment 11 to Annex 14, Volume I – *Aerodrome Design and Operations*.

This paper relates to **Strategic Objectives:**

A: ***Safety*** *– Enhance global civil aviation safety*

C: ***Environmental Protection and Sustainable Development of Air Transport*** *– Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-13 Aerodrome design and management
GPI-14 Runway operations

Action by APANPIRG/24 is in Para 3.

1. INTRODUCTION

1.1 The Amendment 11 to the Aerodromes - Aerodrome Design and Operations (Annex 14, Volume I to the Convention on International Civil Aviation) was adopted by the ICAO Council at the fifth meeting of its 198th Session on 27 February 2013. The Amendment and Resolution of adoption are available as attachments to the electronic version of State letter AN 4/1.2.24-13/20 dated 5 April 2013 on the ICAO NET (http://portal.icao.int)

1.2 The Council prescribed 15 July 2013 as the date on which the amendment will become effective, except for any part concerning which a majority of contracting states has registered their disapproval before that date. In addition the Council resolved that Amendment 11 to the extent it becomes effective will become applicable on 14 November 2013 (Amendment 11-A refers) except for elements concerning new approach classification which will become applicable on 13 November 2014 (Amendment 11-B refers).

1.3 The Amendment 11 to Annex 14, Volume I stems from

i) recommendations of the second meeting of the Aerodromes Panel (AP/1);

ii) consequential amendments of the proposed new Annex on safety management, Annex 19, based on recommendations of the Safety Management Panel (SMP) arising from its Special Meeting (SMP/SM/1);

iii) proposals arising from the Secretariat with the assistance of the Aeronautical Information Services to Aeronautical Information Management Study Group (AIS-AIMSG), regarding the transition of AIS to AIM; and

iv) proposals developed by the Secretariat and supported by the Approach Classification Task Force (ACTF) in coordination with the Aerodromes Panel (AP), the Instrument Flight Procedure Panel (IFPP), the Navigation Systems Panel (NSP) and the Operations Panel (OPSP), regarding new approach classification and the introduction of Approach Procedure with Vertical Guidance (APV) Operations.

2. DISCUSSION

2.1 The proposed amendment relating to the design and operations of aerodromes has the objective of enhancing aerodrome safety and efficiency in a globally harmonized manner. Amendment 11 covers new and revised provisions on

i) maximum allowable tire pressure category in the reporting of strength of pavements in an effort to more efficiently utilize airfield pavements;

ii) effective runway surface friction measurement and reporting for the reduction/prevention of runway excursions;

iii) Runway End Safety Areas (RESA) and arresting systems to mitigate consequences of a runway overrun;

iv) strength of blast pads to avoid engine ingestion of Foreign Object Debris (FOD) during take-off;

v) visual aids for navigation, including simple touchdown zone lights to provide pilots with enhanced situational awareness for the prevention of runway excursions, and enhanced taxiway centre line marking, stop bars and Runway Guard Lights (RGLs) for the prevention of runway incursions;

vi) Rescue and Firefighting (RFF), including the new and more efficient performance level “C” foam;

vii) siting of equipment and installations on operational areas to allow the use of certain devices for aircraft safety purposes; and

viii) increased emphasis on aerodrome and pavement maintenance.

2.2 The transfer of existing overarching safety management provisions to the adopted Annex 19 will consolidate these provisions and organize them in a way to facilitate States’ implementation of the related practices necessary to further enhance aviation safety. It will also assist Member States and aviation service providers in developing their respective State Safety Programmes (SSPs) and Safety Management Systems (SMSs). A cross reference in Annex 14, Volume I to Annex 19 for safety management provisions applicable to certified aerodromes has been included in the amendment proposal.

2.3 For States implementing Quality Management Systems (QMS), the expression of a numeric value of integrity has complicated the effort to develop compliance mechanisms. The deletion of the numeric values in favour of a qualitative description of risk and error avoidance is seen as a means of advancing the implementation of quality management systems in the aeronautical data chain.

2.4 The provisions for Aerodrome Mapping Data (AMD) result from the ongoing work of the joint EUROCAE WG44/RTCA SC217 working group. The provision of AMD will provide a Standardized Data set meeting quality and integrity requirements. The primary envisioned use of the data is to support electronic charting used by both air traffic management and aircraft systems (e.g. cockpit aerodrome map display).

2.5 The amendment concerning new approach classification and the introduction of the term "Approach Procedure with Vertical Guidance (APV) Operations" modifies the existing approach classification in a manner that will both simplify and more accurately describe the various types of approach and landing operations, addressing the concerns expressed by Member States and industry since the introduction of this term. The amendment ensures that all ICAO provisions are harmonized with respect to Performance-Based Navigation (PBN) approach operations with vertical guidance and has the added benefit of optimizing runway requirements in relation to the approach operations.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

i) Urge States to notify ICAO before 15 July 2013 if there is any part of the adopted Standards and Recommended Practices (SARPs) amendments in Amendment 11 [i.e. Amendments 11-A and 11-B] concerning which the States wishes to register disapproval; [Note- only statements of disapproval need to be registered. This does not constitute a notification of differences under Article 38 of the Convention];

ii) urge states to notify ICAO before 14 October 2013 any differences that will exist on 14 November 2013 between the national regulations or practices and the provisions of the whole of Annex 14, Volume I as amended by all amendments up to and including Amendment 11 and thereafter of any further differences that may arise; and

iii) Urge States to provide the date or dates by which their Administration will have complied with the provisions of the whole of Annex 14, Volume I, as amended by all amendments up to and including Amendment 11.

[Note: Guidance on the determination and reporting of differences is given in the note on the Notification of Differences in Attachment E to State Letter AN 4/1.2.24-13/20 dated 5 April 2013.]

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International Civil Aviation Organization | Organisation de l'aviation civile internationale | Organización de Aviación Civil Internacional | Международная организация гражданской авиации | منظمة الطيران المدني الدولي | 国际民用航空组织

Tel.: +1 (514) 954-6717

Ref.: AN 4/1.2.24-13/20

5 April 2013

Subject: Adoption of Amendment 11 to Annex 14, Volume I

Action required: a) Notify any disapproval before 15 July 2013; b) Notify any differences and compliance before 14 October 2013 and 13 October 2014; c) Consider the use of the Electronic Filing of Differences System (EFOD) for notification of differences and compliance

Sir/Madam,

1. I have the honour to inform you that Amendment 11 to the *International Standards and Recommended Practices, Aerodrome Design and Operations* (Annex 14, Volume I to the Convention on International Civil Aviation) was adopted by the Council at the fifth meeting of its 198th Session on 27 February 2013. Copies of the Amendment and the Resolution of Adoption are available as attachments to the electronic version of this State letter on the ICAO-NET (http://portal.icao.int) where you can access all other relevant documentation.

2. When adopting the amendment, the Council prescribed 15 July 2013 as the date on which it will become effective, except for any part concerning which a majority of Contracting States have registered their disapproval before that date. In addition, the Council resolved that Amendment 11, to the extent it becomes effective, will become applicable on 14 November 2013 (Amendment 11-A refers), except for the element concerning new approach classification which will become applicable on 13 November 2014 (Amendment 11-B refers).

3. Amendment 11 arises from:

a) recommendations of the second meeting of the Aerodromes Panel (AP/2);

b) consequential amendments of the proposed new Annex on safety management, Annex 19, based on recommendations of the Safety Management Panel (SMP) arising from its Special Meeting (SMP/SM/1);

999 University Street
Montréal, Quebec
Canada H3C 5H7

Tel.: +1 514-954-8219
Fax: +1 514-954-6077

E-mail: icaohq@icao.int
www.icao.int

c) proposals arising from the Secretariat with the assistance of the Aeronautical Information Services to Aeronautical Information Management Study Group (AIS-AIMSG), regarding the transition of AIS to AIM; and

d) proposals developed by the Secretariat and supported by the Approach Classification Task Force (ACTF) in coordination with the Aerodromes Panel (AP), the Instrument Flight Procedure Panel (IFPP), the Navigation Systems Panel (NSP) and the Operations Panel (OPSP), regarding new approach classification and the introduction of approach procedure with vertical guidance (APV) operations.

4. The proposed amendment relating to the design and operations of aerodromes stems from the recommendations of AP/2 and has the objective of enhancing aerodrome safety and efficiency in a globally harmonized manner. The proposed amendment covers new and revised provisions on maximum allowable tire pressure category in the reporting of strength of pavements in an effort to more efficiently utilize airfield pavements; effective runway surface friction measurement and reporting for the reduction/prevention of runway excursions; runway end safety areas (RESA) and arresting systems to mitigate consequences of a runway overrun; strength of blast pads to avoid engine ingestion of foreign object debris (FOD) during take-off; visual aids for navigation, including simple touchdown zone lights to provide pilots with enhanced situational awareness for the prevention of runway excursions, and enhanced taxiway centre line marking, stop bars and runway guard lights (RGLs) for the prevention of runway incursions; rescue and fire fighting (RFF), including the new and more efficient performance level "C" foam; siting of equipment and installations on operational areas to allow the use of certain devices for aircraft safety purposes, and increased emphasis on aerodrome and pavement maintenance.

5. The transfer of existing overarching safety management provisions to the adopted Annex 19 will consolidate these provisions and organize them in a way to facilitate States' implementation of the related practices necessary to further enhance aviation safety. It will also assist Member States and aviation service providers in developing their respective State safety programmes (SSPs) and safety management systems (SMSs). A cross reference in Annex 14, Volume I to Annex 19 for safety management provisions applicable to certified aerodromes has been included in the amendment proposal. The consolidation of existing safety management provisions into a single Annex will eliminate duplication of SARPs that currently exist in other Annexes.

6. The integrity classifications and levels listed in aeronautical data quality requirements are associated with specified numeric values. The numeric values are associated with target levels of a reduced probability of a transmitted error in information; however, the values themselves have proven to be problematic. For States implementing quality management systems (QMS), the expression of a numeric value of integrity has complicated the effort to develop compliance mechanisms. The deletion of the numeric values in favour of a qualitative description of risk and error avoidance is seen as a means of advancing the implementation of quality management systems in the aeronautical data chain.

7. The provisions for aerodrome mapping data (AMD) result from the ongoing work of the joint EUROCAE WG44/RTCA SC217 working group. The provision of AMD will provide a standardized data set meeting quality and integrity requirements. The primary envisioned use of the data is to support electronic charting used by both air traffic management and aircraft systems (e.g. cockpit aerodrome map display).

8. The amendment concerning new approach classification and the introduction of the term "approach procedure with vertical guidance (APV) operations" modifies the existing approach classification in a manner that will both simplify and more accurately describe the various types of approach and landing operations, addressing the concerns expressed by Member States and industry since the introduction of this term. The amendment ensures that all ICAO provisions are harmonized with

respect to performance-based navigation (PBN) approach operations with vertical guidance and has the added benefit of optimizing runway requirements in relation to the approach operations.

9. In conformity with the Resolution of Adoption, may I request:

a) that before 15 July 2013 you inform me if there is any part of the adopted Standards and Recommended Practices (SARPs) amendments in Amendment 11 (i.e. Amendments 11-A and 11-B) concerning which your Government wishes to register disapproval, using the form in Attachment B for this purpose. Please note that only statements of disapproval need be registered and if you do not reply it will be assumed that you do not disapprove of the amendment;

b) that before 14 October 2013[1] you inform me of the following, using the form in Attachments C and D for this purpose:

1) any differences that will exist on 14 November 2013[2] between the national regulations or practices of your Government and the provisions of the whole of Annex 14, Volume I, as amended by all amendments up to and including Amendment 11, and thereafter of any further differences that may arise; and

2) the date or dates by which your Government will have complied with the provisions of the whole of Annex 14, Volume I, as amended by all amendments up to and including Amendment 11.

10. With reference to the request in paragraph 9 a) above, it should be noted that a registration of disapproval of Amendment 11 or any part of it in accordance with Article 90 of the Convention does not constitute a notification of differences under Article 38 of the Convention. To comply with the latter provision, a separate statement is necessary if any differences do exist, as requested in paragraph 9 b) 1). It is recalled in this respect that international Standards in Annexes have a conditional binding force, to the extent that the State or States concerned have not notified any difference thereto under Article 38 of the Convention.

11. With reference to the request in paragraph 9 b) above, it should be also noted that the Council, at the third meeting of its 192nd Session on 4 March 2011, agreed that pending the development of a concrete policy and operational procedures governing the use of EFOD, this system be used as an alternative means for filing of differences to all Annexes, except for Annex 9 — *Facilitation* and Annex 17 — *Security — Safeguarding International Civil Aviation against Acts of Unlawful Interference*. EFOD is currently available on the USOAP restricted website (http://www.icao.int/usoap) which is accessible by all Member States (AN 1/1-11/28 refers) and you are invited to consider using this for notification of compliance and differences.

12. Guidance on the determination and reporting of differences is given in the Note on the Notification of Differences in Attachment E.

[1] 13 October 2014 for approach classification provisions.
[2] 13 November 2014 for approach classification provisions.

13. Please note that a detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.

14. I would appreciate it if you would also send a copy of your notifications, referred to in paragraph 9 b) above, to the ICAO Regional Office accredited to your Government.

15. As soon as practicable after the amendment becomes effective, on 15 July 2013, replacement pages incorporating Amendment 11-A will be forwarded to you.

16. Please note that the Amendment 11-B regarding new approach classification provisions has an applicability date of 13 November 2014. It should be noted that the time between the effective date and the applicability date is longer than usual due to the multi-disciplinary nature of the proposal and the resulting need for distributing an information package as p art of a roll-out plan to ensure that all disciplines are aligned towards a seam less implementation. As the replacement pages for Amendment 11-B will only be distributed in October 2014, you may wish to use Amendment 11-B contained in the electronic version of this letter to begin updating your approach classification procedures to meet the new requirements which will be applicable in 2014.

Accept, Sir/Madam, the assurances of my highest consideration.

for

Raymond Benjamin
Secretary General

Enclosures:

A — Amendment to the Foreword of Annex 14, Volume I
B — Form on notification of disapproval of all or part of Amendment 11 to Annex 14, Volume I
C — Form on notification of compliance with or differences from Annex 14, Vol. I, Amendment 11-A
D — Form on notification of compliance with or differences from Annex 14, Vol. I, Amendment 11-B
E — Note on the Notification of Differences

ATTACHMENT A to State letter AN 4/1.2.24-13/20

AMENDMENT TO THE FOREWORD OF ANNEX 14, VOLUME I

Add the following at the end of Table A:

Amendment	***Source(s)***	***Subject***	***Adopted/Approved Effective Applicable***
11-A	Recommendation of the second meeting of the Aerodromes Panel (AP/2) Recommendation of the Safety Management Panel (SMP) arising from its Special Meeting (SMP/SM/1) Secretariat supported by the AIS to AIM Study Group (AIS-AIMSG)	a) Definition of hot spot; definitions of Aerodrome Mapping Data and integrity classification; definitions of instrument runway and non-instrument runway; transfer of safety management provisions to Annex 19; maximum allowable tire pressure category; condition of the movement area and related facilities; aerodrome mapping data; surface of runways and of runway turn pads; objects on runway strips; blast pad; runway end safety areas; surface of stopways and of taxiways; enhanced taxiway centre line marking; simple touchdown zone lights; alternate taxiway centre line lights; stop bars; runway guard lights; no-entry bar; reformatting of Chapter 6; visual aids for denoting obstacles; aerodrome emergency planning including modular tests; rescue and fire fighting, including performance level C foam; siting of equipment and installations on operational areas; aerodrome maintenance, including runway surface friction characteristics; removal of contaminants, runway pavement overlays and visual aids, including light emitting diodes (LEDs); Appendix 1, colours for Aeronautical Ground Lights, Markings, Signs and Panels, including white colour for LED; Appendix 2, Aeronautical Ground Light characteristics, including no-entry bar; Appendix 5, integrity classifications; Attachment A, guidance material on assessing the surface friction characteristics of snow, slush-, ice- and frost-covered surface, determination of surface friction characteristics for construction and maintenance purposes, drainage characteristics of movement area and adjacent areas, runway end safety areas	27 February 2013 15 July 2013 14 November 2013
	Source(s)	***Subject***	***Adopted/Approved Effective Applicable***
11-B	Secretariat supported by the Approach Classification Task Force (ACTF) in coordination with the Aerodromes Panel (AP), the Instrument Flight Procedure Panel (IFPP), the Navigation Systems Panel (NSP) and the Operations Panel (OPSP)	Amendment concerning: a) revised instrument and non-instrument approach runway definitions as a result of new approach classification	27 February 2013 15 July 2013 13 November 2014

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ATTACHMENT B to State letter AN 4/1.2.24-13/20

NOTIFICATION OF DISAPPROVAL OF ALL OR PART OF AMENDMENT 11 TO ANNEX 14, VOLUME I

To: The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

(State) ———————————————— hereby wishes to disapprove the following parts of Amendment 11 to Annex 14, Volume I:

Signature ————————————————

Date ————————————

NOTES

1) If you wish to disapprove all or part of Amendment 11 (i.e. 11-A and 11-B) to Annex 14 Volume I, please dispatch this notification of disapproval to reach ICAO Headquarters by 15 July 2013. If it has not been received by that date it will be assumed that you do not disapprove of the amendment. **If you approve of all parts of Amendment 11, it is not necessary to return this notification of disapproval.**

2) This notification should not be considered a notification of compliance with or differences from Annex 14, Volume I. Separate notifications on this are necessary. (See Attachments C and D.)

3) Please use extra sheets as required.

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ATTACHMENT C to State letter AN 4/1.2.24-13/20

NOTIFICATION OF COMPLIANCE WITH OR DIFFERENCES FROM ANNEX 14, VOLUME I
(Including all amendments up to and including Amendment 11-A)

To: The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

1. No differences will exist on ———————————————— between the national regulations and/or practices of **(State)** ———————————————— and the provisions of Annex 14, Volume I, including all amendments up to and including Amendment 11-A.

2. The following differences will exist on ———————————————— between the regulations and/or practices of **(State)** ———————————————— and the provisions of Annex 14, Volume I, including Amendment 11-A (Please see Note 3) below.)

a) **Annex Provision** (Please give exact paragraph reference)	**b)** **Difference Category** (Please indicate A, B, or C)	**c)** **Details of Difference** (Please describe the difference clearly and concisely)	**d)** **Remarks** (Please indicate reasons for the difference)

(Please use extra sheets as required)

3. By the dates indicated below, **(State)** _____ will have complied with the provisions of Annex 14, Volume I, including all amendments up to and including Amendment 11-A for which differences have been notified in 2 above.

a) **Annex Provision** (Please give exact paragraph reference)	**b)** **Date**	**c)** **Comments**

(Please use extra sheets as required)

Signature _____ Date _____

NOTES

1) If paragraph 1 above is applicable to you, please complete paragraph 1 and return this form to ICAO Headquarters. If paragraph 2 is applicable to you, please complete paragraphs 2 and 3 and return the form to ICAO Headquarters.

2) Please dispatch the form to reach ICAO Headquarters by 14 October 2013.

3) A detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.

4) Guidance on the notification of differences from Annex 14, Volume I is provided in the Note on the Notification of Differences at Attachment E.

5) Please send a copy of this notification to the ICAO Regional Office accredited to your Government.

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ATTACHMENT D to State letter AN 4/1.2.24-13/20

NOTIFICATION OF COMPLIANCE WITH OR DIFFERENCES FROM ANNEX 14, VOLUME I
(Including all amendments up to and including Amendment 11-B)

To: The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

1. No differences will exist on ———————————————— between the national regulations and/or practices of **(State)** ———————————————— and the provisions of Annex 14, Volume I, including all amendments up to and including Amendment 11-B.

2. The following differences will exist on ———————————————— between the regulations and/or practices of **(State)** ———————————————— and the provisions of Annex 14, Volume I, including Amendment 11-B (Please see Note 3) below.)

a) **Annex Provision** (Please give exact paragraph reference)	**b)** **Difference Category** (Please indicate A, B, or C)	**c)** **Details of Difference** (Please describe the difference clearly and concisely)	**d)** **Remarks** (Please indicate reasons for the difference)

(Please use extra sheets as required)

3. By the dates indicated below, **(State)** _____ will have complied with the provisions of Annex 14, Volume I, including all amendments up to and including Amendment 11-B for which differences have been notified in 2 above.

a)	**Annex Provision** (Please give exact paragraph reference)	**b)**	**Date**	**c)**	**Comments**

(Please use extra sheets as required)

Signature _____ Date _____

NOTES

1) If paragraph 1 above is applicable to you, please complete paragraph 1 and return this form to ICAO Headquarters. If paragraph 2 is applicable to you, please complete paragraphs 2 and 3 and return the form to ICAO Headquarters.

2) Please dispatch the form to reach ICAO Headquarters by 13 October 2014.

3) A detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.

4) Guidance on the notification of differences from Annex 14, Volume I is provided in the Note on the Notification of Differences at Attachment E.

5) Please send a copy of this notification to the ICAO Regional Office accredited to your Government.

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ATTACHMENT E to State letter AN 4/1.2.24-13/20

NOTE ON THE NOTIFICATION OF DIFFERENCES TO ANNEX 14, VOLUME I AND FORM OF NOTIFICATION

(*Prepared and issued in accordance with instructions of the Council)*

1. *Introduction*

1.1 The Assembly and the Council, when reviewing the notification of differences by States in compliance with Article 38 of the Convention, have repeatedly noted that the state of such reporting is not entirely satisfactory.

1.2 With a view to achieving a more comprehensive coverage, this note is issued to facilitate the determination and reporting of such differences and to state the primary purpose of such reporting.

1.3 The primary purpose of reporting of differences is to promote safety and efficiency in air navigation by ensuring that governmental and other agencies, including operators and service providers, concerned with international civil aviation are made aware of all national regulations and practices in so far as they differ from those prescribed in the ICAO Standards.

1.4 Contracting States are, therefore, requested to give particular attention to the notification before 14 October 2013[1] of differences with respect to Standards in Annex 14, Volume I. The Council has also urged Contracting States to extend the above considerations to Recommended Practices.

1.5 Contracting States are asked to note further that it is necessary to make an explicit statement of intent to comply where such intent exists, or where such is not the intent, of the difference or differences that will exist. This statement should be made not only to the latest amendment but to the whole Annex, including the amendment.

1.6 If previous notifications have been made in respect of this Annex, detailed repetition may be avoided, if appropriate, by stating the current validity of the earlier notification. States are requested to provide updates of the differences previously notified after each amendment, as appropriate, until the difference no longer exists.

2. *Notification of differences to Annex 14, Volume I, including Amendment 11*

2.1 Past experience has indicated that the reporting of differences to Annex 14, Volume I has in some instances been too extensive since some appear merely to be a different manner of expressing the same intent.

[1] 13 October 2014 for approach classification provisions.

2.2 Guidance to Contracting States in the reporting of differences to Annex 14, Volume I can only be given in very general terms. Where the national regulations of States call for compliance with procedures that are not identical but essentially similar to those contained in the Annex, no difference should be reported since the details of the procedures existing are the subject of notification through the medium of aeronautical information publications. Although differences to Recommended Practices are not notifiable under Article 38 of the Convention, Contracting States are urged to notify the Organization of the differences between their national regulations and practices and any corresponding Recommended Practices contained in an Annex. States should categorize each difference notified on the basis of whether the corresponding national regulation is:

a) ***More exacting or exceeds the ICAO Standard or Recommended Practice (SARP) (Category A)***. This category applies when the national regulation is more demanding than the corresponding SARP, or imposes an obligation within the scope of the Annex which is not covered by a SARP. This is of particular importance where a State requires a higher standard which affects the operation of aircraft of other Contracting States in and above its territory;

b) ***Different in character or other means of compliance (Category B)***[*]. This category applies when the national regulation is different in character from the corresponding ICAO SARP, or when the national regulation differs in principle, type or system from the corresponding SARP, without necessarily imposing an additional obligation; and

c) ***Less protective or partially implemented/not implemented (Category C)***. This category applies when the national regulation is less protective than the corresponding SARP; or when no national regulation has been promulgated to address the corresponding SARP, in whole or in part.

2.3 When a Contracting State deems an ICAO Standard concerning aircraft, operations, equipment, personnel, or air navigation facilities or services to be not applicable to the existing aviation activities of the State, notification of a difference is not required. For example, a Contracting State that is not a State of Design or Manufacture and that does not have any national regulations on the subject, would not be required to notify differences to Annex 8 provisions related to the design and construction of an aircraft.

2.4 For States that have already fully reported differences from Annex 14, Volume I or have reported that no differences exist, the reporting of any further differences occasioned by the amendment should be relatively straightforward; however, attention is called to paragraph 1.5 wherein it is indicated that this statement should be not only to the latest amendment but to the whole Annex, including the amendment.

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[*] The expression "different in character or other means of compliance" in b) would be applied to a national regulation which achieves, by other means, the same objective as that of the corresponding ICAO SARPs and so cannot be classified under a) or c).

3. *Form of notification of differences*

3.1 Differences should be notified in the following form:

a) *Reference*: The number of the paragraph or subparagraph in Annex 14, Volume I as amended which contains the Standard or Recommended Practice to which the difference relates;

b) *Category*: Indicate the category of the difference as A, B or C in accordance with paragraph 2.2 above;

c) *Description of the difference*: Clearly and concisely describe the difference and its effect; and

d) *Remarks*: Under "Remarks" indicate reasons for the difference and intentions including any planned date for implementation.

3.2 The differences notified will be recorded in a Supplement to the Annex, normally in the terms used by the Contracting State when making the notification. In the interest of making the supplement as useful as possible, please make statements as clear and concise as possible and confine remarks to essential points. Comments on implementation, in accordance with paragraph 4 b) 2) of the Resolution of Adoption, should not be combined with those concerning differences. The provision of extracts from national regulations cannot be considered as sufficient to satisfy the obligation to notify differences. General comments that do not relate to specific differences will not be published in Supplements.

— END —

AMENDMENT No. 11-A

TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME I
AERODROME DESIGN AND OPERATIONS

The amendment to Annex 14, Volume I contained in this document was adopted by the Council of ICAO on **27 February 2013**. Such parts of this amendment as have not been disapproved by more than half of the total number of Contracting States on or before **15 July 2013** will become effective on that date and will become applicable on **14 November 2013** as specified in the Resolution of Adoption. (State letter AN 4/1.2.24-13/20 refers.) Replacement pages incorporating Amendment No. 11-B are expected to be distributed in October 2014.

MARCH 2013

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AMENDMENT 11 TO THE INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

ANNEX 14, VOLUME I - *AERODROME DESIGN AND OPERATIONS*

RESOLUTION OF ADOPTION

The Council

Acting in accordance with the Convention on International Civil Aviation, and particularly with the provisions of Articles 37, 54 and 90 thereof,

1. *Hereby adopts* on 27 February 2013 Amendment 11 to the International Standards and Recommended Practices contained in the document entitled *International Standards and Recommended Practices, Aerodrome Design and Operations* which for convenience is designated Annex 14, Volume I to the Convention;

2. *Prescribes* 15 July 2013 as the date upon which the said amendment shall become effective, except for any part thereof in respect of which a majority of the Contracting States have registered their disapproval with the Council before that date;

3. *Resolves* that the said amendment or such parts thereof as have become effective shall become applicable on 14 November 2013[1];

4. *Requests the Secretary General*:

a) to notify each Contracting State immediately of the above action and immediately after 15 July 2013 of those parts of the amendment which have become effective;

b) to request each Contracting State:

1) to notify the Organization (in accordance with the obligation imposed by Article 38 of the Convention) of the differences that will exist on 14 November 2013[1] between its national regulations or practices and the provisions of the Standards in the Annex as hereby amended, such notification to be made before 14 October 2013[2], and thereafter to notify the Organization of any further differences that arise;

2) to notify the Organization before 14 October 2013[2] of the date or dates by which it will have complied with the provisions of the Standards in the Annex as hereby amended;

c) to invite each Contracting State to notify additionally any differences between its own practices and those established by the Recommended Practices, when the notification of such differences is important for the safety of air navigation, following the procedure specified in subparagraph b) above with respect to differences from Standards.

— — — — — — — —

[1] 13 November 2014 for definitions of instrument runway and non-instrument runway.
[2] 13 October 2014 for definitions of instrument runway and non-instrument runway.

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

a)	~~Text to be deleted is shown with a line through it~~.	text to be deleted
b)	New text to be inserted is highlighted with grey shading.	new text to be inserted
c)	~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	new text to replace existing text

TEXT OF AMENDMENT 11-A

TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME I
AERODROME DESIGN AND OPERATIONS

CHAPTER 1. GENERAL

1.1 Definitions

. . .

Aerodrome mapping data (AMD). Data collected for the purpose of compiling aerodrome mapping information for aeronautical uses.

Note — Aerodrome mapping data are collected for purposes that include the improvement of the user's situational awareness, surface navigation operations, training, charting and planning.

Aerodrome mapping database (AMDB). A collection of aerodrome mapping data organized and arranged as a structured data set.

. . .

Hot spot. A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

. . .

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost or altered since the data origination or authorized amendment.

Integrity classification (aeronautical data). Classification based upon the potential risk resulting from the use of corrupted data. Aeronautical data is classified as:

a) routine data: there is a very low probability when using corrupted routine data that the continued

safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;

b) essential data: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and

c) critical data: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

. . .

Runway end safety area (RESA). An area symmetrical about the extended runway centre line and adjacent to the end of the strip primarily intended to reduce the risk of damage to an aeroplane undershooting or overrunning the runway.

. . .

Safety management system (SMS). A systematic approach to managing safety including the necessary organizational structure, accountabilities, policies and procedures

~~***State safety programme.*** An integrated set of regulations and activities aimed at improving safety.~~

. . .

1.4 Certification of aerodromes

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1.4.4 As part of the certification process, States shall ensure that an aerodrome manual which will include all pertinent information on the aerodrome site, facilities, services, equipment, operating procedures, organization and management including a safety management system, is submitted by the applicant for approval/acceptance prior to granting the aerodrome certificate.

Note.— The intent of a safety management system is to have in place an organized and orderly approach in the management of aerodrome safety by the aerodrome operator. Annex 19 contains the safety management provisions applicable to certified aerodromes. Guidance on an aerodrome safety management system is given in the Safety Management Manual (SMM) *(Doc 9859) and in the* Manual on Certification of Aerodromes *(Doc 9774).*

Editorial Note.— Delete Chapter 1.5 in toto and renumber subsequent paragraphs accordingly.

. . .

CHAPTER 2. AERODROME DATA

2.1 Aeronautical data

2.1.1 Determination and reporting of aerodrome-related aeronautical data shall be in accordance with the accuracy and integrity requirements set forth in Tables A5-1 to A5-5 contained in Appendix 5 while taking into account the established quality system procedures. Accuracy requirements for aeronautical data are based upon a 95 per cent confidence level and in that respect, three types of positional data shall be identified: surveyed points (e.g. runway threshold), calculated points (mathematical calculations from the known surveyed points of points in space, fixes) and declared points (e.g. flight information region boundary points).

2.1.2 **Recommendation.—** *Aerodrome mapping data should be made available to the aeronautical information services for aerodromes deemed relevant by States where safety and/or performance-based operations suggest possible benefits .*

Note.— Aerodrome mapping databases related provisions are contained in Annex 15 Chapter 11.

2.1.3 Where made available in accordance with 2.1.2, the selection of the aerodrome mapping data features to be collected shall be made with consideration of the intended applications.

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

2.1.4 Where made available in accordance with 2.1.2, aerodrome mapping data shall comply with the accuracy and integrity requirements in Appendix 5.

Note.— 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-99B — User Requirements for Aerodrome Mapping Information.

2.1.~~2~~ 5 Contracting States shall ensure that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. ~~Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classifications and data integrity levels shall apply~~ Based on the applicable integrity classification~~s~~, the validation and verification procedures shall:

~~a) critical data, integrity level 1×10^{-8}: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;~~

~~b) essential data, integrity level 1×10^{-5}: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and~~

~~c) routine data, integrity level 1×10^{-3}: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.~~

a) For routine data: avoid corruption throughout the processing of the data;

b) For essential data assure corruption does not occur at any stage of the entire process and may include additional processes as needed to address potential risks in the overall system architecture to further assure data integrity at this level; and

c) For critical data: assure corruption does not occur at any stage of the entire process and include additional integrity assurance procedures to fully mitigate the effects of faults identified by thorough analysis of the overall system architecture as potential data integrity risks.

Note.— Guidance material in respect to the processing of aeronautical data and ae ronautical information is contained in RTCA Document DO-200A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-76A — Standards for Processing Aeronautical Data.

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Editorial Note.— Renumber subsequent paragraphs accordingly.

CHAPTER 2. AERODROME DATA

2.6 Strength of pavements

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2.6.6 Information on pavement type for ACN-PCN determination, subgrade strength category, maximum allowable tire pressure category and evaluation method shall be reported using the following codes:

c) *Maximum allowable tire pressure category:*

	Code
~~*High*~~ *Unlimited:* no pressure limit	W
~~*Medium*~~ *High:* pressure limited to ~~1.50~~ 1.75 MPa	X
~~*Low*~~ *Medium:* pressure limited to ~~1.00~~ 1.25 MPa	Y
~~*Very l*~~*Low:* pressure limited to 0.50 MPa	Z

Note.— See Note 5 to 10.2.1 where the pavement is used by aircraft with tire pressures in the upper categories.

d) *Evaluation method:*

	Code
Technical evaluation: representing a specific study of the pavement characteristics and application of pavement behaviour technology.	T

Using aircraft experience: representing a knowledge of the specific type and mass of aircraft satisfactorily being supported under regular use. U

Note.— The following examples illustrate how pavement strength data are reported under the ACN-PCN method.

Example 1.— If the bearing strength of a rigid pavement, resting on a medium strength subgrade, has been assessed by technical evaluation to be PCN 80 and there is no tire pressure limitation, then the reported information would be:

PCN 80 / R / B / W / T

Example 2.— If the bearing strength of a composite pavement, behaving like a flexible pavement and resting on a high strength subgrade, has been assessed by using aircraft experience to be PCN 50 and the maximum tire pressure allowable is 1.~~00~~25 MPa, then the reported information would be:

PCN 50 / F / A / Y / U

Note.— Composite construction

Example 3.— If the bearing strength of a flexible pavement, resting on a medium strength subgrade, has been assessed by technical evaluation to be PCN 40 and the maximum allowable tire pressure is 0.80 MPa, then the reported information would be:

PCN 40 / F / B / 0.80 MPa /T

Example 4.— If a pavement is subject to a B747-400 all-up mass limitation of 390 000 kg, then the reported information would include the following note.

Note.— The reported PCN is subject to a B747-400 all-up mass limitation of 390 000 kg.

CHAPTER 2. AERODROME DATA

. . .

2.9 Condition of the movement area and related facilities

2.9.1 Information on the condition of the movement area and the operational status of related facilities shall 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 shall be kept up to date and changes in conditions reported without delay.

Note.— Nature, format and conditions of the information to be provided are specified in Annex 15 and PANS-ATM (Doc 4444).

2.9.2 The condition of the movement area and the operational status of related facilities shall be monitored and reports on matters of operational significance ~~or~~ affecting aircraft ~~performance given~~ and aerodrome operations shall be provided in order to take appropriate action, particularly in respect of the following:

a) construction or maintenance work;

b) rough or broken surfaces on a runway, a taxiway or an apron;

c) snow, slush, ~~or~~ ice, or frost on a runway, a taxiway or an apron;

d) water on a runway, a taxiway or an apron;

e) snow banks or drifts adjacent to a runway, a taxiway or an apron;

f) anti-icing or de-icing liquid chemicals or other contaminants on a runway, ~~or a~~ taxiway or apron;

g) other temporary hazards, including parked aircraft;

h) failure or irregular operation of part or all of the aerodrome visual aids; and

i) failure of the normal or secondary power supply.

Note 1.— Other contaminants may include mud, dust, sand, volcanic ash, oil and rubber. Annex 6, Part 1, Attachment C provides guidance on the description of runway surface conditions. Additional guidance is included in the Airport Services Manual *(Doc 9137), Part 2.*

Note 2. — Particular attention would have to be given to the simultaneous presence of snow, slush, ice, wet ice, snow on ice with anti-icing or de-icing liquid chemicals.

Note 3. — See 2.9.9 for a list of winter contaminants to be reported.

2.9.3 To facilitate compliance with 2.9.1 and 2.9.2, inspections of the movement area shall be carried out each day at least once where the code number is 1 or 2 and at least twice where the code number is 3 or 4.

Note.— Guidance on carrying out daily inspections of the movement area is given in the Airport Services Manual *(Doc 9137), Part 8 and in the* Manual of Surface Movement Guidance and Control Systems (SMGCS) *(Doc 9476).*

2.9.3A **Recommendation.—** *Personnel assessing and reporting runway surface conditions required in 2.9.2 and 2.9.7 should be trained and competent to meet criteria set by the State.*

Note.— Guidance on criteria is included in the Airport Services Manual *(Doc 9137), Part 8, Chapter 7.*

Water on a runway

2.9.4 **Recommendation.—** *Whenever water is present on a runway, a description of the runway surface conditions ~~on the centre half of the width of the runway, including the possible assessment of water depth, where applicable,~~ should be made available using the following terms:*

DAMP — the surface shows a change of colour due to moisture.
WET — the surface is soaked but there is no standing water.
~~*WATER PATCHES — significant patches of standing water are visible.*~~
~~*FLOODED — extensive standing water is visible.*~~
STANDING WATER — for aeroplane performance purposes, a runway where more than 25 per cent of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by water more than 3 mm deep.

2.9.5 Information that a runway or portion thereof may be slippery when wet shall be made available.

~~2.9.6 A When a paved runway or portion thereof does not meet shall be determined as being slippery when wet when the measurements the requirements specified in 10.2.3, notification shall be issued to aerodrome users in a manner show that the runway surface friction characteristics as measured by a continuous friction measuring device are below the minimum friction level specified by the State.~~

Note .— The determination of a runway or portion thereof may be slippery when wet is not based solely on the friction measurement obtained using a continuous friction measuring device. Supplementary tools to undertake this assessment are described in the Airport Services Manual *(Doc 9137), Part 2.*

2.9.6 Notification shall be given to aerodrome users when the friction level of a paved runway or portion thereof is less than that specified by the State in accordance with 10.2.3.

Note.— Guidance on conducting a runway surface friction characteristics evaluation programme that includes determining and expressing the minimum friction level is provided in Attachment A, Section 7.

~~2.9.7 Information on the minimum friction level specified by the State for reporting slippery runway conditions and the type of friction measuring device used shall be made available.~~

~~2.9.8 **Recommendation.** — *When it is suspected that a runway may become slippery under unusual conditions, then additional measurements should be made when such conditions occur, and information on the runway surface friction characteristics made available when these additional measurements show that the runway or a portion thereof has become slippery.*~~

Snow, slush, ~~or~~ ice or frost on a runway

Note 1.— The intent of these specifications is to satisfy the SNOWTAM and NOTAM promulgation requirements contained in Annex 15.

Note 2.— Runway surface condition sensors may be used to detect and continuously display current or predicted information on surface conditions such as the presence of moisture, or imminent formation of ice on pavements.

2.9.~~9~~7 **~~Recommendation.~~** — Whenever an operational runway is ~~affected~~ contaminated by snow, slush, ~~or~~ ice~~,~~ or frost, ~~and it has not been possible to clear the precipitant fully, the condition of~~ the runway surface condition ~~should~~ shall be assessed~~,~~ and ~~the friction coefficient measured~~ reported.

Note.— Guidance on ~~determining and expressing the friction characteristics~~ assessment of snow- and ice-covered paved surfaces is provided in Attachment A, Section 6.

2.9.7A **Recommendation. —***Runway surface friction measurements made on a r unway that is contaminated by slush, wet snow or wet ice should not be reported unless the reliability of the measurement relevant to its operational use can be assured.*

Note.—Contaminant drag on the equipment's measuring wheel, amongst other factors, may cause readings obtained in these conditions to be unreliable.

2.9.~~10~~8 **Recommendation.—** *When friction measurements are taken as part of the assessment, ~~T~~the ~~readings~~ performance of the friction measuring device on compacted snow~~, slush,~~ or ice-covered surfaces should ~~adequately correlate with the readings of one other such device~~ meet the standard and correlation criteria set or agreed by the State.*

Note.— ~~The principal aim is to measure surface friction in a manner that is relevant to the friction experienced by an aircraft tire, thereby providing correlation between the friction measuring device and aircraft braking performance.~~ Guidance on criteria for, and correlation between, friction measuring devices is included in the Airport Services Manual *(Doc 9137), Part 2.*

2.9.9 **Recommendation.—** *Whenever snow, slush, ice or frost is present and reported, the description of the runway surface condition should use the following terms:*

DRY SNOW;

WET SNOW;

COMPACTED SNOW;

WET COMPACTED SNOW;

SLUSH;

ICE;

WET ICE;

FROST;

DRY SNOW ON ICE;

WET SNOW ON ICE;

CHEMICALLY TREATED.

SANDED.

and should include, where applicable, the assessment of contaminant depth.

….

CHAPTER 3. PHYSICAL CHARACTERISTICS

3.1 Runways

….

Surface of runways

3.1.22 The surface of a runway shall be constructed without irregularities that would ~~result in loss in~~ 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 Attachment A, Section 5. Additional guidance is included in the Aerodrome Design Manual *(Doc 9157)*, *Part 3.*

3.1.23 ~~The surface of a~~ A paved runway shall be so constructed or resurfaced as to provide ~~good~~ surface friction characteristics ~~when the runway is wet~~ at or above the minimum friction level set by the State.

3.1.23A **Recommendation.—** *The surface of a paved runway should be evaluated when constructed or resurfaced to determine that the surface friction characteristics achieve the design objectives.*

Note.— Guidance on surface friction characteristics of a new or resurfaced runway is given in Attachment A, Section 7. Additional guidance is included in the Airport Services Manual, *Part 2.*

3.1.24 **Recommendation.—** *Measurements of the surface friction characteristics of a new or resurfaced paved runway should be made with a continuous friction measuring device using self-wetting features ~~in order to assure that the design objectives with respect to its friction characteristics have been achieved~~.*

Note.— Guidance on surface friction characteristics of new runway surfaces is given in Attachment A, Section 7. Additional guidance is included in the Airport Services Manual *(Doc 9137), Part 2.*

3.1.25 **Recommendation.—** *The average surface texture depth of a new surface should be not less than 1.0 mm.*

Note 1.— Macrotexture and microtexture are taken into consideration in order to provide the required surface friction characteristics. ~~This normally requires some form of special surface treatment~~. Guidance on surface design is given in Attachment A, Section 8.

Note 2.— Guidance on methods used to measure surface texture is given in the Airport Services Manual *(Doc 9137), Part 2.*

Note 3.— Guidance on design and methods for improving surface texture is given in the Aerodrome

Design Manual *(Doc 9157)*, *Part 3.*

3.1.26 **Recommendation.—** *When the surface is grooved or scored, the grooves or scorings should 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 Aerodrome Design Manual *(Doc 9157)*, *Part 3.*

…

3.2 Runway shoulders

. . .

3.2.5 **Recommendation.—** *A runway shoulder 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.*

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

. . .

3.3 Runway turn pads

….

Surface of runway turn pads

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

3.3.11 **Recommendation.—** *The surface of a runway turn pad should be so constructed or resurfaced as to provide ~~good~~ surface friction characteristics~~.~~ at least equal to that of the adjoining runway. ~~for aeroplanes using the facility when the surface is wet.~~*

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3.4 Runway strips

. . .

Objects on runway strips

Note.— See 9.9 for information regarding siting of equipment and installations on runway strips.

3.4.6 **Recommendation.—** *An object situated on a runway strip which may endanger aeroplanes should be regarded as an obstacle and should, as far as practicable, be removed.*

3.4.7 No fixed object, other than visual aids required for air navigation or those required for aircraft safety purposes and which must be sited on the runway strip, ~~purposes~~ and satisfying the relevant frangibility requirement in Chapter 5, shall be permitted on a runway strip:

. . .

3.4.11 **Recommendation.—** *That portion of a strip to at least 30 m before a threshold should be prepared against blast erosion in order to protect a landing aeroplane from the danger of an exposed edge.*

3.4.12 **Recommendation.—** *Where the areas in 3.4.11 have paved surfaces, they should be able to withstand the occasional passage of the critical aeroplane for runway pavement design.*

Note. — The area adjacent to the end of a runway may be referred to as a blast pad.

Editorial Note.— Re-number the subsequent paragraphs accordingly.

3.5 Runway end safety areas

General

3.5.1 A runway end safety area shall be provided at each end of a runway strip where:

— the code number is 3 or 4; and

— the code number is 1 or 2 and the runway is an instrument one.

Note.— Guidance on runway end safety areas is given in Attachment A, Section ~~9~~10.

3.5.2 **Recommendation.—** *A runway end safety area should be provided at each end of a runway strip where the code number is 1 or 2 and the runway is a non-instrument one.*

Dimensions of runway end safety areas

3.5.~~2~~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.

Note. — Guidance on arresting systems is given in Attachment A, Section 10.

3.5.~~3~~4 **Recommendation.—** *A runway end safety area should, as far as practicable, extend from the end of a runway strip to a distance of at least:*

a) *240 m where the code number is 3 or 4; ~~and~~ or a reduced length when an arresting system is installed;*

b) *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*

c) *30 m where the code number is 1 or 2 and the runway is a non-instrument one.*

3.5.~~4~~5 The width of a runway end safety area shall be at least twice that of the associated runway.

Editorial Note.— Re-number subsequent paragraphs accordingly.

3.7 Stopways

…

Surface of stopways

3.7.4 **~~Recommendation.—~~** The surface of a paved stopway ~~*should*~~ shall be so constructed or resurfaced as to provide ~~*a good coefficient of*~~ surface friction characteristics ~~*to be compatible with that*~~ at or above those of the associated runway ~~*when the stopway is wet*~~.

~~3.7.5 **Recommendation.** — *The friction characteristics of an unpaved stopway should not be substantially less than that of the runway with which the stopway is associated.*~~

…

3.9 Taxiways

…

Surface of taxiways

3.9.14 **Recommendation.—** *The surface of a taxiway should not have irregularities that cause damage to aeroplane structures.*

3.9.15 **Recommendation.—** *The surface of a paved taxiway should be so constructed or resurfaced as to provide ~~good~~ suitable surface friction characteristics ~~when the taxiway is wet~~.*

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

CHAPTER 5. VISUAL AIDS FOR NAVIGATION

5.2.8 Taxiway centre line marking

. . .

5.2.8.5 Where provided, enhanced taxiway centre line marking shall be installed at ~~all~~ each taxiway/runway intersection~~s at that aerodrome~~.

~~5.2.8.9 Where provided, an enhanced taxiway centre line marking shall extend from the runway-holding position pattern A (as defined in Figure 5-6, Taxiway markings) to a distance of up to 45m (a minimum of three (3) dashed lines) in the direction of travel away from the runway or to the next runway-holding position, if within 45m distance.~~

5.2.8.9 Where provided:

(1) An enhanced taxiway centre line marking shall extend from the runway-holding position Pattern A (as defined in Figure 5-6, Taxiway markings) to a distance of up to 47m in the direction of travel away from the runway. See Figure 5-7(a).

(2) If the enhanced taxiway centre line marking intersects another runway-holding position marking, such as for a precision approach category II or III runway, that is located within 47m of the first runway-holding position marking, the enhanced taxiway centre line marking shall be interrupted 0.9m prior to and after the intersected runway-holding position marking. The enhanced taxiway centre line marking shall continue beyond the intersected runway-holding position marking for at least 3 dashed line segments or 47m from start to finish, whichever is greater. See Figure 5-7(b).

(3) If the enhanced taxiway centre line marking continues through a taxiway/taxiway intersection that is located within 47m of the runway-holding position marking, the enhanced taxiway centre line marking shall be interrupted 1.5m prior to and after the point where the intersected taxiway centre line crosses the enhanced taxiway centre line. The enhanced taxiway centre line marking shall continue beyond the taxiway/taxiway intersection for at least 3 dashed line segments or 47m from start to finish, whichever is greater. See Figure 5-7(c).

(4) Where two taxiway centre lines converge at or before the runway-holding position marking, the inner dashed line shall not be less than 3m in length. See Figure 5-7(d).

(5) Where there are two opposing runway-holding position markings and the distance between the markings is less than 94m, the enhanced taxiway centre line markings shall extend over this entire distance. The enhanced taxiway centre line markings shall not extend beyond either runway-holding position marking. See Figure 5-7(e).

Editorial Note.— Replace existing Figure 5-7 with the following new Figure 5-7.

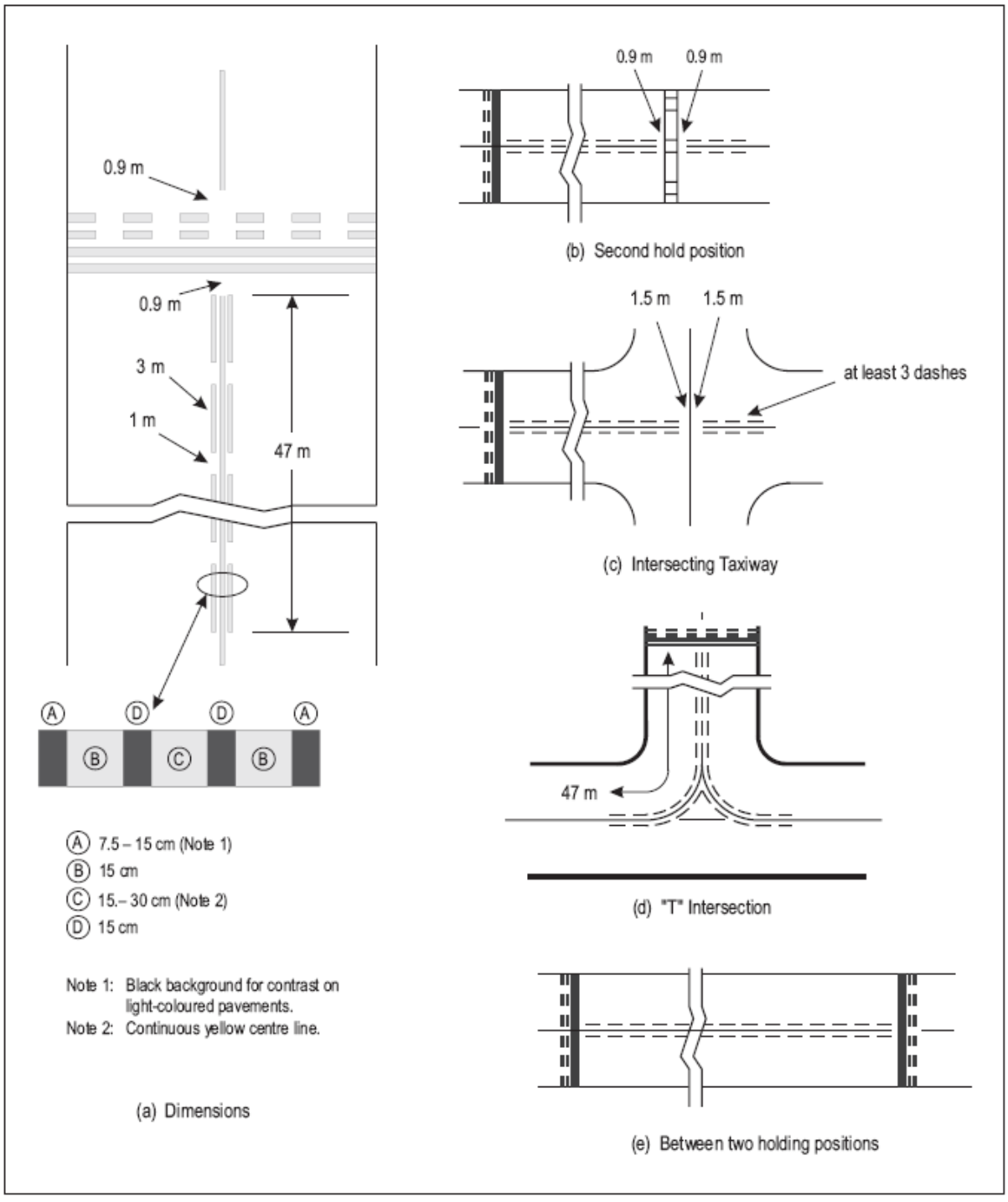

Figure 5-7. Enhanced Taxiway Centre Line Marking

5.3.14 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.

Application

5.3.14.1 **Recommendation.-** *Except where TDZ lights are provided in accordance with paragraph 5.3.13, at an aerodrome where the approach angle is greater than 3.5 degrees and/or the Landing Distance Available combined with other factors increases the risk of an overrun, Simple Touchdown Zone Lights should be provided.*

Location

5.3.14.2 Simple Touchdown Zone Lights shall be a pair of lights located on each side of the runway centreline 0.3 metres beyond the upwind edge of the final Touchdown Zone Marking. The lateral spacing between the inner lights of the two pairs of lights shall be equal to the lateral spacing selected for the Touchdown Zone Marking. The spacing between the lights of the same pair shall not be more than 1.5 m or half the width of the touchdown zone marking, whichever is greater. (see Figure 5-24)

5.3.14.3 **Recommendation.-** *Where provided on a runway without TDZ markings, Simple Touchdown Zone lights should be installed in such a position that provides the equivalent TDZ information.*

Characteristics

5.3.14.4 Simple Touchdown Zone Lights shall be fixed unidirectional lights showing variable white, aligned so as to be visible to the pilot of a landing aeroplane in the direction of approach to the runway.

5.3.14.5 Simple Touchdown Zone Lights shall be in accordance with the specifications in Appendix 2, Figure A2-5.

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.

Editorial Note.— Renumber subsequent paragraphs accordingly.

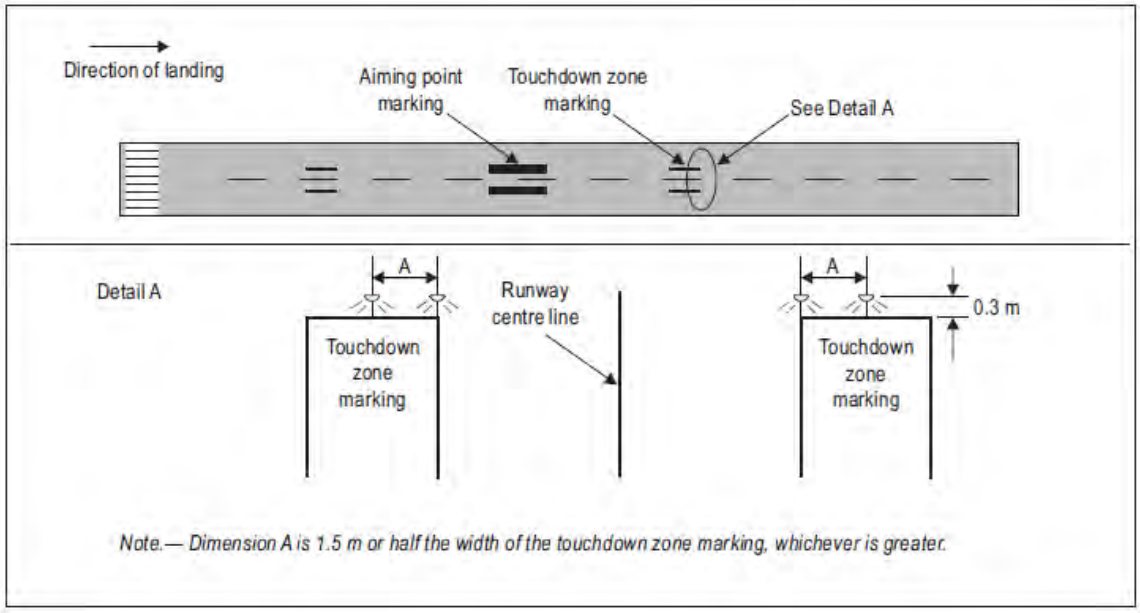

Figure 5-24. Simple touchdown zone lighting

Editorial Note.— Add figure 5-24 Simple touchdown zone lights and re-number all subsequent Chapter 5 figures and text references to those figures.

5.3.16 Taxiway centre line lights

5.3.16.6 Except as provided for in 5.3.16.8, ~~T~~taxiway centre line lights on a taxiway other than an exit taxiway and on a runway forming part of a standard taxi-route shall be fixed lights showing green with beam dimensions such that the light is visible only from aeroplanes on or in the vicinity of the taxiway.

5.3.16.7 Taxiway centre line lights on an exit taxiway shall be fixed lights. Alternate taxiway centre line lights shall 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 shall show green (Figure 5-25). The first light in the exit centre line shall always show green and ~~T~~the light nearest to the perimeter shall always show yellow. ~~Where aircraft may follow the same centre line in both directions, all the centre line lights shall show green to aircraft approaching the runway~~.

5.3.16.8 **Recommendation.—** *Where it is necessary to denote the proximity to a runway, taxiway centre line lights should 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:*

a) their end point near the runway centre line; or
b) in the case of the taxiway centre line lights crossing the runway, to the opposite perimeter of the ILS/MLS critical/sensitive area or the lower edge of the inner transitional surface, whichever is farthest from the runway.

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 5.3.16.8 can form part of effective runway incursion prevention measures.

Editorial Note.— Re-number existing 5.3.16.8 to 5.3.16.9 and cascade the number changes (and all references) through the remainder of Section 5.3.16.

. . .

5.3.19 Stop bars

Application

Note 1.— ~~The provision of~~ A stop bar~~s~~ ~~requires their~~ 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 550 m runway visual range can form part of effective runway incursion prevention measures.

5.3.19.1 A stop bar shall be provided at every runway-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 m, except where:

a) appropriate aids and procedures are available to assist in preventing inadvertent incursions of ~~aircraft and vehicles~~ traffic onto the runway; or

b) operational procedures exist to limit, in runway visual range conditions less than a value of 550 m, the number of:

1) aircraft on the manoeuvring area to one at a time; and

2) vehicles on the manoeuvring area to the essential minimum.

5.3.19.2 A stop bar shall be provided at every runway holding position, serving a runway when it is intended that the runway will be used in runway visual range conditions of values between 350 m and

550 m, except where:

a) appropriate aids and procedures are available to assist in preventing inadvertent incursions of ~~aircraft and vehicles~~ traffic onto the runway; or

b) operational procedures exist to limit, in runway visual range conditions less than a value of 550 m, the number of:
1) aircraft on the manoeuvring area to one at a time; and

2) vehicles on the manoeuvring area to the essential minimum.

5.3.19.3 Where there is more than one stop bar associated with a taxiway/runway intersection, only one shall be illuminated at any given time.

5.3.19.~~3~~4 **Recommendation.—** *A stop bar should be provided at an intermediate holding position when it is desired to supplement markings with lights and to provide traffic control by visual means.*

~~5.3.19.45 **Recommendation.** — *Where the normal stop bar lights might be obscured (from a pilot's view), for example, by snow or rain, or where a pilot may be required to stop the aircraft in a position so close to the lights that they are blocked from view by the structure of the aircraft, then a pair of elevated lights should be added to each end of the stop bar.*~~

Location

5.3.19.~~6~~5 Stop bars shall be located across the taxiway at the point where it is desired that traffic stop. Where the additional lights specified in 5.3.19.~~4~~7 are provided, these lights shall be located not less than 3 m from the taxiway edge.

Characteristics

5.3.19.~~67~~ 6 Stop bars shall 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.

5.3.19.7 Recommendation.— *A pair of elevated lights should be added to each end of the stop bar where the in-pavement stop bar lights might be obscured from a pilot's view, for example, by snow or rain, or where a pilot may be required to stop the aircraft in a position so close to the lights that they are blocked from view by the structure of the aircraft.*

5.3.19.~~79~~ 8Stop bars installed at a runway-holding position shall be unidirectional and shall show red in the direction of approach to the runway.

5.3.19. ~~810~~ 9Where the additional lights specified in 5.3.19.~~4~~7 are provided, these lights shall have the same characteristics as the lights in the stop bar, but shall be visible to approaching aircraft up to the stop bar position.

~~5.3.19.9 Selectively switchable stop bars shall be installed in conjunction with at least three taxiway centre line lights (extending for a distance of at least 90 m from the stop bar) in the direction that it is intended for an aircraft to proceed from the stop bar.~~

~~*Note.— See 5.3.16.12 for provisions concerning the spacing of taxiway centre line lights.*~~

5.3.19.~~10 11~~ 10The intensity in red light and beam spreads of stop bar lights shall be in accordance with the specifications in Appendix 2, Figures A2-12 through A2-16, as appropriate.

5.3.19.~~11 12~~ 11 **Recommendation.—** *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 should be in accordance with the specifications of Appendix 2, Figure A2-17, A2-18 or A2-19.*

Note.— High-intensity stop bars should only be used in case of an absolute necessity and following a specific study.

5.3.19.~~12 13~~ 12**Recommendation.—** *Where a wide beam fixture is required, the intensity in red light and beam spreads of stop bar lights should be in accordance with the specifications of Appendix 2, Figure A2-17 or A2-19.*

5.3.19.~~1314~~ 13The lighting circuit shall be designed so that:

a) stop bars located across entrance taxiways are selectively switchable;

b) stop bars located across taxiways intended to be used only as exit taxiways are switchable selectively or in groups;

c) when a stop bar is illuminated, any taxiway centre line lights installed beyond the stop bar shall be extinguished for a distance of at least 90 m; and

d) stop bars ~~shall be~~ are interlocked with the taxiway centre line lights so that when the centre line lights beyond the stop bar are illuminated the stop bar is extinguished and vice versa.

~~*Note 1.— A stop bar is switched on to indicate that traffic stop and switched off to indicate that traffic proceed.*~~

Note ~~2~~.— 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 Aerodrome Design Manual *(Doc 9157), Part 5.*

5.3.22 Runway guard lights

Note.— The purpose of runway guard lights is to warn pilots, and drivers of vehicles when they are operating on taxiways, that they are about to enter a~~n active~~ runway. There are two standard configurations of runway guard lights as illustrated in Figure 5-28

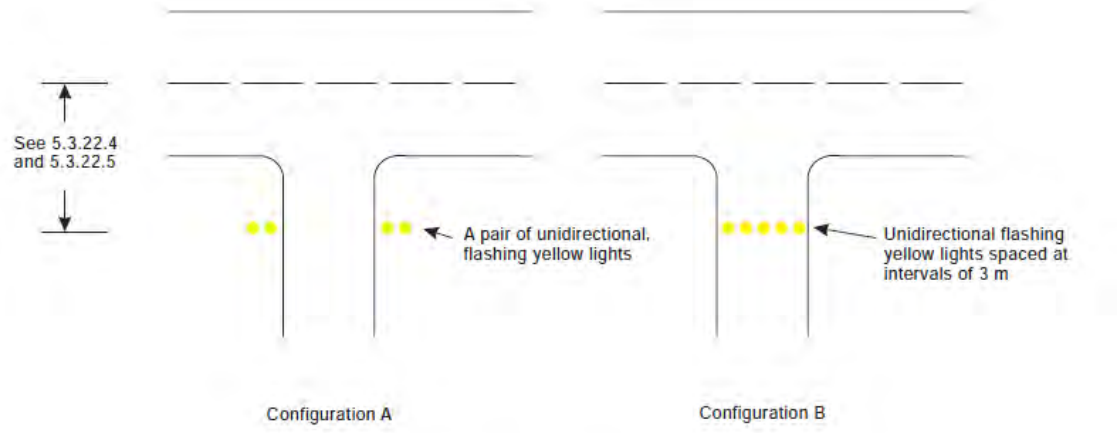

Figure 5-28. Runway guard lights

Application

5.3.22.1 Runway guard lights, Configuration A, shall be provided at each taxiway/runway intersection associated with a runway intended for use in:

a) runway visual range conditions less than a value of 550 m where a stop bar is not installed; and

b) runway visual range conditions of values between 550 m and 1 200 m where the traffic density is heavy.

5.3.22.2 **Recommendation.-** *As part of runway incursion prevention measures, ~~R~~runway guard lights, Configuration A or B, should be provided at each taxiway/runway intersection where runway incursion hot spots have been identified, and used under all weather conditions during day and night. ~~associated with a runway intended for use in:~~*

~~*a) runway visual range conditions of values less than a value of 550 m where a stop bar is installed; and*~~

~~*b) runway visual range conditions of values between 550 m and 1 200 m where the traffic density is medium or light.*~~

~~5.3.22.3 **Recommendation.** — *Runway guard lights, Configuration A or Configuration B or both, should be provided at each taxiway/runway intersection where enhanced conspicuity of the taxiway/runway intersection is needed, such as on a wide-throat taxiway, except that Configuration B should not be collocated with a stop bar.*~~

5.2.22.3 **Recommendation**.— *Configuration B runway guard lights should not be collocated with a stop bar*

. . . . . .

5.3.28 No-entry bar

Note 1.— A no-entry bar is intended to be controlled manually by air traffic services.

Note 2.— Runway incursions may take place in all visibility or weather conditions. The provision of no-entry bars at taxiway/runway intersections and their use at night and in all visibility conditions can form part of effective runway incursion prevention measures.

Application

5.3.28.1 **Recommendation.—***A no-entry bar should be provided across a taxiway which is intended to be used as an exit only taxiway to assist in preventing inadvertent access of traffic to that taxiway.*

Location

5.3.28.2 **Recommendation.**—*A no-entry bar should be located across the taxiway at the end of an exit only taxiway where it is desired to prevent traffic from entering the taxiway in the wrong direction.*

Characteristics

5.3.28.3 **Recommendation.-** *A no-entry bar should consist of unidirectional lights spaced at uniform intervals of no more than 3 m showing red in the intended direction(s) of approach to the runway.*

Note.- Where necessary to enhance conspicuity, extra lights are installed uniformly.

5.3.28.4 **Recommendation.—** *A pair of elevated lights should be added to each end of the no-entry bar where the in-pavement no entry bar lights might be obscured from a pilot's view, for example, by snow or rain, or where a pilot may be required to stop the aircraft in a position so close to the lights that they are blocked from view by the structure of the aircraft.*

5.3.28.5 The intensity in red light and beam spreads of no-entry bar lights shall be in accordance with the specifications in Appendix 2, Figures A2-12 through A2-16, as appropriate.

5.3.28.6 **Recommendation.—** *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 should be in accordance with the specifications of Appendix 2, Figure A2-17, A2-18 or A2-19.*

Note.— High-intensity no-entry bars are typically only used in case of an absolute necessity and following a specific study.

5.3.28.7 **Recommendation.—** *Where a wide beam fixture is required, the intensity in red light and beam spreads of no-entry bar lights should be in accordance with the specifications of Appendix 2, Figure A2-17 or A2-19.*

5.3.28.8 The lighting circuit shall be designed so that:

a) no-entry bars are switchable selectively or in groups;

b) when a no-entry bar is illuminated, any taxiway centre line lights installed beyond the no-entry bar, when viewed towards the runway, shall be extinguished for a distance of at least 90 m; and

c) when a no-entry bar is illuminated, any stop bar installed between the no-entry bar and the runway shall be extinguished.

CHAPTER 6 – VISUAL AIDS FOR DENOTING OBSTACLES

6.1 Objects to be marked and/or lighted

Editorial Note.— Please note renumbering of Chapter 6.

Note – 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.

6.1.1 Objects within the lateral boundaries of the obstacle limitation surfaces

~~6.1.6~~ 6.1.1.1 Vehicles and other mobile objects, excluding aircraft, on the movement area of an aerodrome are obstacles and shall be marked and, if the vehicles and aerodrome are used at night or in conditions of low visibility, lighted, except that aircraft servicing equipment and vehicles used only on aprons may be exempt.

~~6.1.7~~ 6.1.1.2 Elevated aeronautical ground lights within the movement area shall be marked so as to be conspicuous by day. Obstacle lights shall not be installed on elevated ground lights or signs in the movement area.

~~6.1.8~~ 6.1.1.3 All obstacles within the distance specified in Table 3-1, column 11 or 12, from the centre line of a taxiway, an apron taxiway or aircraft stand taxilane shall be marked and, if the taxiway, apron taxiway or aircraft stand taxilane is used at night, lighted.

~~6.1.1~~ 6.1.1.4 **Recommendation –** *A fixed obstacle that extends above a take-off climb surface within 3000 m of the inner edge of the take-off climb surface should be marked and, if the runway is used at night, lighted, except that:*

a) such marking and lighting may be omitted when the obstacle is shielded by another fixed obstacle;

b) the marking may be omitted when the obstacle is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m;

c) the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day; and

d) the lighting may be omitted where the obstacle is a lighthouse and an aeronautical study indicates the lighthouse light to be sufficient.

~~6.1.2~~ 6.1.1.5 **Recommendation** – *A fixed object, other than an obstacle, adjacent to a take-off climb surface should be marked and, if the runway is used at night, lighted if such marking and lighting is considered necessary to ensure its avoidance, except that the marking may be omitted when:*

a) *the object is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m; or*

b) the object is lighted by high-intensity obstacle lights by day.

~~6.1.3~~ 6.1.1.6 A fixed obstacle that extends above an approach ~~or transitional~~ surface within 3000 m of the inner edge ~~of the approach surface~~ or above a transitional surface shall be marked and, if the runway is used

at night, lighted, except that:

a) such marking and lighting may be omitted when the obstacle is shielded by another fixed obstacle;

b) the marking may be omitted when the obstacle is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m;

c) the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day; and

d) the lighting may be omitted where the obstacle is a lighthouse and an aeronautical study indicates the lighthouse light to be sufficient.

~~6.1.4~~ 6.1.1.7 **Recommendation** – *A fixed obstacle that extends above a horizontal surface should be marked and, if the aerodrome is used at night, lighted, except that:*

a) such marking and lighting may be omitted when:

a. the obstacle is shielded by another fixed obstacle; or

b. for a circuit extensively obstructed by immovable objects or terrain, procedures have been established to ensure safe vertical clearance below prescribed flight paths; or

c. an aeronautical study shows the obstacle not to be of operational significance;

b) *the marking may be omitted when the obstacle is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m;*

c) the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day; and

d) *the lighting may be omitted where the obstacle is a lighthouse and an aeronautical study indicates the lighthouse light to be sufficient*.

~~6.1.5~~ 6.1.1.8 A fixed object that extends above an obstacle protection surface shall be marked and, if the runway is used at night, lighted.

Note – See 5.3.5 for information on the obstacle protection surface.

6.1.1.9 **Recommendation** – *Other objects inside the obstacle limitation surfaces should 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 below 4.4.2.

~~6.1.10~~ 6.1.1.10 **Recommendation** – *Overhead wires, cables, etc., crossing a river, waterway, valley or highway should be marked and their supporting towers marked and lighted if an aeronautical study indicated that the wires or cables could constitute a hazard to aircraft.*

6.1.2 Objects outside the lateral boundaries of the obstacle limitation surfaces

~~6.1.9~~ 6.1.2.1 **Recommendation –** *Obstacles in accordance with 4.3.2 should be marked and lighted,*

except that the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day.

6.1.2.~~3~~2**Recommendation** – *Other objects outside the obstacle limitation surfaces should 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, highway).*

~~6.1.10~~ 6.1.2.~~4~~3 **Recommendation** – *Overhead wires, cables, etc., crossing a river, waterway, valley or highway should be marked and their supporting towers marked and lighted if an aeronautical study indicates that the wires or cables could constitute a hazard to aircraft.*

6.2 Marking and/or lighting of objects

6.2.1 General

~~6.3.1~~ 6.2.1.1 The presence of objects which must be lighted, as specified in 6.1, shall be indicated by low-, medium- or high-intensity lights, or a combination of such lights.

~~6.3.23~~ 6.2.1.2 Low-intensity obstacle lights ~~on fixed objects~~, ,Types A ~~and~~ B, C and D, medium-intensity obstacle lights, types A, B and C, high-intensity obstacle lights Type A and B, shall be in accordance with the specifications in Table 6-3 and Appendix 1.~~shall be fixed red lights~~.

~~6.3.22~~ 6.2.1.3 The number and arrangement of low-, medium- or high-intensity obstacle lights at each level to be marked shall be such that the object is indicated from every angle in azimuth. Where a light is shielded in any direction by another part of the object, or by an adjacent object, additional lights shall be provided on that adjacent object or the part of the object that is shielding the light, in such a way as to retain the general definition of the object to be lighted. If the shielded light does not contribute to the definition of the object to be lighted, it may be omitted.

6.2.2 Mobile objects

Marking

~~6.2.2~~ 6.2.2.1 All mobile objects to be marked shall be coloured or display flags.

Marking by colour

~~6.2.6~~ 6.2.2.2 ***Recommendation*** *– When mobile objects are marked by colour, a single conspicuous colour, preferably red or yellowish green for emergency vehicles and yellow for service vehicles should be used.*

Marking by flags

~~6.2.11~~ 6.2.2.3 Flags used to mark mobile objects shall be displayed around, on top of, or around the highest edge of the object. ~~When flags are used to mark extensive objects or groups of closely spaced objects, they shall be displayed at least every 15 m~~. Flags shall not increase the hazard presented by the object they mark.

~~6.2.12~~ 6.2.2.4 Flags used to mark mobile objects shall not be less than 0.9 m ~~square~~ on each side and shall consist of a chequered pattern, each square having sides of not less than 0.3 m. The colours of the pattern shall contrast each with the other and with the background against which they will be seen. Orange and white or alternatively red and white shall be used, except where such colours merge with the background.

Lighting

~~6.3.4~~ 6.2.2.5 Low intensity obstacle lights, Type C, shall be displayed on vehicles and other mobile objects excluding aircraft.

Note – See Annex 2 for lights to be displayed by aircraft.

~~6.3.25~~ 6.2.2.6 Low intensity obstacle lights, Type C, displayed on vehicles associated with emergency or security shall be flashing-blue and those displayed on other vehicles shall be flashing-yellow.

~~6.3.5~~ 6.2.2.7 Low intensity obstacle lights, type D, shall be displayed on follow-me vehicles.

~~6.3.28~~ 6.2.2.8 Low intensity obstacle lights on objects with limited mobility such as aerobridges shall be fixed-red, and as a minimum be in accordance with the specifications for low-intensity obstacle lights, type A, in table 6-3. The intensity of the lights shall 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.

6.2.3 Fixed objects

Note.— The fixed objects of wind turbines are addressed separately in 6.2.4 and the fixed objects of overhead wires, cables, etc. and supporting towers are addressed separately in 6.2.5.

Marking

~~6.2.1~~ 6.2.3.1 All fixed objects to be marked shall, whenever practicable, be coloured, but if this is not practicable, markers or flags shall be displayed on or above them, except that objects that are sufficiently conspicuous by their shape, size or colour need to be otherwise marked.

Marking by colour

~~6.2.3~~ 6.2.3.2 ***Recommendation*** *– An object should be coloured to show a chequered pattern if it has essentially unbroken surfaces and its projection on any vertical plane equals or exceeds 4.5 m in both dimensions. The pattern should consist of rectangles not less than 1.5 m and not more than3 m on a side, the corners being of the darker colour. The colours of the pattern should contrast each with the other and with the background against which they will be seen. Orange and white or alternatively red and white should be used, except where such colours merge with the background. (see figure 6-1).*

~~6.2.4~~ 6.2.3.3 **Recommendation** *– An object should be coloured to show alternating contrasting bands if:*

a) it has essentially unbroken surfaces and has one dimension, horizontal or vertical, greater than 1.5 m, and the other dimension, horizontal or vertical, less than 4.5 m; or

b) it is of skeletal type with either a vertical or a horizontal dimension greater than 1.5 m.

The bands should be perpendicular to the longest dimension and have a width approximately 1/7 of the longest dimension or 30 m, whichever is less. The colours of the bands should contrast with the background against which they will be seen. Orange and white should be used, except where such colours are not conspicuous when viewed against the background. The bands on the extremities of the object should be of the

darker colour. (see figure 6-1 and 6-2).

Note –Table 6-1 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.

~~6.2.5~~ 6.2.3.4 **Recommendation** – *An object should be coloured in a single conspicuous colour if its projection on any vertical plane has both dimensions less than 1.5 m. Orange or red should 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.

Marking by flags

~~6.2.11~~ 6.2.3.5 Flags used to mark fixed objects shall be displayed around, on top of, or around the highest edge of the object. When flags are used to mark extensive objects or a group of closely spaced objects, they shall be displayed at least every 15 m. Flags shall not increase the hazard presented by the object they mark.

~~6.2.12~~ 6.2.3.6 Flags used to mark fixed objects shall not be less than 0.6 m ~~square~~ on each side ~~and flags used to mark mobile objects, not less than 9.m square~~.

~~6.2.14~~ 6.2.3.7 **Recommendation** – *Flags used to mark fixed ~~mobile~~ objects should be orange in colour or a combination of two triangular sections, one orange and the other white, or one red and the other white, except that where such colours merge with the background, other conspicuous colours should be used.*

Marking by markers

~~6.2.7~~ 6.2.3.8 Markers displayed on or adjacent to objects shall be located in conspicuous positions so as to retain the general definition of the object and shall be recognizable in clear weather from a distance of at least 1000 m for an object to be viewed from the air and 300 m for an object to be viewed from the ground in all directions in which an aircraft is likely to approach the object. The shape of markers shall be distinctive to the extent necessary to ensure that they are not mistaken for markers employed to convey other information, and they shall be such that the hazard presented by the object they mark is not increased.

~~6.2.10~~ 6.2.3.9 **Recommendation –** *A marker should be of one colour. When installed, white and red, or white and orange markers should be displayed alternately. The colour selected should contrast with the background against which it will be seen.*

Lighting

~~6.3.11~~ 6.2.3.10 In case of an object to be lighted one or more low-, medium- or high-intensity obstacle lights shall be located as close as practicable to the top of the object. ~~The top lights shall be so arranged as to at least indicate the points or edges of the object highest in relation to the obstacle limitation surface~~.

Note – Recommendations on how a combination of low-, medium-, and/or high-intensity lights on obstacles should be displayed are given in Appendix 6.

~~6.3.12~~ 6.2.3.11 **Recommendation** – *In the case of a chimney or other structure of like function, the top*

lights should be placed sufficiently below the top so as to minimize contamination by smoke etc.~~(see Figures 6-2 and 6-3~~. (see figure 6-2).

~~6.3.13~~ 6.2.3.12 In the case of a tower or antenna structure indicated by high-intensity obstacle lights by day with an appurtenance, such as a rod or an antenna, greater than 12 m where it is not practicable to locate a high intensity obstacle light on top of the appurtenance, such a light shall be located at the highest practicable point and, if practicable, a medium-intensity obstacle light, type A, mounted on the top.

~~6.3.14~~ 6.2.3.13 In case of an extensive object or a group of closely spaced objects to be lighted that are:

a) penetrating a horizontal OLS or located outside an OLS, the top lights shall be so arranged as to at least indicate the points or edges of the object highest in relation to the obstacle limitation surface or above the ground, and so as to indicate the general definition and the extent of the objects; and

b) penetrating a sloping OLS the top lights shall be so arranged as to at least indicate the points or edges of the object highest in relation to the obstacle limitation surface, and so as to indicate the general definition and the extent of the objects. If two or more edges are of the same height, the edge nearest the landing area shall be marked.

~~6.3.15~~ 6.2.3.14 **Recommendation -** *When the obstacle limitation surface concerned is sloping and the highest point above the obstacle limitation surface is not the highest point of the object, additional obstacle lights should be placed on the highest point of the object.*

6.2.3.15 Where lights are applied to display the general definition of an extensive object or a group of closely spaced objects, and

a) low-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 45 m.
b) medium-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 900 m.

~~6.3.32~~ 6.2.3.16 High-intensity obstacle lights, Type A, ~~M~~medium-intensity obstacle lights, Types A and B, located on an object shall flash simultaneously.

~~6.3.21~~ 6.2.3.17 **Recommendation** – *The installation setting angles for high-intensity obstacle lights, Type~~s~~ A ~~and B~~ , should be in accordance with Table 6-2.*

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 Aerodrome Design Manual, Part 4.

~~6.3.10~~ 6.2.3.18 **Recommendation** – *Where, in the opinion of the appropriate authority, the use of high-intensity obstacle lights, type A, or medium-intensity obstacle lights, Type A ~~or B~~, at night may dazzle pilots in the vicinity of an aerodrome (within approximately 10 000 m radius) or cause significant environmental concerns, a dual obstacle lighting system should be provided. This system should be composed of high intensity obstacle lights, Type A ~~or B~~ or medium intensity obstacle lights, Type A, as appropriate, for daytime and twilight use and medium-intensity obstacle light, Type B or C, for night-time use.*

Lighting of objects with a height less than 45m above ground level

~~6.3.2~~ 6.2.3.19 **Recommendation** – *Low-intensity obstacle lights, Type A or B, should be used where the object is a less extensive one and its height above the surrounding ground is less than 45 m.*

~~6.3.3~~ 6.2.3.20 **Recommendation** – *Where the use of low-intensity obstacle lights, Type A or B, would be inadequate or an early special warning is required, then medium- or high-intensity obstacle lights should be used.*

~~6.3.6~~ 6.2.3.21 **Recommendation** – *Low-intensity obstacle lights, Type B, should be used either alone or in combination with medium-intensity obstacle lights, Type B, in accordance with ~~6.3.7~~ 6.2.3.22.*

~~6.3.7~~ 6.2.3.22 **Recommendation** – *Medium-intensity obstacle lights, Type A, B or C, should be used where the object is an extensive one ~~or its height above the level of the surrounding ground is greater than 45 m~~. . Medium-intensity obstacle lights, Types A and C, should be used alone, whereas medium intensity obstacle lights, Type B, should be used either alone or in combination with low-intensity obstacle lights, Type B.*

Note – A group of ~~trees or~~ buildings is regarded as an extensive object.

Lighting of objects with a height 45 m to a height less than 150 m above ground level

~~6.3.7~~ 6.2.3.23 **Recommendation** – *Medium-intensity obstacle lights, Type A, B or C, should be used. ~~where the object is an extensive one or its height above the surrounding ground is greater than 45m~~. Medium-intensity obstacle lights, Types A and C, should be used alone, whereas medium intensity obstacle lights, Type B, should be used either alone or in combination with low-intensity obstacle lights, Type B.*

~~6.3.16~~ 6.2.3.24 Where an object is indicated by medium-intensity obstacle lights, Type A, and the top of the object is more than 105 m above the level of the surrounding ground or the elevation of tops of nearby buildings (when the object to be marked is surrounded by buildings), additional lights shall be provided at intermediate levels. These additional intermediate lights shall be spaced as equally as practicable, between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 105 m.

~~6.3.17~~ 6.2.3.25 Where an object is indicated by medium-intensity obstacle lights, Type B, and the top of the object is more than 45 m above the level of the surrounding ground or the elevation of tops of nearby buildings (when the object to be marked is surrounded by buildings), additional lights shall be provided at intermediate levels. These additional intermediate lights shall be alternately low-intensity obstacle lights, Type B, and medium-intensity obstacle lights, Type B, and shall be spaced as equally as practicable between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 52 m.

~~6.3.18~~ 6.2.3.26 Where an object is indicated by medium-intensity obstacle lights, Type C, and the top of the object is more than 45 m above the level of the surrounding ground or the elevation of tops of nearby buildings (when the object to be marked is surrounded by buildings), additional lights shall be provided at intermediate levels. These additional intermediate lights shall be spaced as equally as practicable between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 52 m.

~~6.3.19~~ 6.2.3.27 Where high-intensity obstacle lights, Type A, are used, they shall be spaced at uniform intervals not exceeding 105 m between the ground level and the top light(s) specified in ~~6.3.11~~ 6.2.3.10 except that where an object to be marked is surrounded by buildings, the elevation of the tops of the buildings may be used as the equivalent of the ground level when determining the number of light levels.

Lighting of objects with a height 150 m or more above ground level

~~6.3.8~~ 6.2.3.28 **Recommendation** – *High-intensity obstacle lights, Type A, should be used to indicate the presence of an o bject if its height above the level of the surrounding ground exceeds 150 m and a n aeronautical study indicates such lights to be essential for the recognition of the object by day.*

~~6.3.19~~ 6.2.3.29 Where high-intensity obstacle lights, Type A, are used, they shall be spaced at uniform intervals not exceeding 105 m between the ground level and the top light(s) specified in ~~6.3.11~~ 6.2.3.10 except that where an object to be marked is surrounded by buildings, the elevation of the tops of the buildings may be used as the equivalent of the ground level when determining the number of light levels.

~~6.3.7~~ 6.2.3.30 **Recommendation** – ~~*Medium-intensity obstacle lights, Type A, B or C, should be used, where the object is an extensive one or its height above the level of the surrounding ground is greater than 45m.*~~ *Where, in the opinion of the appropriate authority, the use of high-intensity obstacle lights, Type A, at night may dazzle pilots in the vicinity of an aerodrome (within approximately 10 000 m radius) or cause significant environmental concerns, medium-intensity obstacle lights, Type~~s ~~A and~~ *C, should be used alone, whereas medium-intensity obstacle lights, Type B, should be used either alone or in combination with low-intensity obstacle lights, Type B.*

~~6.3.16~~ 6.2.3.31 Where an object is indicated by medium-intensity obstacle lights, Type A, ~~and the top of the object is more than 105 m above the level of the surrounding ground or the elevation of tops of nearby buildings (when the object to be marked is surrounded by buildings),~~ additional lights shall be provided at intermediate levels. These additional intermediate lights shall be spaced as equally as practicable, between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 105 m.

~~6.3.16~~ 6.2.3.32 Where an object is indicated by medium-intensity obstacle lights, Type ~~A~~ B, ~~and the top of the object is more than 105 m above the level of the surrounding ground or the elevation of tops of nearby buildings (when the object to be marked is surrounded by buildings),~~additional lights shall be provided at intermediate levels. These additional intermediate lights shall be alternately low-intensity obstacle lights, type B, and medium-intensity obstacle lights, type B, and shall be spaced as equally as practicable between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 52 m.

~~6.3.18~~ 6.2.3.33 Where an object is indicated by medium-intensity obstacle lights, Type C, ~~and the top of the object is more than 45 m above the level of the surrounding ground or the elevation of tops of nearby buildings (when the object to be marked is surrounded by buildings),~~additional lights shall be provided at intermediate levels. These additional intermediate lights shall be spaced as equally as practicable, between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 52 m.

6.2.4 Wind turbines

Markings

6.~~1.2.2~~ 2.4.1A wind turbine shall be marked and/or lighted if it is determined to be an obstacle.

Note – see 4.3.1 and 4.3.2

~~6.4.2~~ 6.2.4.~~1~~2 **Recommendation** – *The rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study.*

Lighting

~~6.4.3~~ 6.2.4.~~2~~3 **Recommendation** – *When lighting is deemed necessary, medium intensity obstacle lights should be used. In the case of a wind farm, i.e. group of two or more wind turbines it should be regarded as an extensive object and the lights should be installed:*

a) to identify the perimeter of the wind farm;

b) respecting the maximum spacing, in accordance with ~~6.3.14~~ 6.2.3.15, between the lights along the perimeter, unless a dedicated assessment shows that a greater spacing can be used;

c) so that, where flashing lights are used, they flash simultaneously; and

d) so that, within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located.

~~6.4.4~~ 6.2.4.~~3~~4 **Recommendation** – *The obstacle lights should be installed on the nacelle in such a manner as to provide an unobstructed view for aircraft approaching from any direction.*

6.2.5 Overhead wires, cables, etc. and supporting towers

Marking

6.2.5.1 **Recommendation -** *The wires, cables, etc. to be marked should be equipped with markers; the supporting tower should be coloured.*

Marking by colours

~~6.1.10~~6.2.5.2 **Recommendation -** ~~*Overhead wires, cables, etc., crossing a river, valley or highway should be marked and their supporting towers marked and lighted if an aeronautical study indicates that the wires or cables could constitute a hazard to aircraft,*~~ *The supporting towers of overhead wires, cables, etc. that require marking should be marked in accordance with 6.2.3.1 to 6.2.3.4, except that the marking of the supporting towers may be omitted when they are lighted by high-intensity obstacle lights by day.*

Marking by markers

~~6.2.7~~ 6.2.5.3 Markers displayed on or adjacent to objects shall be located in conspicuous positions so as to

retain the general definition of the object and shall be recognizable in clear weather from a distance of at least 1 000 m for an object to be viewed from the air and 300 m for an object to be viewed from the ground in all directions in which an aircraft is likely to approach the object. The shape of markers shall be distinctive to the extent necessary to ensure that they are not mistaken for markers employed to convey other information, and they shall be such that the hazard presented by the object they mark is not increased.

~~6.2.8~~ 6.2.5.4 **Recommendation –** *A marker displayed on an o verhead wire, cable, etc. should be spherical and have a diameter of not less than 60 cm.*

~~6.2.9~~ 6.2.5.5 **Recommendation** – *The spacing between two consecutive markers or between a marker and a supporting tower should be appropriate to the diameter of the marker, but in no case should the spacing exceed:*

a) 30 m where the marker diameter is 60 cm progressively increasing with the diameter of the marker to

b) 35 m where the marker diameter is 80 cm and further progressively increasing to a maximum of

c) 40 m where the marker diameter is of at least 130 cm.

Where multiple wires, cables, etc. are involved, a marker should be located not lower than the level of the highest wire at the point marked.

~~6.2.10~~ 6.2.5.6 **Recommendation –** *A marker should be of one colour. When installed, white and red, or white and orange markers should be displayed alternately. The colour selected should contrast with the background against which it will be seen.*

~~6.1.11~~ 6.2.5.7 **Recommendation** – *When it has been determined that an overhead wire, cable, etc., needs to be marked but it is not practicable to install markers on the wire, cable, etc., then high-intensity obstacle lights, Type B, should be provided on their supporting towers.*

Lighting

~~6.3.9~~ 6.2.5.8 **Recommendation** – *High intensity obstacle lights, Type B, should be used to indicate the presence of the tower supporting overhead wires, cables, etc. where:*

a) an aeronautical study indicates such light to be essential for the recognition of the presence of wires, cables, etc.; or

b) it has not been found practicable to install marker on the wires, cables, etc.

~~6.3.20~~ 6.2.5.9 Where high-intensity obstacle lights, Type B, are used, they shall be located at three levels:

– at the top of the tower;

– at the lowest level of the catenary of the wires or cables; and

– at approximately midway between these two levels.

Note -In some cases, this may require locating the lights off the tower.

~~6.3.36~~ 6.2.5.10 **Recommendation** – *High-intensity obstacle lights, Type B, indicating the presence of a tower supporting overhead wires, cables, etc., should flash sequentially; first the middle light, second the top light and last, the bottom light. The intervals between flashes of the lights should be approximate the following ratios:*

Flash interval between	Ratio of cycle time
middle and top light	*1/13*
top and bottom light	*2/13*
bottom and middle light	*10/13.*

Editorial Note.— The following Note is re-located from existing 6.3.1.

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 Aerodrome Design Manual *(Doc 9157), Part 4.*

~~6.3.10~~ 6.2.5.11 **Recommendation.-** *Where, in the opinion of the appropriate authority, the use of high-intensity obstacle lights, Type ~~A or B, or medium-intensity obstacle lights, Type A~~ B, at night may dazzle pilots in the vicinity of an aerodrome (within approximately 10 0 00 m radius) or cause significant environmental concerns, a dual obstacle lighting system should be provided. This system should be composed of high-intensity obstacle lights, Type ~~A or~~ B, ~~or medium-intensity obstacle lights, Type A, as appropriate,~~ for daytime and twilight use and medium-intensity obstacle lights, Type B ~~or C~~, for night-time use. Where medium-intensity lights are used they should be installed at the same level as the high-intensity obstacle light Type B.*

~~6.3.21~~ 6.2.5.12 **Recommendation** – *The installation setting angles for high-intensity obstacle lights, Type~~s~~ ~~A and~~ B, should be in accordance with Table 6-2.*

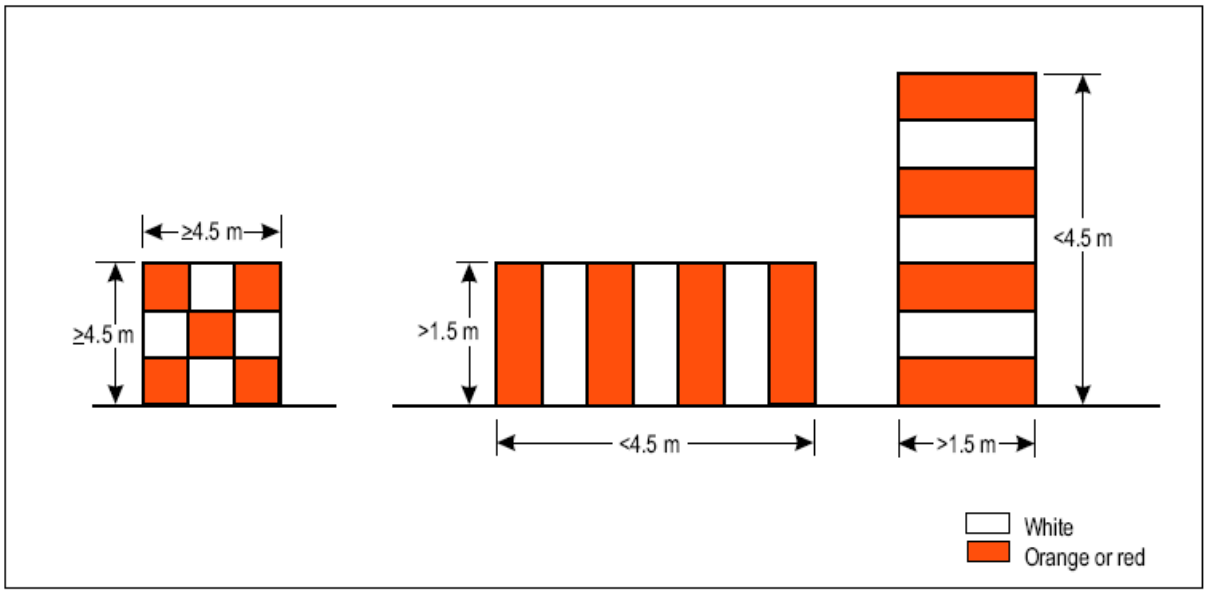

Figure 6-1. Basic marking patterns

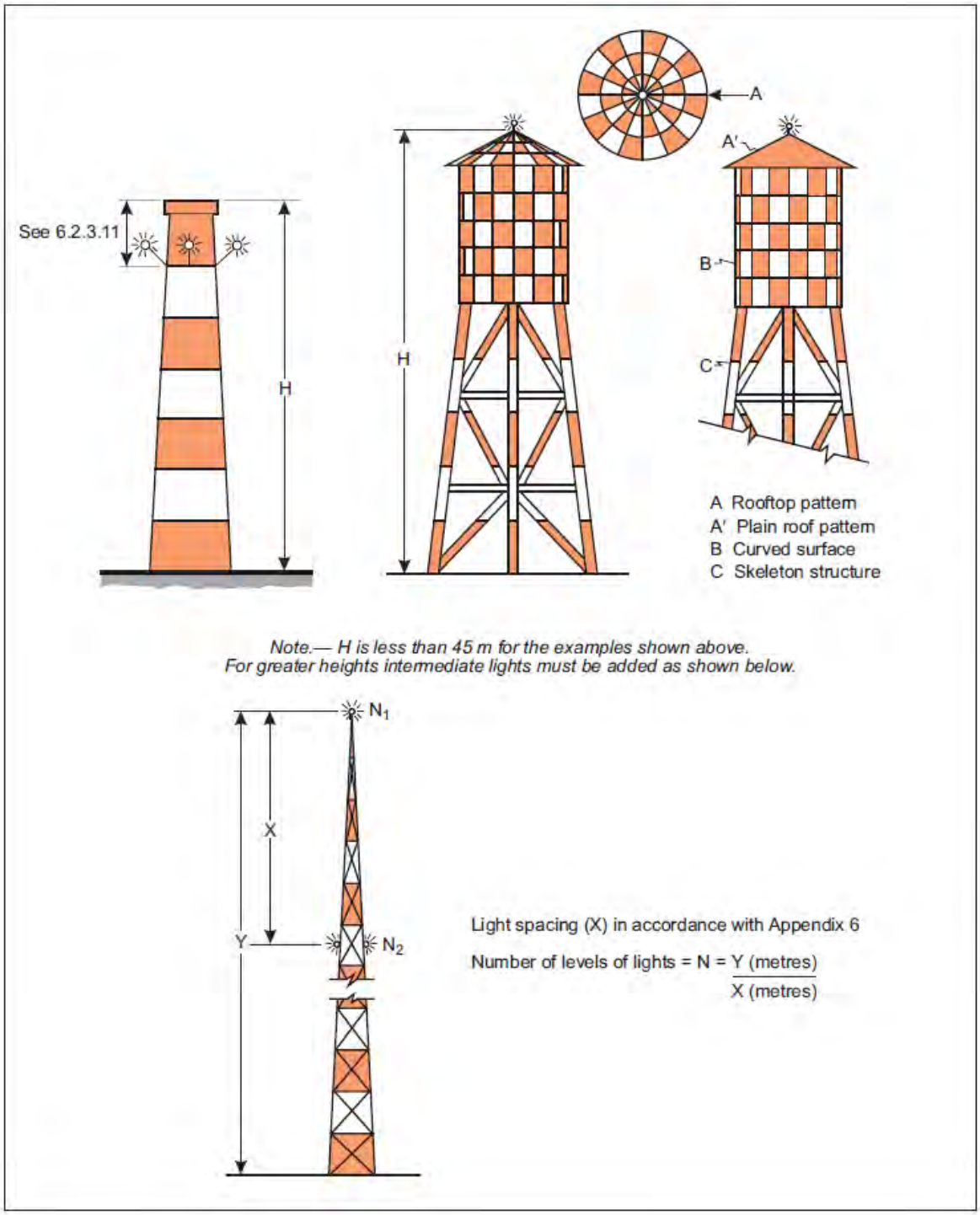

Figure 6-2. Examples of marking and lighting of tall structures

~~Figure 6-3 Lighting of buildings~~

Table 6-1 Marking band widths

Longest dimension		
Greater than	*Not exceeding*	*Band width*
1.5 m	*210 m*	*1/7 of longest dimension*
210 m	*270 m*	*1/9 “ “ “*
270 m	*330 m*	*1/11 “ “ “*
330 m	*390 m*	*1/13 “ “ “*
390 m	*450 m*	*1/15 “ “ “*
450 m	*510 m*	*1/17 “ “ “*
510 m	*570 m*	*1/19 “ “ “*
570 m	*630 m*	*1/21 “ “ “*

Table 6-2 Installation setting angles for high-intensity obstacle lights	
Height of light unit above terrain	*Angle of the peak of the beam above the horizontal*
Greater than 151 m AGL	*0*
122 m to 151 m AGL	*1˚*
92 m to 122 m AGL	*2˚*
Less than 92 m AGL	*3˚*

Table 6-3. Characteristics of obstacle lights

1	2	3	4	5	6	7
Light Type	Colour	Signal type/ (Flash rate)	Peak intensity (cd) at given Background Luminance (b)			Light Distribution Table
			Day (Above 500 cd/m2)	Twilight (50-500 cd/m2)	Night (Below 50 cd/m2)	
Low-intensity, Type A (fixed obstacle)	Red	Fixed	N/A	N/A	10	6-X
Low-intensity, Type B (fixed obstacle)	Red	Fixed	N/A	N/A	32	6-X
Low-intensity, Type C (mobile obstacle)	Yellow/ Blue (a)	Flashing (60-90 fpm)	N/A	40	40	6-X
Low-intensity, Type D Follow-me vehicle	Yellow	Flashing (60-90 fpm)	N/A	200	200	6-X
Medium-intensity, Type A	White	Flashing (20-60 fpm)	20 000	20 000	2 000	6-Y

Medium-intensity, Type B	Red	Flashing (20-60 fpm)	N/A	N/A	2 000	6-Y
Medium-intensity, Type C	Red	Fixed	N/A	N/A	2 000	6-Y
High-intensity, Type A	White	Flashing (40-60 fpm)	200 000	20 000	2 000	6-Y
High-intensity, Type B	White	Flashing (40-60 fpm)	100 000	20 000	2 000	6-Y

(a) See §6.2.2.6

(b) For flashing lights, effective intensity as determined in accordance with the Aerodrome Design Manual, Part 4.

Table 6-X Light distribution for low intensity obstacle lights

	Minimum intensity (a)	Maximum intensity (a)	Vertical beam spread (f)	
			Minimum beam spread	Intensity
Type A	10cd (b)	N/A	10°	5cd
Type B	32cd (b)	N/A	10°	16cd
Type C	40cd (b)	400cd	12° (d)	20cd
Type D	200cd (c)	400cd	N/A (e)	N/A

Note.— This table does not include recommended horizontal beam spreads. 6.2.1.3 requires 360° coverage around an obs tacle. 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.

(a) 360° horizontal. For flashing lights, the intensity is read into effective intensity, as determined in accordance with the Aerodrome Design Manual, Part 4.

(b) Between 2 and 10° vertical. Elevation vertical angles are referenced to the horizontal when the light is levelled.

(c) Between 2 and 20° vertical. Elevation vertical angles are referenced to the horizontal when the light is levelled.

(d) Peak intensity should be located at approximately 2.5° vertical.

(e) Peak intensity should be located at approximately 17° vertical.

(f) Beam spread is defined as the angle between the horizontal plan and the directions for which the intensity exceeds that mentioned in the “intensity” column.

Table 6-Y Light distribution for medium and high intensity obstacle lights according to benchmark intensities of table 6-3

Benchmark intensity	Minimum requirements					Recommendations				
	Vertical elevation angle (b)			Vertical beam spread (c)		Vertical elevation angle (b)			Vertical beam spread (c)	
	0°		-1°			0°	-1°	-10°		
	Minimum average intensity (a)	Minimum intensity (a)	Minimum intensity (a)	Minimum beam spread	Intensity (a)	Maximum intensity (a)	Maximum intensity (a)	Maximum intensity (a)	Maximum beam spread	Intensity (a)
200 000	200 000	150 000	75 000	3°	75 000	250 000	112 500	7 500	7°	75 000
100 000	100 000	75 000	37 500	3°	37 500	125 000	56 250	3 750	7°	37 500
20 000	20 000	15 000	7 500	3°	7 500	25 000	11 250	750	N/A	N/A
2 000	2 000	1 500	750	3°	750	2 500	1 125	75	N/A	N/A

Note.— This table does not include recommended horizontal beam spreads. 6.2.1.3 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.

(a) 360° horizontal. All intensities are expressed in Candela. For flashing lights, the intensity is read into effective intensity, as determined in accordance with the Aerodrome Design Manual, Part 4.

(b) Elevation vertical angles are referenced to the horizontal when the light unit is levelled.

(c) Beam spread is defined as the angle between the horizontal plan and the directions for which the intensity exceeds that mentioned in the “intensity” column.

Note.— an extended beam spread may be necessary under specific configuration and justified by an aeronautical study.

CHAPTER 9. AERODROME OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS

9.1 Aerodrome emergency planning

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Aerodrome emergency exercise

9.1.12 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.

Note.— The plan includes all participating agencies and associated equipment.

9.1.13 The plan shall be tested by conducting:

a) a full-scale aerodrome emergency exercise at intervals not exceeding two years~~;~~ and ~~b)~~ partial emergency exercises in the intervening year to ensure that any deficiencies found during the full-scale aerodrome emergency exercise have been corrected; ~~and~~ or

b) a series of modular tests commencing in the first year and concluding in a full-scale aerodrome emergency exercise at intervals not exceeding three years;

and reviewed thereafter, or after an actual emergency, so as to correct any deficiency found during such exercises or actual emergency.

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 Airport Services Manual, Part 7.

Emergencies in difficult environments

9.1.14 The plan shall include the ready availability of, and 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.

9.1.15 **Recommendation.—** *At those aerodromes located close to water and/or swampy areas, or difficult terrain, the aerodrome emergency plan should include the establishment, testing and assessment at regular intervals of a predetermined response for the specialist rescue services.*

9.1.15A **Recommendation.—** *An assessment of the approach and departure areas within 1,000 m of the runway threshold should be carried out to determine the options available for intervention.*

Note.- Guidance material on assessing approach and departure areas within 1,000 m of runway thresholds can be found in Chapter 13 of the Airport Services Manual (Doc 9137), Part 1.

9.2 Rescue and fire fighting

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Extinguishing agents

9.2.8 **Recommendation.—** *Both principal and complementary agents should normally be provided at an aerodrome.*

Note.— Descriptions of the agents may be found in the Airport Services Manual *(Doc 9137), Part 1.*

9.2.9 **Recommendation.—** *The principal extinguishing agent should be:*

a) a foam meeting the minimum performance level A; or

b) a foam meeting the minimum performance level B; or

c) a foam meeting the minimum performance Level C; or

~~c~~d) a combination of these agents;

except that the principal extinguishing agent for aerodromes in categories 1 to 3 should preferably meet ~~the minimum~~ a performance level B or C foam.

Note.— Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level A, ~~or~~ B or C rating is given in the Airport Services Manual *(Doc 9137), Part 1.*

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9.2.11 The amounts of water for foam production and the complementary agents to be provided on the rescue and fire fighting vehicles shall be in accordance with the aerodrome category determined under 9.2.3, 9.2.4, 9.2.5, 9.2.6 and Table 9-2, except that ~~these amounts may be modified as follows:~~

~~a)~~ for aerodrome categories 1 and 2, up to 100 per cent of the water may be ~~replaced by~~ substituted with complementary agent~~; or~~

~~b) for aerodrome categories 3 to 10 when a foam meeting performance level A is used, up to 30 per cent of the water may be replaced by complementary agent.~~

For the purpose of agent substitution, 1 kg of complementary agent shall be taken as equivalent to 1.0L of water for production of a foam meeting performance level A. ~~the following equivalents shall be used:~~

~~1 kg = 1.0 L water for production of a foam meeting performance level A complementary agent~~

~~1 kg = 0.66 L water for production of a foam meeting performance level B complementary agent~~

Note 1.— The amounts of water specified for foam production are predicated on an appl ication rate of 8.2 L/min/m^2 for a foam meeting performance level A, ~~and~~ 5.5 L/min/m^2 for a foam meeting performance level B and 3.75L/min/m^2 for a foam meeting performance Level C.

Note 2.— When any other complementary agent is used, the substitution ratios need to be checked.

9.2.12 **Recommendation.—** *At aerodromes where operations by aeroplanes larger than the average size in a given category are planned, the quantities of water should be recalculated and the amount of water for foam production and the discharge rates for foam solution should be increased accordingly.*

Note.— ~~Additional g~~Guidance on the determination of quantities of water and discharge rates based on the largest theoretical aeroplane in a given category is available in Chapter 2 of the Airport Services Manual *(Doc 9137), Part 1.*

9.2.12A From 1 January 2015, at aerodromes where operations by aeroplanes larger than the average size in a given category are planned, the quantities of water shall be recalculated and the amount of water for foam production and the discharge rates for foam solution shall 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 Chapter 2 of the Airport Services Manual *(Doc 9137), Part 1.*

9.2.13 The quantity of foam concentrates separately provided on vehicles for foam production shall be in proportion to the quantity of water provided and the foam concentrate selected.

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9.2.16 **Recommendation. .—***When ~~both~~ a combination of different ~~foam meeting~~ performance level ~~A and a~~ foams are provided at an aerodrome, ~~meeting performance level B are to be used~~, the total amount of water to be provided for foam production should ~~first~~ be ~~based~~ calculated for each foam type ~~on the quantity which would be required if only a foam meeting performance level A were used, and then reduced by 3 L for each 2 L of water provided for the foam meeting performance level B.~~ and the distribution of these quantities should be documented for each vehicle and applied to the overall rescue and fire fighting requirement.*

Table 9-2. Minimum usable amounts of extinguishing agents

	Foam meeting performance level A		Foam meeting performance level B		Foam meeting performance level C		Complementary agents	
Aerodrome category	Water (L)	Discharge rate foam solution/minute (L)	Water (L)	Discharge rate foam solution/minute (L)	Water (L)	Discharge rate foam solution/minute (L)	Dry chemical powders (kg)	Discharge Rate (kg/second)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	~~6~~(8)	~~7~~(9)
1	350	350	230	230	160	160	45	2.25
2	1 000	800	670	550	460	360	90	2.25
3	1 800	1 300	1 200	900	820	630	135	2.25
4	3 600	2 600	2 400	1 800	1 700	1 100	135	2.25
5	8 100	4 500	5 400	3 000	3 900	2 200	180	2.25
6	11 800	6 000	7 900	4 000	5 800	2 900	225	2.25
7	18 200	7 900	12 100	5 300	8 800	3 800	225	2.25
8	27 300	10 800	18 200	7 200	12 800	5 100	450	4.5
9	36 400	13 500	24 300	9 000	17 100	6 300	450	4.5
10	48 200	16 600	32 300	11 200	22 800	7 900	450	4.5

Note.— The quantities of water shown in columns 2, ~~and~~ 4, and 6 are based on the average overall length of aeroplanes in a given category.

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~~9.2.21 **Recommendation.** — *A reserve supply of foam concentrate and complementary agent, equivalent to 200 per cent of the quantities of these agents to be provided in the rescue and fire fighting vehicles, should be maintained on the aerodrome for vehicle replenishment purposes. Where a major delay in the replenishment of this supply is anticipated, the amount of reserve supply should be increased.*~~

9.2.21A **Recommendation.—** *A reserve supply of foam concentrate, equivalent to 200 per cent of the quantities identified in Table 9-2, should be maintained on the aerodrome for vehicle replenishment purposes.*

Note.— Foam concentrate carried on fire vehicles in excess of the quantity identified in Table 9-2 can contribute to the reserve.

9.2.21B **Recommendation.—** *A reserve supply of complementary agent, equivalent to 100 per cent of the quantity identified in Table 9-2, should be maintained on the aerodrome for vehicle replenishment purposes. Sufficient propellant gas should be included to utilize this reserve complementary agent.*

9.2.21C **Recommendation.—** *Category 1 and 2 aerodromes that have replaced up to 100 per cent of the water with complementary agent should hold a reserve supply of complementary agent of 200 per cent.*

9.2.21D **Recommendation.—** *Where a major delay in the replenishment of the supplies is anticipated, the amount of reserve supply in 9.2.19A, 9.2.19B and 9.2.19C should be increased as determined by a risk assessment.*

Note.— See Airport Services Manual *(Doc 9137), Part 1 for guidance on the conduct of a risk analysis to determine the quantities of reserve extinguishing agents.*

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Response time

9.2.23 The operational objective of the rescue and fire fighting 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.

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Personnel

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9.2.40 **Recommendation.—** *During flight operations, sufficient trained and competent personnel should be ~~detailed~~ designated ~~and~~ to be readily available to ride the rescue and fire fighting vehicles and to operate the equipment at maximum capacity. These ~~trained~~ personnel should be deployed in a way that ensures that minimum response times can be achieved and that continuous agent application at the appropriate rate(s) can be fully maintained. Consideration should also be given for personnel to use hand lines, ladders and other rescue and fire fighting equipment normally associated with aircraft rescue and fire fighting operations.*

9.2.41 **Recommendation.—** *In determining the minimum number of rescue and fire fighting personnel required, ~~to provide for rescue, consideration should be given to the types of aircraft using the aerodrome~~ a task resource analysis should 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 Airport Services Manual *(Doc 9137), Part 1.*

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9.9 Siting of equipment and installations on operational areas

Note 1.— Requirements for obstacle limitation surfaces are specified in 4.2.

Note 2.— The design of light fixtures and their supporting structures, light units of visual approach slope indicators, signs, and markers, is specified in 5.3.1, 5.3.5, 5.4.1 and 5.5. 1, respectively. Guidance on the frangible design of visual and non-visual aids for navigation is given in the Aerodrome Design Manual *(Doc 9157), Part 6.*

9.9.1 Unless its function requires it to be there for air navigation or for aircraft safety purposes, no equipment or installation shall be:

a) on a runway strip, a runway end safety area, a taxiway strip or within the distances specified in Table 3-1, column 11, if it would endanger an aircraft; or

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

9.9.2 Any equipment or installation required for air navigation or for aircraft safety purposes which must be located:

a) on that portion of a runway strip within:

1) 75 m of the runway centre line where the code number is 3 or 4; or

2) 45 m of the runway centre line where the code number is 1 or 2; or

b) on a runway end safety area, a taxiway strip or within the distances specified in Table 3-1; or

c) on a clearway and which would endanger an aircraft in the air;

shall be frangible and mounted as low as possible.

~~9.9.3 Existing non-visual aids need not meet the requirement of 9.9.2 until 1 January 2010.~~

9.9.43 **Recommendation.—** *Any equipment or installation required for air navigation or for aircraft safety purposes which must be located on the non-graded portion of a runway strip should be regarded as an obstacle and should be frangible and mounted as low as possible.*

Note.— Guidance on the siting of navigation aids is contained in the Aerodrome Design Manual *(Doc 9157), Part 6.*

9.9.5~~4~~ Unless its function requires it to be there for air navigation or for aircraft safety purposes, no equipment or installation shall be located within 240 m from the end of the strip and within:

a) 60 m of the extended centre line where the code number is 3 or 4; or

b) 45 m of the extended centre line where the code number is 1 or 2;

of a precision approach runway category I, II or III.

9.9.6~~5~~ Any equipment or installation required for air navigation or for aircraft safety purposes which must be located on or near a strip of a precision approach runway category I, II or III and which:

a) is situated on that portion of the strip within 77.5 m of the runway centre line where the code number is 4 and the code letter is F; or

b) is situated within 240 m from the end of the strip and within:

1) 60 m of the extended runway centre line where the code number is 3 or 4; or

2) 45 m of the extended runway centre line where the code number is 1 or 2; or

c) penetrates the inner approach surface, the inner transitional surface or the balked landing surface;

shall be frangible and mounted as low as possible.

~~9.9.7 Existing non-visual aids need not meet the requirement of 9.9.6 b) until 1 January 2010.~~

Note.— See 5.3.1.5 for the protection date for existing elevated approach lights.

9.9.~~8~~6 **Recommendation.—** *Any equipment or installation required for air navigation or for aircraft safety purposes which is an obstacle of operational significance in accordance with 4.2.4, 4.2.11, 4.2.20 or 4.2.27 should be frangible and mounted as low as possible.*

CHAPTER 10. AERODROME MAINTENANCE

10.1 General

10.1.1 ~~**Recommendation.—**~~ A maintenance programme, including preventive maintenance where appropriate, ~~should~~ shall 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 and electrical systems and buildings.

10.1.2 **Recommendation.—** *The design and application of the maintenance programme should observe Human Factors principles*.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683) and in the* Airport Services Manual *(Doc 9137), Part 8.*

10.2 Pavements

10.2.1 The surfaces of all movement areas including pavements (runways, taxiways and aprons) and adjacent areas shall 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 loose objects/debris that might cause damage to aircraft or impair the operation of aircraft systems.

Note 1.— See 2.9.3 for inspections of movement areas.

Note 2.— Guidance on carrying out daily inspections of the movement area is given in the Airport Services Manual *(Doc 9137), Part 8, the* Manual of Surface Movement Guidance and Control Systems (SMGCS)

(Doc 9476) and the Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual *(Doc 9830)*.

Note 3.— Additional guidance on sweeping/cleaning of surfaces is contained in the Airport Services Manual *(Doc 9137), Part 9.*

Note 4.— Guidance on precautions to be taken in regard to the surface of shoulders is given in Attachment A, Section 8, and the Aerodrome Design Manual *(Doc 9157), Part 2.*

Note 5.— Where the pavement is used by large aircraft or aircraft with tire pressures in the upper categories referred to in 2.6.6(c), particular attention should be given to the integrity of light fittings in the pavement and pavement joints.

10.2.2 The surface of a runway shall be maintained in a condition such as to prevent formation of harmful irregularities.

Note.— See Attachment A, Section 5.

10.2.3 A paved runway shall be maintained in a condition so as to provide surface friction characteristics at or above the minimum friction level specified by the State.

Note.— The Airport Services Manual *(Doc 9137), Part 2, contains further information on this subject, on improving surface friction characteristics of runways.*

10.2.~~3~~4 ~~Measurements of the~~ ~~r~~Runway surface friction characteristics ~~of a runway surface~~ for maintenance purpose shall be ~~made~~ periodically measured with a continuous friction measuring device using self-wetting features and documented. The frequency of these measurements shall be sufficient to determine the trend of the surface friction characteristics of the runway.

Note 1.— Guidance on evaluating the friction characteristics of a runway is provided in Attachment A, Section 7. Additional guidance is included in the Airport Services Manual *(Doc 9137), Part 2.*

Note 2.— The objective of 10.2.3 to 10.2.6 is to ensure that the surface friction characteristics for the entire runway remain at or above a minimum friction level specified by the State.

Note 3.— Guidance for the determination of the required frequency is provided in Attachment A, Section 7 and in the Airport Services Manual *(Doc 9137), Part 2, Appendix 5.*

10.2.~~4~~5 Corrective maintenance action shall be taken to prevent the runway surface ~~when the~~ friction characteristics for either the entire runway or a portion thereof ~~are~~ from falling below a minimum friction level specified by the State.

Note.— A portion of runway in the order of 100 m long may be considered significant for maintenance or reporting action.

~~10.2.5 **Recommendation.** — *Corrective maintenance action should be considered when the friction characteristics for either the entire runway or a portion thereof are below a maintenance planning level specified by the State.*~~

10.2.6 **Recommendation.—** *When there is reason to believe that the drainage characteristics of a runway, or portions thereof, are poor due to slopes or depressions, then the runway surface friction characteristics should be assessed under natural or simulated conditions that are representative of local rain, and corrective maintenance action should be taken as necessary.*

10.2.7 **Recommendation.—** *When a taxiway is used by turbine-engined aeroplanes, the surface of the taxiway shoulders should 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 Aerodrome Design Manual *(Doc 9157), Part 2.*

(new section) 10.3 Removal of contaminants

~~10.2.8~~ 10.3.1 ~~The surface of a paved runway shall be maintained in a condition so as to provide good friction characteristics and low rolling resistance.~~ Snow, slush, ice, standing water, mud, dust, sand, oil, rubber deposits and other contaminants shall be removed from the surface of runways in use as rapidly and completely as possible to minimize accumulation.

Note.— ~~Guidance on determining and expressing the friction characteristics when conditions of snow or ice cannot be avoided is given in Attachment A, Section 6. The~~ Airport Services Manual *~~(Doc 9137), Part 2, contains further information on this subject, on improving friction characteristics and on clearing of runways.~~ The above requirement does not imply that winter operations on compacted snow and ice are prohibited. Guidance on snow removal and ice control and removal of other contaminants is given in the* Aerodrome Services Manual *(Doc 9137), Parts 2 and 9.*

~~10.2.9~~ 10.3.2 **Recommendation.—** *~~A t~~Taxiways should be kept clear of snow, slush, ice, etc., to the extent necessary to enable aircraft to be taxied to and from an operational runway.*

~~10.2.10~~ 10.3.3 **Recommendation.—** *Aprons should be kept clear of snow, slush, ice, etc., to the extent necessary to enable aircraft to manoeuvre safely or, where appropriate, to be towed or pushed.*

~~10.2.11~~ 10.3.4 **Recommendation.—** *Whenever the clearance of snow, slush, ice, etc., from the various parts of the movement area cannot be carried out simultaneously, the order of priority after the runway(s) in use should be set in consultation with the ~~aerodrome users~~ affected parties such as rescue and fire fighting service and documented in a snow plan.*

Note 1. — See Annex 15, Appendix 1, Part 3, AD 1.2.2 for information to be promulgated in an AIP concerning a snow plan. Doc 8126, Chapter 5 contains guidance on the description of a snow plan including general policy concerning operational priorities established for the clearance of movement areas.

Note 2. —Doc 9137, Part 8, Chapter 6 specifies that an aerodrome snow plan clearly define, inter alia, the priority of surfaces to be cleared.

~~*1st — runway(s) in use;*~~

~~*2nd — taxiways serving runway(s) in use;*~~

~~*3rd — apron(s);*~~

~~*4th — holding bays; and*~~

~~*5th other areas.*~~

….

10.3 ~~3~~ 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 ~~overlay of the entire runway~~ resurfacing is complete. ~~thus normally~~ This may necessitate ~~ing~~ a temporary ramp between the new and old runway surfaces. Guidance on overlaying pavements and assessing their operational status is given in the Aerodrome Design Manual (Doc 9157), Part 3.

~~10.3.1~~ 10.4.1 The longitudinal slope of the temporary ramp, measured with reference to the existing runway surface or previous overlay course, shall be:

a) 0.5 to 1.0 per cent for overlays up to and including 5 cm in thickness; and

b) not more than 0.5 per cent for overlays more than 5 cm in thickness.

….

Editorial Note.— Renumber subsequent paragraphs accordingly.

…

10.4.5 **Recommendation.—** *The overlay should be constructed and maintained above the minimum friction level specified in 10.2.3.*

Editorial Note.— Renumber subsequent paragraphs accordingly.

10.4 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. Aerodrome operators who have come to expect the melting of ice and s now by this heat signature may wish to evaluate whether or not a m odified maintenance schedule is required during such conditions, or evaluate the possible operational value of installing LED fixtures with heating elements.

Note 3.- Enhanced vision systems (EVS) technology relies on t he infra-red heat signature provided by incandescent lighting. Annex 15 protocols provide an appropriate means of notifying aerodrome users of EVS when lighting systems are converted to LED.

ATTACHMENT A. GUIDANCE MATERIAL SUPPLEMENTARY TO ANNEX 14, VOLUME I

6. ~~Determining and expressing~~ Assessing the surface friction characteristics of snow ~~and~~ , slush-, ice- and frost-covered paved surfaces

6.1 There is an operational need for reliable and uniform information concerning the ~~friction~~ surface condition of contaminated runways. Contaminant type, distribution and for loose contaminants, depth are assessed for each third of the runway. An indication of surface friction characteristics ~~of ice- and snow-covered runways. Accurate and reliable indications of surface friction characteristics~~ is helpful in conducting runway condition assessment. It can be obtained by friction measuring devices; however, ~~further experience is required~~ there is no international consensus on the ability to correlate the results obtained by such equipment directly with aircraft performance. ~~, owing~~. However, for contaminants such as slush, wet snow and wet ice, contaminant drag on t he equipment's measuring wheel, amongst other factors, may cause readings obtained in these conditions to be unreliable.

6.2 Any friction measuring device intended ~~to the many variables involved, such as:~~ predict aircraft ~~mass, speed,~~ braking ~~mechanism, tire and undercarriage characteristics~~ performance according to an agreed local or national procedure should be shown to correlate such performance in a manner acceptable to the State. Information on t he practice of one State providing correlation directly with aircraft braking performance can be found in the *ICAO Circular 329 Runway Surface Condition Assessment, Measurement and Reporting, Appendix A*.

6.~~2~~ 3 The friction ~~coefficient should be measured if a runway is covered wholly or partly by snow or ice and repeated as~~ conditions ~~change. Friction measurements and/or braking action assessments on surfaces other than runways should be made when an unsatisfactory friction condition~~ of a runway can ~~be expected on such surfaces.~~

~~6.3 The measurement of the friction coefficient provides the best basis for determining~~ assessed in descriptive terms of "estimated surface friction ~~conditions~~". The ~~value of~~ estimated surface friction ~~should be the maximum value which occurs when a wheel is slipping but still rolling. Various friction measuring devices may be used. As there is an operational need for uniformity in the method of assessing and reporting runway friction conditions, the measurements should preferably be made with equipment which provides continuous measuring of the maximum friction along the entire runway. Measuring techniques and information on limitations of the various friction measuring devices and precautions to be observed are given~~ is categorized as good, medium to good, medium, medium to poor, and poor, and promulgated in ~~the *Airport Services Manual* (Doc 9137), Part 2.~~

~~6.4 A chart, based on results of tests conducted on selected ice- or snow-covered surfaces, showing the correlation between certain friction measuring devices on ice- or snow-covered surfaces is presented in the *Airport Services Manual* (Doc 9137), Part 2.~~

~~*Note. This criteria addresses single event roughness, not long wavelength harmonic effects nor the effect of repetitive surface undulations.*~~

~~6.5 The friction conditions of a runway should be expressed as "braking action information" in terms of the measured friction coefficient μ or estimated braking action. Specific numerical μ values are~~

~~necessarily related to the design and construction of each friction measuring device~~ Annex 15, Appendix 2-SNOWTAM format as well as ~~to the surface being measured and the speed employed~~ in PANS-ATM, Chapter 12.3-ATC phraseologies.

6.~~6~~ 4 The table below with associated descriptive terms was developed from friction data collected only in compacted snow and ice and should not therefore be taken to be absolute values applicable in all conditions. If the surface is affected by snow or ice and the ~~braking action~~ estimated surface friction is reported as "good", pilots should not expect to find conditions as good as on a clean dry runway (where the available friction may well be greater than that needed in any case). The value "good" is a comparative value and is intended to mean that aeroplanes should not experience directional control or braking difficulties, especially when landing. The figures in the "Measured Coefficient μ" column are given as an indication. At each aerodrome a specific table can be developed according to the measuring device used on the aerodrome and according to the standard and correlation criteria set or agreed by the State. The μ values given will be specific to each friction measuring device as well as to the surface being measured and the speed employed.

~~*Measure coe icient*~~	~~*Es imated braking action*~~	~~*Code*~~
~~0.40 and above~~	~~G od~~	~~5~~
~~0.39 to .36~~	~~M diu to good~~	~~4~~
~~0.35 to 0 30~~	~~Medium~~	~~3~~
~~0.29 to 0.26~~	~~Medium to poor~~	~~2~~
~~0.25 and below~~	~~Poor~~	~~1~~

~~6.7 It has been found necessary to provide surface friction information~~

Measured Coefficient μ	*Estimated surface friction*	*Code*
0.40 and above	Good	5
0.39 to 0.36	Medium to good	4
0.35 to 0.30	Medium	3
0.29 to 0.26	Medium to poor	2
0.25 and below	Poor	1

6.5 It has been elusive trying to relate braking action to friction measurements over the years. The main reason is that the industry to date has not achieved the ability to control the total uncertainty associated with the readings from these devices. Consequently, readings from a friction measuring device should only be used as part of an overall runway condition assessment. A major difference between the decelerometer type of devices and the other types is that when using the decelerometer type the operator is an integrated part of the measuring process. In addition to carrying out the measurement, the operator can feel the behavior of the vehicle where the decelerometer is installed and by that feel the deceleration process. This gives additional information in the total assessment process.

6.6 It has been found necessary to provide assessed surface condition information, including estimated surface friction, for each third of a runway. The thirds are called A, B and C. For the purpose of reporting information to aeronautical service units, section A is always the section associated with the lower runway designation number. When giving landing information to a pilot before landing, the sections are

however referred to as first, second or third part of the runway. The first part always means the first third of the runway as seen in the direction of landing. ~~Friction measurements~~ Assessments are made along two lines parallel to the runway, i.e. along a line on each side of the centre line approximately 3 m, or that distance from the centre line at which most operations take place. The objective of the ~~tests~~ assessment is to determine the ~~mean~~ type, depth and coverage of the contaminants and its effect on estimated surface friction ~~value~~, given the prevailing weather conditions for sections A, B and C. In cases where a continuous friction measuring device is used, the mean values are obtained from the friction values recorded for each section. ~~The distance between each test point should be approximately 10 per cent~~ In cases where a spot measuring friction measuring device is used as part of the ~~usable length~~ total assessment of ~~the runway. If it is decided that a single test line on one side of the runway centre line gives adequate coverage of the runway, then it follows that~~ estimated surface friction, each third of the runway should have a minimum of three tests carried out on it~~. Test results and calculated mean friction values are entered in a special form~~ where achievable. Information collected and assessed on the state of pavement surface is disseminated using forms prepared by the State for SNOWTAM and NOTAM(see ~~the~~ *Airport Services Manual* (Doc 9137) Part 2).

~~*Note.— Where applicable, figures for stopway friction value should also be made available on request.*~~

~~6.8 A continuous friction measuring device (e.g. Skiddometer, Surface Friction Tester, Mu-meter, Runway Friction Tester or GripTester), can be used for measuring the friction values for compacted snow- and ice-covered runways. A decelerometer (e.g. Tapley Meter or Brakemeter Dynometer) may be used on certain surface conditions, e.g. compacted snow, ice and very thin layers of dry snow. Other friction measuring devices can be used, provided they have been correlated with at least one of the types mentioned above. A decelerometer should not be used in loose snow or slush, as it can give misleading friction values. Other friction measuring devices can also give misleading friction values under certain combinations of contaminants and air/pavement temperature.~~

~~6.9~~ 7The *Airport Services Manual* (Doc 9137), Part 2 provides guidance on the uniform use of test equipment ~~to achieve compatible test results~~ and other information on removal of surface contamination and improvement of friction conditions.

7. Determination of surface friction characteristics for construction and maintenance purposes

~~**of wet paved runways**~~

The guidance in this section deals with the functional measurement of friction-related aspects related to runway construction and maintenance. Excluded in this section is the operational, as opposed to functional, measurement of friction for contaminated runways. However, the devices used for functional measurement could also be used for operational measurement, but in the latter case, the figures given in Airport Services Manual (Doc 9137), *Part 2, Table 3-1 are not relevant.*

7.1 The surface friction characteristics of a ~~wet~~ paved runway should be ~~measured to:~~

a) assessed to verify the surface friction characteristics of new or resurfaced paved runways ~~when wet~~ (Chapter 3, 3.1.24); and

b) assessed periodically in order to determine the slipperiness of paved runways ~~when wet~~ (Chapter 10, 10.2.~~3~~4);

~~c) determine the effect on friction when drainage characteristics are poor (Chapter 10, 10.2.6); and~~

~~d) determine the friction of paved runways that become slippery under unusual conditions (Chapter 2, 2.9.8).~~

7.2 ~~Runways should be evaluated when first constructed or after resurfacing to determine the wet runway surface friction characteristics.~~ The condition of a runway pavement is generally assessed under dry conditions using a self wetting continuous friction measuring device. Evaluation tests of runway surface friction characteristics~~. Although it is recognized that friction reduces with use, this value will represent the friction of the relatively long central portion of the runway that is uncontaminated by rubber deposits from aircraft operations and is therefore of operational value. Evaluation tests should be~~ are made on clean surfaces~~. If it is not possible to clean a surface before testing, then for purposes of preparing an initial report a test could be made on a portion of clean surface in the central part of the runway~~ of the runway when first constructed or after resurfacing.

7.3 Friction tests of existing surface conditions ~~should be~~ are taken periodically in order to ~~identify runways with low friction when wet. A State should define what~~ avoid falling below the minimum friction level ~~it considers acceptable before a runway is classified as slippery when wet and publish this value in the State's aeronautical information publication (AIP).~~ specified by the State. When the friction of any portion of a runway is found to be below this ~~reported minimum friction level~~ value, then such information ~~should be~~ is promulgated ~~by~~ in a NOTAM~~. The State should also establish a maintenance planning level, below~~ specifying which~~, appropriate corrective maintenance action should be initiated to improve the friction. However, when the friction characteristics for either the entire runway or a portion thereof are~~ portion of the runway is below the minimum friction level~~,~~ and its location on the runway. A corrective maintenance action must be ~~taken~~ initiated without delay. Friction measurements ~~should be~~ are taken at time intervals that will ensure the identification of runways in need of maintenance or of special surface treatment before ~~the~~their condition becomes serious. The time ~~interval between~~ intervals and mean frequency of measurements ~~will~~ depend on factors such as: aircraft type and frequency of usage, climatic conditions, pavement type, and pavement service and maintenance requirements.

7.4 ~~For uniformity and to permit comparison with other runways, friction tests~~ Friction measurements of existing, new or resurfaced runways ~~should be~~ are made with a continuous friction measuring device provided with a smooth tread tire. The device should ~~have a capability of using~~ use self-wetting features to ~~enable~~ allow measurements of the surface friction characteristics ~~of the surface~~ to be made at a water depth of ~~at least~~ 1 mm.

7.5 When it is suspected that the surface friction characteristics of a runway may be reduced because of poor drainage, owing to inadequate slopes or depressions, then an additional ~~test should be~~ measurement is made, but this time under natural conditions representative of a local rain. This ~~test~~ measurement differs from the previous one in that water depths in the poorly cleared areas are normally greater in a local rain condition. The ~~test~~ measurement results are thus more apt to identify problem areas having low friction values that could induce aquaplaning than the previous test. If circumstances do not permit ~~tests~~ measurements to be conducted during natural conditions representative of a rain, then this condition may be simulated. *(See section 8)*

~~7.6 Even when the friction has been found to be above the level set by the State to define a slippery runway, it may be known that under unusual conditions, such as after a long dry period, the runway may have become slippery. When such a condition is known to exist, then a friction measurement should be made as soon as it is suspected that the runway may have become slippery.~~

~~7.7 When the results of any of the measurements identified in 7.3 through 7.6 indicate that only a particular portion of a runway surface is slippery, then action to promulgate this information and, if appropriate, take corrective action is equally important.~~

~~7.8~~ 7.6 When conducting friction tests ~~on wet runways~~ using a self wetting continuous friction measuring device, it is important to note that, unlike compacted snow and ice conditions, in which there is very limited variation of the friction coefficient with speed, a wet runway produces a drop in friction with an increase in speed. However, as the speed increases, the rate at which the friction is reduced becomes less. Among the factors affecting the friction coefficient between the tire and the runway surface, texture is particularly important. If the runway has a good macro-texture allowing the water to escape beneath the tire, then the friction value will be less affected by speed. Conversely, a low macro-texture surface will produce a larger drop in friction with increase in speed. ~~Accordingly, when testing runways to determine their friction characteristics and whether maintenance action is necessary to improve it, a speed high enough to reveal these friction/speed variations should be used.~~

7.~~9~~ 7 Annex 14, Volume I~~,~~ requires States to specify ~~two friction levels as follows:~~

~~a)~~ a ~~maintenance~~ minimum friction level below which corrective maintenance action should be ~~initiated; and~~ taken. As criteria for surface friction characteristics of new or resurfaced runway surfaces and its maintenance planning, the State can establish a maintenance planning level below which appropriate corrective maintenance action should be initiated

~~b) a minimum friction level below which information that a runway may be slippery when wet should be made available.~~

~~Furthermore, States should establish criteria for the friction characteristics of new or resurfaced runway surfaces.~~ to improve the friction. ~~Table A-1~~ The Airport Services Manual (Doc 9137), Part 2, provides guidance on establishing ~~the design objective for new runway surfaces and~~ maintenance planning and minimum friction levels for runway surfaces in use.

~~7.10 The friction values given above are absolute values and are intended to be applied without any tolerance. These values were developed from a research study conducted in a State. The two friction measuring tires mounted on the Mu-meter were smooth tread and had a special rubber formulation, i.e. Type A. The tires were tested at a 15-degree included angle of alignment along the longitudinal axis of the trailer. The single friction measuring tires mounted on the Skiddometer, Surface Friction Tester, Runway Friction Tester and TATRA were smooth tread and used the same rubber formulation, i.e. Type B. The GripTester was tested with a single smooth tread tire having the same rubber formulation as Type B but the size was smaller, i.e. Type C. The specifications of these tires (i.e. Types A, B and C) are contained in the *Airport Services Manual* (Doc 9137), Part 2. Friction measuring devices using rubber formulation, tire tread/groove patterns, water depth, tire pressures, or test speeds different from those used in the programme described above, cannot be directly equated with the friction values given in the table. The values in columns (5), (6) and (7) are averaged values representative of the runway or significant portion thereof. It is considered desirable to test the friction characteristics of a paved runway at more than one speed.~~

Table A-1. Friction levels for new and existing runway surfaces

Test equipment	Test tire Type	Test tire Pressure (kPa)	Test speed (km/h)	Test water depth (mm)	Design objective for new surface	Maintenance planning level	Minimum friction level
(1)	(2)		(3)	(4)	(5)	(6)	(7)
Mu-meter Trailer	A	70	65	1.0	0.72	0.520.38	0.42
	A	70	95	1.0	0.66		0.26
Skiddometer Trailer	B	210	65	1.0	0.82	0.60	0.50
	B	210	95	1.0	0.74	0.47	0.34
Surface Friction Tester Vehicle	B	210	65	1.0	0.82	0.60	0.50
	B	210	95	1.0	0.74	0.47	0.34
Runway Friction Tester Vehicle	B	210	65	1.0	0.82	0.60	0.50
	B	210	95	1.0	0.74	0.54	0.41
TATRA Friction Tester Vehicle	B	210	65	1.0	0.76	0.57	0.48
	B	210	95	1.0	0.67	0.52	0.42
GripTester Trailer	C	140	65	1.0	0.74	0.53	0.43
	C	140	95	1.0	0.64	0.36	0.24

7.11 Other friction measuring devices can be used, provided they have been correlated with at least one test equipment measurement device mentioned above. The Airport Services Manual (Doc 9137),, Part 2, provides guidance on the methodology for determining the friction values corresponding to the design objective, maintenance planning level and minimum friction level for a friction tester not identified in Table A-1.the above table.

New section – incorporate Section 8 following paragraph 7.10 with the following.

8. Drainage characteristics of the movement area and adjacent areas

8.1 General

8.1.1 Rapid drainage of surface water is a primary safety consideration in the design, construction and maintenance of movement area and adjacent areas. The objective is to minimize water depth on the surface by draining water off the runway in the shortest path possible and particularly out of the area of the wheel path. There are two distinct drainage processes taking place:

a) natural drainage of the surface water from the top of the pavement surface until it reaches the final recipient such as rivers or other water bodies; and

b) dynamic drainage of the surface water trapped under a moving tire until it reaches outside the tire-to-ground contact area.

8.1.2 Both processes can be controlled through:

a) design;
b) construction;and
c) maintenance.

of the pavements in order to prevent accumulation of water on the pavement surface.

8.2 Design of pavement

8.2.1 Surface drainage is a basic requirement and serves to minimize water depth on the surface. The objective is to drain water off the runway in the shortest path. Adequate surface drainage is provided primarily by an appropriately sloped surface (in both the longitudinal and transverse directions). The resulting combined longitudinal and transverse slope is the path for the drainage runoff. This path can be shortened by adding transverse grooves.

8.2.2 Dynamic drainage is achieved through built-in texture in the pavement surface. The rolling tire builds up water pressure and squeezes the water out the escape channels provided by the texture. The dynamic drainage of the tire-to-ground contact area may be improved by adding transverse grooves provided that they are subject to rigorous maintenance.

8.3 Construction of pavement

8.3.1 Through construction, the drainage characteristics of the surface are built into the pavement. These surface characteristics are:

a) Slopes;
b) Texture
   i) Microtexture;
   ii) Macrotexture;

8.3.2 Slopes for the various parts of the movement area and adjacent parts are described in Annex 14, Volume I, Chapter 3 and figures are given as per cent. Further guidance is given in Aerodrome Design Manual, Part 1, Runways, Chapter 5.

8.3.3 Texture in the literature is described as microtexture or macrotexture. These terms are understood differently in various part of the aviation industry.

8.3.4 Microtexture is the texture of the individual stones and is hardly detectable by the eye. Microtexture is considered a primary component in skid resistance at slow speeds. On a wet surface at higher speeds a water film may prevent direct contact between the surface asperities and the tire due to insufficient drainage from the tire-to-ground contact area.

8.3.5 Microtexture is a built-in quality of the pavement surface. By specifying crushed material that will withstand polishing microtexture, drainage of thin waterfilms are ensured for a longer period of time. Resistance against polishing is expressed in terms of the Polished Stone Values (PSV) which is in principle a value obtained from a friction measurement in accordance with international standards. These standards define the PSV minima that will enable a material with a good microtexture to be selected.

8.3.6 A major problem with microtexture is that it can change within short time periods without being easily detected. A typical example of this is the accumulation of rubber deposits in the touchdown area which will largely mask microtexture without necessarily reducing macrotexture.

8.3.7 Macrotexture is the texture among the individual stones. This scale of texture may be judged approximately by the eye. Macrotexture is primarily created by the size of aggregate used or by surface treatment of the pavement and is the major factor influencing drainage capacity at high speeds. Materials shall be selected so as to achieve good macrotexture.

8.3.8 The primary purpose of grooving a runway surface is to enhance surface drainage. Natural drainage can be slowed down by surface texture, but grooving can speed up the drainage by providing a shorter drainage path and increasing the drainage rate.

8.3.9 For measurement of macrotexture, simple methods such as the "sand and grease patch"– methods described in the *Airport Services Manual* (Doc 9137), Part 2 were developed. These methods were used for the early research on which current airworthiness requirements are based upon, which refer to a classification categorizing macrotexture from A to E. This classification was developed, using sand or grease patch measuring techniques, and issued in 1971 by the Engineering Sciences Data Unit (ESDU).

Runway classification based on texture information from ESDU 71026:

Classification	Texture depths (mm)
A	0.10 – 0.14
B	0.15 – 0.24
C	0.25 – 0.50
D	0.51 – 1.00
E	1.01 – 2.54

8.3.10 Using this classification the threshold value between microtexture and macrotexture is 0.1 mm mean texture depth (MTD). Related to this scale the normal wet runway aircraft performance is based upon texture giving drainage and friction qualities midway between classification B and C (0.25 mm). Improved drainage through better texture might qualify for a better aircraft performance class. However such credit must be in accordance with aeroplane manufacturers documentation and agreed by the State. Presently credit is given to grooved or porous friction course runways following design, construction and maintenance criteria acceptable to the State. The harmonized certification standards of some States refer to texture giving drainage and friction qualities midway between classification D and E (1.0 mm).

8.3.11 For construction, design and maintenance, States use various international standards. Currently *ISO 13473-1: Characterization of pavement texture by use of surface profiles -- Part 1: Determination of Mean Profile Depth* links the volumetric measuring technique with non contact profile measuring techniques giving comparable texture values. These standards describe the threshold value between microtexture and macrotexture as 0.5 mm. The volumetric method has a validity range from 0.25 to 5 mm MTD. The profilometry method has a validity range from 0 to 5 mm mean profile depth (MPD). The values of MPD and MTD differ due to the finite size of the glass spheres used in the volumetric technique and because the MPD is derived from a two-dimensional profile rather than a three-dimensional surface. Therefore a transformation equation must be established for the measuring equipment used to relate MPD to MTD.

8.3.12 The ESDU scale groups runway surfaces based on macro texture from A through E, where E represents the surface with best dynamic drainage capacity. The ESDU scale thus reflects the dynamic drainage characteristics of the pavement. Grooving any of these surfaces enhances the dynamic drainage capacity. The resulting drainage capacity of the surface is thus a function of the texture (A through E) and grooving. The contribution from grooving is a function of the size of the grooves and the spacing between the grooves. Aerodromes exposed to heavy or torrential rainfall must ensure that the pavement and adjacent areas have drainage capability to withstand these rainfalls or put limitations on the use of the pavements under such extreme situations. These airports should seek to have the maximum allowable slopes and the use of aggregates providing good drainage characteristics. They should also consider grooved pavements in the E classification to ensure that safety is not impaired.

8.4 Maintenance of drainage characteristics of pavement

8.4.1 Macrotexture does not change within a short timespan but accumulation of rubber can fill up the texture and as such reduce the drainage capacity, which can result in impaired safety. Furthermore the runway structure may change over time and give uneveness which results in ponding after rainfall. Guidance on rubber removal and uneveness can be found in *Airport Services Manual* (Doc 9137), Part 2. Guidance on methods for improving surface texture can be found in *Aerodrome Design Manual* (Doc 9157), Part 3.

8.4.2 When groovings are used, the condition of the grooves should be regularly inspected to ensure that no deterioration has occurred and that the grooves are in good condition. Guidance on maintenance of pavements is available in Doc 9137, *Airport Services Manual*, Part 2 — *Pavement Surface Conditions* and Part 9 — *Airport Maintenance Practices* and Doc 9157, Part 2.

8.4.3 The pavement may be shot blasted in order to enhance the pavement macrotexture.

Editorial Note.— Renumber subsequent paragraphs accordingly.

~~9~~ 10. Runway end safety areas

~~9~~ 10.1 Where a runway end safety area is provided in accordance with Chapter 3, consideration should be given to providing an area long enough to contain overruns and undershoots resulting from a reasonably probable combination of adverse operational factors. On a precision approach runway, the ILS localizer is normally the first upstanding obstacle, and the runway end safety area should extend up to this facility. In other circumstances ~~and on a non-precision approach or non-instrument runway,~~ the first upstanding obstacle may be a road, a railroad or other constructed or natural feature. ~~In such circumstances, t~~ The provision of a runway end safety area should ~~extend as far as the obstacle.~~ take such obstacles into consideration.

~~9~~ 10.2 Where provision of a runway end safety area ~~may involve encroachment in areas where it~~ would be particularly prohibitive to implement, ~~and the appropriate authority considers a runway end safety area essential,~~ consideration ~~may~~ would have to be given to reducing some of the declared distances of the runway for the provision of a runway end safety area and installation of an arresting system.

10.3 Research programmes, as well as evaluation of actual aircraft overruns into arresting systems, have demonstrated that the performance of some arresting systems can be predictable and effective in arresting aircraft overruns.

10.4 Demonstrated performance of an arresting system can be achieved by a validated design method, which can predict the performance of the system. The design and performance should be based on the type of aircraft anticipated to use the associated runway that imposes the greatest demand upon the arresting system.

10.5 The design of an arresting system must consider multiple aircraft parameters, including but not limited to, allowable aircraft gear loads, gear configuration, tire contact pressure, aircraft center of gravity and aircraft speed. Accommodating undershoots must also be addressed. Additionally, the design must allow the safe operation of fully loaded rescue and fire fighting vehicles, including their ingress and egress.

10.6 The information relating to the provision of a runway end safety area and the presence of an arresting system should be published in the AIP.

10.7 Additional information is contained in the Aerodrome Design Manual *(Doc 9157), Part 1.*

Editorial Note.— Add the new Figure A-5 after the existing Figure A-4 and renumber the following figures in Attachment A.

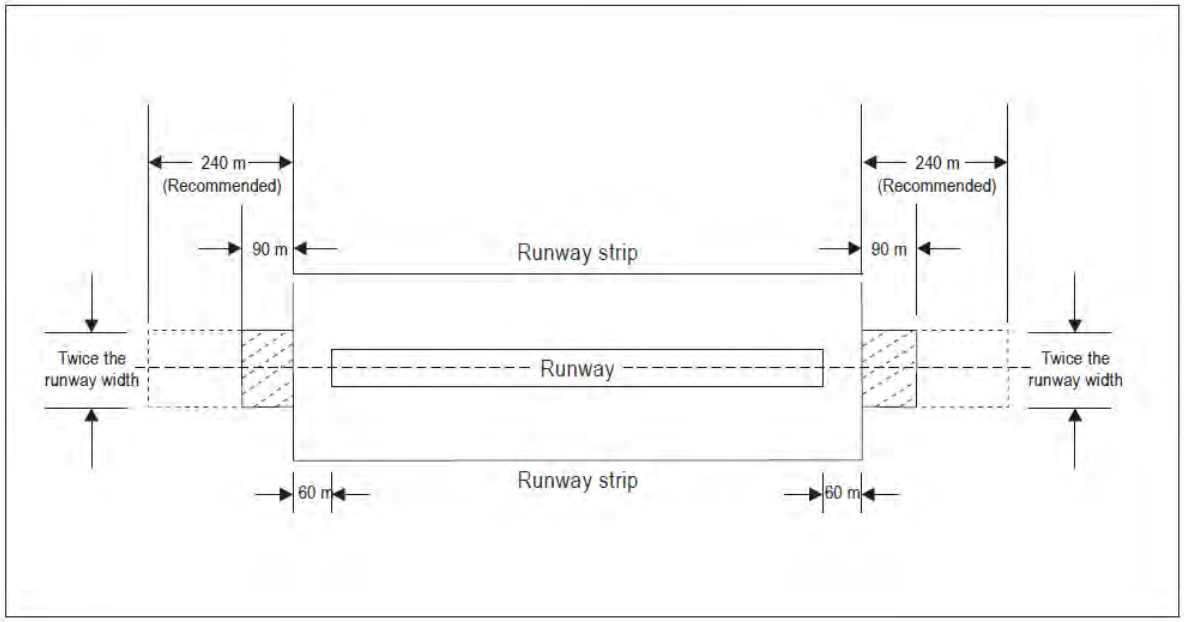

Figure A-5. Runway end safety area for a runway where the code number is 3 or 4.

Editorial Note.— Renumber subsequent paragraphs accordingly.

APPENDIX 1. COLOURS FOR AERONAUTICAL GROUND LIGHTS, MARKINGS, SIGNS AND PANELS

1. General

Introductory Note.— The following specifications define the chromaticity limits of colours to be used for aeronautical ground lights, markings, signs and panels. The specifications are in accord with the 1983 specifications of the International Commission on Illumination (CIE).

It is not possible to establish specifications for colours such that there is no possibility of confusion. For reasonably certain recognition, it is important that the eye illumination be well above the threshold of perception, that the colour not be greatly modified by selective atmospheric attenuations and that the observer's colour vision be adequate. There is also a risk of confusion of colour at an extremely high level of eye illumination such as may be obtained from a hi gh-intensity source at very close range. Experience indicates that satisfactory recognition can be achieved if due attention is given to these factors

.

*The chromaticities are expressed in terms of the standard observer and coordinate system adopted by the International Commission on Illumination (CIE) at its Eighth Session at Cambridge, England, in 1931.**

2. Colours for aeronautical ground lights

2.1 Chromaticities

2.1.1 The chromaticities of aeronautical ground lights shall be within the following boundaries:

CIE Equations (see Figure A1-1):

a) Red
Purple boundary y = 0.980 – x
Yellow boundary y = 0.335

b) Yellow
Red boundary y = 0.382
White boundary y = 0.790 – 0.667x
Green boundary y = x – 0.120

c) Green
Yellow boundary x = 0.360 – 0.080y
White boundary x = 0.650y
Blue boundary y = 0.390 – 0.171x

d) Blue
Green boundary y = 0.805x + 0.065
White boundary y = 0.400 – x
Purple boundary x = 0.600y + 0.133

e) White
i) Incandescent
Yellow boundary x = 0.500
Blue boundary x = 0.285
Green boundary y = 0.440
and y = 0.150 + 0.640x
Purple boundary y = 0.050 +0.750x
and y = 0.382

ii) LED
Yellow boundary x = 0.440
Blue boundary x = 0.320
Green boundary y = 0.150 + 0.643x
Purple boundary y = 0.050 +0.757x

~~f~~gf) Variable white
Yellow boundary x = 0.255 + 0.750y
and x = 1.185 – 1.500y

Blue boundary x = 0.285
Green boundary y = 0.440
and y = 0.150 + 0.640x
Purple boundary y = 0.050 + 0.750x
and y = 0.382

Note.— Guidance on chromaticity changes resulting from the effect of temperature on filtering elements is given in the Aerodrome Design Manual *(Doc 9157), Part 4.*

Editorial Note.— The following proposals are for Annex 14, Volume I, Appendix 2.

APPENDIX 2. AERONAUTICAL GROUND LIGHT CHARACTERISTICS

Figure A2-12. Isocandela diagram for taxiway centre line (15 m spacing), no-entry bar and stop bar lights in straight sections intended for use in runway visual range conditions of less than a value of 350 m where large offsets can occur and for low-intensity runway guard lights, Configuration B

Figure A2-13. Isocandela diagram for taxiway centre line (15 m spacing), no-entry bar and stop bar lights in straight sections intended for use in runway visual range conditions of less than a value of 350 m

Figure A2-14. Isocandela diagram for taxiway centre line (7.5 m spacing), no-entry bar and stop bar lights in curved sections intended for use in runway visual range conditions of less than a value of 350 m

Figure A2-15. Isocandela diagram for taxiway centre line (30 m, 60 m spacing), no-entry bar and stop bar lights in straight sections intended for use in runway visual range conditions of 350 m or greater

Figure A2-16. Isocandela diagram for taxiway centre line (7.5 m, 15 m, 30 m spacing), no-entry bar and stop bar lights in curved sections intended for use in runway visual range conditions of 350 m or greater

Figure A2-17. Isocandela diagram for high-intensity taxiway centre line (15 m spacing), no-entry bar and stop bar lights in straight sections intended for use in an advanced surface movement guidance and control system where higher light intensities are required and where large offsets can occur

Figure A2-18. Isocandela diagram for high-intensity taxiway centre line (15 m spacing), no-entry bar and stop bar lights in straight sections intended for use in an advanced surface movement guidance and control system where higher light intensities are required

Figure A2-19. Isocandela diagram for high-intensity taxiway centre line (7.5 m spacing), no-entry bar and stop bar lights in curved sections intended for use in an advanced surface movement guidance and control system where higher light intensities are required.

APPENDIX 5. AERONAUTICAL DATA QUALITY REQUIREMENTS

Editorial Note.—The deletion of the numeric values for integrity classification in Appendix 5 of Annex 14 is consequential and follows from the recommendation for their deletion in Annex 15.

Table A5-1. Latitude and longitude

Latitude and longitude	Accuracy Data type	Integrity Classification
Aerodrome reference point	30 m surveyed/calculated	~~1×10^{-3}~~ routine
Navaids located at the aerodrome	3 m surveyed	~~1×10^{-5}~~ essential
Obstacles in Area 3	0.5 m surveyed	~~1×10^{-5}~~ essential
Obstacles in Area 2 (the part within the aerodrome boundary)	5 m surveyed	~~1×10^{-5}~~ essential
Runway thresholds	1 m surveyed	~~1×10^{-8}~~ critical
Runway end (flight path alignment point)	1 m surveyed	~~1×10^{-8}~~ critical
Runway centre line points	1 m surveyed	~~1×10^{-8}~~ critical
Runway-holding position	0.5 m surveyed	~~1×10^{-8}~~ critical
Taxiway centre line/parking guidance line points	0.5 m surveyed	~~1×10^{-5}~~ essential
Taxiway intersection marking line	0.5 m surveyed	~~1×10^{-5}~~ essential
Exit guidance line	0.5 m surveyed	~~1×10^{-5}~~ essential
Apron boundaries (polygon)	1 m surveyed	~~1×10^{-3}~~ routine
De-icing/anti-icing facility (polygon)	1 m surveyed	~~1×10^{-3}~~ routine
Aircraft stand points/INS checkpoints	0.5 m surveyed	~~1×10^{-3}~~ routine

Note.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Table A5-2. Elevation/altitude/height

Elevation/altitude/height	Accuracy Data type	Integrity Classification
Aerodrome elevation	0.5 m surveyed	~~1×10^{-5}~~ essential
WGS-84 geoid undulation at aerodrome elevation position	0.5 m surveyed	~~1×10^{-5}~~ essential
Runway threshold, non-precision approaches	0.5 m surveyed	~~1×10^{-5}~~ essential
WGS-84 geoid undulation at runway threshold, non-precision approaches	0.5 m surveyed	~~1×10^{-5}~~ essential
Runway threshold, precision approaches	0.25 m surveyed	~~1×10^{-8}~~ critical
WGS-84 geoid undulation at runway threshold, precision approaches	0.25 m surveyed	~~1×10^{-8}~~ critical
Runway centre line points	0.25 m surveyed	~~1×10^{-8}~~ critical
Taxiway centre line/parking guidance line points	1 m surveyed	~~1×10^{-5}~~ essential
Obstacles in Area 2 (the part within the aerodrome boundary)	3 m surveyed	~~1×10^{-5}~~ essential
Obstacles in Area 3	0.5 m surveyed	~~1×10^{-5}~~ essential
Distance measuring equipment/precision (DME/P)	3 m surveyed	~~1×10^{-5}~~ essential

Note.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Editorial Note.— Delete all of the numeric values for integrity classification in Appendix 5, tables A5-3 to A5-5 (i.e. all values 1 × 10-3, 1 × 10-5, and 1 × 10-8) leaving only the classifications "routine", "essential", and "critical" as shown in the preceding changes to tables A5-1 and A5-2.

. . . .

~~APPENDIX 7. FRAMEWORK FOR SAFETY MANAGEMENT SYSTEMS (SMS)~~

Editorial Note.— Delete Appendix 7 in toto.

. . . .

~~ATTACHMENT C. FRAMEWORK FOR THE STATE SAFETY PROGRAMME (SSP)~~

Editorial Note.— Delete Attachment C in toto.

. . . .

— END —

AMENDMENT No. 11-B

TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME I
AERODROME DESIGN AND OPERATIONS

The amendment to Annex 14, Volume I, contained in this document was adopted by the Council of ICAO on **27 February 2013**. Such parts of this amendment as have not been disapproved by more than half of the total number of Contracting States on or before **15 July 2013** will become effective on that date and will become applicable on **13 November 2014** as specified in the Resolution of Adoption. (State letter AN 4/1.2.24-13/20 refers.) Replacement pages incorporating Amendment 11-A will be forwarded as soon as practicable after the amendment becomes effective. Replacement pages incorporating Amendment 11-B are expected to be distributed in October 2014.

MARCH 2013

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AMENDMENT 11 TO THE INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

ANNEX 14, VOLUME I — *AERODROME DESIGN AND OPERATIONS*

RESOLUTION OF ADOPTION

The Council

Acting in accordance with the Convention on International Civil Aviation, and particularly with the provisions of Articles 37, 54 and 90 thereof,

1. *Hereby adopts* on 27 February 2013 Amendment 11 to the International Standards and Recommended Practices contained in the document entitled *International Standards and Recommended Practices, Aerodrome Design and Operations* which for convenience is designated Annex 14, Volume I to the Convention;

2. *Prescribes* 15 July 2013 as the date upon which the said amendment shall become effective, except for any part thereof in respect of which a majority of the Contracting States have registered their disapproval with the Council before that date;

3. *Resolves* that the said amendment or such parts thereof as have become effective shall become applicable on 14 November 2013[1];

4. *Requests the Secretary General*:

a) to notify each Contracting State immediately of the above action and immediately after 15 July 2013 of those parts of the amendment which have become effective;

b) to request each Contracting State:

1) to notify the Organization (in accordance with the obligation imposed by Article 38 of the Convention) of the differences that will exist on 14 November 2013[1] between its national regulations or practices and the provisions of the Standards in the Annex as hereby amended, such notification to be made before 14 October 2013[2], and thereafter to notify the Organization of any further differences that arise;

2) to notify the Organization before 14 October 2013[2] of the date or dates by which it will have complied with the provisions of the Standards in the Annex as hereby amended;

c) to invite each Contracting State to notify additionally any differences between its own practices and those established by the Recommended Practices, when the notification of such differences is important for the safety of air navigation, following the procedure specified in subparagraph b) above with respect to differences from Standards.

— — — — — — — —

[1] 13 November 2014 for definitions of instrument and non-instrument runways.
[2] 13 October 2014 for definitions of instrument and non-instrument runways.

NOTES ON THE PRESENTATION OF THE AMENDMENT TO ANNEX 14, VOLUME I

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

~~Text to be deleted is shown with a line through it.~~	text to be deleted
New text to be inserted is highlighted with grey shading.	new text to be inserted
~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	new text to replace existing text

TEXT OF AMENDMENT 11-B

TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AEROROMES

ANNEX 14
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME I
AERODROME DESIGN AND OPERATIONS

CHAPTER 1. DEFINITIONS

. . .

Instrument runway. One of the following types of runways intended for the operation of aircraft using instrument approach procedures:

a) *Non-precision approach runway*. ~~An instrument~~ A runway served by visual aids and non-visual aid(s) ~~providing at least directional guidance adequate for a straight in approach~~ intended for landing operations following an instrument approach operation type A and a visibility not less than 1 000 m.

b) *Precision approach runway, category I*. ~~An instrument~~ A runway served by ~~ILS and/or MLS and~~ visual aids and non-visual aid(s) intended for ~~operations~~ landing operations following an instrument approach operation type B with a decision height (DH) not lower than 60 m (200 ft) and either a visibility not less than 800 m or a runway visual range not less than 550 m.

c) *Precision approach runway, category II*. ~~An instrument~~ A runway served by ~~ILS and/or MLS and~~ visual aids and non-visual aid(s) intended for ~~operations~~ landing operations following an instrument approach operation type B with a decision height (DH) lower than 60 m (200 ft) but not lower than 30 m (100 ft) and a runway visual range not less than 300 m.

d) *Precision approach runway, category III*. ~~An instrument~~ A runway served by ~~ILS and/or MLS~~ visual aids and non-visual aid(s) intended for landing operations following an instrument approach operation type B to and along the surface of the runway and:

A — intended for operations with a decision height (DH) lower than 30 m (100 ft), or no decision height and a runway visual range not less than 175 m.

B — intended for operations with a decision height (DH) lower than 15 m (50 ft), or no decision height and a runway visual range less than 175 m but not less than 50 m.

C — intended for operations with no de cision height (DH) and no r unway visual range limitations.

~~*Note 1.— See Annex 10, Volume I, for related ILS and/or MLS specifications.*~~

Note ~~2.~~1. — Visual aids need not necessarily be matched to the scale of non-visual aids provided. The criterion for the selection of visual aids is the conditions in which operations are intended to be conducted.

Note 2.— Refer to Annex 6 for instrument approach operation types.

. . .

Non-instrument runway. A runway intended for the operation of aircraft using visual approach procedures or an instrument approach procedure to a point beyond which the approach may continue in visual meteorological conditions.

Note.— Visual meteorological conditions (VMC) are described in Chapter 3 of Annex 2.

— END —