INTERNATIONAL CIVIL AVIATION ORGANIZATION

THE THIRD MEETING OF THE AERODROMES OPERATIONS AND PLANNING – WORKING GROUP (AOP/WG/3)

Malaysia, 2 – 4 June 2015

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

PROPOSALS FOR THE AMENDMENT TO ANNEX 14, VOLUME I AND VOLUME II

(Presented by the Secretariat)

SUMMARY

This Paper provides information on the Proposals for the Amendment of Annex 14, Volumes I and II and Annex 15 circulated in State Letter AN 4/1.1.54-14/97 dated 19 December 2014 for comments.

This paper relates to –

Strategic Objectives:

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

*B: **Air Navigation Capacity and Efficiency –** Increase Capacity and improve efficiency of the global civil aviation system*

1. INTRODUCTION

1.1 The Air Navigation Commission, at the eighth meeting of its 197th Session on 30 October 2014, considered the proposals developed by the third meeting of the Aerodromes Panel (AP/3) to amend the SARPs in Annex 14, Volume I – *Aerodrome Design and Operations*, *Annex 14 — Aerodromes*, Volume II — *Heliports* and Annex 15 – *Aeronautical Information Services* relating to design and operations of aerodromes including the publication of Runway End Safety Area (RESA) and arresting system in the Aeronautical Information Publication (AIP), and authorized their transmission to Contracting States and appropriate international organizations for comments.

2. DISCUSSION

2.1 The amendment proposals to Annex 14, Volumes I and II, include, inter alia amendments in regard to the

i) Adoption of a new definition for arresting system;

ii) Clarification for clear distances on aircraft stands;

iii) Publishing RESA and arresting system in AIP;

iv) Wheel-to-edge clearance for straight portions of code C taxiways;

v) Reduced taxiway and taxi lane separation distances;

vi) Taxiway design guidance for the prevention of runway incursion;

vii) Flashing characteristics and colour specifications for Light Emitting Diode (LED) lighting;

viii) simplification and clarification of Annex 14 Volume I on visual aids, clarification on light intensity distribution, marking and lighting of wind turbines over 150 m in height;

ix) Location criteria for Precision Approach Path Indicator (PAPI) obstacle protection surface;

x) Mandatory instruction and information markings;

xi) Prevention of Foreign Object Debris (FOD) and installation of devices for their detection; and

xii) Maintenance (simplification or clarification) of Annex 14 Volume II on definitions, emergency response and frangibility requirements for heliports.

2.3 The proposed amendment to Annex 15 relates to the promulgation of information on RESA and arresting system in the AIP.

2.4 The proposed amendments to Annex 14, Volumes I and II, and Annex 15 is envisaged for applicability on 10 November 2016.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to note the information provided in this Paper.

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International
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Ref.: AN 4/1.1.54-14/97 19 December 2014

Subject: Proposals for the amendment of Annex 14, Volumes I and II and Annex 15

Action required: Comments to reach Montréal by 19 March 2015

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission, at the eighth meeting of its 197th Session on 30 October 2014, considered the proposals developed by the third meeting of the Aerodromes Panel (AP/3) to amend the SARPs in Annex 14, Volume I – *Aerodrome Design and Operations, Annex 14 — Aerodromes*, Volume II — *Heliports* and Annex 15 – *Aeronautical Information Services* relating to design and operations of aerodromes including the publication of runway end safety area (RESA) and arresting system in the aeronautical information publication (AIP), and authorized their transmission to Contracting States and appropriate international organizations for comments.

2. To facilitate your review of the proposed amendments, the rationale for the proposals has been provided throughout Attachments A, B and C in the text boxes immediately following the relevant proposals. Also provided in Attachment D is the background information on the proposal for reduced taxiway separation distances, to further assist you in the review of the proposed SARPs in this respect.

3. The amendment proposals to Annex 14, Volumes I and II, include, inter alia amendments in regard to the adoption of a new definition for arresting system, clarification for clear distances on aircraft stands, publishing RESA and arresting system in AIP, wheel-to-edge clearance for straight portions of code C taxiways, reduced taxiway and taxilane separation distances, taxiway design guidance for the prevention of runway incursion, flashing characteristics and colour specifications for light emitting diode (LED) lighting, maintenance (simplification and clarification) of Annex 14 Volume I on visual aids, clarification on light intensity distribution, marking and lighting of wind turbines over 150 m in height, location criteria for precision approach path indicator (PAPI) obstacle protection surface, mandatory instruction and information markings, prevention of foreign object debris (FOD) and installation of devices for their detection, maintenance (simplification or clarification) of Annex 14 Volume II on definitions, emergency response and frangibility requirements for heliports.

4. The proposed amendment to Annex 15 relates to the promulgation of information on RESA and arresting system in the AIP.

5. In examining the proposed amendments, you should not feel obliged to comment on editorial aspects as such matters will be addressed by the Air Navigation Commission during its final review of the draft amendment.

6. May I request that any comments you may wish to make on the proposed amendments to Annex 14, Volumes I and II, and Annex 15, be dispatched to reach me not later than 19 March 2015. The Air Navigation Commission has asked me to specifically indicate that comments received after the due date may not be considered by the Commission and the Council. In this connection, should you anticipate a delay in the receipt of your reply, please let me know in advance of the due date.

7. For your information, the proposed amendments to Annex 14, Volumes I and II, and Annex 15 is envisaged for applicability on 10 November 2016. Any comments you may have thereon would be appreciated.

8. The subsequent work of the Air Navigation Commission and the Council would be greatly facilitated by specific statements on the acceptability or otherwise of the amendment proposal.

9. Please note that, for the review of your comments by the Air Navigation Commission and the Council, replies are normally classified as "agreement with or without comments", "disagreement with or without comments", or "no indication of position". If in your reply the expressions "no objections" or "no comments" are used, they will be taken to mean "agreement without comment" and "no indication of position", respectively. In order to facilitate proper classification of your response, a form has been included in Attachment E, which may be completed and returned together with your comments, if any, on the proposals in Attachments A, B and C.

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

Raymond Benjamin
Secretary General

Enclosures:

A — Proposed amendment to Annex 14, Volume I
B — Proposed amendment to Annex 14, Volume II
C — Proposed amendment to Annex 15
D — Background information on the proposal for reduced taxiway separation distances
E — Response Form

APPENDIX A to State letter AN 4/1.1.54-14/97

PROPOSED AMENDENT TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AERODROME DESIGN AND OPERATIONS

ANNEX 14, VOLUME I

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

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:

1.	~~Text to be deleted is shown with a line through it~~.	text to be deleted
2.	New text to be inserted is highlighted with grey shading.	new text to be inserted
3.	~~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

INITIAL PROPOSAL 1

CHAPTER 1. GENERAL

1.1 DEFINITIONS

. . .

Apron management service. *A service provided to regulate the activities and the movement of aircraft and vehicles on an apron.*

Arresting System*. A system designed to decelerate an aeroplane overrunning the runway*.

Balked landing*. A landing manoeuvre that is unexpectedly discontinued at any point below the obstacle clearance altitude/height (OCA/H).*

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Origin

AP Work Programme ADWG item (c) (3)

ADWG/9 through ADWG/13

Rationale

The above amendment aims to formally define the *functional aspects* for any arresting system referred to in paragraph 3.5.3 of Annex 14, Volume I. This paragraph, revised in 2013 by Amendment 11A to the Annex, offers States the ability to use proven arresting systems when deemed *acceptable by the States*.

INITIAL PROPOSAL 2

CHAPTER 3. PHYSICAL CHARACTERISTICS

3.13 Aprons

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Clearance distances on aircraft stands

3.13.6 **Recommendation**.— *An aircraft stand should provide the following minimum clearances between an aircraft ~~using~~ entering or exiting the stand and any adjacent building, aircraft on another stand and other objects:*

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

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

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

b) over any portion of the stand provided with azimuth guidance by a visual docking guidance system.

Note.— On aprons, consideration also has to be given to the provision of service roads and to manoeuvring and storage area for ground equipment (see the Aerodrome Design Manual (Doc 9157), Part 2, for guidance on storage of ground equipment).

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Origin

AP Work Programme ADWG task (a) Aerodrome Design Specifications: Review of Chapter 3, Annex14, Volume I

ADWG Special Task Force Meeting – London, England: Taxiway centerline separations and clearances

ADWG/11 through ADWG/13

Rationale

A problem arises with the accidental misapplications of the object clearance dimensions for aircraft parking stands under paragraph 3.13.6 of Annex 14, Volume I.

The existing phraseology, *"an aircraft using the stand"* within paragraph 3.13.6 is not sufficiently explicit to indicate when the object clearances are measured. Basically, should the measurements between an aircraft and nearby objects be taken while the aircraft is stationary or moving in the parking stand?

The proposed change resolves this costly misapplication with new phraseology that clearly indicates that aircraft are in motion, not stationary.

Adoption of the proposals offers costs savings and improved operational efficiencies to the aviation industry.

INITIAL PROPOSAL 3

CHAPTER 2. AERODROME DATA

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2.5 Aerodrome dimensions and related information

2.5.1 The following data shall be measured or described, as appropriate, for each facility provided on an aerodrome:

a) runway — true bearing to one-hundredth of a degree, designation number, length, width, displaced threshold location to the nearest metre or foot, slope, surface type, type of runway and, for a precision approach runway category I, the existence of an obstacle free zone when provided;

b) strip
runway end safety area } length, width to the nearest metre or
stopway } foot, surface type; and

arresting system (if any) —location (which runway end) and description;

c) taxiway — designation, width, surface type;

d) apron — surface type, aircraft stands;

. . .

Origin:

ADWG/12

Rationale:

Amendment 11A to Annex 14, Volume I has included new SARPs on the provision of an arresting system in relation to the dimension of RESA. Accordingly, there is a need to include the arresting system in the aerodrome data, from both regulatory and operational perspectives.

In addition to the location of an arresting system, information on the description of the system, such as the type and dimension would also be helpful.

INITIAL PROPOSAL 4

CHAPTER 3. PHYSICAL CHARACTERISTICS

. . .

~~3.9.3 **Recommendation.** — *The design of a taxiway should be such that, when the cockpit of the aeroplane for which the taxiway is intended remains over the taxiway centre line markings, the clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway should be not less than that given by the following tabulation:*~~

~~Code letter~~	~~Clearance~~
~~*A*~~	~~*1.5 m*~~
~~*B*~~	~~*2.25 m*~~
~~*C*~~	~~*3 m if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m;*~~ ~~*4.5 m if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.*~~
~~*D*~~	~~*4.5 m*~~
~~*E*~~	~~*4.5 m*~~
~~*F*~~	~~*4.5 m*~~

~~*Note 1.— Wheel base means the distance from the nose gear to the geometric centre of the main gear.*~~

~~*Note 2.— Where the code letter is F and the traffic density is high, a wheel-to-edge clearance greater than 4.5 m may be provided to permit higher taxiing speeds.*~~

3.9.43 ~~As of 20 November 2008, the~~ The design of a taxiway shall be such that, when the cockpit of the aeroplane for which the taxiway is intended remains over the taxiway centre line markings, the clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway shall be not less than that given by the following tabulation:

Code Letter	Clearance
A	1.5 m
B	2.25 m
C	3 m ~~if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m~~ on straight portions;

	3 m on curved portions if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m;
	4.5 m on curved portions if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.
D	4.5 m
E	4.5 m
F	4.5 m

Note 1.— Wheel base means the distance from the nose gear to the geometric centre of the main gear.

Note 2.— Where the code letter is F and the traffic density is high, a wheel-to-edge clearance greater than 4.5 m may be provided to permit higher taxiing speeds.

Note 3.— This provision applies to taxiways first put into service on or after 20 November 2008.

Width of taxiways

3.9.~~5~~ 4 **Recommendation** — *A straight portion of a taxiway should have a width of not less than that given by the following tabulation:*

Code letter	*Taxiway width*
A	*7.5 m*
B	*10.5 m*
C	*15 m ~~if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m;~~* *~~18 m if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m~~*
D	*18 m if the taxiway is intended to be used by aeroplanes with an outer main gear wheel span of less than 9 m;* *23 m if the taxiway is intended to be used by aeroplanes with an outer main gear wheel span equal to or greater than 9 m.*
E	*23 m*
F	*25 m*

Editorial Note.— Renumber subsequent paragraphs accordingly.

Origin:

AP Work Programme ADWG task (a) Aerodrome Design Specifications: Review of Chapter 3, Annex14, Volume I.

ADWG/10 through ADWG/13

Rationale:

Earlier discussions on taxiway design criteria for the width of taxiways identified that for Code C paragraphs 3.9.4 and 3.9.5 of Annex 14, Volume I, applied the aircraft parameter of "wheelbase length" to prescribe two numeric taxi widths. However, these values did not differentiate if they applied to the design of curved taxiways or straight taxiways. In designing taxiway width for straight portions of a taxiway, the aircraft parameter of outer main gear wheel span should be considered and not that of wheel base length. Accordingly, the current design criteria for Code C need to be revised to differentiate between straight portions and curved portions of a taxiway.

Adoption of the proposal would eliminate costly over construction of straight taxiways for all Code C aircraft.

The proposed deletion of the existing paragraph 3.9.3 is because it would be replaced with the existing paragraph 3.9.4.

INITIAL PROPOSAL 5

Table 3-1 Taxiway minimum separation distances

	Distance between taxiway centre line and runway centre line (metres)											
Code letter	*Instrument runways Code number 1*	*2*	*3*	*4*	*Non-instrument runways Code number 1*	*2*	*3*	*4*	*Taxiway centre line to taxiway centre line (metres)*	*Taxiway, other than aircraft stand taxilane, centre line to object (metres)*	*Aircraft stand taxilane centre line to aircraft stand taxilane centre line (metres)*	*Aircraft stand taxilane centre line to object (metres)*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	***(12)***	*(13)* ~~*(12)*~~
A	*82.5*	*82.5*	*–*	*–*	*37.5*	*47.5*	*–*	*–*	***23*** ~~*(23.75)*~~	***15.5*** ~~*(16.25)*~~	***19.5***	*12*
B	*87*	*87*	*–*	*–*	*42*	*52*	*–*	*–*	***32*** ~~*(33.5)*~~	***20*** ~~*(21.5)*~~	***28.5***	*16.5*
C	*–*	*–*	*168*	*–*	*–*	*–*	*93*	*–*	*44*	*26*	***40.5***	***22.5*** ~~*(24.5)*~~
D	*–*	*–*	*176*	*176*	*–*	*–*	*101*	*101*	***63*** ~~*(66.5)*~~	***37*** ~~*(40.5)*~~	***59.5***	***33.5*** ~~*(36)*~~
E	*–*	*–*	*–*	*182.5*	*–*	*–*	*–*	*107.5*	***76*** ~~*(80)*~~	***43.5*** ~~*(47.5)*~~	***72.5***	***40*** ~~*(42.5)*~~
F	*–*	*–*	*–*	*190*	*–*	*–*	*–*	*115*	***91*** ~~*(97.5)*~~	***51*** ~~*(57.5)*~~	***87.5***	***47.5*** ~~*(50.5)*~~

Origin

ANC task for Aerodrome Panel work item on aerodrome design specifications: "*Review the basis and the adoption of a risk-based approach for the development of aerodrome design SARPs on physical characteristics, based on the aerodrome reference code and the consequential development of revised SARPs as deemed necessary*".

ADWG/10 - 13

Previous ADWG/1 - 9

Rationale

The existing taxi centre line separation distances in Annex 14, Volume I, Table 3-1 were derived before the advent of modern, new large aircraft and many aerodrome systems in use today. The original design groups were correct to be cautious in establishing the present values, but scientific assessments, together with practical risk-based studies, have shown that there is room for the values to be reduced without having a negative impact on the safety or regularity of taxiing operations. Flight crew can be confident that they will have the sufficient centre line separations to manoeuvre their aircraft without limitation.
The proposed revisions to Table 3-1 retain the ICAO taxi centre line separation methodology.
Additionally, this will enable aerodromes to develop their facilities within their existing footprints and reduce the overall costs of doing future upgrades.
See Appendix D of this State letter for more background information.

INITIAL PROPOSAL 6

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3.9 Taxiways

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

Note 2. — See Attachment A, Section 21 for specific taxiway design guidance which may assist in the prevention of runway incursions when developing a new taxiway or improving existing ones with a known runway incursion safety risk.

General

3.9.1 **Recommendation.—** *Taxiways should be provided to permit the safe and expeditious surface movement of aircraft.*

Note.— Guidance on layout of taxiways is given in the Aerodrome Design Manual *(Doc 9157), Part 2.*

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Attachment A. Guidance Material Supplementary to Annex 14, Volume I

20.2 ACNs for several aircraft types

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21. Taxiway design guidance for minimizing the potential for runway incursions

21.1 Good aerodrome design practices can reduce the potential for runway incursions while maintaining operating efficiency and capacity. The following taxiway design guidance may be considered to be part of a runway incursion prevention programme as a means to ensure that runway incursion aspects are addressed during the design phase for new runways and taxiways. Within this focused guidance, the prime considerations are to limit the number of aircraft or vehicles entering or crossing a runway, provide pilots with enhanced unobstructed views of the entire runway, and correct taxiways identified as hot spots as far as possible.

21.2 The centre line of an entrance taxiway should be perpendicular to the runway centre line, where possible. This design principle provides pilots with an unobstructed view of the entire runway, in both directions, to confirm that the runway and approach are clear of conflicting traffic before proceeding towards the runway. Where the taxiway angle is such that a clear unobstructed view, in both directions, is not possible, consideration should be given to providing a perpendicular portion of the taxiway immediately adjacent to the runway to allow for a full visual scan by the pilots prior to entering or crossing a runway.

21.3 For taxiways intersecting with runways, avoid designing taxiways wider than recommended in Annex 14. This design principle offers improved recognition of the location of the runway holding position and the accompanying sign, marking, and lighting visual cues.

21.4 Existing taxiways wider than recommended in Annex 14, can be rectified by painting taxi side stripe markings to the recommended width. As far as practicable, it is preferable to redesign such locations properly rather than to repaint such locations.

21.5 Multi-taxiway entrances to a runway should be parallel to each other and should be distinctly separated by an unpaved area. This design principle allows each runway holding location an earthen area for the proper placement of accompanying sign, marking, and lighting visual cues at each runway holding position. Moreover, the design principle eliminates the needless costs of building unusable pavement and as well as the costs for painting taxiway edge markings to indicate such unusable pavement. In general, excess paved areas at runway holding positions reduce the effectiveness of sign, marking, and lighting visual cues.

21.6 Build taxiways that cross a runway as a single straight taxiway. Avoid dividing the taxiway into two after crossing the runway. This design principle avoids constructing "Y-shaped" taxiways known to present opportunities for runway incursions.

21.7 If possible, avoid building taxiways that enter at the mid-runway location. This design principle helps to reduce the collision risks at the most hazardous locations (high energy location) because normally departing aircraft have too much energy to stop, but not enough speed to take-off, before colliding with another errant aircraft.

21.8 Provide clear separation of pavement between a rapid exit taxiway and other non-rapid taxiways entering or crossing a runway. This design principle avoids two taxiways from overlapping each other to create an excessive paved area that would confuse pilots entering a runway.

21.9 Avoid the placement of different pavement materials (asphalt and cement concrete) at or near the vicinity of the runway holding position, as far as practicable. This design principle avoids creating visual confusion as to the actual location of the runway holding position.

21.10 Perimeter taxiways. Many aerodromes have more than one runway, notably paired parallel runways (two runways on one side of the terminal), which creates a difficult problem in that either on arrival or departure an aircraft is required to cross a runway. Under such a configuration, the safety objective here is to avoid or at least keep to a minimum the number of runway crossings. This safety objective may be achieved by constructing a "perimeter taxiway". A perimeter taxiway is a taxi route that goes around the end of a runway, enabling arrival aircraft (when landings are on outer runway of a pair) to get to the terminal or departure aircraft (when departures are on outer runway of a pair) to get to the runway without either crossing a runway, or conflicting with a departing or approaching aircraft.

21.11 A perimeter taxiway would be designed according to the following criteria:

> a) Sufficient space is required between the landing threshold and the taxiway centre line where it crosses under the approach path, to enable the critical taxiing aircraft to pass under the approach without violating any approach surface.

b) The jet blast impact of aircraft taking off should be considered in consultation with aircraft manufacturers; the extent of take-off thrust should be evaluated when determining the location of a perimeter taxiway.

c) The requirement for a runway end safety area, as well as possible interference with landing systems and other navigation aids should also be taken into account. For example, in the case of an Instrument Landing System, the perimeter taxiway should be located behind the localiser antenna, not between the localiser antenna and the runway, due to the potential for severe Instrument Landing System disturbance, noting that this is harder to achieve as the distance between the localizer and the runway increases.

d) Human factors issues should also be taken into account. Appropriate measures should be put in place to assist pilots to distinguish between aircraft that are crossing the runway and those that are safely on a perimeter taxiway.

Origin
AP Work Programme ADWG item (c) (3)
ADWG/9 through ADWG/13

Rationale

Runway incursion is a leading safety issue for aviation worldwide. Adoption of the proposed guidance would help minimize this safety risk.

This would be accomplished by providing uniquely focused taxiway design guidance known to reduce the risk of runway incursions. For example, the centre line of taxiways entering the runway should be perpendicular to the runway centreline, where possible.

Moreover, the guidance offers cost savings for aerodrome operators and State aviation regulatory agencies in the sense that new taxiway construction should not become a designated HOT SPOT. Such designation generally triggers reconstruction of the problematic taxiway.

It is proposed to insert this material in Attachment A Annex 14, Volume I instead of in a manual (e.g. ADM) to give it more visibility.

INITIAL PROPOSAL 7

1.1 Definitions

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~~***Capacitor discharge light.*** A lamp in which high intensity flashes of extremely short duration are produced by the discharge of electricity at high voltage through a gas enclosed in a tube.~~

5.3.4 Approach lighting systems

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Precision approach category I lighting system

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Characteristics

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5.3.4.17 **Recommendation —** *If the centre line consists of barrettes as described in 5.3.4.14 b) or 5.3.4.15 b), each barrette should be supplemented by a ~~capacitor discharge~~ flashing light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.*

5.3.4.18 Each ~~capacitor discharge~~ flashing light as described in 5.3.4.17 shall be flashed twice a second in sequence, beginning with the outermost light and progressing toward the threshold to the innermost light of the system. The design of the electrical circuit shall be such that these lights can be operated independently of the other lights of the approach lighting system.

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Precision approach category II and III lighting system
Characteristics

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5.3.4.34 **Recommendation —** *If the centre line beyond 300 m from the threshold consists of barrettes as described in 5.3.4.31 a) or 5.3.4.32 a), each barrette beyond 300 m should be supplemented by a ~~capacitor discharge~~ flashing light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.*

5.3.4.35 Each ~~capacitor discharge~~ flashing light as described in 5.3.4.34 shall be flashed twice a second in sequence, beginning with the outermost light and progressing toward the threshold to the innermost light of the system. The design of the electrical circuit shall be such that these lights can be operated independently of the other lights of the approach lighting system.

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5.3.7 Runway lead-in lighting systems

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Characteristics

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5.3.7.5 **Recommendation.—** *The flashing lights and the steady burning lights should be white~~, and the steady burning lights gaseous discharge lights~~.*

Origin:

VAWG/9-DP/01, VAWG/11-DP/18, APWGs/2-DP/01, AP/3-WP/04

Rationale:

The LED compared to incandescent lamps is nearly free from any delay in the change of intensity. Therefore, dynamic flashing lights based on Xenon tubes can be replaced by high intensity LEDs producing an equally conspicuous light signal.

The text in paragraphs 5.3.4.17, 5.3.4.18, 5.3.4.34 and 5.3.4.35 explicitly states gas discharging tubes as the technology to be used for flashing approach strobe lights and should be changed to a description of the required light characteristics.

The term *flashing light* gives information about the characteristics and allows a clear differentiation from the steady types.

It is proposed to remove the definition of capacitor discharge light and replace the term by flashing light in all paragraphs. The characteristics of these lights shall follow Appendix 2, as stated in 5.3.4.21 and 5.3.4.39.

The reference to this technology is also suppressed from 5.3.7.5.

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), except for the colour orange in Figure A1-2.

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 high-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.**

The chromaticities for solid state lighting (e.g. LED) are based upon the boundaries given in the standard S 004/E-2001 of the International Commission on Illumination (CIE), except for the blue boundary of white.

2. Colours for aeronautical ground lights

2.1 Chromaticities for lights having filament-type light sources

2.1.1 The chromaticities of aeronautical ground lights with filament-type light sources shall be within the following boundaries:

CIE Equations (see Figure A1-1a):

a) Red
Purple boundary $y = 0.980 - x$
Yellow boundary $y = 0.335$, except for visual approach slope indicator systems;
Yellow boundary $y = 0.320$, for visual approach slope indicator systems.

Note:- See 5.3.5.14 and 5.3.5.30.

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

c) Green (refer also 2.1.2 and 2.1.3)
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
~~1) 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
~~2) 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~~ [moved to 2.3.1 e]

f) Variable white
Yellow boundary   x = 0.255 + 0.750y and ~~x = 1.185 – 1.500y~~ y = 0.790 - 0.667x
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, Part 4 — *Visual Aids* (Doc 9157).

2.1.2 **Recommendation.—** *Where dimming is not required, or where observers with defective colour vision must be able to determine the colour of the light, green signals should be within the following boundaries:*

Yellow boundary   y = 0.726 – 0.726x
White boundary   x = 0.650y
Blue boundary   y = 0.390 – 0.171x

Note.— Where the colour signal is to be seen from long range, it has been the practice to use colours within the boundaries of 2.1.2.

2.1.3 **Recommendation.—** *Where increased certainty of recognition from white, is more important than maximum visual range, green signals should be within the following boundaries:*

Yellow boundary   y = 0.726 – 0.726x
White boundary   x = 0.625y – 0.041
Blue boundary   y = 0.390 – 0.171x

2.2 Discrimination between lights having filament-type sources

2.2.1 **Recommendation.—** *If there is a requirement to discriminate yellow and white from each other, they should be displayed in close proximity of time or space as, for example, by being flashed successively from the same beacon.*

2.2.2 **Recommendation.—** *If there is a requirement to discriminate yellow from green and/or white, as for example on exit taxiway centre line lights, the y coordinates of the yellow light should not exceed a value of 0.40.*

Note.— The limits of white have been based on the assumption that they will be used in situations in which the characteristics (colour temperature) of the light source will be substantially constant.

2.2.3 **Recommendation.—** *The colour variable white is intended to be used only for lights that are to be varied in intensity, e.g. to avoid dazzling. If this colour is to be discriminated from yellow, the lights should be so designed and operated that:*

a) the x coordinate of the yellow is at least 0.050 greater than the x coordinate of the white; and

b) the disposition of the lights will be such that the yellow lights are displayed simultaneously and in close proximity to the white lights.

~~2.2.4 The colour of aeronautical ground lights shall be verified as being within the boundaries specified in Figure A1-1 by measurement at five points within the area limited by the innermost isocandela curve (isocandela diagrams in Appendix 2 refer), with operation at rated current or voltage. In the case of elliptical or circular isocandela curves, the colour measurements shall be taken at the centre and at the horizontal and vertical limits. In the case of rectangular isocandela curves, the colour measurements shall be taken at the centre and the limits of the diagonals (corners). In addition, the colour of the light shall be checked at the outermost isocandela curve to ensure that there is no colour shift that might cause signal confusion to the pilot~~. [new version in 2.4.1]

~~*Note 1.— For the outermost isocandela curve, a measurement of colour coordinates should be made and recorded for review and judgement of acceptability by the appropriate authority.*~~ [moved to 2.4.1]

~~*Note 2.— Certain light units may have application so that they may be viewed and used by pilots from directions beyond that of the outermost isocandela curve (e.g. stop bar lights at significantly wide runway-holding positions). In such instances, the appropriate authority should assess the actual application and if necessary require a check of colour shift at angular ranges beyond the outermost curve.*~~ [moved to 2.4.1]

~~2.2.5 In the case of visual approach slope indicators and other light units having a colour transition sector, the colour shall be measured at points in accordance with 2.2.4, except that the colour areas shall be treated separately and no point shall be within 0.5 degrees of the transition sector.~~ [moved to 2.4.2]

2.3 Chromaticities for lights having a solid state light source

2.3.1 The chromaticities of aeronautical ground lights with solid state light sources, e.g. LEDs, shall be within the following boundaries:

CIE Equations (see Figure A1-1b):

a) Red

Purple boundary	$y = 0.980 – x$
Yellow boundary	$y = 0.335$, except for visual approach slope indicator systems;
Yellow boundary	$y = 0.320$, for visual approach slope indicator systems.

Note.— See 5.3.5.14 and 5.3.5.30.

b) Yellow

Red boundary	$y = 0.387$
White boundary	$y = 0.980 – x$
Green boundary	$y = 0.727x + 0.054$

c) Green (also refer 2.3.2 and 2.3.3)

Yellow boundary	$x = 0.310$
White boundary	$x = 0.625y – 0.041$
Blue boundary	$y = 0.400$

d) Blue

Green boundary	$y = 1.141x – 0.037$
White boundary	$x = 0.400 – y$
Purple boundary	$x = 0.134 + 0.590y$

e) White

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) Variable white

The boundaries of variable white for solid state light sources are those of *e) White* above.

2.3.2 **Recommendation.—** *Where observers with defective colour vision must be able to determine the colour of the light, green signals should be within the following boundaries:*

Yellow boundary	$y = 0.726 – 0.726x$
White boundary	$x = 0.625y – 0.041$
Blue boundary	$y = 0.400$

2.3.3 **Recommendation.—** *In order to avoid a large variation of shades of green, if colours within the boundaries below are selected, colours within the boundaries of 2.3.2 should not be used.*

Yellow boundary $x = 0.310$
White boundary $x = 0.625y - 0.041$
Blue boundary $y = 0.726 - 0.726x$

2.4 Colour measurement for filament-type and solid state-type light sources

2.4.1 The colour of aeronautical ground lights shall be verified as being within the boundaries specified in Figure A1-1a or A1-1b, as appropriate, by measurement at five points within the area limited by the innermost isocandela curve (isocandela diagrams in Appendix 2 refer), with operation at rated current or voltage. In the case of elliptical or circular isocandela curves, the colour measurements shall be taken at the centre and at the horizontal and vertical limits. In the case of rectangular isocandela curves, the colour measurements shall be taken at the centre and the limits of the diagonals (corners). In addition, the colour of the light shall be checked at the outermost isocandela curve to ensure that there is no colour shift that might cause signal confusion to the pilot.

Note 1.— For the outermost isocandela curve, a measurement of colour coordinates should be made and recorded for review and judgement of acceptability by the appropriate authority.

Note 2.— Certain light units may have application so that they may be viewed and used by pilots from directions beyond that of the outermost isocandela curve (e.g. stop bar lights at significantly wide runway-holding positions). In such instances, the appropriate authority should assess the actual application and if necessary require a check of colour shift at angular ranges beyond the outermost curve.

2.4.2 In the case of visual approach slope indicator systems and other light units having a colour transition sector, the colour shall be measured at points in accordance with 2.4.1, except that the colour areas shall be treated separately and no point shall be within 0.5 degrees of the transition sector.

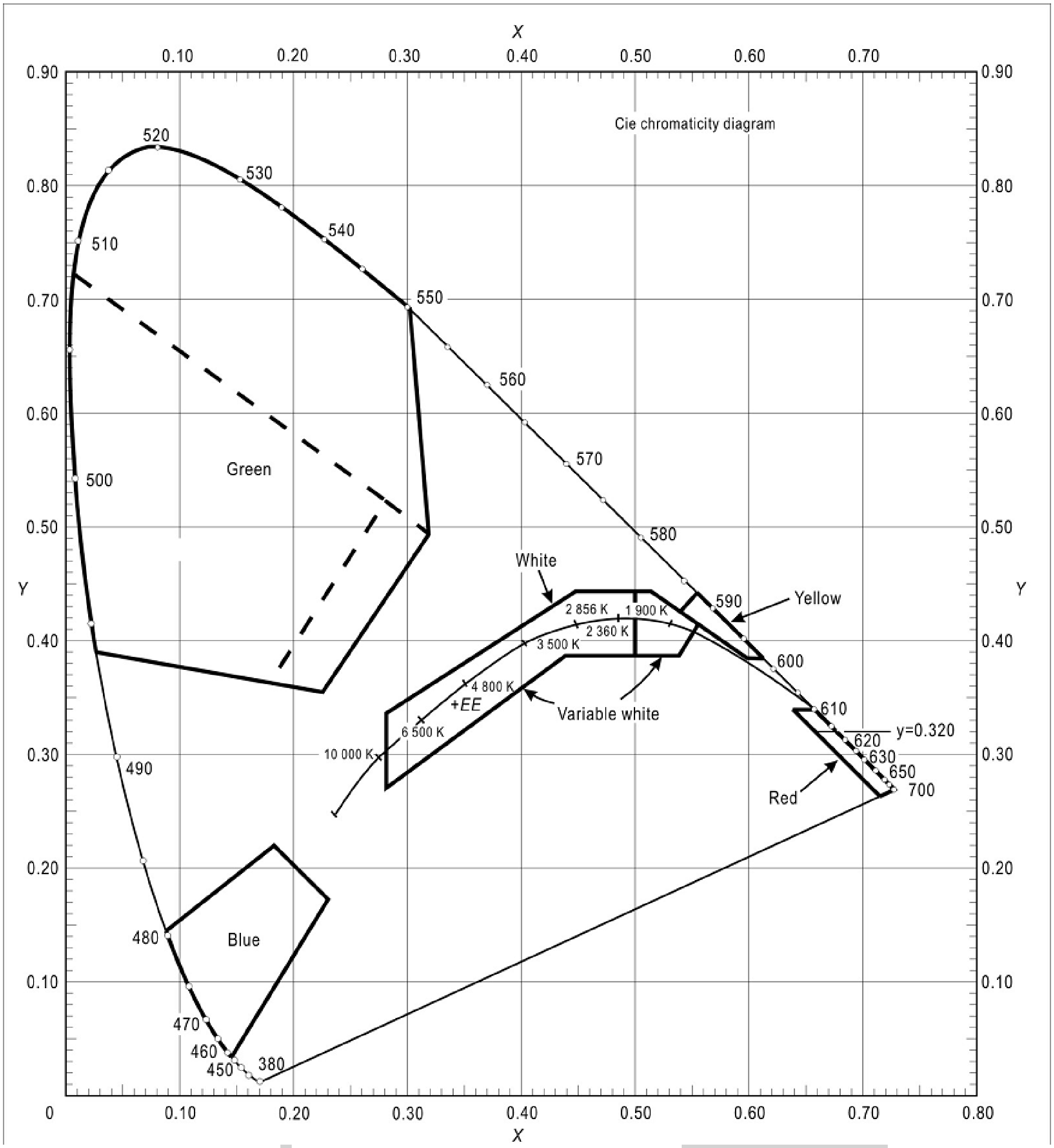

Figure A1-1a. Colours for aeronautical ground lights (filament-type lamps)

Editorial Note.— This figure is identical to the existing Figure A1-1 but for the marking "y=0.320" for the red area, which has been displayed explicitly.

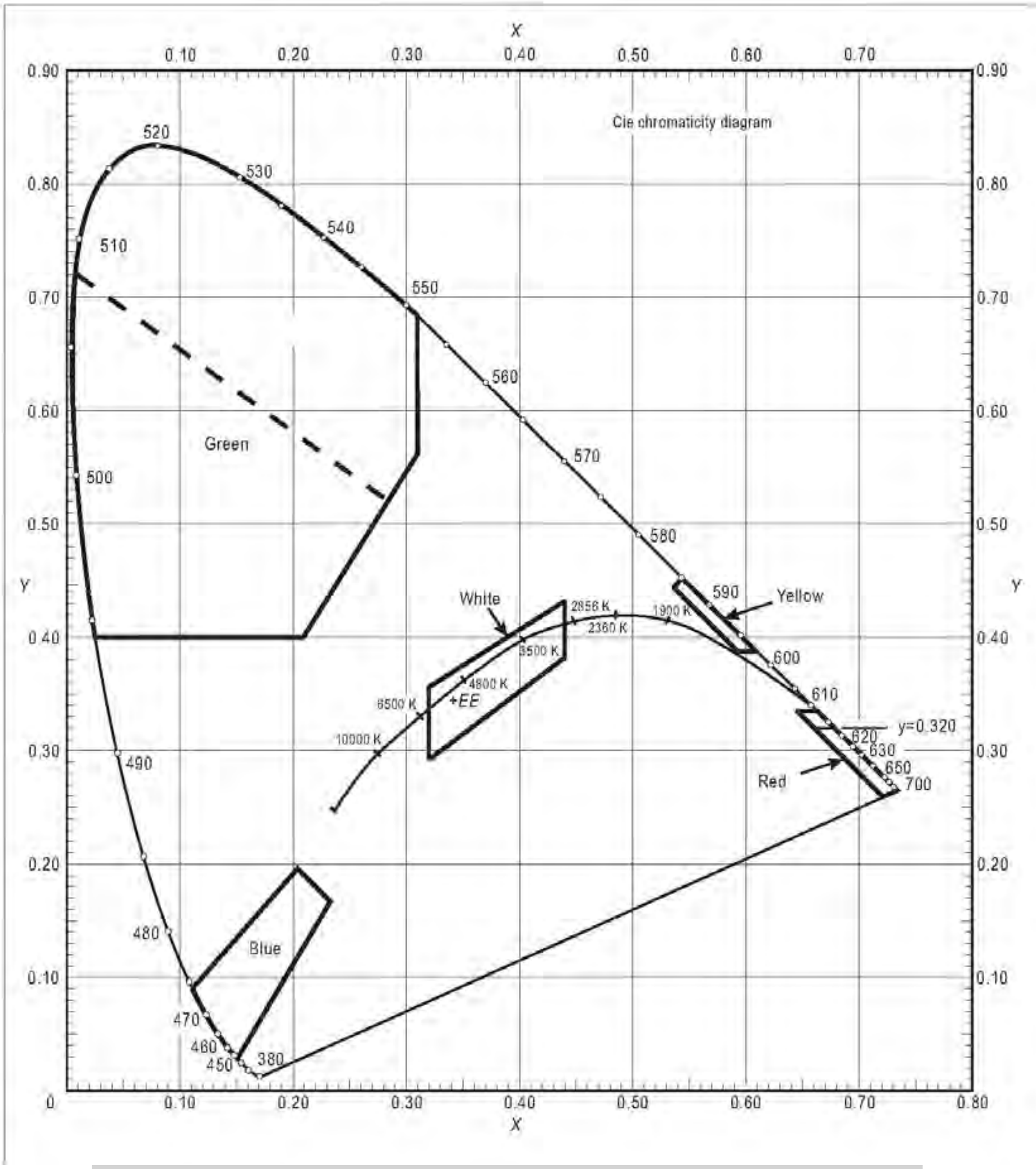

Figure A1-1b. Colours for aeronautical ground lights (solid state lighting)

Origin:

VAWG/8-DP/08, VAWG/9-DP/04, VAWG/10-DP/01, VAWG/11-DP/06, APWGs/2-DP/03, AP/3-WP/04

Rationale:

The intention is to have the LED colours in a new Figure A1-1(b). The current figure becomes A1-1(a) for incandescent lighting.

The LED colours are that of CIE S 004/E-2001, except for white, as explained below. This standard has been chosen for LEDs because they are less sensitive to brightness setting change which, in the case of filament lighting, causes a colour shift.

The differences in the text are the following.

1. Gen. The section "1. General" applies to all colours including that of painted surfaces. The sentence "*except for the colour orange in Figure A1-2*" is added because the aviation orange paint colour is special to ICAO. The last paragraph points out the exception of the blue boundary of white.
2.1.1 (a) Notation is made for the yellow boundary x=0.320 for PAPI.
2.1.1 (f) The yellow boundary equation is changed to y=0.790-0.667x because this is the equation for the white boundary of yellow in 2.1.1 (b). Since this is the same line, the equation should be the same.
2.1.2 A note is added to point out that it has been practice to use colours in the blue-green area where the signal is to be seen and distinguished at long range.
2.1.3 The phrase "*from white*" is added in order to qualify what the green is to be distinguished from.
2.2.4 and 5 These articles moved to 2.4.1 and 2.4.2, since they are also applicable to LED lights
2.3.1 The equations for green, red, blue and yellow.
2.3.1 (a) Same notation as for 2.1.1(a) for PAPI colour.
2.3.1 (e) The equations for boundaries of white are as reported in State Letter AN 4/1.2.24-13/20
2.3.2 Same as 2.1.2 for colour deficient observers.
2.3.3 This recommendation applies to the initial concern to not have a variation of shades of green on the airfield. In essence, if the yellow-green colour is picked then other selections should be in the same area. The article is a recommendation because that it has not been shown that there is a safety issue should there be a variation of shades of green. Also, ICAO cannot restrict greens to the yellow-green only, when blue-green is presently specified by some states, e.g., Japan and Australia.
2.4.1 & 2 Colour measurement. Previously 2.2.4 and 2.2.5.

The explanations for each colour are the following.

GREEN: The white boundary for green is now at the restrictive boundary that was specified in the current Annex 14, Appendix 1, article 2.1.3. This provides increased certainty of recognition.

The yellow boundary for green is now a straight vertical line of x=0.310.

The blue boundary for green is moved further from blue to the horizontal line y=0.400. This provides more separation where lights from the blue-green portion of the green area are used.

BLUE: The blue area is reduced by a half on the portion away from the green area.

WHITE: The blue and yellow boundaries of white are moved inwards to x=0.320 and x=0.440, respectively. The blue boundary in CIE S 004/E-2001 is at x=0.300 but the Visual Aids Working Group concluded that the blue boundary at x=0.320 is more appropriate for greater certainty of recognition from blue.

The LED specification does not need a "*variable white*" because of the relative stability of colour with dimming. The "*variable white*" which follows the temperature line is only necessary for incandescent lighting whose output colour is dependent upon heating. A section variable white has nevertheless been added because many SARPs of Annex 14 Volume I refer to variable white.

YELLOW: The green boundary of yellow is moved upwards along the spectral locus to y=0.452. Thus the yellow area now includes the yellows specified by Institute of Transportation Engineers (ITE). The red boundary of yellow is moved slightly upwards away from the red area.

RED: The overall red area is the same as that of the current figure. The restrictive boundary at y=0.320 for PAPI (refer Annex 14, article 5.3.5.30) is retained, as it is for incandescent lights.

Finally, please note that the spectral locus (the outer horseshoe shaped curve) is slightly offset in the existing Annex 14 figure used as the source drawing. This will be corrected at some time in the future. For this paper the locus is manually shifted at the red and yellow so that the intersection points match that given in the associated CIE standard. The locus near blue and green is not shifted and one can discern a slight divergence between the locus and the colour boundaries.

INITIAL PROPOSAL 8

Rationale
The following modifications are intended to simplify and clarify the existing standards but not to create new ones.
While the reading and interpretation will be improved, no significant impact is expected from these modifications.

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5.4.2 Mandatory instruction signs

Note.— See Figure 5-30 for pictorial representation of mandatory instruction signs and Figure 5-32 for examples of locating signs at taxiway/runway intersections.
. . .

Characteristics
. . .

5.4.2.14 The inscription on a runway designation sign shall consist of the runway designations of the intersecting runway properly oriented with respect to the viewing position of the sign, except that a runway designation sign installed in the vicinity of a runway extremity may show the runway designation of the concerned runway extremity only.

5.4.2.15 The inscription on a category I, II, III, joint II/III or joint I/II/III ~~or joint II/III~~ holding position sign shall consist of the runway designator followed by CAT I, CAT II, CAT III, CAT II/III or CAT I/II/III ~~or CAT II/III~~, as appropriate.

5.4.2.16 The inscription on a NO ENTRY sign shall be in accordance with Figure 5-30.

5.4.2.17 The inscription on a runway-holding position sign at a runway-holding position established in accordance with 3.12.3 shall consist of the taxiway designation and a number.

5.4.2.18 Where ~~appropriate~~ installed, the ~~following~~ inscriptions/symbol of Figure 5-30 shall be used:

~~*Inscription/symbol*~~	~~*Use*~~
~~Runway designation of a runway extremity~~	~~To indicate a runway-holding position at a runway extremity~~
~~OR~~	
~~Runway designation of both extremities of a runway~~	~~To indicate a runway-holding position located at other taxiway/runway intersections or runway/runway intersections~~
~~25 CAT I (Example)~~	~~To indicate a category I runway-holding position at the threshold of runway 25~~

25 CAT II (Example)	To indicate a category II runway-holding position at the threshold of runway 25
25 CAT III (Example)	To indicate a category III runway-holding position at the threshold of runway 25
25 CAT II/III (Example)	To indicate a joint category II/III runway-holding position at the threshold of runway 25
NO ENTRY symbol	To indicate that entry to an area is prohibited
B2 (Example)	To indicate a runway-holding position established in accordance with 3.12.3

Editorial Note.— Remove existing figure 5-30.

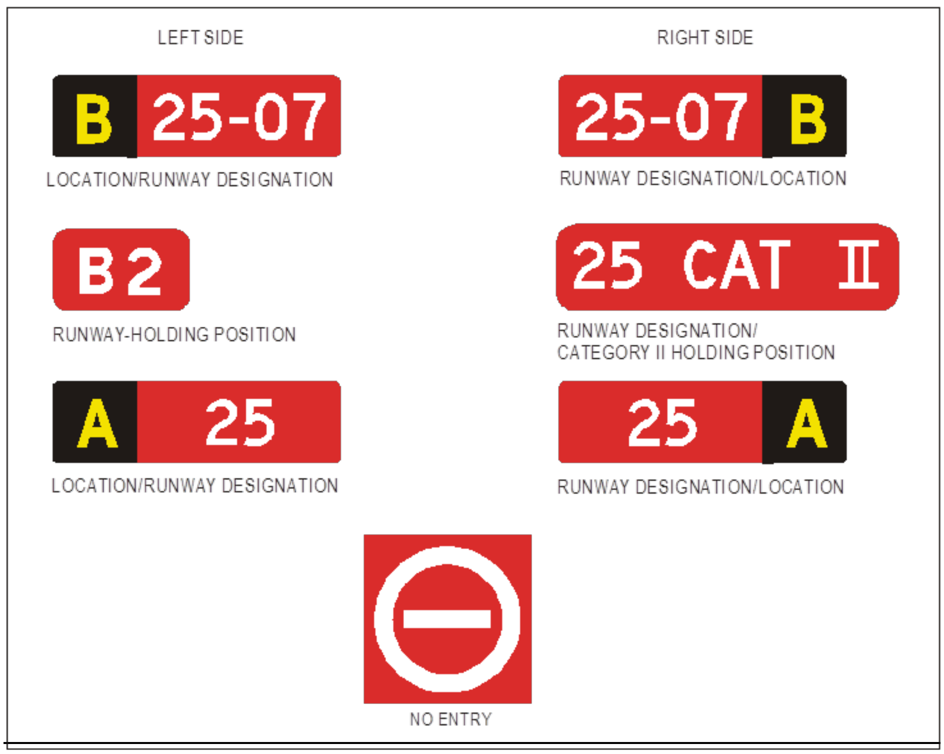


Figure 5-30. Mandatory instruction signs

Editorial Note.— Insert new Figure 5-30.

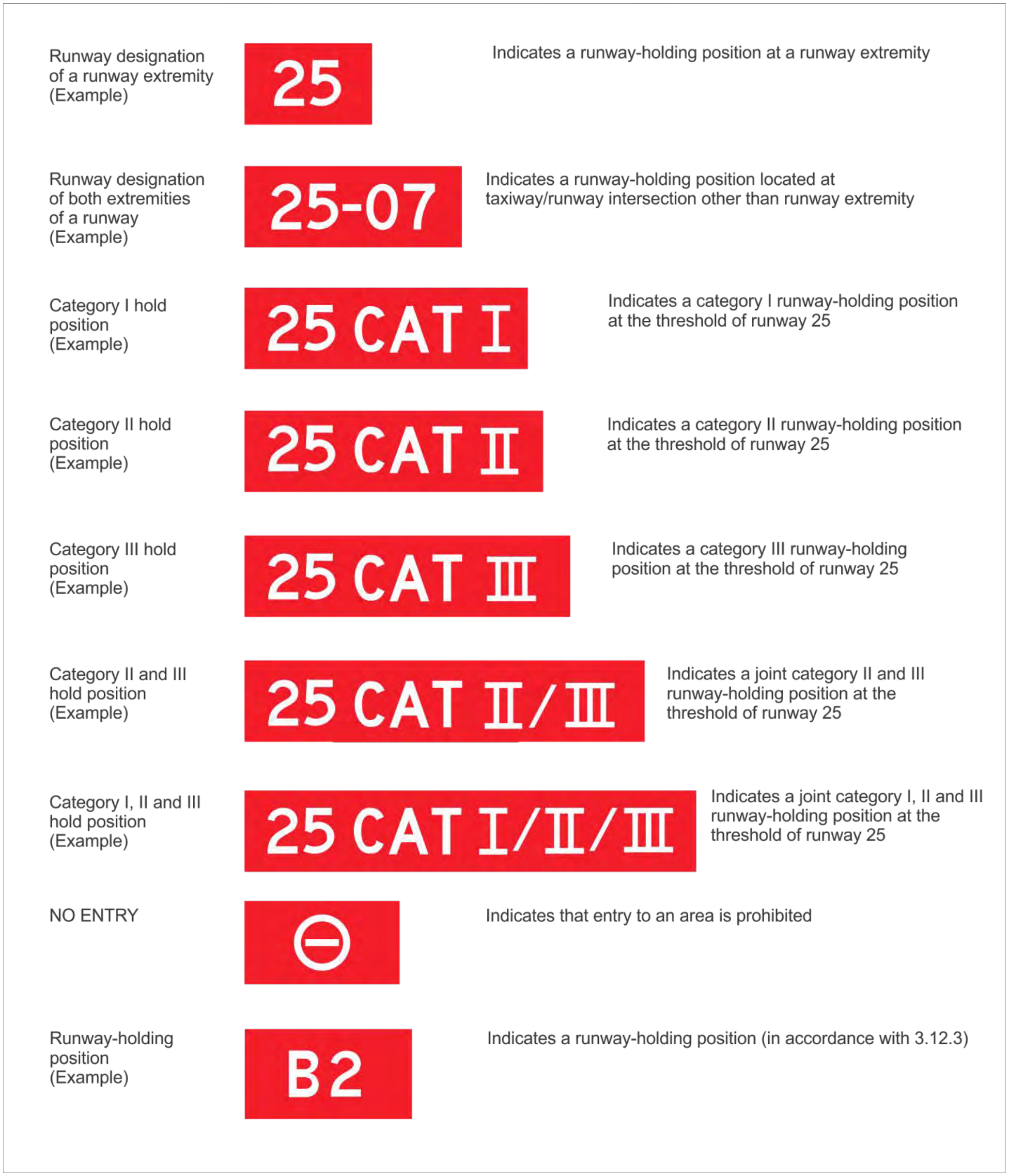


Figure 5-30. Mandatory instruction signs

Origin
VAWG/11-DP/07, APWGs/2-DP/05

Rationale
Mandatory instruction signs are described in paragraph 5.4.2 with reference to Figure 5-30 *Mandatory Instruction Signs* and Figure 5-32 *Examples of sign positions at taxiway/runway intersections*.

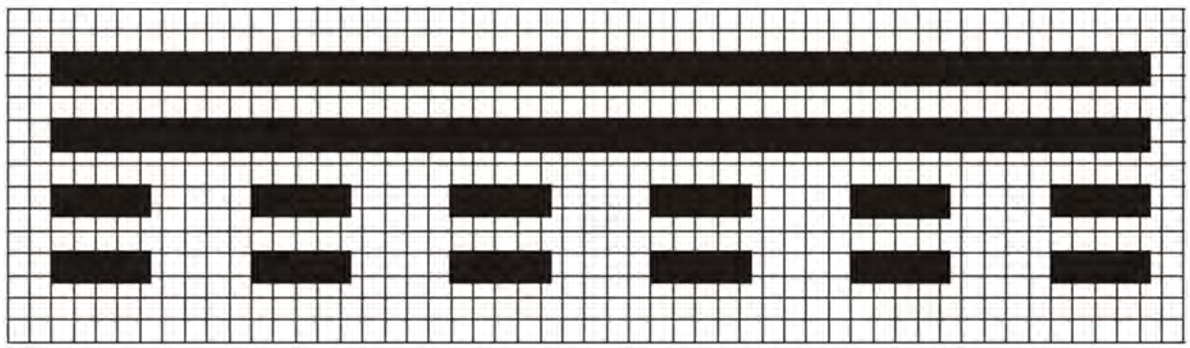
While paragraph 5.4.2.18 describes all the inscription/symbols that shall be used, Figure 5-30 shows in two columns, left side and right side, different signs. On the same line, the runway-holding position sign is on the left and the runway designation-category II holding position sign is on the right. This gives the wrong impression that these two signs should be placed on opposite sides when used.

The proposal is to replace the text description of the signs of paragraph 5.4.2.18 by a new Figure 5-30. This new presentation would remove possible confusion and illustrate the different signs.
Note: the symmetry (left side/right side) of the signs is illustrated in the examples of Figure 5-32.

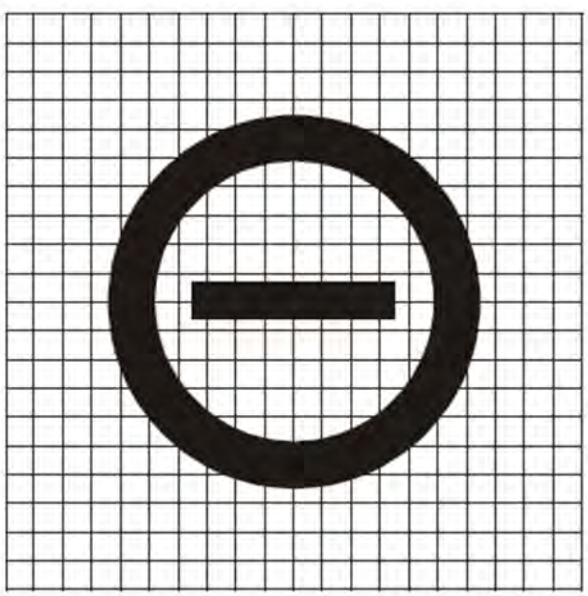
This should clarify any ambiguity with minimal cost impact.

APPENDIX 4

Editorial Note.— Remove the following existing figures for Runway vacated sign and NO-ENTRY sign.



Runway vacated sign

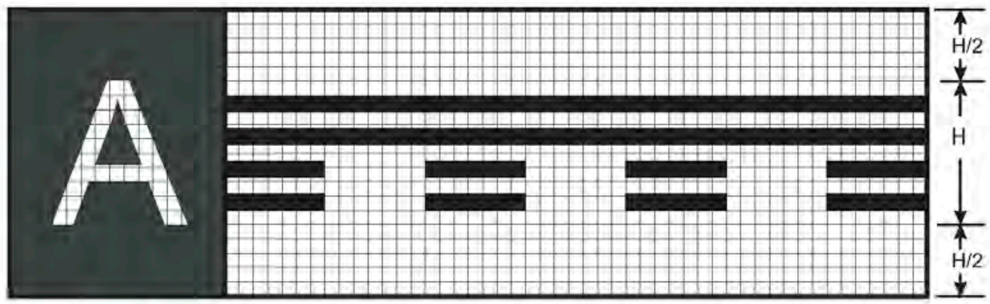


NO ENTRY sign

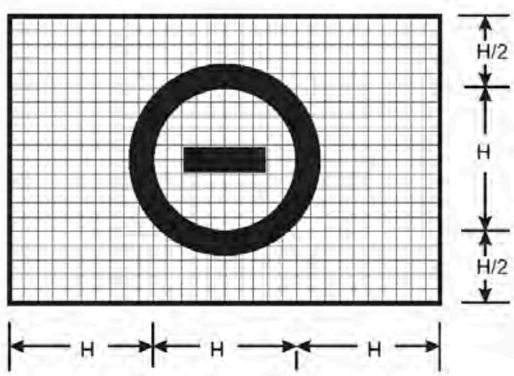
Note.— Existing NO ENTRY signs not conforming to these dimensions are to be replaced not later than 1 January 2012.

Figure A4-2. (cont.)

Editorial Note.— Insert the new figure as follows.



Runway vacated sign (with typical location sign)



NO ENTRY sign

Figure A4-3. Runway vacated and NO ENTRY signs

Editorial Note.— Delete existing figure 5-31.

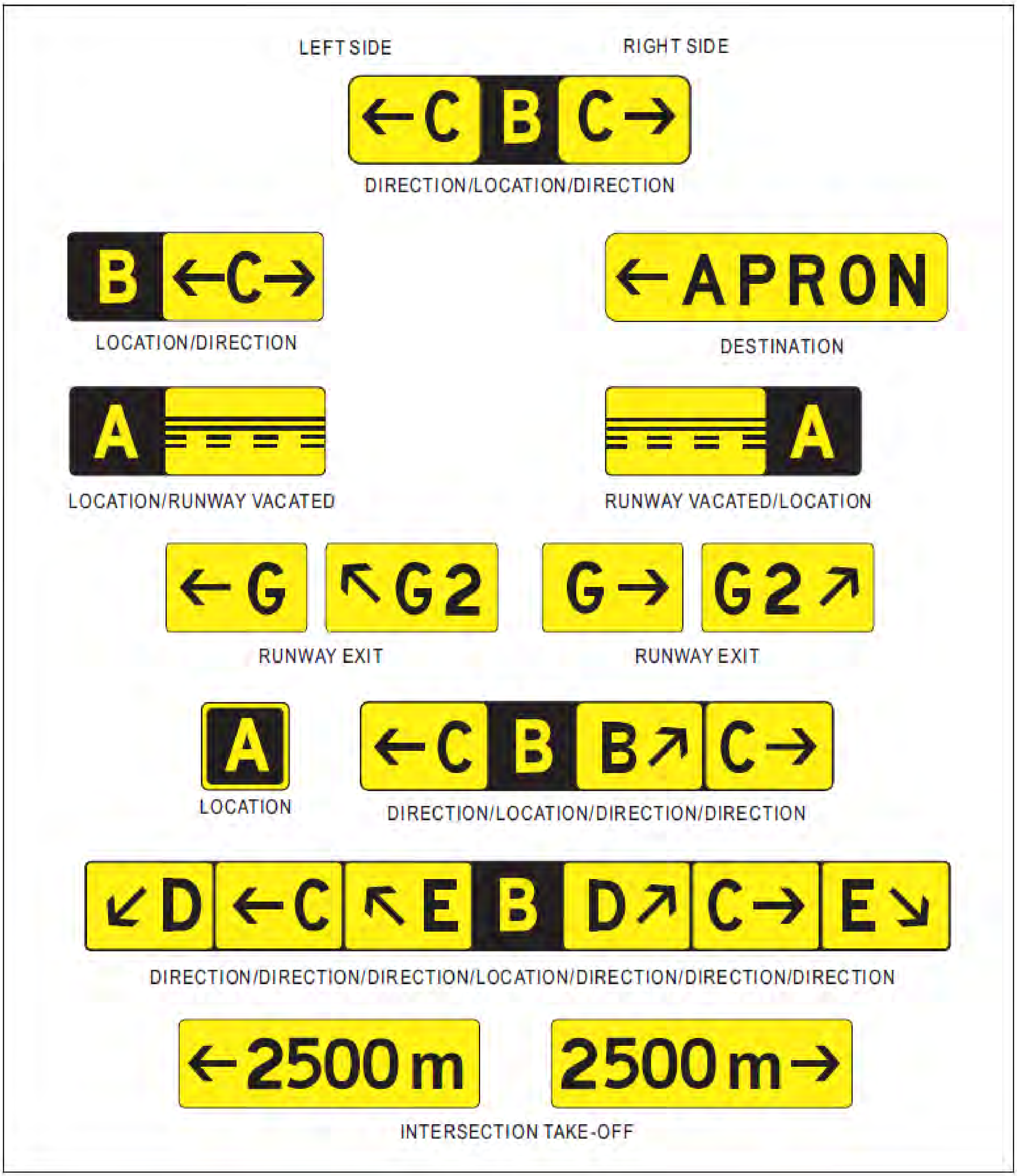


Figure 5-31. Information signs

Editorial Note.— Replace the existing Figure 5-31 with the following new Figure 5-31.

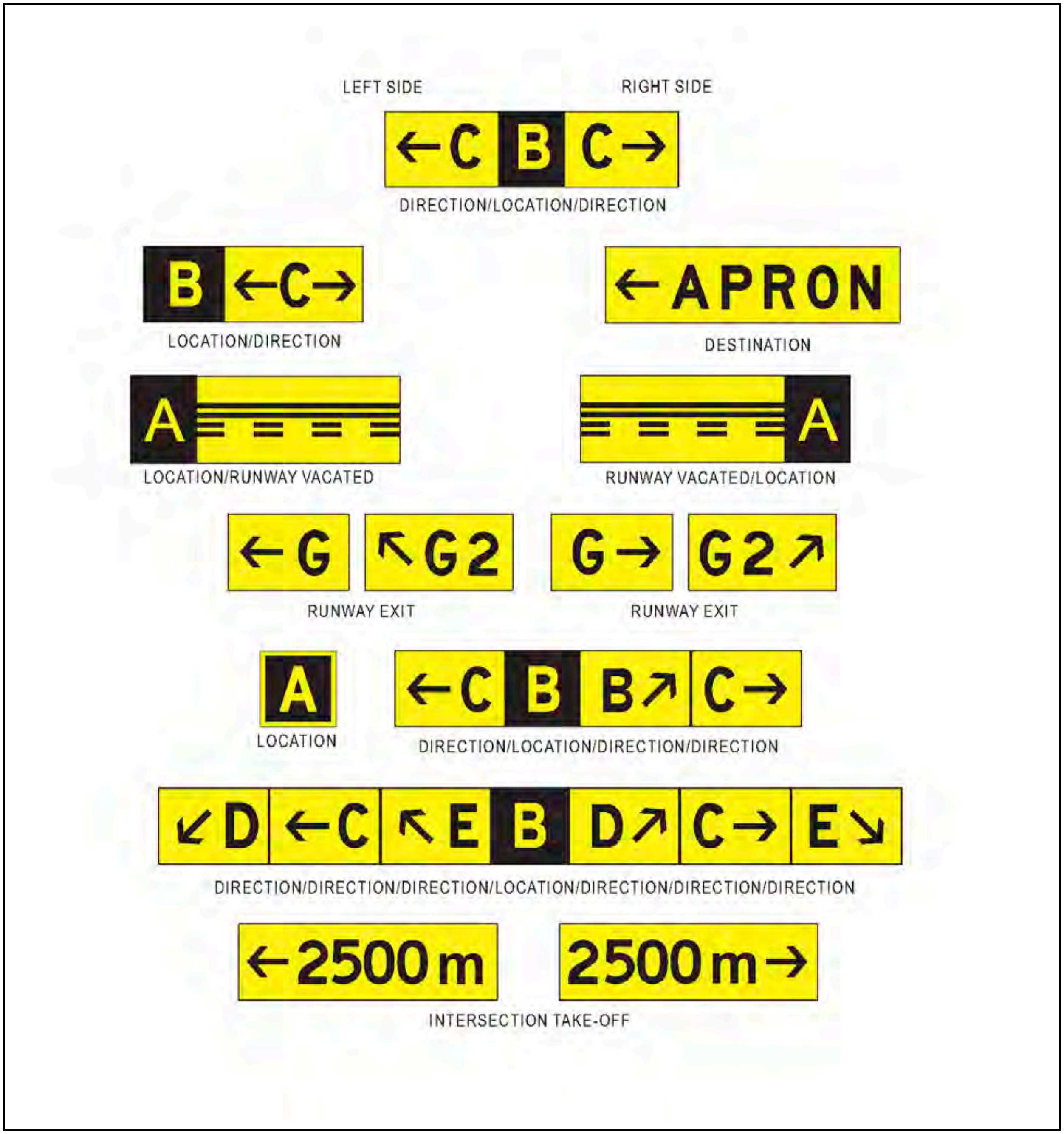


Figure 5-31. Information Signs

Origin
VAWG/11-DP/17, APWGs/2-DP/10

Rationale
The displayed pattern of Figure 5-31 (4 equal gaps) and defined pattern of Figure A4-2 (6 equal gaps) are not congruent. The same applies for the displayed and defined letter "A".

Similarly, the NO ENTRY sign for which the inscription is defined in Figure A4-2 should be rectangular but is displayed as a square sign in Figure 5-30.

It is proposed to remove both inscriptions of runway vacated and NO ENTRY from Figure A4-2 and create special figures to define the signs themselves. The standard height H is specified in each case.

The runway vacated sign in Figure 5-31 and the NO ENTRY sign in Figure 5-30 (see previous change) are changed accordingly.
Finally, Figure 5-31 is also modified to show signs with rectangular corners instead of round corners.

This proposal reconciles SARPs and practice.

Chapter 6

. . .

Table 6-5. 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°~~

Height of light unit above terrain (AGL)		Angle of the peak of the beam above the horizontal
Greater than	Not exceeding	
151 m		0°
122 m	151 m	1°
92 m	122 m	2°
	92 m	3°

. . .

Origin
VAWG/11-DP/11, APWGs/2-DP/02

Rationale
From the original table, it is unclear which value of 1 or 2 degrees is acceptable for 122 m AGL.

It is proposed to use the format of Table 6-4 to clarify the limit of each range of height. The intended value of 2 degrees is kept for 122 m AGL.

INITIAL PROPOSAL 9

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APPENDIX 2. AERONAUTICAL GROUND LIGHT CHARACTERISTICS

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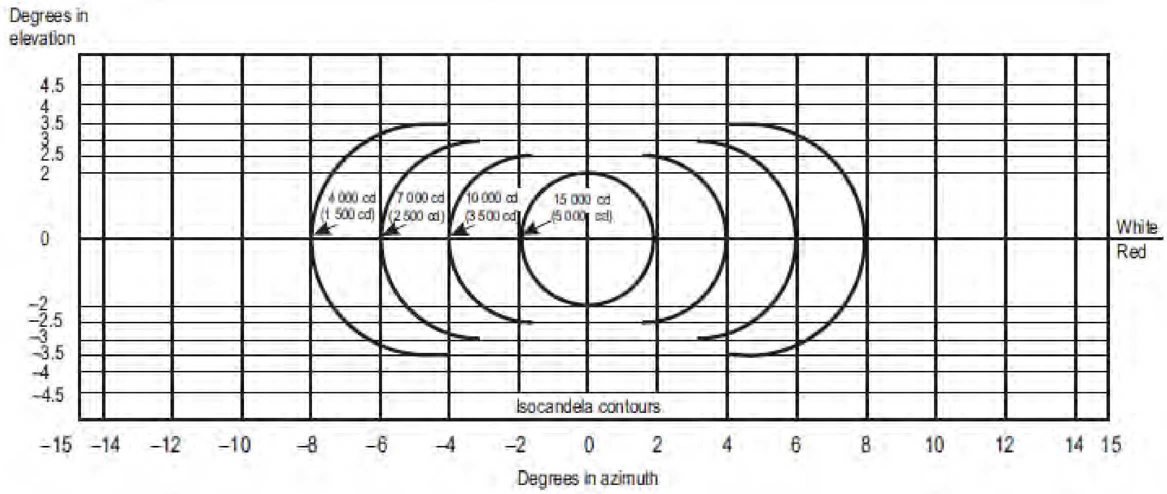
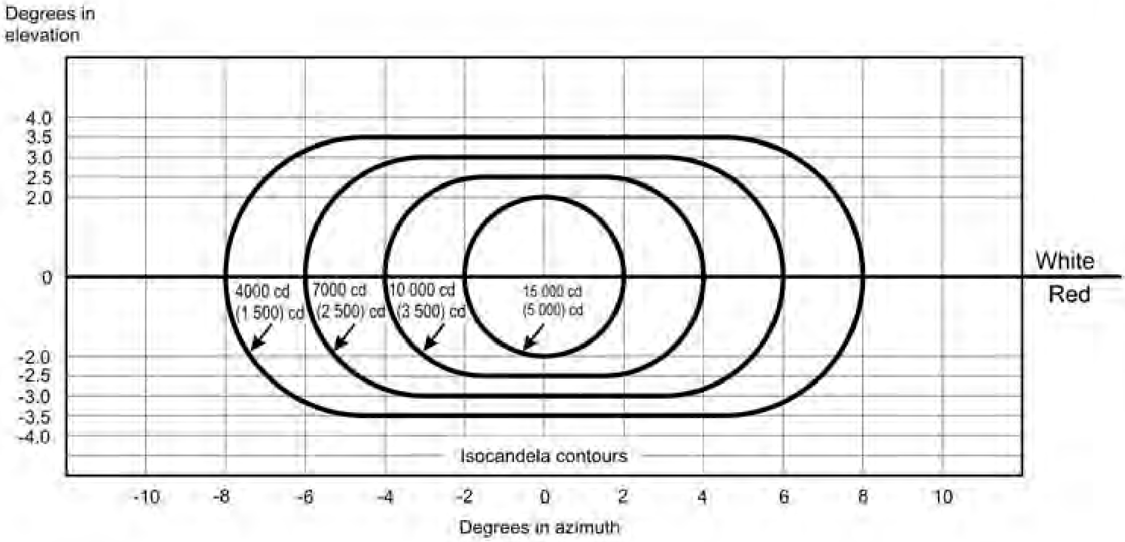


Notes:

1. These curves are for minimum intensities in red light.
2. The intensity value in the white sector of the beam is no less than 2 and may be as high as 6.5 times the corresponding intensity in the red sector.
3. The intensity values shown in brackets are for APAPI.

Figure A2-23. Light intensity distribution of PAPI and APAPI

[Existing figure in Annex 14 volume I to be deleted]



Notes:

1. These curves are for minimum intensities in red light.
2. The intensity value in the white sector of the beam is no less than 2 and may be as high as 6.5 times the corresponding intensity in the red sector.
3. The intensity values shown in brackets are for APAPI.

Figure A2-23. Light intensity distribution of PAPI and APAPI

[New figure to replace Figure A2-23]

Origin
AP/3

Rationale
The arrows and numbers in Figure A2-23 Light intensity distribution of PAPI and APAPI should point to the red area, instead of the white area. This modification clarifies the figure with no impact.

INITIAL PROPOSAL 10

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CHAPTER 6. VISUAL AIDS FOR DENOTING OBSTACLES

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6.2.4 Wind turbines

6.2.4.1 A wind turbine shall be marked and/or lighted if it is determined to be an obstacle.

Note 1 — Additional lighting or markings may be provided where in the opinion of the State such lighting or markings are deemed necessary.

Note 2.— See 4.3.1 and 4.3.2.

Markings

~~6.2.4.1 A 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.*~~

6.2.4.2 **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

6.2.4.3 **Recommendation.—** *When lighting is deemed necessary~~, medium intensity obstacle lights should be used. I~~in the case of a wind farm, i.e. a group of two or more wind turbines, ~~it~~ the wind farm 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 6.2.3.15, 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 throughout the wind farm; ~~and~~*
- *d) so that, within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located~~.~~; and*
- *e) at locations prescribed in a), b) and d):*
  - *i) for wind turbines of less than 150 m in overall height (hub height plus vertical blade height), medium intensity lighting on the nacelle.*
  - *ii) for wind turbines from 150 m to 315 m in overall height, in addition to the medium intensity light installed on the nacelle, a second light serving as an alternate should be provided in case of failure of the operating light. The lights should be installed to assure that the output of either light is not blocked by the other.*
  - *iii) in addition, for wind turbines from 150 m to 315 m in overall height, an intermediate level at half the nacelle height of at least 3 low intensity Type E lights, as specified in 6.2.1.3,*

that are configured to flash at the same rate as the light on the nacelle. If an aeronautical study shows that low intensity type E lights are not suitable, low-intensity type A or B lights may be used.

Note.— The above 6.2.4.3 e) does not address wind turbines of more than 315 m of overall height. For such wind turbines, additional marking and lighting may be required as determined by an aeronautical study.

6.2.4.4 **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.*

6.2.4.5 **Recommendation.—** *Where lighting is deemed necessary for a single wind turbine or short line of wind turbines, the installation should be in accordance with 6.2.4.3(e) or as determined by an aeronautical study.*

Table 6-1. Characteristics of obstacle lights

1	2	3	4	5	6	7
			Peak intensity (cd) at given Background Luminance (b)			
Light Type	Colour	Signal type/ (flash rate)	Day (Above 500 cd/m^2)	Twilight (50-500 cd/m^2)	Night (Below 50 cd/m^2)	Light Distribution Table
Low-intensity, Type A (fixed obstacle)	Red	Fixed	N/A	N/A	10	Table 6-2
Low-intensity, Type B (fixed obstacle)	Red	Fixed	N/A	N/A	32	Table 6-2
Low-intensity, Type C (mobile obstacle)	Yellow/Blue (a)	Flashing (60-90 fpm)	N/A	40	40	Table 6-2
Low-intensity, Type D (follow-me vehicle)	Yellow	Flashing (60–90 fpm)	N/A	200	200	Table 6-2
Low-intensity, Type E	Red	Flashing (c)	N/A	N/A	32	Table 6-2 (type B)
Medium-intensity, Type A	White	Flashing (20–60 fpm)	20 000	20 000	2 000	Table 6-3
Medium-intensity, Type B	Red	Flashing (20–60 fpm)	N/A	N/A	2 000	Table 6-3
Medium-intensity, Type C	Red	Fixed	N/A	N/A	2 000	Table 6-3
High-intensity, Type A	White	Flashing (40–60 fpm)	200 000	20 000	2 000	Table 6-3
High-intensity, Type B	White	Flashing (40–60 fpm)	100 000	20 000	2 000	Table 6-3

a) See 6.2.2.6

b) For flashing lights, effective intensity as determined in accordance with the *Aerodrome Design Manual* (Doc 9157), Part 4.

c) For wind turbine application, to flash at the same rate as the lighting on the nacelle

Origin

VAWG/10-DP/13, VAWG/11-DP/05, APWGs/2-DP/07

Rationale

The standards for wind turbines were developed at a time when the overall height (nacelle plus vertical blade) of wind turbines was less than 150 m. The advent of wind turbines of more than 150 m necessitates that these be addressed in revised standards.

6.2.4.1 is moved up to be generic. The provisions are considered as minimal requirements, and additional lighting may be provided if deemed necessary (note 1).

Because the articles are written with respect to numerous wind turbines in a wind farm, article 6.2.4.5 provides a recommendation in the case of a single wind turbine or a short line of wind turbines.

At least one State in the subgroup suggested that for wind turbines over 150 m the blades and nacelle should be marked by orange or red banding. This proposal retains the current specification that the wind turbine is to be painted white for day protection.

For 6.2.4.3, the subject is now wind farms. The present definition of a wind farm (i.e., two or more wind turbines) is retained.

For the introduction to 6.2.4.3 the text "*medium-intensity obstacle lights should be used*" is removed, because the type of lighting is given in 6.2.4.3 d).

In as much as lights of sufficient intensity cannot in practicality be installed on the blade tips, the revision considers augmenting the nacelle lighting and the addition of an intermediate level of low intensity lighting.

In the case of nacelle lighting, for wind turbines of more than 150 m, one of the lights may be on standby. The issue of redundancy is related to the whole installation and not the source (incandescent or LED) of light used. The mounting is such that the lights are physically on top of each other so that the standby light does not obstruct the output of the operational light.

Low intensity lighting is installed at an intermediate point on the support mast. These lights are made to flash at the same rate as the nacelle light. This increases their conspicuity, and the use of a flashing mode would reduce avian fatalities. But States may consider using steady lights, already used in several countries without report of safety issues.

The specification ends at 315 m. It is considered that wind turbines of more than 315 m would require a different approach for protection.

INITIAL PROPOSAL 11

5.3.5 Visual approach slope indicator system

. . .

5.3.5.45 Where an aeronautical study indicates that an existing object extending above an obstacle protection surface (OPS) could adversely affect the safety of operations of aeroplanes one or more of the following measures shall be taken:

a) remove the object
b) ~~a)~~ suitably raise the approach slope of the system;
c) ~~b)~~ reduce the azimuth spread of the system so that the object is outside the confines of the beam;
d) ~~c)~~ displace the axis of the system and its associated obstacle protection surface by no more than 5°;
~~d) suitably displace the threshold; and~~
e) ~~where d) is found to be impracticable,~~ suitably displace the system upwind of the threshold ~~to provide an increase in threshold crossing height equal to the height of the object penetration.~~ such that the object no longer penetrates the OPS.

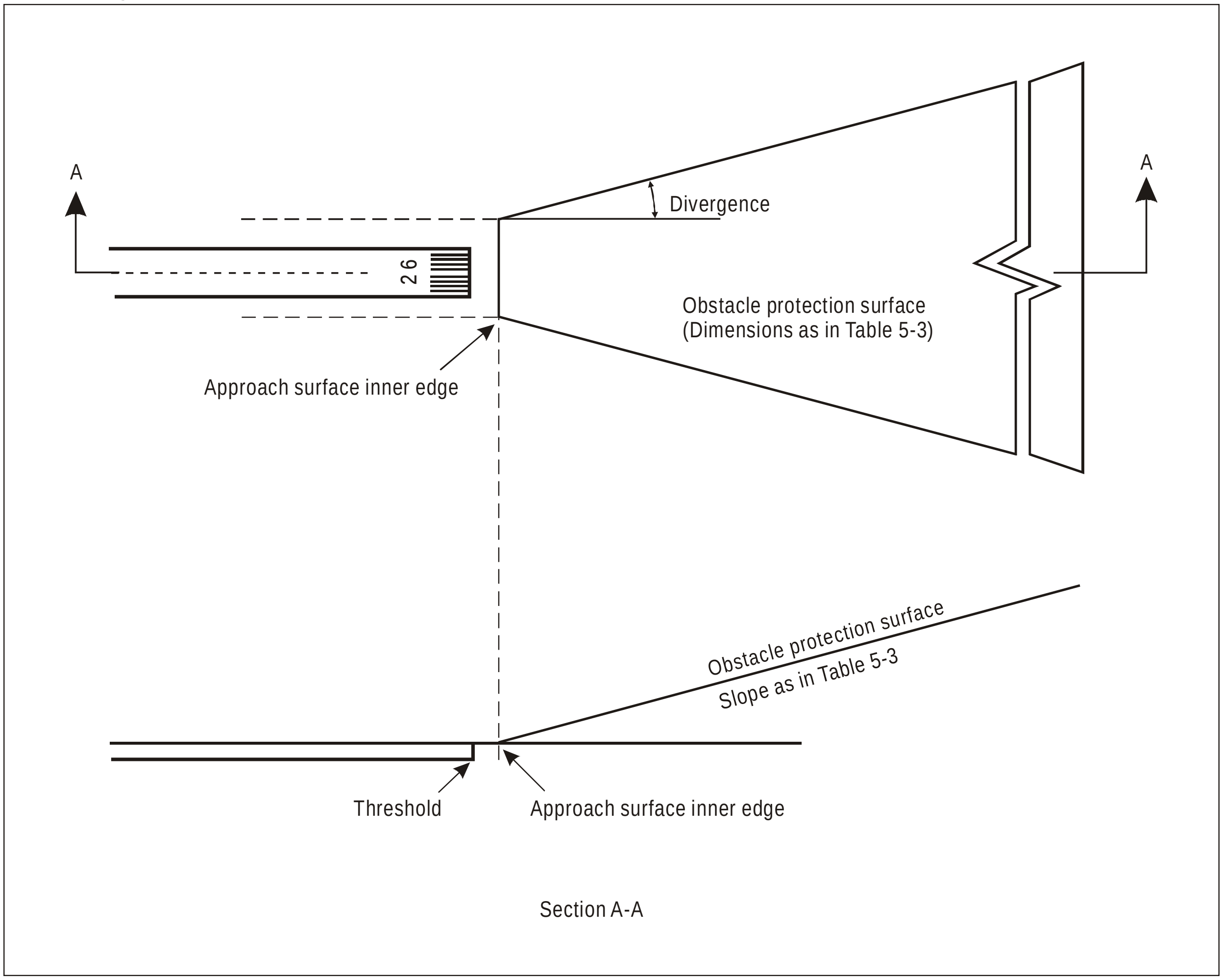
Note.— Guidance on this issue is contained in the Aerodrome Design Manual *(Doc 9157), Part 4.*

Table 5-3. Dimensions and slopes of the obstacle protection surface

	Runway type/code number								
	Non-instrument Code number					Instrument Code number			
Surface dimensions	1	2	3	4		1	2	3	4
Length of inner edge	60 m	80 m(a)	150 m	150 m		150 m	150 m	300 m	300 m
Distance from ~~threshold~~ the visual approach slope indicator system (e)	D_1+30 m ~~30 m~~	D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~		D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~
Divergence (each side)	10%	10%	10%	10%		15%	15%	15%	15%
Total length	7 500m	7 500m(b)	15 000m	15 000m		7 500m	7 500m(b)	15 000m	15 000m
Slope a) T-VASIS and AT-VASIS	–(c)	1.9°	1.9°	1.9°		–	1.9°	1.9°	1.9°
b) PAPI(d)	–	A–0.57°	A–0.57°	A–0.57°		A–0.57°	A–0.57°	A–0.57°	A–0.57°
c) APAPI(d)	A–0.9°	A–0.9°	–	–		A–0.9°	A–0.9°	–	–

a. This length is to be increased to 150 m for a T-VASIS or AT-VASIS.
b. This length is to be increased to 15 000 m for a T-VASIS or AT-VASIS.
c. No slope has been specified if a system is unlikely to be used on runway type/code number indicated.
d. Angles as indicated in Figure 5-20.
e. D1 is the distance of the visual approach slope indicator system from threshold prior to any displacement to remedy object penetration of the OPS (refer Figure 5-19). The start of the OPS is fixed to the visual approach slope indicator system location, such that displacement of the PAPI results in an equal displacement of the start of the OPS. See 5.3.5.45(e)

[Current Figure 5-21 to be deleted]



[Revised Figure 5-21]

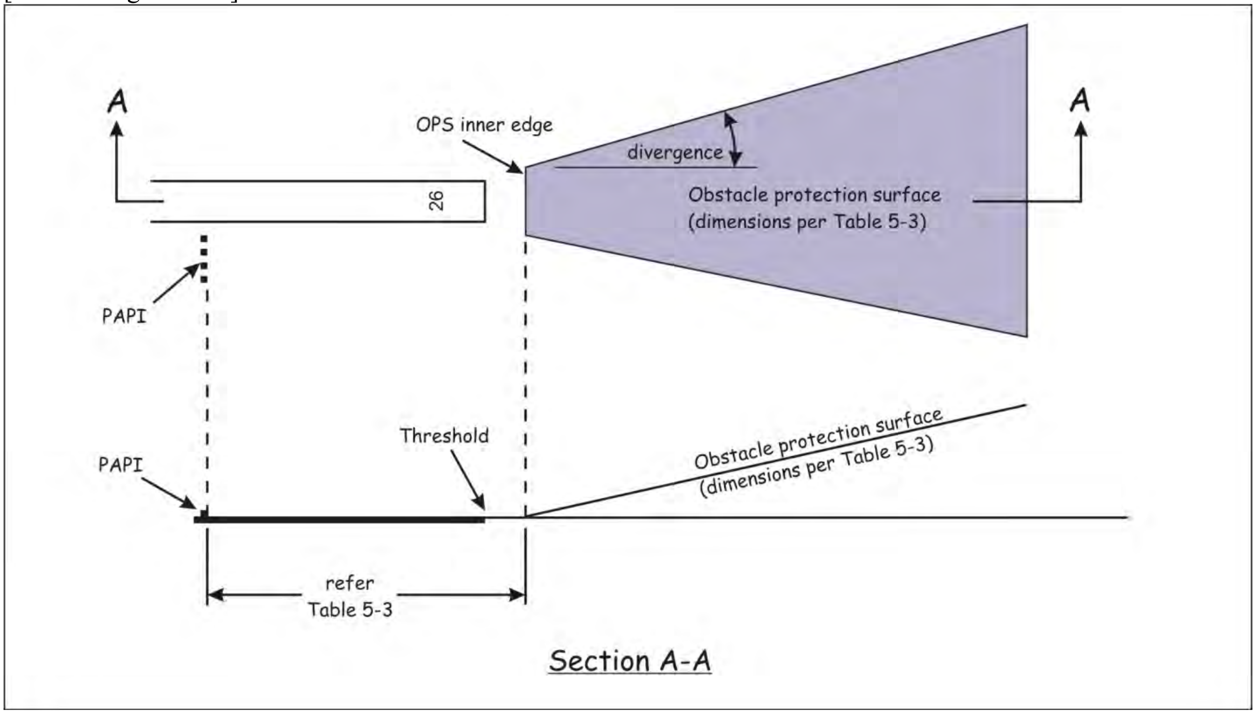


Figure 5-21. Obstacle protection surface for visual approach slope indicator systems

Origin

VAWG/10-DP/12, VAWG/11-DP/12, APWGs/2-DP/04

Rationale

The above amendments are for the purpose of facilitating a correct means to remedy a penetration of the OPS by fixing the start of the OPS to the location of the PAPI. The principle of this amendment already exists in Annex 14, i.e., to move the OPS with the PAPI, albeit the criteria of movement given in 5.3.5.45 is incorrect. The correct movement of PAPI is introduced.

The order of listing of remedies in 5.3.5.45 is by priority. Removing the object should be the first possible remedy. Displacing the threshold is no longer a primary mean of solving the penetration problem and has been removed.

The note (e) to Table 5-3 is necessary to point out that the distance *D1* is that obtained prior to movement to remedy an object penetration (*D1* is calculated to provide the required MEHT, refer Figure 5-19). Once *D1* is known, it becomes a constant. If this statement is not made, the user might interpret *D1* to be the distance of the PAPI from threshold after movement and thus, in effect, the OPS remains at its original distance downwind of the threshold and there is no movement.

INITIAL PROPOSAL 12

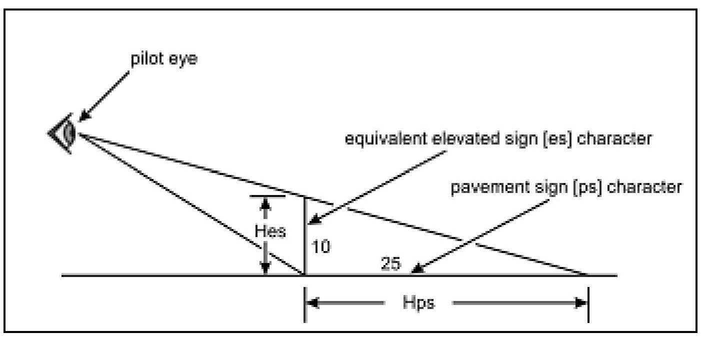
APPENDIX 3. MANDATORY INSTRUCTION MARKINGS AND INFORMATION MARKINGS

Note 1.— See Chapter 5, Sections 5.2.16 and 5.2.17, for specifications on the application, location and characteristics of mandatory instruction markings and information markings.

Note 2.— This appendix details the form and proportions of the letters, numbers and symbols of mandatory instruction markings and information markings on a ~~20 cm~~ grid.

Note 3. — The mandatory instruction markings and information markings on pavements are formed as if shadowed (i.e., stretched) from the characters of an equivalent elevated sign by a factor of 2.5 as shown in the figure below. The shadowing, however, only affects the vertical dimension. Therefore, the spacing of characters for pavement marking is obtained by first determining the equivalent elevated sign character height and then proportioning from the spacing values given in Table A4-1.

*For example, in the case of the runway designator "10" which is to have a height of 4 000 mm (Hps), the equivalent elevated sign character height is 4 000/2.5=1 600 mm (Hes). Table A4-1(b) indicates numeral to numeral code 1 and from Table A4-1(c) this code has a dimension of 96 mm, for a character height of 400 mm. The pavement marking spacing for "10" is then (1 600/400)*96=384 mm.*



Origin

VAWG/10-DP/02, VAWG/11-DP/02, APWGs/2-DP/16

Rationale

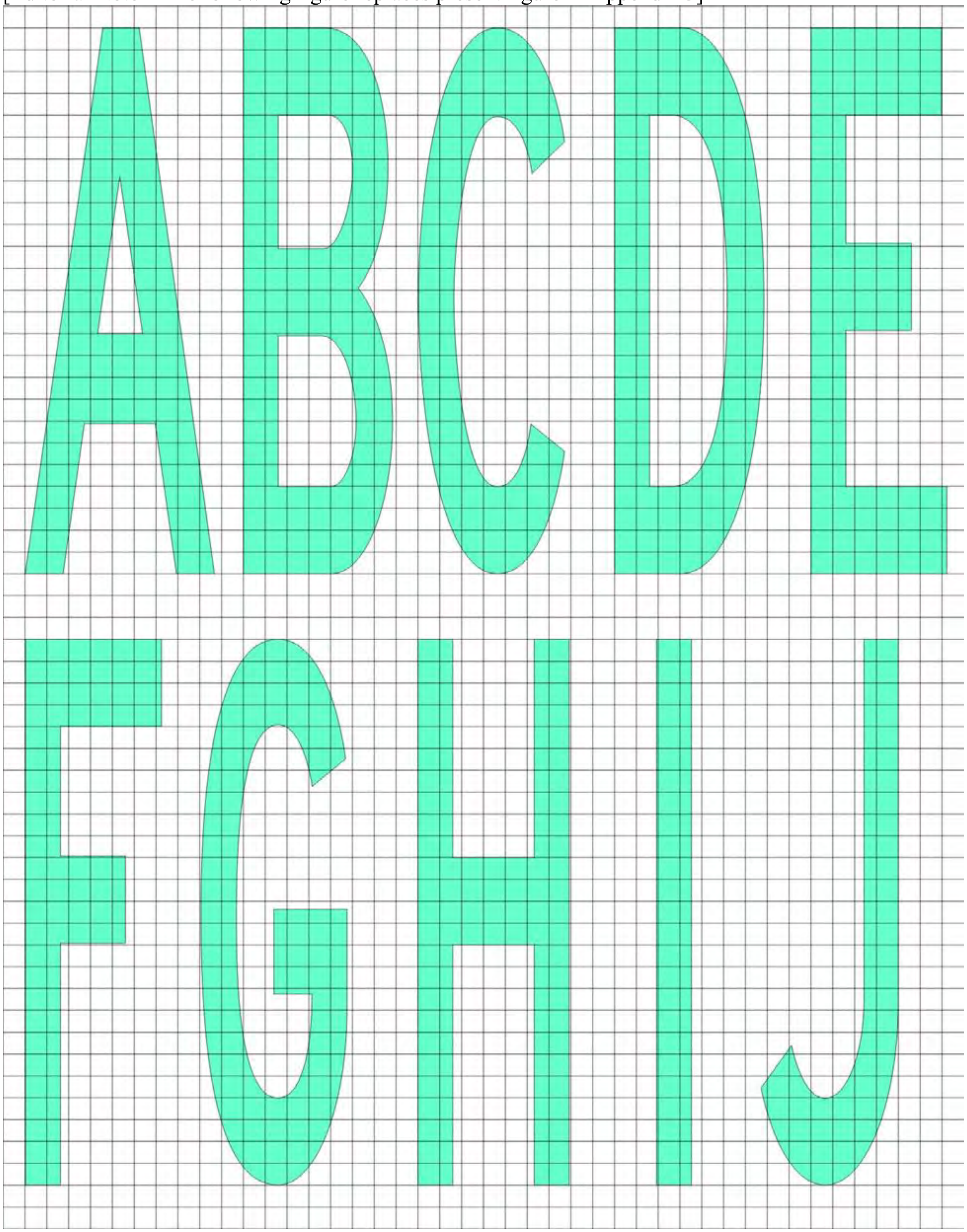
Annex 14, Appendix 3, introduces specifications for pavement sign characters – character set on a grid – but does not provide criteria for the spacing of the characters. For elevated guidance signs, the spacing is given in Table A4-1(c) for particular character codes. This proposal gives an explicit method of computing the spacing between pavement sign markings, based on the one used for elevated signs.

An explicit example of calculation of spacing is given and a figure is provided for further clarity.

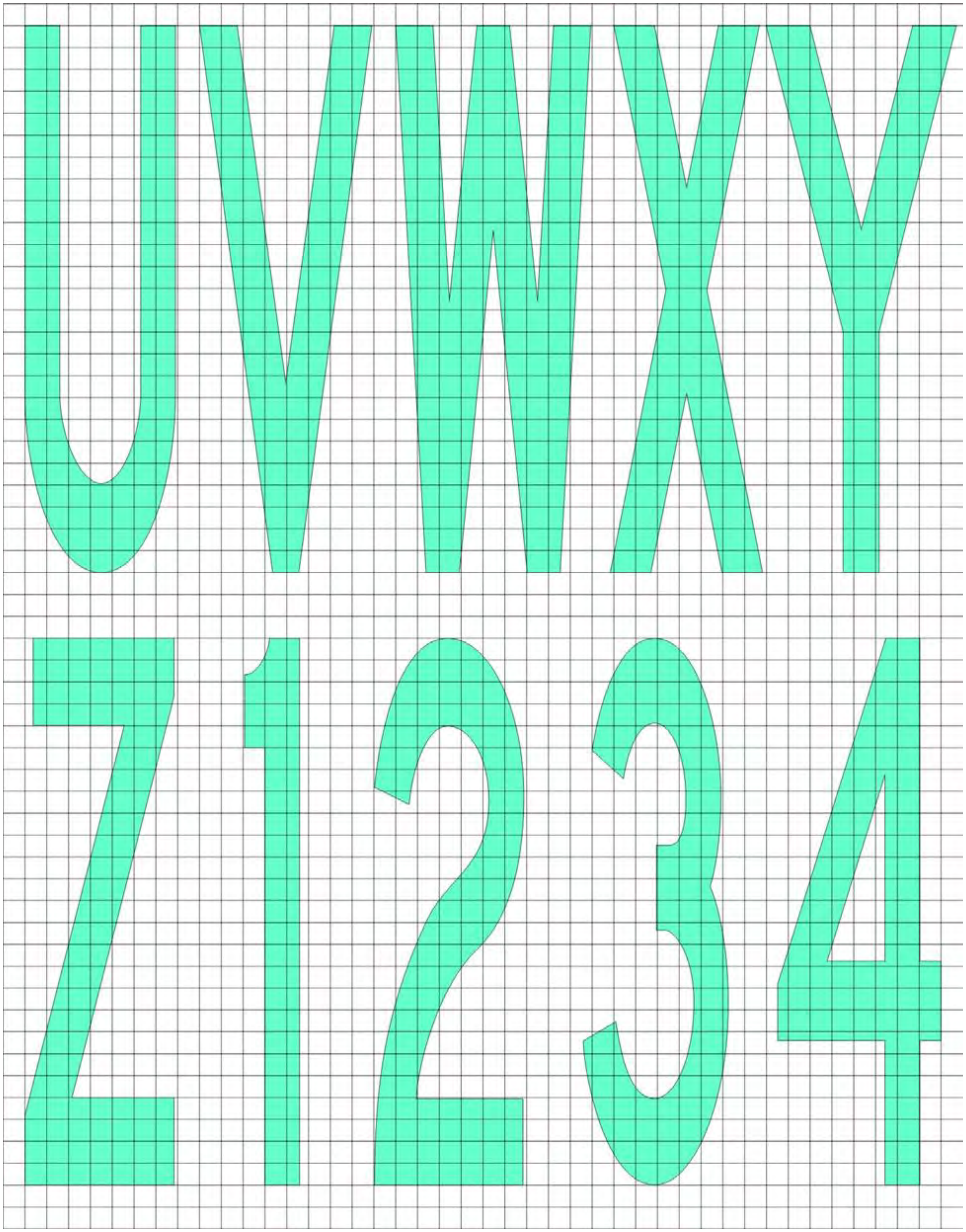
For the grid, as for elevated sign characters in Appendix 4, it is suggested to remove the reference to the dimension of 20 cm and to use a 25 squares height instead of present 20 for ease of conversion.

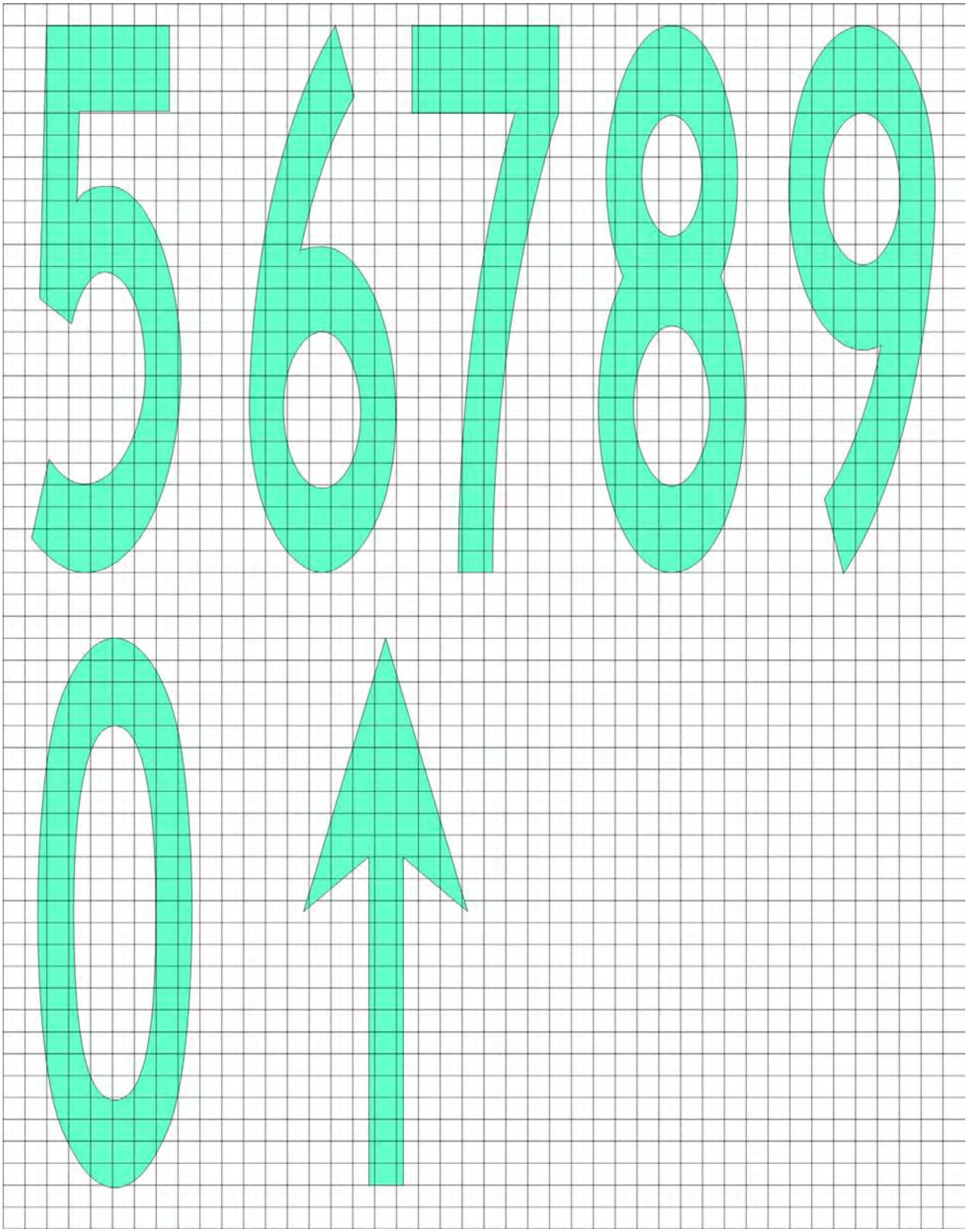
The size of the marking characters is not modified. The cost impact should be minimal.

[Editorial Note – The following figure replaces present figure in Appendix 3]




KLMNO
PQRST


UVWXY
Z1234



INITIAL PROPOSAL 13

CHAPTER 1. GENERAL

….

1.1 Definitions

….

Foreign Object Debris (FOD). An inanimate object within the movement area which has no operational or aeronautical function and which has the potential to be a hazard to aircraft operations.

Origin: AP-WG-WHL/7, AOSWGs/10 to 13, PASG/5, APWG/2, EUROCAE WG/83, FAA AC 150/5210-24

Rationale

The term Foreign Object Debris (FOD) has been precisely defined, notably, to make a clear distinction from wildlife. This is also necessary to introduce the section on FOD Control which is being introduced with the development of PANS Aerodromes 2nd Edition. Initial draft PANS material is under review by the PANS Aerodrome Study Group.

CHAPTER 10. AERODROME MAINTENANCE

….

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~~ foreign object debris (FOD) that might cause damage to aircraft or impair the operation of aircraft systems.

….

Note 2.— ~~Guidance~~ Procedures on carrying out daily inspections of the movement area and control of FOD ~~is~~ are given in the ~~Airport Services Manual *(Doc 9137), Part*~~ *8, PANS-Aerodromes (Doc 9981), 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).*

Rationale
Part of referenced information in Doc 9137 ASM Part 8 is proposed to be moved to *PANS-Aerodromes* (Doc 9981), specific reference to be included later.

INITIAL PROPOSAL 14

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

Origin
AP/2, AOSWG/13, AIS AIM SG/8, APWG/2

Rationale
Whilst approving the inclusion of provisions on aerodrome mapping data in ICAO material, guidance was requested on the determination of aerodromes eligible for collection of aerodrome mapping data features. The purpose is to have ICAO criteria for prioritisation of AMDB implementation.
The draft guidance has been developed in coordination between the AIS AIM SG and the AOSWG, as requested in the AP/2 Report recommendation 6/1 and paragraph 6.7.

22. Aerodrome mapping data

22.1 Introduction

Chapter 2, 2.1.2 and 2.1.3, contain provisions related to the provision of aerodrome mapping data. The aerodrome mapping data features are collected and made available to the aeronautical information services for aerodromes designated by States with consideration of the intended applications. These applications are closely tied to an identified need and operational use where the application of the data would provide a safety benefit or could be used as mitigation to a safety concern.

22.2 Applications

22.2.1 Aerodrome mapping data include aerodrome geographic information that support applications which improve the use r's situational awareness or supplement surface navigation, thereby increasing safety margins and operational efficiency. With appropriate data element accuracy, these data sets support collaborative decision making, common situational awareness, and aerodrome guidance applications. The data sets are intended to be used in the following air navigation applications:

a) on-board positioning and route awareness including moving maps with own aircraft position, surface guidance and navigation;

b) traffic awareness including surveillance and runway incursion detection and alerting (such as respectively in A-SMGCS levels 1 and 2);

c) ground positioning and route awareness including situational displays with aircraft and vehicles position and taxi route, surface guidance and navigation (such as A-SMGCS levels 3 and 4);

d) facilitation of aerodrome-related aeronautical information, including NOTAMs;

e) resource and aerodrome facility management; and

f) aeronautical chart production.

22.2.2 The data may also be used in other applications such as training / flight simulators and on-board or ground enhanced vision systems (EVS), synthetic vision systems (SVS) and combined vision systems (CVS).

22.3 Determination of aerodromes to be considered for collection of aerodrome mapping data features

22.3.1 In order to determine which aerodromes may make use of applications requiring the collection of aerodrome mapping data features, the following aerodrome characteristics may be considered:

- safety risks at the aerodrome ;
- visibility conditions ;
- aerodrome layout ; and
- traffic density.

Note.— Further guidance on aerodrome mapping data can be found in Doc 9137, *Airport Services Manual*, Part 8 — *Airport Operational Service.*

INITIAL PROPOSAL 15

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

…

5. Runway surface evenness

5.1 In adopting tolerances for runway surface irregularities, the following standard of construction is achievable for short distances of 3 m and conforms to good engineering practice:

> Except across the crown of a camber or across drainage channels, the finished surface of the wearing course is to be of such regularity that, when tested with a 3 m straight-edge placed anywhere in any direction on the surface, there is no deviation greater than 3 mm between the bottom of the straight-edge and the surface of the pavement anywhere along the straight-edge.

5.2 Caution should also be exercised when inserting runway lights or drainage grilles in runway surfaces to ensure that adequate smoothness of the surface is maintained.

5.3 The operation of aircraft and differential settlement of surface foundations will eventually lead to increases in surface irregularities. Small deviations in the above tolerances will not seriously hamper aircraft operations. In general, isolated irregularities of the order of 2.5 cm to 3 cm over a 45 m distance are ~~tolerable~~ acceptable, as shown in Figure A-3. Although maximum acceptable deviations vary with the type and speed of an aircraft, the limits of acceptable surface irregularities can be estimated to a reasonable extent. The following table describes ~~maximum~~ acceptable and ~~temporarily acceptable~~ tolerable limits~~. If the maximum limits are exceeded, corrective action should be undertaken as soon as reasonably practicable to improve the ride quality. If the temporarily acceptable limits are exceeded, the portions of the runway that exhibit such roughness should have corrective measures taken immediately if aircraft operations are to be continued.~~:

a) if the irregularities exceed the acceptable limit but are less than the tolerable limit, corrective action should be undertaken as soon as reasonably practicable to improve the surface condition. The runway may remain in service; and
b) if the irregularities exceed the tolerable limit, the area of the runway where the roughness has been identified warrants closure until repairs are made to restore the condition to within the acceptable limit and the aircraft operators may be advised accordingly.

Surface Irregularity	~~Minimum acceptable l~~Length of irregularity (m)								
	3	6	9	12	15	20	30	45	60
~~Maximum surface irregularity height (or depth) (cm)~~	~~3~~	~~3.5~~	~~4.0~~	~~5~~	~~5.5~~	~~6.0~~	~~6.5~~	~~8.0~~	~~10~~
~~Temporary acceptable~~ Maximum acceptable surface irregularity height (or depth) (cm)	~~3.5~~ 3.9	5.5	~~6.5~~ 6.8	~~7.5~~ 7.8	~~8.0~~ 8.6	~~9.0~~ 9.6	11	~~13.0~~ 13.6	~~15~~ 16
Maximum tolerable surface irregularity height (or depth) (cm)	5.8	7.6	9.1	10	10.8	11.9	13.9	17	20

Note that “surface irregularity” is defined herein to mean isolated surface elevation deviations that do not lie along a uniform slope through any given section of a runway. For the purposes of this concern, a “section of a runway” is defined herein to mean a segment of a runway throughout which a continuing general uphill, downhill or flat slope is prevalent. The length of this section is generally between 30 and 60 metres, and can be greater, depending on the longitudinal profile and the condition of the pavement.

The maximum permissible step type bump, such as that which could exist between adjacent slabs, is simply the bump height corresponding to zero bump length at the upper end of the acceptable region of the roughness criteria of Figure A-3. The bump height at this location is 1.75 cm.

5.4 Figure A-3 illustrates a comparison of the surface roughness criteria with those developed by the United States Federal Aviation Administration. Further guidance can be found in *Aerodrome Design Manual*, Part 3 — *Pavements* (Doc 9157).

5.5 Deformation of the runway with time may also increase the possibility of the formation of water pools. Pools as shallow as approximately 3 mm in depth, particularly if they are located where they are likely to be encountered at high speed by landing aeroplanes, can induce aquaplaning, which can then be sustained on a wet runway by a much shallower depth of water. Improved guidance regarding the significant length and depth of pools relative to aquaplaning is the subject of further research. It is, of course, especially necessary to prevent pools from forming whenever there is a possibility that they might become frozen.

Origin
AP/1, AP-WG-WHL/7, AOSWGs/10 to 13, AP-WGs/2

Rationale
The revision to the table is to correct the surface irregularity bump heights corresponding to the applicable minimum lengths. Additionally, data was added to define the unacceptable region of the roughness criteria, thereby aiding in the planning or undertaking of any corrective actions which may be required for a pavement.
Guidance is now provided for step type bumps which typically are found on rigid pavements that have undergone some differential settlement. A minor correction was made to Figure A-3 regarding the FAA smoothness criteria for new construction

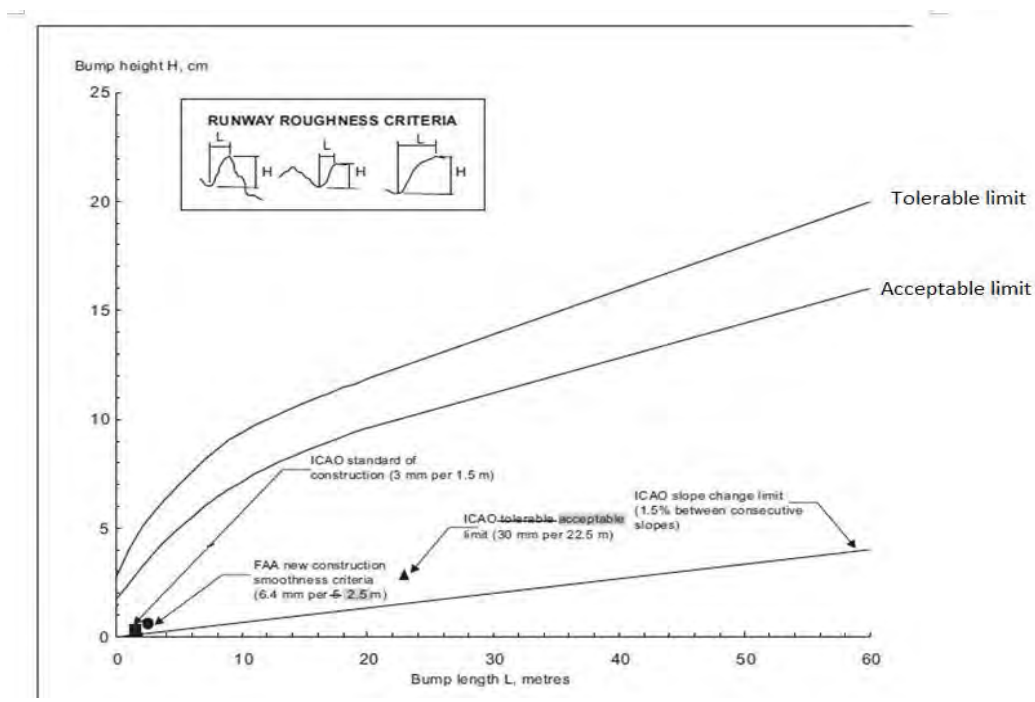


Figure A-3. Comparison of roughness criteria

Note.— These criteria address single event roughness, not long wavelength harmonic effects nor the effect of repetitive surface undulations.

— — — — — — — —

APPENDIX B to State letter AN 4/1.1.54-14/97

PROPOSED AMENDENT TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

HELIPORTS

ANNEX 14, VOLUME II

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

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

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:

1.	~~Text to be deleted is shown with a line through it~~.	text to be deleted
2.	New text to be inserted is highlighted with grey shading.	new text to be inserted
3.	~~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

INITIAL PROPOSAL 1

. . .

1.1 Definitions

Annex 14, Volume I, contains definitions for those terms which are used in both volumes. When the following terms are used in this volume, they have the same meanings as in Annex 14, Volume I.

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

a) are located on an area intended for the surface movement of aircraft; or
b) extend above a defined surface intended to protect aircraft in flight; or
c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

Rationale:

Two definitions need to be kept in Annex 14,Volume II for easy reference even though they are already defined in Annex 14, Volume I.

An introductory note details the redundancy between the two volumes.

When the following terms are used in this volume, they have the meanings given below. ~~Annex 14, Volume I, contains definitions for those terms which are used in both volumes.~~

~~***Accuracy.*** A degree of conformance between the estimated or measured value and the true value.~~

~~— *Note.— For measured positional data, the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.*~~

~~***Calendar.*** Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).~~

~~***Cyclic redundancy check (CRC).*** A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.~~

. . .

~~***Data quality.*** A degree or level of confidence that the data provided meet the requirements of the data user in terms of accuracy, resolution and integrity.~~

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* ~~ISO Standard 19108, Geographic information — Temporal schema~~

~~***Datum.*** Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104**).~~

. . .

~~***Ellipsoid height (Geodetic height).*** The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.~~

. . .

~~***Geodetic datum.*** A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.~~

~~***Geoid.*** The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.~~

~~*Note.— The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.*~~

~~***Geoid undulation.*** The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.~~

~~*Note.— In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.*~~

~~***Gregorian calendar.*** Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108***).~~

~~*Note.— In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.*~~

. . .

~~***Heliport.*** An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.~~

. . .

~~***Integrity (aeronautical data).*** A degree of assurance that an aeronautical data and its value has not been lost nor 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;~~

~~** ISO Standard 19104, Geographic information — Terminology~~

~~*** ISO Standard 19108, Geographic information — Temporal schema~~

~~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.~~

~~***Obstacle.*** All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:~~

~~a) are located on an area intended for the surface movement of aircraft; or~~

~~b) extend above a defined surface intended to protect aircraft in flight; or~~

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

~~***Orthometric height.*** Height of a point related to the geoid, generally presented as an MSL elevation.~~

. . .

~~***Station declination.*** An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.~~

. . .

Rationale:

All other duplicated definitions can be safely deleted.

INITIAL PROPOSAL 2

CHAPTER 6. HELIPORT ~~SERVICES~~ EMERGENCY RESPONSE

6.1 Heliport Emergency Planning

General

Introductory Note.— Heliport emergency planning is the process of preparing a heliport to cope with an emergency that takes place at the heliport or in its vicinity. Examples of emergencies include crashes on or off the heliport, medical emergencies, dangerous goods occurrences, fires and natural disasters.

The purpose of heliport emergency planning is to minimize the impact of an emergency by saving lives and maintaining helicopter operations.

The heliport emergency plan sets out the procedures for co-ordinating the response of heliport agencies or services (air traffic services unit, fire fighting services, heliport administration, medical and ambulance services, aircraft operators, security services and police) and the response of agencies in the surrounding community (fire departments, police, medical and ambulance services, hospitals, military, and harbour patrol or coast guard) that could be of assistance in responding to the emergency.

6.1.1 A heliport emergency plan shall be established commensurate with the helicopter operations and other activities conducted at the heliport.

6.1.2 The plan shall identify agencies which could be of assistance in responding to an emergency at the heliport or in its vicinity.

6.1.3 **Recommendation.—** *The heliport emergency plan should provide for the coordination of the actions to be taken in an emergency occurring at a heliport or in its vicinity.*

6.1.4 **Recommendation.—** *Where an approach/departure path at a heliport is located over water, the plan should identify which agency is responsible for co-ordinating rescue in the event of a helicopter ditching and indicate how to contact that agency.*

6.1.5 **Recommendation.—** *The plan should include, as a minimum, the following information:*

a) the types of emergencies planned for;

b) how to initiate the plan for each emergency specified;

c) the name of agencies on and off the heliport to contact for each type of emergency with telephone numbers or other contact information;

d) the role of each agency for each type of emergency;

e) *a list of pertinent on-heliport services available with telephone numbers or other contact information;*

f) *copies of any written agreements with other agencies for mutual aid and the provision of emergency services; and*

g) *a grid map of the heliport and its immediate vicinity.*

6.1.6 **Recommendation.—** *All agencies identified in the plan should be consulted about their role in the plan.*

6.1.7 **Recommendation.—** *The plan should be reviewed and the information in it updated yearly.*

6.1.8 **Recommendation.—** *A test of the emergency plan should be carried out at least once every three years at a heliport that provides a scheduled service for the transport of passengers.*

Rationale

Based on discussions held during RFFWGs, a consensus was reached that the emergency planning provisions incorporated in Annex 14, Volume I Chapter 9.1, were too prohibitive for heliports. There was agreement that Annex 14, Volume II should contain a section about emergency response planning which addresses the special needs of the heliport world. Therefore, this proposal presents a high-level approach to implement SARPs for Heliport Emergency Response Planning which follows the basic principal of the provisions in Annex 14, Volume I, Chapter 9.1, while being not overly prescriptive and detailed.
A Heliport Emergency Response Plan is an important tool especially for the heliport operator to define the required tasks to successfully cope with a helicopter emergency and to improve the chances to save lives in such an event.

Editorial Note.— Renumber subsequent paragraphs.

INITIAL PROPOSAL 3

CHAPTER 3. PHYSICAL CHARACTERISTICS

…

3.3 Helidecks

Note.— The following specifications are for helidecks located on structures engaged in such activities as mineral exploitation, research or construction. See 3.4 for shipboard heliport provisions.

Final approach and take-off areas and touchdown and lift-off areas

. . .

Note 2.— Guidance on the effects of airflow direction and turbulence, prevailing wind velocity and high temperatures from gas turbine exhausts or flare-radiated heat on the location of the FATO is given in the Heliport Manual *(Doc 9261).*

Note 3.— Guidance on the design and markings for helideck parking areas is given in the Heliport Manual *(Doc 9261).*

3.3.1 The specifications in paragraphs 3.3.14 and 3.3.15 shall be applicable for helidecks completed on or after 1 January 2012.

. . .

3.3.10 No fixed object shall be permitted around the edge of the TLOF except for frangible objects, which, because of their function, must be located thereon.

3.3.11 For any TLOF 1D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 25 cm.

3.3.12 **Recommendation.—** *For any TLOF 1D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF should be as low as possible and in any case not exceed a height of 15 cm.*

RATIONALE for frangibility and height restriction

For those helidecks that are <1D and 16.0 m or less, Standards are already adopted from tranche 1 and tranche 2 respectively which limit essential objects around the TLOF to 5 cm (2 in) rather than to 25 cm (10 in). For smaller helidecks, it is concluded that a review of the height and location of objects has already been completed.

For helidecks which are either >16.0 m and/or 1D or larger, a Recommendation is added to restrict essential objects, such as perimeter lights etc., to a height of no more than 15 cm (6 in) when these are located on the edge of the TLOF. In general, those objects should be as low as possible.

RATIONALE for 15 cm

A 15 cm height restriction is considered to strike a good balance between the competing objectives to minimize the height of essential objects around the helideck, to as low as possible, but without compromising the functionality of essential systems that are sited around the helideck for the purpose of safety of operations. A good example is the Ring Main System that might be introduced in Chapter 6 as a means of compliance for a Fixed Foam Application System (FFAS). Manufacturer-derived data confirms that these systems need to "sit" about 15 cm above helideck level in order to perform effectively the function for which they are intended, i.e., the uniform distribution of foam to all parts of the landing area.

3.3.1~~2~~3 For any TLOF designed for use by helicopters having a D-value of 16.0 m or less, and any TLOF having dimensions of less than 1D, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF, shall not exceed a height of 5 cm.

~~3.3.13 For any TLOF having dimensions of less than 1 D, the maximum height of such objects in the obstacle-free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 5 cm.~~

Note.— Lighting that is mounted at a height of less than 25 cm is typically assessed for adequacy of visual cues before and after installation.

3.3.14 Objects whose function requires them to be located within the TLOF (such as lighting or nets) shall not exceed a height of 2.5 cm. Such objects shall only be present if they do not represent a hazard to helicopters.

. . .

3.4 Shipboard heliports

. . .

3.4.3 A shipboard heliport shall be provided with one FATO and one coincidental or collocated TLOF.

3.4.4 A FATO may be any shape but shall be of sufficient size to contain an area within which can be accommodated a circle of diameter of not less than 1 D of the largest helicopter the ~~helideck~~ heliport is intended to serve.

3.4.5 The TLOF of a shipboard heliport shall be dynamic load-bearing.

. . .

3.4.12 No fixed object shall be permitted around the edge of the TLOF except for frangible objects, which, because of their function, must be located thereon.

3.4.13 For any TLOF 1D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 25 cm.

3.4.14 **Recommendation.—** *For any TLOF 1D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF should be as low as possible and in any case not exceed a height of 15 cm.*

RATIONALE for frangibility and height restriction (shipboard heliports)

For those helidecks and shipboard heliports that are <1D and 16.0 m or less, Standards have already been adopted from tranche 1 and tranche 2 respectively which limit essential objects around the TLOF to 5 cm (2 in) rather than to 25 cm (10 in). For smaller shipboard heliports, it is concluded that a review of the height and location of objects has already been completed.

For shipboard heliports which are either >16.0 m and/or 1D or larger, a Recommendation is added to restrict essential objects, such as perimeter lights etc., to a height of no more than 15 cm when these are located on the edge of the TLOF. In general, those objects should be as low as possible.

RATIONALE for 15 cm

A 15 cm height restriction is considered to strike a good balance between the competing objectives to minimise the height of essential objects around a shipboard heliport, to as low as possible, but without compromising the functionality of essential systems that are sited around the heliport for the purpose of safety of operations. A good example is the Ring Main System that might be introduced in Chapter 6 as a means of compliance for a Fixed Foam Application System (FFAS). Manufacturer derived data confirms that these systems need to "sit" about 15 cm above helideck level in order to perform effectively the function for which they are intended, i.e., the uniform distribution of foam to all parts of the landing area.

3.4.145 For any TLOF designed for use by helicopters having a D-value of 16.0 m or less, and any TLOF having dimensions of less than 1D, objects in the obstacle-free sector, whose function requires them to be located on the edge of the TLOF, shall not exceed a height of 5 cm.

~~3.4.15 For any TLOF having dimensions of less than 1 D, the maximum height of such objects in the obstacle-free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 5 cm.~~

Note.— Lighting that is mounted at a height of less than 25 cm is typically assessed for adequacy of visual cues before and after installation.

3.4.16 Objects whose function requires them to be located within the TLOF (such as lighting or nets) shall not exceed a height of 2.5 cm. Such objects shall only be present if they do not represent a hazard to helicopters.

…

CHAPTER 5. VISUAL AIDS

…

5.2.2 Heliport identification marking

…

5.2.2.8 **Recommendation.—** *On a helideck ~~and~~ or a shipboard heliport where the D value is 16.0 m or larger, the size of the heliport identification H marking should have a height of 4 m with an overall width not exceeding 3 m and a stroke width not exceeding 0.75 m. Where the D value is less than 16.0 m, the size of the heliport identification H marking should have a height of 3 m with an overall width not exceeding 2.25 m and a stroke width not exceeding 0.5 m.*

…

5.2.10 Touchdown/positioning marking

…

5.2.10.5 A touchdown positioning marking shall be a yellow circle and have a line width of at least 0.5 m. For a helideck or a purpose-built shipboard heliport with a D value of 16.0 m or larger, the line width shall be at least 1 m.

Rationale for the reduction of size of touchdown markings for small helidecks and shipboard heliports:

The standard 1 m TD/PM circle used for larger (>16 m) helidecks and shipboard heliports provides adequate and effective visual cues for pilots operating to these helidecks and shipboard heliports by day. For smaller helidecks and shipboard heliports (<16 m) the smaller load-bearing surface area (the TLOF) has to accommodate all the same essential markings as the larger decks. However, the "standard" size of these markings results in an "over-busy" or "overlapping" deck marking arrangement (i.e. markings are found to be too "concentrated" so as to extend or confuse the mental process of recognition for a pilot required to interpret safety information conveyed by markings in an expeditious manner).

Additionally, a narrower landing circle marking allows for improved accuracy (reduction in scatter) in the landing manoeuvre, so a thinner TD/PM marking of 0.5 m is proposed that will still provide adequate visual cues for the reduced size decks while providing improved obstacle clearance.

The proposal also includes a reduction in the size of the heliport identification "H" marking (to correspond with the smaller landing circle marking – whose new dimensions are between the larger offshore "H" marking and the smaller onshore "H" marking).

The 16 m "cut-off" is broadly consistent with other offshore SARPS in both Chapters 3 and 6.

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PROPOSED AMENDENT TO THE

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERONAUTICAL INFORMATION SERVICES

ANNEX 15

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT TO ANNEX 15

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:

1.	~~Text to be deleted is shown with a line through it~~.	text to be deleted
2.	New text to be inserted is highlighted with grey shading.	new text to be inserted
3.	~~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

INITIAL PROPOSAL 1

APPENDIX 1. CONTENTS OF THE AERONAUTICAL INFORMATION PUBLICATION (AIP)

. . .

****** AD 2.12 Runway physical characteristics**

Detailed description of runway physical characteristics, for each runway, including:

. . .

8) dimensions of stopway (if any) to the nearest metre or foot;

9) dimensions of clearway (if any) to the nearest metre or foot;

10) dimensions of strips;

11) dimensions of runway end safety areas;

12) location (which runway end) and description of arresting system (if any);

1~~1~~3) the existence of an obstacle-free zone; and

1~~2~~4) remarks.

Origin:

ADWG/12

Rationale:

Amendment 11A to Annex 14, Volume I has included new SARPs on the provision of an arresting system in relation to the dimension of RESA. From both regulatory and operational perspectives, it would be beneficial to safety to publish information on RESA and arresting system in the AIP.
In addition to the location of an arresting system, information on the description of the system, such as the type and dimension would also be helpful.

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APPENDIX D to State letter AN4/1.1.54-14/97

Background Information on the Proposal for Reduced Taxiway Separation Distances

As part of the Annex 14, Volume I, Chapter 3 review, taxiway centre line separations had been extensively discussed within the Aerodromes Panel's Aerodrome Design Working Group (ADWG) over the past three years. In general, the ADWG had considered that the existing figures were derived before the advent of modern, new large aircraft and many aerodrome systems in use today, and that they were overly conservative.

The ADWG had adopted a risk-based approach, which was based on utilising existing ICAO separation principles, analysis of actual movements of aircraft derived from infield taxiway centre line deviation studies, a scientific approach based on assessment of a wing tip collision risk and a statistical approach of lateral centre line deviations from straight taxiway centre lines. A unique element of the proposed centre line separation distances is an aim for a more coherent, uniform set of design specifications across all code letters.

The first methodology examined by the ADWG was based on taxiway centreline deviation studies. Extensive taxiway centre line deviation studies had been performed at LHR, AMS, ANC, JFK, SYD, CDG, FRA and SFO, between the years 1987 and 2006, which had involved over 400,000 movements measured by aircraft across the code letters C-E. Similar studies had also been conducted by the U.S. FAA for codes C and D aircraft from 2009 to 2012. The ADWG had assessed those studies in detail and concluded that for a given risk level of 1e10-6, the estimated centre line separation distances could be reduced by 10-15%.

The second methodology examined by the ADWG was the methodology adopted by the European Aerodrome Operations Planning Group (AOPG), formalized as ICAO Document 7754 to support entry into service of the B747-400. Based on this document the ADWG had concluded that if one were to take the AOPG minimum taxiway centre line separation distances of 8 metres for code letters A-C, and 11 metres for code letters D-F, along with taxilane to taxilane centre line separations of 4.5 metres (for code letters A-C) and 7.5 metres (for code letters D-F), then a coherent, uniform, and easily indexed set of design of centre line separations could be supported, all of which was lower than a risk level of 1e10-6.

The third methodology examined by ADWG was based on risk assessment. Using a risk-based assessment methodology, the ADWG had sought to review and validate the taxiway centre line deviation measurements from the studies worldwide, and concluded that the lower centre line separations proposed by the ADWG could achieve a target level of safety (TLS) between 1e10-7 and 1e10-8, which is equivalent to or better than the ICAO global risk factor.

In light of the foregoing, the AP/3 meeting considered that based on various studies conducted in different States and using a risk-based approach, the ADWG's work was comprehensive and its proposal well justified, and this was also agreed by the Air Navigation Commission.

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RESPONSE FORM TO BE COMPLETED AND RETURNED TO ICAO TOGETHER WITH ANY COMMENTS YOU MAY HAVE ON THE PROPOSED AMENDMENTS

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

(State) ____

Please make a checkmark (✓) against one option for each amendment. If you choose options "agreement with comments" or "disagreement with comments", **please provide your comments on separate sheets**.

	Agreement without comments	*Agreement with comments**	*Disagreement without comments*	*Disagreement with comments*	*No position*
Amendment to Annex 14, Volume I – *Aerodrome Design and Operations* (Attachment A refers)					
Amendment to Annex 14, Volume II – *Heliports* (Attachment B refers)					
Amendment to Annex 15 – *Aeronautical Information Services* (Attachment C refers)					

*"Agreement with comments" indicates that your State or organization agrees with the intent and overall thrust of the amendment proposal; the comments themselves may include, as necessary, your reservations concerning certain parts of the proposal and/or offer an alternative proposal in this regard.

Signature: ________________________________ Date: ____________________________________

— END —