CERTIFICATION SPECIFICATIONS AND GUIDANCE MATERIAL FOR AERODROMES DESIGN

CS-ADR-DSN — ISSUE 6 — CHANGE INFORMATION

The European Union Aviation Safety Agency (EASA) publishes issues of certification specifications (CSs) and guidance material (GM) as consolidated documents. These documents are used for establishing the certification basis for applications submitted after the date of entry into force of the applicable issue.

Consequently, except for a note '[Issue: ADR-DSN/6]' under the amended certification specification (CS) or guidance material (GM), the consolidated text of CS-ADR-DSN (the Annex to ED Decision 2022/006/R) does not allow readers to see the amendments that have been introduced compared to the previous issue. To show the changes, this change information document was created, using the following format:

— deleted text is ~~struck through~~;

— new or amended text is highlighted in blue;

— an ellipsis '[…]' indicates that the rest of the text is unchanged.

Note to the reader

In amended, and in particular in existing (that is, unchanged) text, 'Agency' *is used interchangeably with* 'EASA'*. The interchangeable use of these two terms is more apparent in the consolidated versions. Therefore, please note that both terms refer to the* 'European Union Aviation Safety Agency (EASA)'.

PREAMBLE

CS-ADR-DSN Issue 6 Effective: See Decision 2022/006/R

The following is a list of paragraphs affected by this amendment:

CS ADR-DSN.A.002	Definitions	Amended (NPA 2020-10)
GM1 ADR-DSN.A.002	Definitions	Amended (NPA 2020-10)
GM1 ADR-DSN.A.005	Aerodrome reference code (ARC)	Amended (NPA 2020-10)
GM1 ADR-DSN.B.070	Sight distance for slopes of runways	Amended (NPA 2020-10)
GM1 ADR-DSN.B.085	Runway strength	Amended (NPA 2020-10)
GM1 ADR-DSN.B.095	Runway turn pads	Amended (NPA 2020-10)
CS ADR-DSN.B.115	Width of shoulders for runway turn pads	Amended (NPA 2020-10)
GM1 ADR-DSN.B.115	Width of shoulders for runway turn pads	Amended (NPA 2020-10)
CS ADR-DSN.B.125	Runway shoulders	Amended (NPA 2020-10)
GM1 ADR-DSN.B.150	Runway strip to be provided	Amended (NPA 2020-10)
GM1 ADR-DSN.B.165	Objects on runway strips	Amended (NPA 2020-10)

GM1 ADR-DSN.B.175	Grading of runway strips	Amended (NPA 2020-10)
CS ADR-DSN.B.200	Stopways	Amended (NPA 2020-10)
GM1 ADR-DSN.B.200	Stopways	Amended (NPA 2020-10)
GM1 ADR-DSN.C.210	Runway end safety areas (RESA)	Amended (NPA 2020-10)
CS ADR-DSN.C.236	Engineered Materials Arresting System (EMAS)	Created (NPA 2020-10)
GM1 ADR-DSN.C.236	Engineered Materials Arresting System (EMAS)	Created (NPA 2020-10)
GM1 ADR-DSN.D.240	Taxiways general	Amended (NPA 2020-10)
GM1 ADR-DSN.D.285	Strength of taxiways	Amended (NPA 2020-10)
CS ADR-DSN.D.340	Location of holding bays, runway-holding positions, intermediate holding positions, and road-holding positions	Amended (NPA 2020-10)
GM1 ADR-DSN.D.340	Location of holding bays, runway-holding positions, intermediate holding positions, and road-holding positions	Amended (NPA 2020-10)
GM1 ADR-DSN.E.355	Strength of aprons	Editorial change
GM1 ADR-DSN.E.360	Slopes on aprons	Amended (NPA 2020-10)
CS ADR-DSN.G.380	Location	Amended (NPA 2020-10)
GM1 ADR-DSN.G.380	Location	Amended (NPA 2020-10)
GM1 ADR-DSN.G.400	Clearance distances on a de-icing/anti-icing pad	Amended (NPA 2020-10)
CS ADR-DSN.L.555	Taxiway centre line marking	Amended (NPA 2020-10)
CS ADR-DSN.L.570	Enhanced taxiway centre line marking	Amended (NPA 2020-10)
CS ADR-DSN.L.605	Mandatory instruction marking	Editorial change
CS ADR-DSN.L.610	Information marking	Amended (NPA 2020-10)
CS ADR-DSN.M.650	Approach slope and elevation setting of light units for PAPI and APAPI	Amended (NPA 2020-10)
CS ADR-DSN.M.655	Obstacle protection surface for PAPI and APAPI	Amended (NPA 2020-10)
CS ADR-DSN.M.690	Runway centre line lights	Editorial change
CS ADR-DSN.M.710	Taxiway centre line lights	Amended (NPA 2020-10)
CS ADR-DSN.M.715	Taxiway centre line lights on taxiways, runways, rapid exit taxiways, or on other exit taxiways	Amended (NPA 2020-10)
CS ADR-DSN.M.745	Runway guard lights	Amended (NPA 2020-10)
GM1 ADR-DSN.M.745	Runway guard lights	Amended (NPA 2020-10)
CS ADR-DSN.M.771	No-entry bar	Amended (NPA 2020-10)
GM1 ADR-DSN.M.771	No-entry bar	Amended (NPA 2020-10)
CS ADR-DSN.N.775	General	Amended (NPA 2020-10)
GM1 ADR-DSN.N.775	General	Amended (NPA 2020-10)
CS ADR-DSN.N.780	Mandatory instruction signs	Editorial change
CS ADR-DSN.N.785	Information signs	Amended (NPA 2020-10)
GM1 ADR-DSN.P.825	Taxiway edge markers	Amended (NPA 2020-10)
GM1 ADR-DSN.Q.840	Objects to be marked and/or lighted within the lateral boundaries of the obstacle limitation surfaces	Amended (NPA 2020-10)
CS ADR-DSN.Q.845	Marking of fixed objects	Amended (NPA 2020-10)
CS ADR-DSN.Q.852	Marking and lighting of overhead wires, cables, supporting towers, etc.	Amended (NPA 2020-10)
CS ADR-DSN.T.915	Siting of equipment and installations on operational areas	Amended (NPA 2020-10)
GM1 ADR-DSN.T.915	Siting of equipment and installations on operational areas	Amended (NPA 2020-10)
CS ADR-DSN.U.935	Colours for markings, signs and panels	Amended (NPA 2020-10)

LIST OF ABBREVIATIONS

(used in CS-ADR-DSN)

~~ACN~~	~~Aircraft classification number~~
[…]	
EMAS	Engineered Materials Arresting System
[…]	
MLW	Maximum landing weight
[…]	
MTOW	Maximum take-off weight
[…]	
~~PCN~~	~~Pavement classification number~~
[…]	

CS ADR-DSN.A.002 Definitions

[…]

~~'Aircraft classification number (ACN)' means the number expressing the relative effect of an aircraft on a pavement for a specified standard subgrade category.~~

[…]

'Effective intensity' means that the effective intensity of a flashing light is equal to the intensity of a fixed light of the same colour which will produce the same visual range under identical conditions of observation.

[…]

'Instrument runway' means one of the following types of runways intended for the operation of aircraft using instrument approach procedures:

1. 'Non-precision approach runway': a runway served by visual aids and at least one non-visual aid, intended for landing operations following a type A instrument approach operation.
2. 'Precision approach runway, Category I': a runway served by visual aids and at least one non-visual aid, intended for landing operations following a type B CAT I instrument approach operation.
3. 'Precision approach runway, Category II': a runway served by visual aids and at least one non-visual aid, intended for landing operations following a type B CAT II instrument approach operation.
4. 'Precision approach runway, Category III': a runway served by visual aids and at least one non-visual aid, intended for landing operations following a type B CAT III~~A, IIIB or IIIC~~ instrument approach operation ~~to and along the surface of the runway~~.

[…]

'Isolated ~~A~~aircraft ~~P~~parking ~~P~~position' means an area suitable for the parking of an aircraft which is known or suspected to be the subject of unlawful interference, or for other reasons needs isolation from normal aerodrome activities.

[…]

'Lighting system reliability' means the probability that the complete installation operates within the specified tolerances and that the system is operationally usable.

[…]

'Near-parallel runways' means non-intersecting runways whose extended centre lines have an angle of convergence/divergence of 15 degrees or less.

[…]

~~'Pavement classification number (PCN)' means a number expressing the bearing strength of a pavement for unrestricted operations.~~

[…]

'Segregated parallel operations' means simultaneous operations on parallel or near-parallel instrument runways in which one runway is used exclusively for approaches and the other runway is used exclusively for departures.

[…]

'Type B instrument approach operation' means an instrument approach operation with a decision height below 75 m (250 ft)~~. Type B instrument approach operations are~~ categorised as follows:

1. Category I (CAT I): a decision height not lower than 60 m (200 ft) and with either a visibility not less than 800 m or a runway visual range not less than 550 m;
2. Category II (CAT II): a decision height lower than 60 m (200 ft), but not lower than 30 m (100 ft) and a runway visual range not less than 300 m;
3. Category III~~A~~ (CAT III~~A~~): a decision height lower than 30 m (100 ft) or no decision height and a runway visual range ~~not~~ less than 300 ~~175~~ m or;
4. ~~Category IIIB (CAT IIIB): a decision height lower than 15 m (50 ft) or no decision height and a runway visual range less than 175 m, but not less than 50 m;~~
5. ~~Category IIIC (CAT IIIC): no decision height and~~ no runway visual range limitations.

[…]

'Usability factor' means the percentage of time during which the use of a runway or system of runways is not restricted because of the crosswind component.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/5]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.A.002 Definitions

Crosswind component is the surface wind component at right angles to the runway centre line.

[Issue: ADR-DSN/6]

GM1 ADR-DSN.A.005 Aerodrome reference code (ARC)

[…]

(g) In the case of an aeroplane equipped with folding wing tips, its reference code letter may change as a result of the folding/extending of the wing tips. Consideration will be given to the wingspan configuration and resultant operations of the aeroplane at an aerodrome.

Further information concerning aeroplanes with folding wing tips, physical characteristics, and the concept of normal and non-normal operations can be found in the manufacturer's aircraft characteristics for airport planning manual.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.B.070 Sight distance for slopes of runways

(a) Runway longitudinal slopes and slopes changes are so designed that the pilot in the aircraft has an unobstructed line of sight over all or as much of the runway as possible, thereby enabling him to see aircraft or vehicles on the runway, and to be able to manoeuvre and take avoiding action.

(b) Consideration will have to be given to providing an unobstructed line of sight over the entire length of a single runway where a full-length parallel taxiway is not available. Where an aerodrome has intersecting runways, additional criteria on the line of sight of the intersection area needs to be considered for operational safety. Additional guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.B.085 Runway strength

(a) Additional information on the bearing strength, the design and evaluation of pavements is given in ICAO Doc 9157, Aerodrome Design Manual, Part 3, Pavements.

(b) The method for reporting the bearing strength of the pavement is available in Part-ADR.OPS of Regulation (EU) No 139/2014.

~~Pavement forming part of the movement area needs to be of sufficient strength to allow aircraft to operate without risk of damage either to the pavement or to the aircraft. Pavements subject to overload conditions should deteriorate at an increasing rate depending upon the degree of overload. To control this, it is necessary to classify both pavement and aircraft under a system whereby the load-bearing capacity of the pavement and the loads imposed by the aircraft can be compared. The method used is the Aircraft Classification Number – Pavement Classification Number (ACN/PCN) method. The ACN/PCN method has been developed by ICAO as an international method of reporting the bearing strength of pavements.~~

~~(b) All pavements forming part of the movement area should be of adequate bearing strength for the types of aircraft expected to use the aerodrome. All pavements should be regularly examined by a suitably qualified person. Any pavements which have been subjected to overload conditions should be closely monitored by suitably qualified staff for a period of several weeks or until it is clear that no rapid deterioration of the pavement has been triggered.~~

~~(c) Reporting pavement bearing strength:~~

~~(1) The ACN/PCN method of classifying the bearing strength of pavements considers the load imposed on the pavement by the aircraft. In this respect, the load rating of the aircraft is most significantly affected by the subgrade support strength of the pavement. ACNs are,~~

~~therefore, numbers giving a relative load rating of the aircraft on pavements for certain specified subgrade strengths. ACN values for most aeroplanes have been calculated by ICAO and are published in Aeronautical Information Publications. The PCN is also a number which represents the load-bearing strength of the pavement in terms of the highest ACN which can be accepted on the pavement for unrestricted use.~~

~~(2) A PCN can also be identified and reported without a technical evaluation of the pavement by means of an assessment of the results of aircraft using the pavement. Providing the type and subgrade support strength of the pavement are known, the ACN of the most demanding aircraft successfully using the pavement can be reported as the PCN.~~

~~(3) A PCN is reported in a five-part format. Apart from the numerical value, notification is also required of the pavement type (rigid or flexible) and the subgrade support category. Additionally, provision is made for the aerodrome operator to limit the maximum allowable tire pressure. A final indication is whether the assessment has been made by a technical evaluation or from past experience of aircraft using the pavement~~.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.B.095 Runway turn pads

[...]

(b) Such areas, if provided along a runway, may also be useful to reduce taxiing time and distance for aeroplanes which may not require the full length of the runway.

(c) Additional guidance on the design of runway turn pads is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

CS ADR-DSN.B.115 Width of shoulders for runway turn pads

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

[Issue: ADR-DSN/6]

GM1 ADR-DSN.B.115 Width of shoulders for runway turn pads

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

[Issue: ADR-DSN/6]

CS ADR-DSN.B.125 Runway shoulders

(a) The safety objective of a runway shoulder is that it should be so constructed as to mitigate any hazard to an aircraft running off the runway or stopway or to avoid the ingestion of loose stones or other objects by turbine engines.

(b) Runway shoulders should be provided for a runway where the code letter is D, E or F, for aeroplanes with an OMGWS from 9 m up to but not including 15 m.

(c) Runway shoulders need not be provided where the runway width is 60 m, for aeroplanes with an OMGWS from 9 m up to but not including 15 m and code letter:

(1) D, E; or

(2) F with two or three engines.

(d) Where the runway width is 60 m, for aeroplanes with an OMGWS from 9 m up to but not including 15 m and code letter F with four (or more) engines, only the portion of runway shoulders between the runway edge up to a distance as prescribed in paragraph (c) of CS ADR-DSN.B.135 should be provided.

[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.B.150 Runway strip to be provided

(a) A runway strip extends laterally to a specified distance from the runway centre line, longitudinally before the threshold, and beyond the runway end. It provides an area clear of objects that may endanger aeroplanes. Any equipment or installation required for air navigation or for aircraft safety purposes and is located in this object-free area should be frangible and mounted as low as possible. The term 'aircraft safety purposes' refers to the installation of arresting systems.

[…]

[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.B.165 Objects on runway strips

[…]

(f) The term 'aircraft safety purposes' refers to the installation of arresting systems.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.B.175 Grading of runway strips

[…]

(b) Where the areas in paragraph (a) above have paved surface, they should be able to withstand the occasional passage of the critical aeroplane for runway pavement design.

~~(c) The area adjacent to the end of a runway may be referred to as a blast pad~~.

(c~~d~~) Additional guidance on grading is given in ICAO Doc 9157, Aerodrome Design Manual Part 1, Runways.

(d~~e~~) The area adjacent to the end of a runway provided to reduce the erosive effects of jet blast and propeller wash may be referred to as a blast pad.

(ef) Guidance on protection against aeroplane engine blast is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

CS ADR-DSN.B.200 Stopways

[…]

(c) Slopes on stopways:

Slopes and changes in slope on a stopway, and the transition from a runway to a stopway, should comply with the specifications in CS ADR-DSN.B.060 to CS ADR-DSN.B.080 for the runway with which the stopway is associated except that:

(1) the limitation in CS ADR-DSN.B.060(cb) of a 0.8 % ~~per cent~~ slope for the first and last quarter of the length of a runway need not be applied to the stopway; and

(2) at the junction of the stopway and runway and along the stopway the maximum rate of slope change may be 0.3 % ~~per cent~~ per 30 m (minimum radius of curvature of 10 000 m) for a runway where the code number is 3 or 4.

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.B.200 Stopways

(a) The transition from one slope to another should be accomplished by a curved surface with a rate of change not exceeding:

(1) 0.3 % per 30 m (minimum radius of curvature of 10 000 m) where the code number is 3 or 4; and

(2) 0.4 % per 30 m (minimum radius of curvature of 7 500 m) where the code number is 1 or 2.

(b) The friction characteristics of an unpaved stopway should not be substantially less than that of the runway with which the stopway is associated.

(c) The economy of a stopway can be entirely lost if, after each usage, it should be regraded and compacted. Therefore, it should be designed to withstand at least a certain number of loadings of the aeroplane which the stopway is intended to serve without inducing structural damage to the aeroplane.

(d) Notwithstanding that a stopway may have a paved surface, it is not intended that ~~PCN Figures~~ bearing strength data need to be developed for a stopway (see Part-ADR.OPS of Regulation (EU) No 139/2014 for the method on reporting the bearing strength of the pavement). ~~Further guidance is given in ICAO Doc 4444, PANS-OPS.~~

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.C.210 Runway end safety areas (RESA)

[…]

(b) Assessment of runway end safety areas

[…]

(2) Combined with this, measures may be considered that would reduce the severity of the consequences should an event occur. Wherever practicable, aerodrome operators should seek to optimise the RESA. This may be achieved through a combination of:

[…]

(v) installing ~~suitably positioned and designed~~ an arresting systems according to CS ADR-DSN.C.236 (EMAS), or another suitably positioned and designed type of an arresting system, to supplement or as an alternative to a RESA where an equivalent level of safety is demonstrated;

[…]

[…]

(c) Arresting systems on runway end safety areas

~~(1) In recent years, recognising the difficulties associated with achieving a standard runway end safety area (RESA) at all aerodromes, research programmes have been undertaken on the use of various materials for arresting systems. Furthermore, research programmes have been undertaken to evaluate and develop arrestor systems using engineered materials. This research was driven by the recognition that many runways where natural obstacles, local development, and/or environmental constraints inhibit the provision of RESA and lead to limited dimension of RESA. Additionally, there had been accidents at some aerodromes where the ability to stop an overrunning aeroplane within the RESA would have prevented major damage to aeroplane and/or injuries to passengers.~~

(1~~2~~) ~~The research programmes, as well as evaluation of actual aeroplane overruns into arresting system, have demonstrated that the performance of some a~~Arresting systems can be predictable and effective in arresting aeroplane overruns.

(2~~3~~) Arresting system designs should be supported by a validated design method that can predict the performance of the system. The design method should be derived from field or laboratory tests. Testing may be based either on passage of an actual aircraft or an equivalent single wheel load through a test bed. The design should consider multiple aircraft parameters, including but not limited to allowable aircraft gear loads, gear configuration, tire contact pressure, aircraft centre of gravity, and aircraft speed. The model should calculate imposed aircraft gear loads, g-forces on aircraft occupants, deceleration rates, and stopping distances within the arresting system. ~~Any rebound of the crushed material that may lessen its effectiveness, should also be considered.~~

(3~~4~~) Demonstrated performance of an arresting system can be achieved by a validated design method which can predict the performance of the system. The design and performance should be based on the type of aeroplane anticipated to use the associated runway that imposes the greatest demand upon the arresting system. The design of an arresting system should be based on a critical (or design) aircraft which is defined as aircraft using the associated runway that imposes the greatest demand upon the arresting system. This is usually but not always, the heaviest/largest aircraft that regularly uses the runway. Arresting system performance is dependent not only on aircraft weight but allowable aeroplane gear loads, gear configuration, tire contact pressure, aeroplane centre of gravity and aeroplane speed. Accommodating undershoots should also be addressed. All configurations should be considered in optimising the arresting system design. The aerodrome operator and arresting system manufacturer should consult regarding the selection of the design aeroplane that should optimise the arresting system for a particular aerodrome. Additionally, the design should allow the safe operation of fully loaded rescue and fire fighting vehicles, including their ingress and egress.

~~(5) Additional information is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.~~

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.C.236 Engineered Materials Arresting System (EMAS)

(a) An EMAS, provided in accordance with paragraph (b) of CS ADR-DSN.C.215, is a type of arresting system consisting of high energy absorbing materials of specific strength, which will reliably and predictably crush under the weight of an aircraft.

(b) Location: An EMAS should be located beyond the end of the runway or stopway, if provided, at enough setback distance to avoid damage due to jet blast.

(c) General: An EMAS should:

(1) be supported by a design method that can predict the performance of the system that is validated through laboratory or field tests;

(2) decelerate an aircraft overrunning the runway by exerting predictable forces on the landing gear without causing major structural damage to the aircraft and avoiding injuries to its occupants;

(3) be a passive system that requires no external means to initiate/trigger its operation to arrest an aircraft;

(4) be constructed not to be damaged by jet blast or projected debris during normal aircraft operations;

(5) use materials which do not generate nor worsen fire hazards to an incoming aircraft. The materials should be non-sparking, non-flammable, not promote combustion, and not emit toxic or malodorous fumes in a fire environment after installation;

(6) be compatible with the installation of approach lighting systems, the radio altimeter operating area and with the meteorological conditions and aerodrome environment;

(7) together with its surroundings, allow ice and snow removal and prevent water accumulation;

(8) have enough mechanical property to avoid damage resulting from personnel walking on it for routine maintenance;

(9) enable the access, movement, and egress of the RFFS vehicles without impeding their activities during an emergency;

(10) be designed for repair to a usable condition (conforming to the original specifications) after an overrun or other type of physical damage, and have an established maintenance programme;

(11) not increase the potential for damage and not cause control capabilities to an aircraft in case of an undershoot more than the risk associated with an undershoot in a RESA;

(12) be frangible and mounted as low as possible with ramps that are provided to avoid vertical surface;

(13) not impede crew and passenger evacuation nor hinder disabled aircraft removal procedures;

(14) not cause visual or electromagnetic interference with any air navigation aids nor have reflecting surfaces that could cause dazzling;

(15) not increase wildlife hazard;

(16) not be considered to meet the definition of a stopway as provided in CS ADR-DSN.A.002.

(d) Dimensions:

(1) The functional length of an EMAS should be designed based on the operating conditions of the associated runway with its centre line coincidental with the extended centre line of the runway.

(2) The functional width of an EMAS should not be less than the runway width.

(e) Arresting performance:

(1) An EMAS should be designed to decelerate the design aircraft at an exit speed of 70 knots at both maximum take-off weight (MTOW) and 80 % maximum landing weight (MLW) without imposing loads that exceed the aircraft's design limits, causing major structural damage to the aircraft or imposing excessive forces on its occupants.

(2) When there is insufficient space available for the design on an EMAS in accordance with paragraph (c)(4) above, an EMAS should be designed to achieve the maximum arresting performance of the critical aeroplane.

(3) The design method for EMAS should factor in no reverse thrust of the aeroplane, using a 0.25 braking friction coefficient for the runway and length of pavement prior to the arrestor bed (setback).

(4) The design method for the EMAS assumes no braking friction coefficient (0.00) within the EMAS arrestor bed itself, unless the minimum actual braking friction coefficient that can be achieved as an aeroplane passes through the EMAS arrestor bed material can be demonstrated.

(f) Access:

(1) Slopes or steps should be provided to allow the entrance of the RFFS vehicles from the front and sides and to facilitate crew and passenger evacuation.

(2) On both sides of an EMAS, the requirements for RESA according CS ADR-DSN.C.210 to CS ADR-DSN.C.235 should be applied.

(3) Service roads should be set up for maintenance and emergency access. The width of the service roads should allow access and egress of RFFS vehicles. Service roads should be graded to avoid water accumulation. The strength of the service roads pavement should be capable of supporting the passage of fully loaded RFFS vehicles.

(g) Marking:

(1) An EMAS should be provided with yellow chevrons in accordance with CS ADR-DSN.R.865.

[Issue: ADR-DSN/6]

GM1 ADR-DSN.C.236 Engineered Materials Arresting System (EMAS)

(a) Engineered materials:

(1) The materials are tailored to specific mechanical properties and are referred to as engineered materials.

(2) The engineered materials have to meet a force-deformation profile within limits which have been shown to assure uniform characteristics, and therefore, predictable response to an aircraft entering the EMAS.

(3) The engineered materials will crush under the landing gears of the aeroplane when it engages the EMAS. The crushing is an irreversible or partly irreversible process and the arresting performance of the system is proportional to the amount of energy that is dissipated.

(b) The compatibility of the EMAS with the specific meteorological and aerodrome conditions is ensured by using materials which:

(1) are water-resistant to the extent that the presence of water does not affect system performance;

(2) do not attract or are physically vulnerable to:

(i) vermin,

(ii) birds,

(iii) wildlife, or

(iv) other creatures

to the greatest extent possible;

(3) do not support unintended plant growth with proper application of herbicides;

(4) exhibit constant strength and density characteristics during all climatic conditions within a temperature range that is appropriate for the local conditions;

(5) are resistant to deterioration as a result of:

(i) salt;

(ii) aircraft and runway de-icing and anti-icing fluids and solids;

(iii) aircraft fuels, hydraulic fluids, and lubricating oils;

(iv) ultraviolet;

(v) water;

(vi) freezing/thawing;

(vii) blowing sand and snow;

(viii) hail;

(viii) paint;

(ix) herbicides.

(c) Undershoot:

(1) An EMAS is not intended to reduce the risk of damage to an aeroplane undershooting the runway. However, the presence of an EMAS cannot increase the potential for damage in case of undershoot more than the risk that is associated with an undershoot in a RESA.

(2) Compliance with CS ADR-DSN.C.236 (c)(11) could be justified through experience of real cases of undershoot in an EMAS, flight simulator tests, other type of studies, or a combination of the three.

(d) An EMAS is a passive system which does not require any specific action or procedures by the flight crew. However, a basic knowledge of the systems by the crew is considered advantageous to prevent undesired evasive manoeuvres that could cause the aircraft to avoid entering the bed or system. The EMAS is designed to be entered preferably straight ahead with the unrestricted use of wheel brakes and/or thrust reversers. Additionally, the availability of an EMAS cannot be used for flight planning purposes, i.e., it cannot be included in the declared distances.

(e) Mechanical property:

(1) An EMAS is not intended to support vehicular traffic for maintenance or normal operating purposes.

(2) The EMAS needs to be capable of supporting personnel walking on it for the purposes of its own maintenance and co-located air navigation aids without causing any damage to its surface.

(3) Precaution needs to be taken during snow and ice removal to prevent damage to the EMAS bed.

(4) Light equipment for snow removal may be used in accordance with the manufacturer´s specification to avoid any damage to the surface.

(f) Setback distance:

(1) The setback distance is defined as the distance between the runway end or stopway, if provided, and the beginning of the EMAS.

(2) The setback distance will vary depending on the available area and the EMAS design.

(3) The calculation of the setback distance balances the risk objectives of:

(i) providing enough area for arresting purposes;

(ii) providing enough separation to protect the bed from jet blast;

(iii) providing separation from the threshold to reduce the probability of undershoot in the EMAS; and

(iv) decreasing the probability of aircraft overruns passing by one side of the EMAS due to lateral dispersion.

The safety assessment determines the relevance of each risk objective, taking into account the operating particularities of the associated runway, including usage of the runway, types of approach, weather conditions, fleet, incidents and accidents, and any other particularity related with runway safety.

(4) To reduce the probability of an aircraft undershooting in an EMAS, it is recommended to provide a minimum setback distance of at least 60 m from the threshold or runway end. However, this separation may be reduced if a safety assessment determines that it is the best alternative for both overrun and undershoot protection.

(g) An EMAS normally includes steps and/or slopes at its end and both sides, but they are not considered functional for arresting purposes. Where possible, the functional width of the EMAS is to be maintained the same throughout the whole length of the system.

(h) Exit speed is defined as the speed of the nose gear of the aeroplane as it passes the runway end or stopway, if provided.

(i) The critical aircraft is defined as the aircraft that regularly uses the associated runway that imposes the greatest demand upon the EMAS.

(j) Design aircraft list refers to the combination of aircraft types which are/will be operating regularly on the runway.

The critical aircraft is usually, but not always, the heaviest/largest aircraft that regularly uses the runway. The performance of an EMAS is dependent not only on aeroplane weight, but also on the landing gear configuration, tyre pressure, and centre of gravity. In general, the operational maximum take-off weight (operational MTOW) is used for the critical aircraft. However, there may be instances where less than the MTOW will require a longer EMAS. All parameters are to be considered in optimising the EMAS design. However, to the extent practicable, the EMAS design may consider both the aeroplane that imposes the greatest demand upon the EMAS and the range of aircraft expected to operate regularly on the runway. In some instances, a composite of design aircraft may be preferable to optimising the EMAS for a specific runway than a single critical aircraft. Other factors that are unique to a particular aerodrome, such as available RESA and air cargo operations, should also be considered in the final design.

(k) Testing:

Testing is to be based either on passage of an actual aircraft, or a single wheel bearing an equivalent load through a test bed. The design will need to consider multiple aircraft parameters, including but not limited to allowable aircraft gear loads, gear configuration, tyre contact pressure, weight, centre of gravity, and speed.

[Issue: ADR-DSN/6]

GM1 ADR-DSN.D.240 Taxiways general

[…]

(k) CS ADR-DSN.N.785 provides the certification specifications for a standardised scheme for the nomenclature of taxiways to improve situational awareness and as a part of an effective runway incursion prevention measure.

(l) Additional Gguidance on layout and standardised nomenclature of taxiways is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.D.285 Strength of taxiways

Information regarding pavement bearing strength, including the ACN/PCN classification system may be found in GM1 ADR-DSN.B.085.

(a) Due consideration ~~being~~is to be given to the fact that a taxiway ~~should be~~is subjected to a greater density of traffic and as a result of slow moving and stationary aeroplanes, to higher stresses than the runway it serves.

(b) The method for reporting the bearing strength of the pavement is available in Part-ADR.OPS of Regulation (EU) No 139/2014.

(c) Additional information on the bearing strength, the design, and evaluation of pavements is given in ICAO Doc 9157, Aerodrome Design Manual, Part 3, Pavements.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.D.340 Location of holding bays, runway-holding positions, intermediate holding positions, and road-holding positions

[…]

(a) The distance between a holding bay, runway-holding position established at a taxiway/runway intersection or road-holding position and the centre line of a runway should be in accordance with Table D-2 and such that a holding aircraft or vehicle should not interfere with the operation of radio navigation aids or penetrate the inner transitional surface.

[…]

Type of runway	Code number[d]			
	1	2	3	4
Non-instrument	30 m	40 m	75 m	75 m
Non-precision approach	40 m	40 m	75 m	75 m
Precision approach Category I	60 m[b]	60 m[b]	90 m[a,b]	90 m[a,b,c]
Precision approach Categories II and III	—	—	90 m[a,b]	90 m[a,b,c]
Take-off runway	30 m	40 m	75 m	75 m

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

b. This distance may need to be increased to avoid interference with radio navigation aids, particularly the glide path and localiser facilities (see CS ADR-DSN.D.340).

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

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

c. Where the code letter is F, this distance should be at least 100 ~~107.5~~ m.

Note: The distance of 100 ~~107.5~~ m for code number 4 where the code letter is F is based on an aircraft with a tail height of 24 m, a distance from the nose to the highest part of the tail of 62.2 m and a nose height of 10 m holding at an angle of 45° or more with respect to the runway centre line, being clear of the obstacle-free zone.

Type of runway	Code number[d]			
	1	2	3	4
d. Elevation of taxiway should be taken into account for possible increase of the distances indicated in this table.				

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

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.D.340 Location of holding bays, runway-holding positions, intermediate holding positions, and road-holding positions

[…]

(f) If a holding bay, runway-holding position or road-holding position for a precision approach runway code number 4 is at a greater elevation compared to the threshold, the distance ~~of 90 m or 107.5 m, as appropriate,~~ specified in Table D-2 could be further increased 5 m for every metre the bay or position is higher than the threshold.

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.E.355 Strength of aprons

[...]

(e) The method for reporting the bearing strength of the pavement is available in Part-ADR.OPS of Regulation (EU) No 139/2014.

(f) Additional information on the bearing strength, the design and evaluation of pavements is given in ICAO Doc 9157, Aerodrome Design Manual, Part 3, Pavements.

[Issue: ADR-DSN/6]

GM1 ADR-DSN.E.360 Slopes on aprons

[…]

(b) Slopes on apron have the same purpose as other pavement slopes, meaning to prevent the accumulation of water (or possible fluid contaminant) on the surface and to facilitate rapid drainage of surface water (or possible fluid contaminant). Nevertheless, the design of the apron, especially for the parts containing aircraft ~~airplane~~ stands, should specifically take into account the impact of the slopes on the aircraft ~~airplane~~ during its braking at the stand and during its start for departure (with push-back or with its own engines). The aims are, on the one hand, to avoid that an aircraft ~~airplane~~ passes its stop point and goes on the apron service road or to the closest building and on the other hand, to save fuel and optimise the manoeuvrability of the aircraft ~~airplane~~ or of the push-back device.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.G.380 Location

(a) De-icing/anti-icing facilities should be provided either at aircraft stands or at specified remote areas.

(b) The remote de-icing/anti-icing facilities should be located to be clear of the obstacle limitation surfaces, ~~to~~ not cause interference to the radio navigation aids and be clearly visible from the air traffic control tower for clearing the treated aeroplane.

[Issue: ADR-DSN/6]

GM1 ADR-DSN.G.380 Location

[…]

(e) The remote de-icing/anti-icing facilities should be so located as to provide for an expeditious traffic flow, perhaps with a bypass configuration, and not require unusual taxiing manoeuvre into and out of the pads.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.G.400 Clearance distances on a de-icing/anti-icing pad

(a) The separation criteria should take into account the need for individual de-icing/anti-icing pads to provide sufficient manoeuvring area around the aircraft ~~airplane~~ to allow simultaneous treatment by two or more mobile de-icing/anti-icing vehicles and sufficient non-overlapping space for a vehicle safety zone between adjacent de-icing pads and for other de-icing/anti-icing pads.

[…]

[Issue: ADR-DSN/6]

CS ADR-DSN.L.555 Taxiway centre line marking

[…]

(b) Characteristics:

[…]

(4) Where taxiway centre line marking is provided in accordance with (a)(2) above, the marking should be located on the centre line of the designated taxiway.

[…]

[…]
[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.L.570 Enhanced taxiway centre line marking

[…]

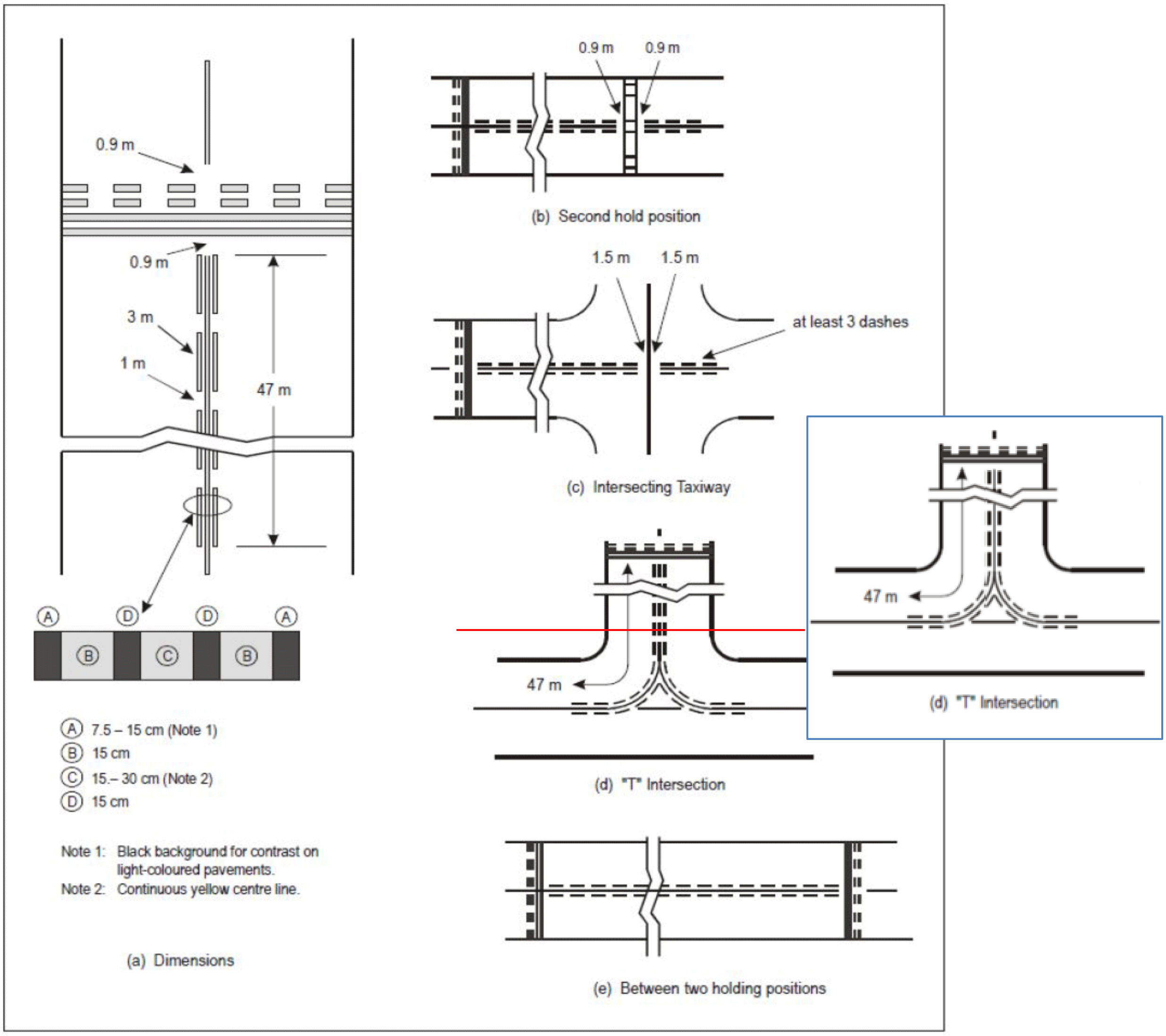

Figure L-6. Enhanced taxiway centre line marking

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.L.605 Mandatory instruction marking

[…]

(c) Characteristics:

(1) A mandatory instruction marking should consist of an inscription in white on a red background. Except for a ~~NO ENTRY~~ no-entry marking, the inscription should provide information identical to that of the associated mandatory instruction sign.

(2) A ~~NO ENTRY~~ no-entry marking should consist of an inscription in white reading NO ENTRY on a red background.

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

CS ADR-DSN.L.610 Information marking

[…]

(b) Characteristics:

[…]

(3) The character height, spacing, and the form and proportions of the inscription should be as for mandatory instruction markings.

~~(4) The spacing of characters for information marking should be as specified in Table N-3(c).~~

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

CS ADR-DSN.M.650 Approach slope and elevation setting of light units for PAPI and APAPI

[…]

Eye-to-wheel height of aeroplane in the approach configuration[a]	Desired wheel clearance (metres)[b, c]	Minimum wheel clearance (metres)[d]
(1)	(2)	(3)
up to but not including 3 m	6	3[e]
3 m up to but not including 5 m	9	4
5 m up to but not including 8 m	9	5
8 m up to but not including 14 m	9	6

a. In selecting the eye-to-wheel height group, only aeroplanes meant to use the system on a regular basis should be considered. The most demanding amongst such aeroplanes ~~aircrafts~~ should determine the eye-to-wheel height group.

b. Where practicable, the desired wheel clearances shown in column (2) should be provided.

c. The wheel clearances in column (2) should be reduced to no less than those in column (3) where a~~n~~ safety assessment indicates that such reduced wheel clearances are acceptable.

d. When a reduced wheel clearance is provided at a displaced threshold, it should be ensured that the corresponding desired wheel clearance specified in column (2) should be available when an aeroplane at the top end of the eye-to-wheel height group chosen overflies the extremity of the runway.

e. This wheel clearance should be reduced to 1.5 m on runways used mainly by light-weight non-turbo-jet aeroplanes.

Table M-1. Wheel clearance over threshold for PAPI and APAPI

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.M.655 Obstacle protection surface for PAPI and APAPI

[…]

~~Eye-to-wheel height of aeroplane in the approach configuration[a]~~	~~Desired wheel clearance (metres)[b,c]~~	~~Minimum wheel clearance (metres)[d]~~
~~(1)~~	~~(2)~~	~~(3)~~
~~up to but not including 3 m~~	~~6~~	~~3[e]~~
~~3 m up to but not including 5 m~~	~~9~~	~~4~~
~~5 m up to but not including 8 m~~	~~9~~	~~5~~
~~8 m up to but not including 14 m~~	~~9~~	~~6~~

~~a. In selecting the eye-to-wheel height group, only aeroplanes meant to use the system on a regular basis should be considered. The most demanding amongst such aircrafts should determine the eye-to-wheel height group.~~

~~b. Where practicable, the desired wheel clearances shown in column (2) should be provided.~~

~~c. The wheel clearances in column (2) should be reduced to no less than those in column (3) where an safety assessment indicates that such reduced wheel clearances are acceptable.~~

~~d. When a reduced wheel clearance is provided at a displaced threshold, it should be ensured that the corresponding desired wheel clearance specified in column (2) should be available when an aeroplane at the top end of the eye-to-wheel height group chosen overflies the extremity of the runway.~~

~~e. This wheel clearance should be reduced to 1.5 m on runways used mainly by light-weight non-turbo-jet aeroplanes.~~

~~Table M-1. Wheel clearance over threshold for PAPI and APAPI~~

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

[1] Angles as indicated in Figure M-5.

[2] D_1 is the distance of the visual approach slope indicator system from threshold prior to any displacement to remedy object penetration of the obstacle protection surface (refer to Figure M-4). The start of the obstacle protection surface 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 obstacle protection surface.

Table M-2. Dimensions and slopes of the obstacle protection surface

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

CS ADR-DSN.M.690 Runway centre line lights

(a) The safety objective of runway centre line lights is to facilitate safe take-off and landing ~~in reduced visibility conditions~~.

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/5]
[Issue: ADR-DSN/6]

CS ADR-DSN.M.710 Taxiway centre line lights

(a) The safety objective of taxiway centre line lights is to provide guidance for the safe taxi of aircraft as described in paragraph (b) ~~a taxiway in reduced visibility conditions and at night~~.

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

CS ADR-DSN.M.715 Taxiway centre line lights on taxiways, runways, rapid exit taxiways, or on other exit taxiways

(a) The safety objective of taxiway centre line lights is to provide guidance for the safe taxi of aircraft as described in paragraph (b) ~~a taxiway de-icing/anti-icing facility, and apron in reduced visibility conditions and at night~~.

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.M.745 Runway guard lights

(a) The safety objective of the ~~The purpose of~~ runway guard lights is to warn pilots and drivers of vehicles, when ~~they are~~ operating on taxiways, that they are about to enter a~~n active~~ runway. There are two standard configurations of runway guard lights as illustrated in Figure M-12.

(b) Applicability:

(1) Runway guard lights, Configuration A, should be provided at each taxiway/runway intersection associated with a runway intended for use in:

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

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

(2) As part of runway incursion prevention measures, runway guard lights, Configuration A or B, should be provided at each taxiway/runway intersection where runway incursion hot spots have been identified, and used under all weather conditions during day and night.

(3) Configuration B runway guard lights should not be collocated with a stop bar.

(4) Where more than one runway-holding position exists at a runway/taxiway intersection, only the set of runway guard lights associated with the operational runway-holding position should be illuminated.

(c) Location:

(1) Runway guard lights, Configuration A, should be located at each side of the taxiway within the area delimited by the inner and the outer edges of the runway holding position marking ~~and at the same distance as the runway-holding position marking~~.

(2) Runway guard lights, Configuration B, should be located across the taxiway within the area delimited by the inner and the outer edges of the runway holding position marking ~~and at the same distance as the runway-holding position marking~~.

(d) Characteristics:

(1) Runway guard lights, Configuration A, should consist of two pairs of yellow lights.

(2) Runway guard lights, Configuration B, should consist of yellow lights spaced at intervals of 3 m across the taxiway.

(3) The light beam should be unidirectional and should show yellow in the direction of approach to ~~aligned so as to be visible to the pilot of an aeroplane taxiing to~~ the runway-holding position.

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.M.745 Runway guard lights

(a) Runway incursions may take place in all visibility or weather conditions. The use of runway guard lights at runway-holding positions can form part of effective runway incursion prevention measures.

~~Some other device or design, e.g. specially designed optics, may be used in lieu of the visor.~~

(b) Where taxiways are substantially wider than those specified in CS ADR-DSN.D.245, such as wide-throat taxiways, the lights in Configuration A, located at each of the sides, are likely to be missed by pilots and may be necessary to be supplemented by a row of lights (inset) located across the taxiway, Configuration B.

(c~~b~~) Higher light intensities may be required to maintain ground movement at a certain speed in low visibilities.

(d~~c~~) The optimum flash rate is dependent on the rise and fall times of the lamps used. Runway guard lights, Configuration A, installed on 6.6 ampere series circuits have been found to look best when operated at 45 to 50 flashes per minute per lamp. Runway guard lights, Configuration B, installed on 6.6 ampere series circuits have been found to look best when operated at 30 to 32 flashes per minute per lamp.

(ed) Where there is a need to enhance the contrast between the on- and off-state of runway guard lights, Configuration A, intended for use during the day, a visor of sufficient size to prevent sunlight from entering the lens without interfering with the function of the fixture should be located above each lamp. Some other device or design, e.g. special designed optics, may be used in lieu of the visor.

~~(e) Active runway is to consider any runway or runways currently being used for take-off or landing. When multiple runways are used, they are all considered active runways.~~

(f) Additional guidance on runway guard lights is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.M.771 No-entry bar

(a) Applicability: A no-entry bar should be provided across a taxiway which is intended to be used as an exit only taxiway. The purpose of a no-entry bar is to assist in preventing inadvertent access of traffic to that taxiway.

(b) Location:

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

(2) A no-entry bar should be collocated with a no-entry sign and/or a no-entry marking.

(c) Characteristics:

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

(2) ~~The lighting circuit should be so designed that:~~

~~(i) no-entry bars are switchable selectively or in groups;~~

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

~~(iii) when a no-entry bar is illuminated, any stop bar installed between the no-entry bar and the runway should be extinguished.~~

Taxiway centre line lights installed beyond the no-entry bar, looking in the direction of the runway, should not be visible when viewed from the taxiway.

(3) The intensity in red light and beam spreads of no-entry bar lights should be in accordance with the specifications in CS ADR-DSN.U.940, Figures U-16 to U-20, as appropriate.

(4) No-entry bar lights chromaticity should be in accordance with the specifications in CS ADR-DSN.U.930 and Figure U-1A or U-1B, as appropriate.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.M.771 No-entry bar

~~(a) A no-entry bar is intended to be controlled either manually or automatically by air traffic services.~~

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

(b~~c~~) Where necessary to enhance conspicuity, extra lights should be installed uniformly.

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

(d~~e~~) Where no-entry bars are specified as components of an advanced surface movement guidance and control system and where, from an operational point of view, higher intensities are required to maintain ground movements at a certain speed in very low visibilities or in bright daytime conditions, the intensity in red light and beam spreads of no-entry bar lights should be in accordance with the specifications in CS ADR-DSN.U.940, Figures U-21, U-22 or U-23, as appropriate.

(e~~f~~) High-intensity no-entry bars are typically used only in case of an absolute necessity and following a safety assessment.

(f~~g~~) Where a wide beam fixture is required, the intensity in red light and beam spreads of no-entry bar lights should be in accordance with the specifications in CS ADR-DSN.U.940, Figures U-21 or U-23, as appropriate.

(g~~h~~) Care is required in the design of the electrical system to ensure that all of the lights of a no-entry bar will not fail at the same time. No-entry bar lights should be supplied with power on a separate circuit to other runway lighting so that they may be used when other lighting is switched off.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.N.775 General

[…]

(c) Characteristics:

[…]

~~(4) The inscriptions on a sign should be in accordance with the provisions of Figures N-2A to N-2H and N-3.~~

(4~~5~~) Signs should be illuminated when intended for use:

(i) in runway visual range conditions less than a value of 800 m; or

(ii) at night in association with instrument runways; or

(iii) at night in association with non-instrument runways where the code number is 3 or 4.

(5~~6~~) Signs should be retroreflective and/or illuminated when intended for use at night in association with non-instrument runways where the code number is 1 or 2.

(6~~7~~) Where variable pre-determined information is required, a variable sign should be provided.

(i) A variable message sign should show a blank face when not in use.

(ii) In case of failure, a variable message sign should not provide information that could lead to unsafe action from a pilot or a vehicle driver.

(iii) The time interval to change from one message to another on a variable message sign should be as short as practicable and should not exceed 5 seconds.

(7) The taxiing guidance signs should be in accordance with the specifications of paragraphs (c)(8) to (c)(22).

(8) The location distance for taxiing guidance signs including runway exit signs should conform to Table N-1.

Sign height (mm)				Perpendicular distance from defined taxiway pavement edge to near side of sign	Perpendicular distance from defined runway pavement edge to near side of sign
Runway code number	Legend	Face (min)	Installed (max)		
1 or 2	200	400	700	5–11 m	3–10 m
1 or 2	300	600	900	5–11 m	3–10 m
3 or 4	300	600	900	11–21 m	8–15 m
3 or 4	400	800	1 100	11–21 m	8–15 m

Table N-1. Location distances for taxiing guidance signs including runway exit signs

(9~~8~~) Inscription heights should conform to the Table N-2.

Runway code number	Minimum character height		
	Mandatory instruction sign	Information sign	
		Runway exit and runway vacated signs	Other signs
1 or 2	300 mm	300 mm	200 mm
3 or 4	400 mm	400 mm	300 mm

Table N-2. Minimum character height

(10~~9~~) Where a taxiway location sign is installed in conjunction with a runway designation sign (see CS ADR-DSN.N.785(b)(9)), the character size should be that specified for mandatory instruction signs.

(11) The dimensions should be as follows for:

(i) Arrow ~~dimensions should be as follows~~:

Legend height	Stroke
200 mm	32 mm
300 mm	48 mm
400 mm	64 mm

(ii) Stroke ~~width for single letter should be as follows~~:

Legend height	Stroke
200 mm	32 mm
300 mm	48 mm

400 mm	64 mm

(12~~0~~) Sign luminance should be as follows:

(i) Where operations are conducted in runway visual range conditions less than a value of 800 m, average sign luminance should be at least:

Red	30 cd/m2
Yellow	150 cd/m2
White	300 cd/m2

(ii) Where operations are conducted in accordance with CS ADR-DSN.N.775(c)(4~~5~~)(ii) and (c)(5~~6~~), average sign luminance should be at least:

Red	10 cd/m2
Yellow	50 cd/m2
White	100 cd/m2

Note: In runway visual range conditions less than a value of 400 m, there will be some degradation in the performance of signs.

(13~~1~~) The luminance ratio between red and white elements of a mandatory instruction sign should be between 1:5 and 1:10.

(14~~2~~) The average luminance of the sign is calculated by establishing grid points as shown in Figure N-1, and using the luminance values measured at all grid points located within the rectangle representing the sign.

(15~~3~~) The average value is the arithmetic average of the luminance values measured at all considered grid points.

(16~~4~~) The ratio between luminance values of adjacent grid points should not exceed 1.5:1. For areas on the sign face where the grid spacing is 7.5 cm, the ratio between luminance values of adjacent grid points should not exceed 1.25:1. The ratio between the maximum and minimum luminance value over the whole sign face should not exceed 5:1.

(17~~5~~) The forms of characters, i.e. letters, numbers, arrows, and symbols should conform to those shown in Figures N-2A to N-2H. The width of characters and the space between individual characters should be determined as indicated in Table N-3.

(18~~6~~) The face height of signs should be as follows:

Legend height	Face height (min)
200 mm	400 mm
300 mm	600 mm
400 mm	800 mm

(19~~7~~) The face width of signs should be determined using Figure N-3 except that, where a mandatory instruction sign is provided on one side of a taxiway only, the face width should not be less than:

(i) 1.94 m where the code number is 3 or 4; and

(ii) 1.46 m where the code number is 1 or 2.

(~~18~~20) Borders:

(i) The black vertical delineator between adjacent direction signs should have a width of approximately 0.7 of the stroke width.

(ii) The yellow border on a stand-alone location sign should be approximately 0.5 stroke width.

(2119) The colours of signs should be in accordance with the appropriate specifications in CHAPTER U — Colours for aeronautical ground lights, markings, signs and panels.

(220) ~~If instruction or information during a certain period of time, and/or there is a need to display variable pre-determined information, a variable information sign should be provided.~~

~~(i) A variable message sign should show a blank face when not in use.~~

~~(ii) In case of failure, a variable message sign should not provide information that could lead to unsafe action from a pilot or a vehicle driver.~~

~~(iii) The time interval to change from one message to another on a variable message sign should be as short as practicable and should not exceed 5 seconds.~~

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

[…]

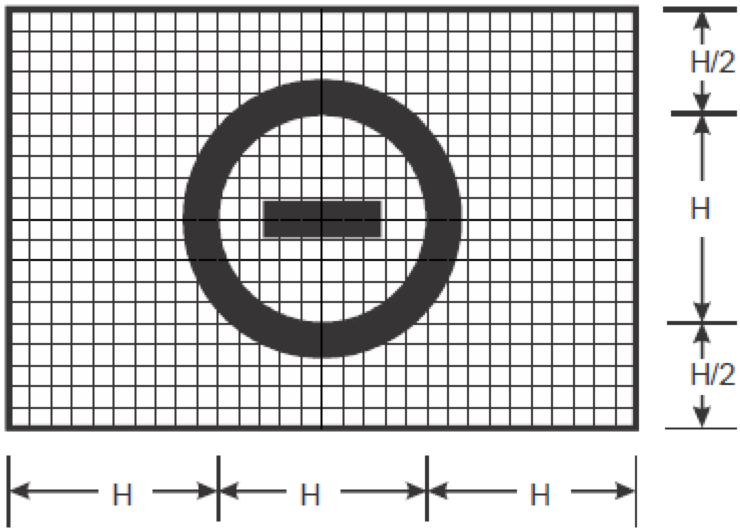

Figure N-2G. No-entry sign

[…]

e) Width of numeral			
~~Code No.~~ Numeral	Numeral height (mm)		
	200	300	400
	Width (mm)		
1	50	74	98
2	137	205	274
3	137	205	274
4	149	224	298
5	137	205	274
6	137	205	274
7	137	205	274
8	137	205	274
9	137	205	274
0	143	214	286

[…]

Table N-3. Letter and numeral width and space between letters or numerals

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.N.775 General

(a) Signs may need to be orientated to improve readability.

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

(b~~c~~) Guidance on signs is contained in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids, Chapter 11.

(c~~d~~) Guidance on frangibility is contained in ICAO Doc 9157, Aerodrome Design Manual, Part 6, Frangibility.

(d~~e~~) Guidance on measuring the average luminance of a sign is contained in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.N.780 Mandatory instruction signs

(a) Applicability:

(1) A mandatory instruction sign should be provided to identify a location beyond which an aircraft taxiing or vehicle should not proceed unless authorised by the aerodrome control tower.

(2) Mandatory instruction signs should include runway designation signs, Category I, II, or III holding position signs, runway-holding position signs, road-holding position signs, and ~~NO ENTRY~~ no-entry signs.

[…]

(8) A ~~NO ENTRY~~ no-entry sign should be provided when entry into an area is prohibited.

(b) Location:

[…]

(3) A ~~NO ENTRY~~ no-entry sign should be located at the beginning of the area to which entrance is prohibited on each side of the taxiway as viewed by the pilot.

(4) A runway-holding position sign should be located on each side of the runway-holding position facing the approach to the obstacle limitation surface or ILS/MLS critical/sensitive area as appropriate.

(c) Characteristics:

[…]

(4) The inscription on a ~~NO ENTRY~~ no-entry sign should be in accordance with Figure N-4.

(5) The inscription on a runway-holding position sign at a runway-holding position should consist of the taxiway designation and a number.

[…]
[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

CS ADR-DSN.N.785 Information signs

[…]

(c) Characteristics:

[…]

(11) A taxiway should be identified by a designator that is used only once on an aerodrome and comprising a single letter, two letters, or a combination of a letter or letters followed by a number.

(12) When designating taxiways~~,~~:

(i) ~~the use of~~ the letters I, O, or X~~,~~ should not be used ~~and the use of words such as 'inner' and 'outer' should be avoided wherever possible,~~ to avoid confusion with the numerals 1, 0, and the closed marking~~.~~;

(ii) the use of words such as 'inner' and 'outer' should be avoided wherever possible.

(13) The use of numbers alone on the manoeuvring area should be reserved for the designation of runways.

(14) Apron stand designators should not be the same as taxiway designators.

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.P.825 Taxiway edge markers

(a) At small aerodromes, taxiway edge markers may be used, in lieu of taxiway edge lights, to delineate the edges of taxiways, particularly at night. Additional guidance is given in ~~(~~ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids~~, Chapter 2, paragraph 2.4.1)~~.

(b) On a straight section of a taxiway, taxiway edge markers should be spaced at uniform longitudinal intervals of not more than 60 m. On a curve the markers should be spaced at intervals less than 60 m so that a clear indication of the curve is provided. The markers should be located as near as practicable to the edges of the taxiway, or outside the edges at a distance of not more than 3 m. Additional guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids~~, Chapter 2, paragraph 2.4.2~~.

(c) The markers commonly used are cylindrical in shape. Ideally, the design of the marker should be such that when installed properly, no portion should exceed 35 cm total height above the mounting surface. However, where significant snow heights are possible, markers exceeding 35 cm in height may be used but their total height should be sufficiently low to preserve clearance for propellers, and for the engine pods of jet aircraft. Additional guidance is given is ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids~~, Chapter 2, paragraph 2.4.4~~.

(d) A taxiway edge marker should be lightweight and frangible. One type of marker meeting these requirements is detailed in Figure GM-P-1. The post is made up of flexible PVC and its colour is blue. The sleeve which is retro-reflective, is also blue. Note that the area of the marked surface is 150 cm2. Additional guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids~~, Chapter 2, paragraph 2.4.5~~.

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.Q.840 Objects to be marked and/or lighted within the lateral boundaries of the obstacle limitation surfaces

[…]

(d) An autonomous aircraft detection system may be installed on or near an obstacle (or group of obstacles such as wind farms) within or outside the lateral boundaries of the obstacle limitation surfaces. This system is designed to operate the lighting only when it detects an aircraft approaching the obstacle, to reduce light exposure to local residents. Additional guidance on the design and installation of an autonomous aircraft detection system is available in the ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.

The inclusion of this guidance is not intended to imply that such a system has to be provided.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.Q.845 Marking of fixed objects

[…]

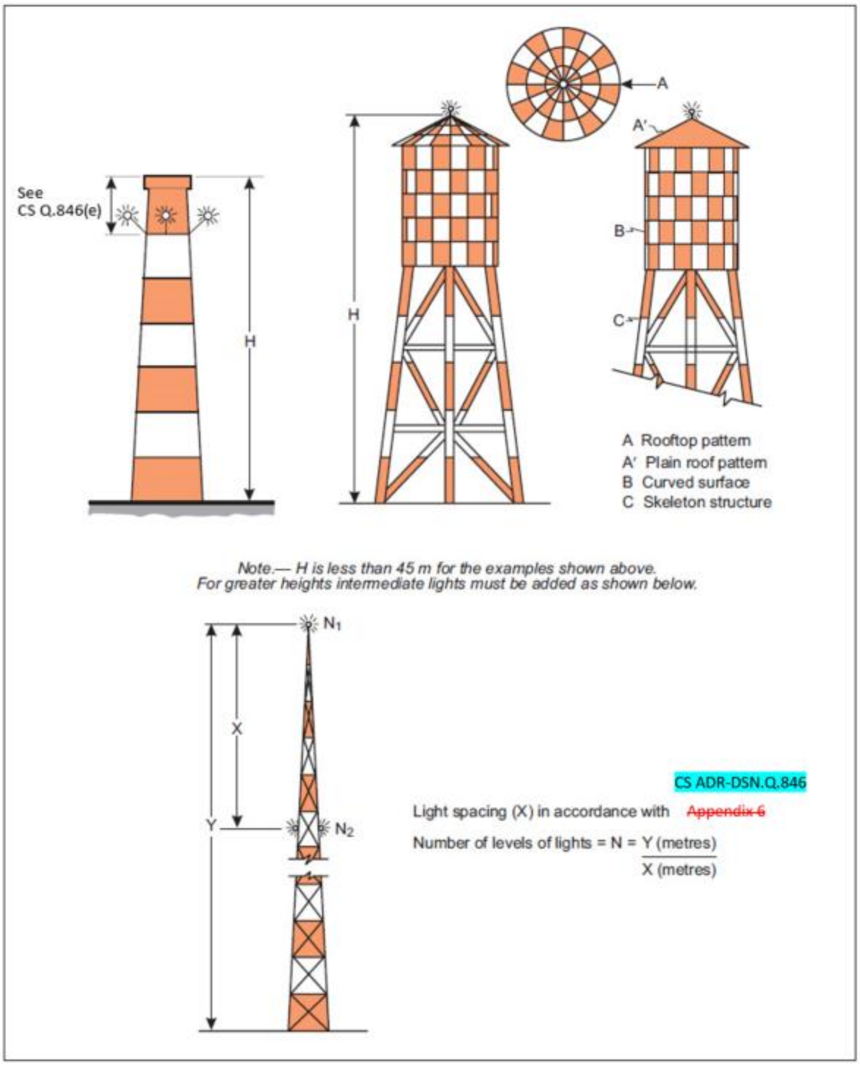

Figure Q-2. Examples of marking and lighting of tall structures

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

CS ADR-DSN.Q.852 Marking and lighting of overhead wires, cables, supporting towers, etc.

[…]

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

Note: This table does not include recommended horizontal beam spreads. CS ADR-DSN.Q.846(c) requires 360° coverage around an obstacle. Therefore, the number of lights needed to meet this requirement will depend on the horizontal beam spreads of each light as well as the shape of the obstacle. Thus, with narrower beam spreads, more lights will be required.

(a) 360° horizontal. All intensities are expressed in Candela. For flashing lights, the intensity is read into effective intensity, as determined in accordance with ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.

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

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

Note: an extended beam spread may be necessary under specific configuration and justified by an safety assessmentaeronautical study.

Table Q-3. Light distribution for medium- and high-intensity obstacle lights according to benchmark intensities of Table Q-1

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/4]
[Issue: ADR-DSN/6]

CS ADR-DSN.T.915 Siting of equipment and installations on operational areas

[…]

(e) Any equipment or installation required for air navigation or for aircraft safety purposes, which should be located on or near a strip of a precision approach runway Category I, II, or III and which:

~~(1) is situated on that portion of the strip within 77.5 m of the runway centre line where the code number is 4 and the code letter is F; or~~

(1~~2~~) is situated within 240 m from the end of the strip and within:

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

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

(2~~3~~) penetrates the inner approach surface, the inner transitional surface, or the balked landing surface;

should be frangible and mounted as low as possible.

[…]

[Issue: ADR-DSN/2]
[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]

GM1 ADR-DSN.T.915 Siting of equipment and installations on operational areas

(a) The design of light fixtures and their supporting structures, light units of visual approach slope indicators, signs and markers is specified in CS ADR-DSN.M.615, CS ADR-DSN.M.640, CS ADR-DSN.N.775, and Book 1 Chapter P respectively.

(b) Guidance on siting of equipment and installations on operational areas is given in ICAO Doc 9157, Aerodrome Design Manuals, Part 2, Taxiways, Aprons and Holding Bays and Part 6, Frangibility.

(c) Guidance on the frangible design of visual and non-visual aids for navigation is given in the ICAO Doc 9157, Aerodrome Design Manual, Part 5, Electrical Systems.

(d) Requirements for obstacle limitation surfaces are specified in Book 1, Chapter J.

(e) The term 'aircraft safety purposes' refers to the installation of arresting systems.

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/5]
[Issue: ADR-DSN/6]

CS ADR-DSN.U.935 Colours for markings, signs and panels

[…]

(c) The chromaticities and luminance factors of ordinary colours, colours of retroreflective materials, and colours of internally illuminated ~~(internally illuminated)~~ signs and panels should be determined under the following standard conditions:

[…]

[Issue: ADR-DSN/3]
[Issue: ADR-DSN/6]