THE NETHERLANDS
MILITARY AVIATION REGULATIONS

Requirements for Military Aerodromes
Acceptable Means of Compliance &
Guidance Material

NLD-MAR-ADR
AMC & GM

Version Number	**1.0**
Version Date	**10 January 2024**

MILITARY AVIATION AUTHORITY
THE NETHERLANDS (MAA-NLD)

STATUS PAGE

Version	Issue Date	Change content	Affected Pages
1.0	10-01-2024	-	All

Notes:

1. This AMC and GM for the NLD-MAR-ADR document and its CS-ADR-DSN is a derivative from the EASA AMC and GM for these documents, and is kept as close as possible to the original text. Additions, changes or deletions are applied by the MAA-NLD based only on military operational specificities. Military operational specificities are supported by specific national legislation, NATO Standardisation Agreements (STANAGs) and/or internal documents of the Netherlands Ministry of Defense. In case there are compelling budgetary or technical constraints (including capacity), (temporary) preventing implementation, the MAA-NLD and the Sector will determine together whether application of the specification is proportionate. The aim however should always be to deliver a level of safety and interoperability with civil systems that is as effective as that resulting from the application of the essential requirements set out in Annexes V this Regulation, as required through the Regulation (EU) 2018/1139

2. The following choices where made whilst creating this CS-ADR-DSN part of the NLD-MAR-ADR:

a. EASA Acceptable Means of Compliance are used verbatim if the applicability is identical in the military context;

b. Specific military deviations from the EASA AMC that are applicable to more than one military aerodrome are added in this AMC document;

c. Specific military deviations from the EASA AMC that are applicable at one military aerodrome only, can be filled as Deviation Acceptance and Action Document (DAAD), Special Condition (SC) or Equivalent Level of Safety (ELoS);

d. EASA AMC are deleted when there is no relevance in the military (and/or civil co-use) context, as long as it has no adverse effect on the level of safety and interoperability;

e. EASA GM is not transposed in this document unless is of extreme added value. Even if the EASA original GM is not transposed in this document it can be used as reference material when needed.

3. The numbering of the AMC and GM is identical to the numbering of the EASA AMC and GM. For military specific additions numbers are chosen that do not exist in the EASA document.

4. This AMC and GM part of NLD-MAR-ADR document and its CS-ADR-DSN relies on definitions laid down in NLD-MAD-1. The Forms referred to in this document are published on the MAA-NLD Intranet and Internet.

Content

ANNEX II Part Authority Requirements — Aerodrome Operators (Part-MAR-ADR.AR)

SUBPART B — MANAGEMENT (NLD-MAR-ADR.AR.B)

AMC1 MAR-ADR.AR.B.005(a) Management system

GENERAL

(a) The following should be considered when deciding upon the required organisational structure:
  (1) the number of certificates and approvals to be issued;
  (2) the number of declared organisations;
  (3) the number and complexity of aerodromes, aerodrome operators, and providers of apron management services within that Member State;
  (4) the possible allocation of tasks to third natural or legal persons of resources needed to fulfil the continuing oversight obligations;
  (5) reserved;
  (6) reserved;
  (7) reserved;
(b) The set-up of the organisational structure ensures that carrying out the various tasks and obligations of the MAA-NLD does not rely solely on individuals. A continuous and undisturbed fulfilment of these tasks and obligations of the MAA-NLD is also guaranteed in case of illness, accident, or leave of individual employees.

AMC1 MAR-ADR.AR.B.005(a)(1) Management system

DOCUMENTED POLICIES AND PROCEDURES

(a) The various elements of the MAA-NLD are documented in order to establish a reference source for the establishment and maintenance of the MAA-NLD.
(b) The documented policies and procedures are established in a way that facilitates their use. They are clearly identified, kept up to date, and made readily available to all personnel involved in the relevant activities.
(c) The documented policies and procedures cover the following aspects:
  (1) policy and objectives;
  (2) organisation structure;
  (3) responsibilities and associated authority;
  (4) processes and procedures;
  (5) internal and external interfaces;
  (6) internal control procedures;
  (7) training of personnel;
  (8) cross references to associated documents; and
  (9) assistance from other (military) competent authorities (where required).
(d) Reserved

AMC2 MAR-ADR.AR.B.005(a)(1) Management system

DOCUMENTED POLICIES AND PROCEDURES

(a) The procedures in the MAA-NLD's management system provide the following information:
  (1) regarding continuing oversight functions undertaken by the MAA-NLD, its organisational structure with description of the main processes. This information demonstrates the allocation of responsibilities within the MAA-NLD, and that the MAA-NLD is capable of carrying out the full range of tasks. It considers overall proficiency and authorisation scope of MAA-NLD personnel;
  (2) changes which significantly affect the MAA-NLD's oversight capabilities;
  (3) for personnel involved in oversight activities, the minimum professional qualification requirements and experience, and principles guiding appointment (e.g. assessment);
  (4) how the following are carried out: assessing applications and evaluating compliance, issuance of certificates, performance of continuing oversight, follow-up of findings and observations, enforcement measures, and resolution of safety concerns;

(5) principles of managing exemptions, derogations, cases of equivalent level of safety, and special conditions;
(6) systems used to disseminate applicable safety information for timely reaction to a safety problem;
(7) criteria for planning continuing oversight (oversight programme), including adequate management of interfaces when conducting continuing oversight (aerodrome operations and ATS operations for example); and
(8) outline of the initial training of newly recruited oversight personnel (taking future activities into account), and the basic framework for continuation training of oversight personnel.

(b) The procedures in the MAA-NLD's management system include any amendments to these procedures.

AMC2 MAR-ADR.AR.B.005(a)(2) Management system

QUALIFICATION AND TRAINING — AERODROME INSPECTORS

(a) Initial training should encompass:

(1) Initial theoretical training

The objective of the initial theoretical training is to familiarise the trainee aerodrome inspectors with the finding categorisation, reporting, follow-up procedures, and enforcement. The primary objective of the theoretical training is not the transfer of technical knowledge as the trainees should possess such knowledge, either from previous work experience or through specialised training, prior to attending the theoretical course (for the areas to be covered in the training programme, see AMC1 MAR-ADR.AR.B.005(a)(2)). Amongst others, the theoretical training should cover theory of audits and inspections, as well as quality/safety assurance.

(2) Practical training

The objective of the practical training is to instruct on audit/inspection techniques and specific areas of attention without interference with the operation of the aerodrome activities.

The MAA-NLD ensures that trainees have successfully completed the initial theoretical and practical training above by passing a relevant assessment.

(3) On-the-job training

The objective of the on-the-job training is to familiarise trainees with the particularities of performing an aerodrome audit/inspection in a real, operational environment.

i) Duration and conduct of the on-the-job training

The duration of the on-the-job training should be customised to the particular training needs of every trainee and cover, as much as possible, the audit/inspection items which the inspector will be authorized to inspect. The on-the-job training should include at least four aerodrome audits/ inspections.

The scope and elements to be covered during the on-the-job training

i) Preparation of an audit/inspection:
   (1) sources of information for the preparation of an audit/inspection;
   (2) areas of concern and/or open findings;
   (3) selection of aerodrome operator(s) or organisation(s) responsible for the provision of AMS to be audited/inspected; and
   (4) task allocation among the members of the audit/inspection team.
ii) Administrative issues of the inspection:
   (1) aerodrome inspector credentials, rights, and obligations;
   (2) aerodrome access procedures;
   (3) safety and security airside procedures; and
   (4) aerodrome inspector toolkit (fluorescent vest, checklists, clinometer, distance-measurement devices, digital camera, GPS, etc.).
iii) Audit/Inspection:
   (1) introduction — opening meeting;
   (2) on-site activities (audit/inspection according to the area of expertise of the trainee);
   (3) findings (identification, categorisation, evidencing, reporting); and
   (4) corrective actions — enforcement.
iv) Closing meeting — debriefing on the audit/inspection conclusions.
v) Preparation, completion, and delivery of the audit/inspection report.
vi) Human factors elements:

(1) cultural aspects;
(2) resolution of disagreements and/or conflicts; and
(3) auditee stress.

vii) Team leading, if required.

viii) Post-audit/-inspection procedures, such as monitoring the status of open audit findings, follow-up audits/inspections, and closing the findings after appropriate action has been taken by the aerodrome operator or by the organisation responsible for the provision of AMS.

(b) Assessment of trainee aerodrome inspectors
The assessment of the trainee aerodrome inspectors should be done by the aerodrome inspector that provides the training. A trainee aerodrome inspector should be considered to have successfully completed the on-the-job training only after demonstrating to the aerodrome inspector that provides the training that they possess the professional competence, knowledge, judgement, and ability to perform aerodrome inspections and audits in a real, operational environment, in accordance with the applicable requirements.

(c) Aerodrome inspectors appointed to provide training and assess trainees
The aerodrome inspectors that provide the training, and that assess trainee aerodrome inspectors, are appointed by the MAA-NLD and meet the qualification criteria established by the MAA-NLD. These criteria should require that the appointee has been a qualified aerodrome for the last 3 years prior to their appointment. Additional factors to be considered when appointing aerodrome inspectors to provide training, and to assess trainee aerodrome inspectors, include: knowledge of training techniques, professionalism, maturity, judgment, integrity, safety awareness, communication skills, and personal performance standards.

AMC3 MAR-ADR.AR.B.005(a)(2) Management system

QUALIFICATION OF AERODROME INSPECTORS AFTER SUCCESSFUL COMPLETION OF TRAINING

(a) Upon the successful completion of the initial training (initial theoretical training, practical training, and on-the-job training) the MAA-NLD issues a formal qualification statement for each qualified aerodrome inspector listing their privileges. Credentials are also issued for the aerodrome inspectors, to facilitate their work.

(b) The background knowledge and/or working experience of the aerodrome inspectors determines their privileges (the scope of their inspection; what they are entitled to inspect). The MAA-NLD determines what the inspector is entitled to inspect taking into account the following considerations:
(1) background knowledge; and
(2) working experience.

(c) The MAA-NLD has a system which ensures that aerodrome inspectors meet at all times the qualification criteria with regard to the eligibility, training, and recent experience.

AMC1 MAR-ADR.AR.B.020(a)(4);(a)(5) Record keeping

AERODROMES — AERODROME OPERATORS — ORGANISATIONS RESPONSIBLE FOR THE PROVISION OF AMS

Records related to a certified aerodrome and its aerodrome operator, or the organisation responsible for the provision of AMS should include, as appropriate to the type of organisation:

(a) the application for a certificate, approval, or declaration;

(b) the documentation based upon which:
(1) the certificate or the approval has been granted with amendments; and
(2) the declaration has been registered;

(c) the documentation related to notifications of changes by the applicant and their assessment;

(d) the certificate or approval issued, including any changes to it;

(e) a copy of the continuing oversight programme listing the dates when audits are due and when such audits were carried out;

(f) continuing oversight records, including all audit and inspection records;

(g) copies of all relevant correspondence;

(h) details of any exemption or derogation, and enforcement actions;

(i) any report from other competent authorities relating to the oversight of the aerodrome, the aerodrome operator, and the organisation responsible for the provision of AMS, if applicable; and

(j) a copy of any other document approved by the MAA-NLD.

AMC1 MAR-ADR.AR.B.020(c) Record keeping

AERODROMES — AERODROME OPERATORS — PROVIDERS OF APRON MANAGEMENT SERVICES

(a) Records which are considered to be related to the certification of an aerodrome, and to be maintained for the lifespan of the certificate include, but are not limited to, the following:
  (1) applications submitted;
  (2) notifications of the certification specifications for an initial certification and any changes thereof, including:
    i) any provisions for which an equivalent level of safety has been accepted; and
    ii) any special conditions.
  (3) documentation related to alternative means of compliance used;
  (4) documentation related to Deviation Acceptance and Action Documents (DAAD) if relevant;
  (5) documentation related to exemptions or derogations granted;
  (6) aeronautical studies and safety assessments;
  (7) designs of the aerodrome;
  (8) declarations made by the applicant;
  (9) current version of an aerodrome manual, and evidence of its evaluation; and
  (10) approvals granted.
(b) Records for aerodrome equipment, or parts of the aerodrome infrastructure which have been removed from the aerodrome need not be maintained.
(c) For providers of apron management services, records include, but may not be limited to, the declarations, and the relevant documentation submitted by the providers.

AMC1 MAR-ADR.AR.C.010 Oversight programme

PROCEDURES FOR THE OVERSIGHT OF AERODROME OPERATORS AND OF ORGANISATIONS RESPONSIBLE FOR THE PROVISION OF AMS

(a) The MAA-NLD assigns a focal point for each aerodrome operator and for each organisation responsible for the provision of AMS. Where more than one aerodrome inspector is assigned to an aerodrome operator or to an organisation responsible for the provision of AMS, one of them is appointed as focal point having the overall responsibility for the supervision of, and liaison with, the aerodrome operator's management or the management of the organisation responsible for the provision of AMS, and be responsible for reporting on the compliance with the requirements for its operations.

(b) Inspections, audits, and oversight procedures, on a scale and frequency appropriate to the operation, should include but not be limited, as appropriate, to the items from the following list:

(1) aerodrome infrastructure and equipment;
(2) visual aids and aerodrome electrical systems, including their maintenance programme;
(3) obstacle restriction and control;
(4) aerodrome data reporting, including reporting of surface contaminants and runway surface conditions, and NOTAM origination;
(5) aerodrome emergency planning;
(6) rescue and firefighting;
(7) removal of disabled aircraft;
(8) storage facilities and handling of dangerous goods and fuel, including fuel installations, fuel quality, and fuelling equipment;
(9) low-visibility operations;
(10) winter and adverse weather operations;
(11) protection of radar, navigation aids, and other aerodrome equipment;
(12) apron management;
(13) apron safety management;
(14) vehicle authorisation and operation on the movement area, including maintenance programmes;
(15) control of pedestrians;
(16) wildlife hazard management;
(17) runway excursion and incursion prevention programmes of the aerodrome operator, as part of the MAA-NLD's runway safety programme, including the functioning and effectiveness of the aerodrome's local runway safety team, as well as the implementation of identified actions;
(18) FOD control programme of the aerodrome operator;
(19) inspections of the movement area;
(20) maintenance programme of the aerodrome systems and the movement area;
(21) aerodrome works;
(22) protection against hazardous activities in the aerodrome surroundings;
(23) personnel training and records, including review of training programme on runway excursion and incursion prevention, as well as the drivers' authorisations and language proficiency assessments, training programmes, and their implementation;
(24) aerodrome manuals and documentation;
(25) operator's management system, including its safety management system and its quality, and security management system for aeronautical data;
(26) operator's oversight of the compliance of the organisations operating, or providing services at the aerodrome (third parties).
(27) Inspection or audits are a 'deep cut' through the items selected, and all findings and observations are recorded.

(c) Aerodrome inspectors should analyse and assess the root cause(s) identified by the aerodrome operator or the organisation responsible for the provision of AMS, and be satisfied that the corrective actions taken are adequate to correct the non-compliance, and to prevent its reoccurrence.

(d) Inspections and audits may be conducted jointly or separately. Inspections and audits may also be coordinated with inspections and audits conducted by the competent authorities responsible for other areas, to address areas of coordination between aerodrome operator and the providers of other services (e.g. ATM/ANS). Joint audits with competent authorities for other areas should also

be performed because they are particularly effective to examine the interfaces between different actors at the aerodrome (e.g. airport and ATS), including the prevention of runway excursions and incursions.

(e) Inspections may, at the discretion of the MAA-NLD, be conducted with or without prior notice to the aerodrome operator or the organisation responsible for the provision of AMS.

(f) Where it is apparent to an aerodrome inspector that an aerodrome operator or an organisation responsible for the provision of AMS has failed to comply with the applicable requirements, with the result that safety has been or might have been compromised, the aerodrome inspector should ensure that the person in charge within the MAA-NLD is informed without delay.

(g) In the first few months of a new operation, physical change of the aerodrome or organisational restructure, aerodrome inspectors should be particularly alert to any irregular procedures, evidence of inadequate facilities or equipment, or indications that management control of the operation may be ineffective.

(h) Aerodrome inspectors should take account of any conditions that may indicate a significant deterioration in the financial situation of the aerodrome operator or of the organisation responsible for the provision of AMS. When any financial difficulties are identified, aerodrome inspectors should increase the technical surveillance of the operation with particular emphasis on the upholding of safety standards.

(i) The number or the magnitude of the non-compliances identified by the MAA-NLD will serve to support the MAA-NLD's continuing confidence in the aerodrome operator's competence or in the competence of the organisation responsible for the provision of AMS, or, alternatively, may lead to a breach of confidence. In the latter case, the MAA-NLD reviews any identified shortcomings of the management system, and take appropriate action if required.

AMC1 MAR-ADR.AR.C.010(b) Oversight programme

AUDIT

(a) The oversight programme indicates which aspects will be covered with each audit.

(b) Part of the audit concentrates on compliance-monitoring reports to determine whether the aerodrome operator or the organisation responsible for the provision of AMS identifies the root causes and corrects its problems.

(c) Upon conclusion of the audit, an audit report is completed by the auditing aerodrome inspector, including all findings raised.

AMC1 MAR-ADR.AR.C.010(b);(c) Oversight programme

OVERSIGHT PLANNING CYCLE

(a) The safety performance of the aerodrome operator and the organisation responsible for the provision of AMS are continuously monitored in order to ensure that the oversight programme and the applicable oversight planning cycle remain appropriate.

(b) The oversight planning cycle and the related oversight programme for each aerodrome operator or for each organisation responsible for the provision of AMS are reviewed annually.

(c) The oversight planning cycle and the related oversight programme, including their annual review, are determined according to the following elements:
  (1) the results of past certification and oversight activities;
  (2) the capability to effectively identify aviation safety hazards, and manage the associated risks;
  (3) the effective control over all changes in accordance with point MAR-ADR.OR.B.040 for aerodrome operators and with point MAR-ADR.OR.F.025 for organisations responsible for the provision of AMS;
  (4) the absence of level 1 findings;
  (5) the response time to implement corrective actions requested by the MAA-NLD in accordance with MAR-ADR.AR.C.055(d)(2); and
  (6) the risk exposure related to the aerodrome operated, such as traffic volume, type of aircraft operated at the aerodrome, or physical characteristics of the aerodrome.

(d) During each oversight planning cycle, the MAA-NLD convenes meetings with the accountable manager of the aerodrome operator or the organisation responsible for the provision of AMS, or with their delegate.

AMC2 MAR-ADR.AR.C.015(c) Initiation of the certification process

ESTABLISHMENT AND NOTIFICATION OF THE CERTIFICATION BASIS

(a) Upon receipt of the application, the MAA-NLD examines and assesses the content of the application and the related documentation, including the proposed certification specifications and any provisions for which compliance is proposed to be demonstrated in a different way that provides for an equivalent level of safety. (See also paragraph (a)(2) of AMC1 MAR-ADR.AR.C.035(c)).
(b) The MAA-NLD establishes the certification basis of the aerodrome in accordance with MAR-ADR.AR.C.020;
(c) The MAA-NLD documents and notifies the applicant of:
  (1) the certification basis as established in paragraph (b) above; and
  (2) any change thereto, as a result of certification specifications which became effective after the notification of the certification basis and which the applicant decided to comply with, or that the MAA-NLD has found necessary to be complied with, or design changes made, compliance demonstration results, new special conditions that the MAA-NLD considers necessary, etc.
(d) In addition, the MAA-NLD assesses the documentation demonstrating the way the applicant is proposing to with the applicable requirements of the NLD-MAR-ADR, and any other applicable requirements that are matching the aerodrome design and its operation.
(e) When notifying the applicant in accordance with paragraph (c), the MAA-NLD also informs him/her of the right of appeal.

AMC1 MAR-ADR.AR.C.020(a) Certification basis

EFFECTIVE CERTIFICATION SPECIFICATIONS

(a) The certification specifications that the MAA-NLD uses to establish and notify the certification basis to the applicant, are those that were effective during the date of the application.
(b) Notwithstanding paragraph (a) above, if at any point of the certification process the applicant requests to use certification specifications which came into force after the filing of his/her application, or the notification of the certification basis by the MAA-NLD, then the MAA-NLD examines if it is necessary to also include in the certification basis other certification specifications, which also came into effect after the filling of the initial application and which are, in the opinion of the MAA-NLD, directly related to those certification specifications that have been proposed by the applicant.
(c) Notwithstanding paragraph (a) and (b) above, the MAA-NLD may at any time, after the filing of the application, decide to include in the certification basis any certification specifications that it deems necessary.

AMC1 MAR-ADR.AR.C.020(b);(c) Certification basis

CASES OF EQUIVALENT LEVEL OF SAFETY AND SPECIAL CONDITIONS

When deciding on cases of equivalent safety or special conditions and their respective underpinning justification material, the MAA-NLD considers whether any of the applicable certification specifications compare to
(a) a Standard or a Recommended Practice and their different implications foreseen by the ICAO Convention and its Annexes;
(b) a Standard NATO Agreement (STANAG) and its technical publications.

GM1 MAR-ADR.AR.C.020(b) Certification basis

CERTIFICATION BASIS — PROPOSALS FOR EQUIVALENT LEVEL OF SAFETY

When the MAA-NLD assesses a proposal of an applicant who has requested to demonstrate an equivalent level of safety, the MAA-NLD pays, amongst others, particular attention to:
(a) the intent of the certification specifications in question, and assess if the proposal satisfies that intent;

(b) any possible interconnections/relationships between the certification specifications which the proposal is related to, with any other certification specifications or requirements, in order to:
  (1) identify any implications of the proposal to other design, operational, human, or other elements of the system; and
  (2) establish if such interconnections/relationships and implications have been properly and adequately addressed by the applicant.
(c) The applicant's proposal may involve design, technical, procedural, or other suitable means.

The demonstration of an equivalent level of safety may involve various methodologies, quantitative or qualitative, whose magnitude and complexity may vary, depending on each case.

In any case, the applicant should demonstrate to the satisfaction of the MAA-NLD that the proposed solution offers a level of safety, which is effectively not lower than that associated with the relevant certification specifications.

GM3 MAR-ADR.AR.C.035(a) Issuance of certificates

EVALUATION OF SAFETY ASSESSEMENTS PROVIDED BY THE AERODROME OPERATOR AT THE INITIAL CERTIFICATION OR ACCOMPANYING A REQUEST FOR PRIOR APPROVAL OF A CHANGE IN ACCORDANCE WITH MAR-ADR.OR.B.040.

(a) The MAA-NLD evaluates the conclusion of a submitted safety assessment provided by the aerodrome operator to ensure compliance with the relevant requirement for the operator on how to assess changes under MAR-ADR.OR.B.040(f).
(b) The MAA-NLD evaluates the safety assessment and, in particular, makes sure that:
  (1) the identified safety concern(s) has (have) been assessed through the safety assessment process and is (are) adequately documented.
  (2) an appropriate coordination has been performed between the parties affected by the safety concern(s);
  (3) the assessment covers the whole system and the interactions of its elements;
  (4) the hazards have been properly identified and the level of risk assessed;
  (5) the proposed mitigation measures are adequate and consistent with the objective of reducing the identified level of risk and the safety objectives, if relevant;
  (6) the timeframes of the planned implementation of the proposed associated actions are appropriate.
(c) After its evaluation, the MAA-NLD either:
  (1) agrees to the proposed associated actions, such as mitigation measures; or
  (2) coordinates with the aerodrome operator to reach an agreement on revised mitigation measures if some risks have been underestimated, or have not been identified; or
  (3) imposes additional measures; or
  (4) rejects the proposal if no agreement can be reached.
(d) The MAA-NLD defines and undertakes oversight actions that ensure that mitigation and/or additional measures are properly implemented so that the measures actually meet the risk reduction objectives, and that the planned timeframes are applied.
(e) When necessary, the MAA-NLD requires the aerodrome operator to promulgate appropriate information, for use by the aerodrome organisation, various stakeholders, and notably by the air navigation service providers and aircraft operators.

AMC1 MAR-ADR.AR.C.035(b)(2) Issuance of certificates

ISSUANCE OF SEPARATE CERTIFICATES

(a) In case that there is a possibility to issue both separate and single certificates, the MAA-NLD acts in accordance with the application made by the applicant.
(b) In case that there is a possibility to issue separate certificates, both certificates are issued by the MAA-NLD.
(c) In case that an aerodrome operator operates several aerodromes, these should be listed on the aerodrome operator's certificate.

AMC1 MAR-ADR.AR.C.035(d) Issuance of certificates

OPERATING CONDITIONS OR LIMITATIONS

(a) If, during the certification process, an operating condition or a limitation has been determined as necessary to be imposed on or implemented at the aerodrome, the MAA-NLD ensures that such limitation or procedure is also included in the aerodrome manual.
(b) The MAA-NLD also ensures that the aerodrome manual contains all limitations, or any other similar information prescribed in the certification specifications included in the certification basis of the aerodrome.

AMC2 MAR-ADR.AR.C.035(d) Issuance of certificates

OPERATING CONDITIONS OR LIMITATIONS

(a) Operating conditions and limitations, such as noise mitigation or abatement procedures, should not increase, but should seek to reduce where possible, the risk of runway incursions and excursions.
(b) Operating conditions and limitations should undergo a safety risk assessment to determine if they may adversely affect runway incursion and excursion risk levels.

GM1 MAR-ADR.AR.C.035(d) Issuance of certificates

SCOPE OF AIRCRAFT OPERATIONS WITH A HIGHER AERODROME REFERENCE CODE LETTER

Any restrictions or mitigation measures for the use of aircraft type/s at the aerodrome should only be mentioned in the aerodrome manual. Notably any limitations arising from the assessment to be undertaken for the use of the aerodrome by higher code letter aircraft according to MAR-ADR.OPS.B.090 should be included there.

GM1 MAR-ADR.AR.C.035(e) Issuance of certificates

MODEL FOR THE TERMS OF THE CERTIFICATE TO BE ATTACHED TO THE CERTIFICATES

TERMS OF THE CERTIFICATE	
Aerodrome name — ICAO location indicator[1]:	
Conditions to operate[2]:	
Runway designation — declared distances[3]:	
Types of approaches[4]:	
Aerodrome reference code[5]:	
Scope of aircraft operations with a higher aerodrome reference code letter[6]:	
Provision of apron management services[7]:	
Rescue and firefighting level of protection[8]:	
Other [9]:	

[1] To be specified: the official name of the aerodrome and the ICAO location indicator for the aerodrome.
[2] To be specified: day/ night and IFR/ VFR.

[3] To be specified: ASDA, LDA, TODA, TORA in metres for each direction of each runway, including intersection take-off if applicable.

[4] To be specified: approval of the runway for non-instrument, instrument, non-precision approach. In case of precision approach (-es) it is to be indicated, which of the following precision approach (-es) is (are) approved:
— EFVS 200 operation;
— EFVS-A operation;
— EFVS-L operation;
— Standard Category I;
— Special authorisation category I;
— Precision approach category II;
— Special authorisation category II;
— Precision approach category III

[5] To be specified: Aerodrome Reference Code (Code number/Code letter).

[6] To be specified: the approved type of aeroplanes with a higher code letter than indicated in point 6 above.

[7] To be specified: the name of the service provider, both in case such services are or are not provided by the aerodrome operator.

[8] To be specified: the rescue and firefighting level of protection as per Annex IV (MAR-ADR.OPS) of this Regulation.

[9] To be specified: any other information that the MAA-NLD finds necessary to include.

GM2 MAR-ADR.AR.C.035(e) Issuance of certificates

EFVS 200 OPERATION

A runway is suitable for EFVS 200 operation when:

(a) an instrument approach procedure providing at least lateral guidance in which the final approach track is offset by a maximum of 3 degrees from the extended centre line of the runway is established; and

(b) either an obstacle free zone (OFZ) is established or the visual segment surface (VSS) is not penetrated by obstacles, and an instrument departure procedure is established.

AMC1 MAR-ADR.AR.C.035(h) Issuance of certificates

APPROVAL OF THE PROCEDURE FOR THE MANAGEMENT AND NOTIFICATION OF CHANGES

The MAA-NLD establishes and document its process to be followed by the aerodrome inspectors when assessing the scope of the changes in the procedure proposed by the aerodrome operator to be followed for the management and notification of the changes. Criteria to be used include, but are not limited to:

(a) frequency of changes;
(b) magnitude of changes;
(c) complexity of the aerodrome and type of operations;
(d) density of traffic at the aerodrome;
(e) time required to assess the documentation of the changes notified by the aerodrome operator;
(f) reasonable reaction times in relation to types of changes for the MAA-NLD to object to a notification;
(g) need for the timely publication of the changes and their notification by the AIRAC system;
(h) previous conduct of the aerodrome operator; and
(i) effectiveness of the safety management system of the aerodrome operator.

AMC1 MAR-ADR.AR.C.040(a) Changes

EFFECTIVE CERTIFICATION SPECIFICATIONS FOR CHANGES

(a) The certification specifications that the MAA-NLD uses to assess the application for or the notification of a change, are those which were effective on the date of the notification of the change by the aerodrome operator.

(b) Notwithstanding paragraph (a) above, at any point of the process the aerodrome operator may request to use certification specifications that came into force after the filing of the application for, or notification of a change. In such cases, the MAA-NLD examines if it is necessary to also notify the aerodrome operator of other certification specifications, which also came into effect after the date of the application for, or the notification of the change by the aerodrome operator, and which are, in the opinion of the MAA-NLD, directly related to those already identified as being affected by the change.
(c) Notwithstanding paragraph (a) and (b) above, the MAA-NLD will, after the application or notification of a change by the aerodrome operator, notify the aerodrome operator of any certification specifications that it deems necessary for the proposed change.

AMC2 MAR-ADR.AR.C.040(a) Changes

CHANGES REQUIRING PRIOR APPROVAL

(a) Upon receiving an application for a proposed change that requires a prior approval, the MAA-NLD, in due time:
  (1) assesses the proposed change in relation to the certification basis, and the applicable requirements of Part-ADR.OR, Part-ADR.OPS, as well as any other applicable requirements;
  (2) assesses if the aerodrome operator has identified all the applicable certification specifications, applicable requirements of Part-ADR.OR, Part-ADR.OPS, or other applicable requirements which are related to or affected by the change, as well as any proposal of the applicant for the demonstration of an equivalent level of safety;
  (3) assesses the actions proposed by the aerodrome operator in order to show compliance with (1) and (2) above;
  (4) reviews and assess the content of proposed changes to the aerodrome manual; and
  (5) evaluates the safety assessment that has been submitted by the aerodrome operator, in accordance with GM3 MAR-ADR.AR.C.035(a) and verifies its compliance with MAR-ADR.OR.B.040(f).
(b) The MAA-NLD also determines, in due time:
  (1) if the proposed change is directly related to any other certification specification which had been included in the certification basis. If the MAA-NLD finds such a relationship, it includes these related certification specifications amongst those notified to the applicant; and
  (2) if the proposed change is such that a special condition, or an amendment to an existing special condition is required.
(c) The MAA-NLD documents and notifies, in writing, the aerodrome operator, in due time, of:
  (1) the certification specifications that are applicable in accordance with the previous paragraphs (a) and (b);
  (2) any provisions for which the MAA-NLD has accepted the applicant to demonstrate an equivalent level of safety; and
  (3) any special conditions, or amendments to special conditions it finds necessary.
(d) Any subsequent changes to the items mentioned in paragraph (c), are documented and notified to the aerodrome operator, in writing, in due time.
(e) The MAA-NLD, in due time, verifies the compliance of the aerodrome operator and, depending on the change, examines the need for prescribing any condition for the operation of the aerodrome during the change.
(f) When notifying the aerodrome operator in accordance with paragraph (c) or (d), the MAA-NLD also informs him/her of the right of appeal, as exists under the applicable national legislation.

AMC1 MAR-ADR.AR.C.040(a);(f) Changes

GENERAL

(a) Changes in nominated persons: The MAA-NLD should be informed of any changes to nominated persons (see MAR-ADR.OR.D.015) that may affect the certificate or the terms of approval attached to it. When an aerodrome operator submits the name of a nominee for the nominated persons, the MAA-NLD assesses his/her qualifications, and may interview the nominee, or call for additional evidence of his/her suitability.
(b) The MAA-NLD receives from the aerodrome operator each management system documentation

amendment, including amendments that do not require prior approval by the MAA-NLD. A documented systematic approach is used for maintaining the information on when an amendment was received by the MAA-NLD and when it was approved.

(c) Where the amendment requires the MAA-NLD's approval, the MAA-NLD, when satisfied, indicates its approval in writing. Where the amendment does not require prior approval, the MAA-NLD acknowledges receipt in writing.

(d) For changes requiring prior approval, in order to verify the aerodrome operator's compliance with the applicable requirements, the MAA-NLD considers the need to conduct an audit of the operator, limited to the extent of the changes. If required for verification, the audit should include additional interviews and inspections carried out at the aerodrome operator's facilities.

ANNEX III Part Organisation Requirements — Aerodrome Operators (Part-MAR-ADR.OR)

SUBPART B — CERTIFICATION (NLD-MAR-ADR.OR.B)

AMC1 MAR-ADR.OR.B.015(a) Application for a certificate

APPLICATION

The application should be made in writing, and be signed by the applicant, using a standardised MAA-NLD Form 320.

AMC1 MAR-ADR.OR.B.015(b)(1);(2);(3);(4) Application for a certificate

INFORMATION TO BE PROVIDED TO THE MAA-NLD

(a) The applicant should:
  (1) provide its telephone and e-mail address for communication with the MAA-NLD;
  (2) indicate the names of its employees whom the MAA-NLD would contact in order to address any issues that might arise during the evaluation of the application, and the certification process.
(b) The applicant should provide the MAA-NLD with the following:
  (1) information about the location of the aerodrome: the exact location of the aerodrome should be depicted on a map of a suitable scale acceptable to the MAA-NLD;
  (2) information about the type of operations at the aerodrome, including:
    (i) operations during the day and/or night, and type of approaches;
    (ii) landing, and/or take-off operations on each runway;
    (iii) the aircraft types to be served at the aerodrome, and the aircraft type to be used for the design of the aerodrome; and
    (iv) any limitations to the operation of the aerodrome.
  (3) the drawing(s) showing the design of the aerodrome, which should:
    (i) be in a suitable scale, acceptable to the MAA-NLD;
    (ii) be in an electronic format if this is acceptable to the MAA-NLD.
    (iii) contain all the necessary information, including:
      (A) runway(s) orientation;
      (B) the dimensions of the aerodrome's physical characteristics;
      (C) the visual and non-visual aids;
      (D) the obstacle limitation surfaces, and any other surfaces applicable; and
      (E) the aerodrome facilities, installations, and fixed equipment and their location.
  (4) description, height, and location of obstacles, in accordance with the applicable aeronautical data requirements (see MAR-ADR.OPS.A.005 and AMC1 MAR-ADR.OPS.A.005).
(c) The applicant should identify the applicable certification specifications for the design and type of operations of the proposed aerodrome and provide the MAA-NLD with evidence that the proposed design and operation complies with them. If relevant, the applicant should also provide the MAA-NLD with:
  (1) the certification specifications for which it proposes to show compliance in a different manner and demonstrate an equivalent level of safety. Such a proposal has to be acceptable to the MAA-NLD. In such cases, the applicant should also propose the method that will be used to demonstrate compliance and achieve an equivalent level of safety, and submit all necessary documentation to support the proposal;
  (2) any other proposal for which the applicant assumes that the certification specifications issued by the MAA-NLD are inadequate or inappropriate.
(d) The applicant should provide the MAA-NLD documentation to demonstrate how it will comply with the applicable requirements of this Regulation, and any other applicable requirements that are matching the aerodrome design and its operation.

GM1 MAR-ADR.OR.B.015(b)(2) Application for a certificate

AERODROME BOUNDARIES

The map submitted with the application should indicate the boundary of the aerodrome area. It should include, at least, runways, taxiways, aprons, associated strips, runway end safety areas, stopways, clearways, aerodrome visual aids, fixed aerodrome equipment, other aerodrome operational areas, areas adjacent to the movement area, etc, while maintenance areas may be excluded if acceptable to the MAA-NLD.
The above aerodrome boundary should not be confused with the boundaries established for other purposes, such as fences, the land ownership boundaries used by local planning authorities, or those used to designate security restricted zones.

AMC1 MAR-ADR.OR.B.015(b)(4) Application for a certificate

EVIDENCE OF ARRANGEMENTS WITH THIRD PARTIES

The applicant should provide all necessary evidence for arrangements with third parties that provide, or intend to provide services, or undertake activities at the aerodrome, whose activities may have an impact on safety.

AMC1 MAR-ADR.OR.B.015(b)(5) Application for a certificate

ADEQUACY OF RESOURCES

(a) General
The applicant should provide all necessary information needed in order to demonstrate to the MAA-NLD that its proposed organisation and management are suitable, and properly matched to the scale and scope of the operation.
The aerodrome operator should have the ability to discharge its responsibilities with regard to safety. The accountable manager should have access, as well as the authorisation, to the necessary resources to ensure that operations are carried out in accordance with the applicable requirements. The resources include, but are not limited to, personnel, tools and equipment.
(b) Arrangements with other parties
The applicant should indicate those services that are going to be provided directly by the applicant itself and those that will be provided by contracted third parties with regard to the adequacy of the resources.
The applicant should also provide evidence of arrangements if third parties are going to be involved in the provision of services. In addition, the applicant should provide any relevant information needed, or requested by the MAA-NLD, regarding such third parties.

GM1 MAR-ADR.OR.B.015(b)(5) Application for a certificate

ADEQUACY OF RESOURCES

(a) General
In demonstrating to the MAA-NLD the suitability of its organisation and management, the applicant should, amongst others, take into account in its analysis the following:
(1) the size and complexity of the aerodrome;
(2) the type of traffic;
(3) the type of operations;
(4) the level and the density of the traffic;
(5) the operating hours of the aerodrome;
(6) the amount of full-time equivalents (FTEs) necessary for each activity;
(7) human factors principles;
(8) reserved; and
(9) the degree of subcontracting.

AMC1 MAR-ADR.OR.B.015(b)(7) Application for a certificate

INFORMATION TO BE PROVIDED FOR MANAGEMENT PERSONNEL

The applicant should provide information regarding the qualifications, and experience of the accountable manager, and the other nominated persons required, by means of the MAA Form 4.

AMC1 MAR-ADR.OR.B.015(b)(9) Application for a certificate

AERODROME MANUAL

The aerodrome manual and its amendments may be submitted to the MAA-NLD in electronic format the format should be such that allows the MAA-NLD to review, store, and reproduce it.

AMC1 MAR-ADR.OR.B.025(a)(1) Demonstration of compliance

USE OF THIRD PARTIES TO DEMONSTRATE COMPLIANCE

While performing the necessary actions, inspections, tests, safety assessments, or exercises necessary to demonstrate compliance, the aerodrome operator may also use contracted third parties. In any case, the responsibility remains with the aerodrome operator.

AMC2 MAR-ADR.OR.B.025(a)(1) Demonstration of compliance

FLIGHT PROCEDURES

Evidence that the flight procedures of the aerodrome have been approved, as required by the applicable requirements, is considered to be an Acceptable Means of Compliance.

AMC1 MAR-ADR.OR.B.040(a);(b) Changes

CHANGES REQUIRING PRIOR APPROVAL

The aerodrome operator should ensure that prior to initiating any change to the aerodrome or its operation, which requires prior approval, an application is submitted to the MAA-NLD. The applicant should provide documentation containing a description of the proposed change, in which the following are identified:

(a) the terms of the certificate, and/or the elements of the certification basis, and/or the safety-critical aerodrome equipment and/or aerodrome operator's management system (as required by MAR-ADR.OR.D.005(b)), and the parts of aerodrome manual, which are affected by the change, including relevant appropriate detailed design drawings;
(b) the certification specifications with which the proposed change has been designed to comply with, including the certification specifications for which the applicant proposes to show compliance in a different manner in order to demonstrate an equivalent level of safety (for such cases see AMC1 MAR-ADR.OR.B.015(b)(1);(2);(3);(4), paragraph (c)(1));
(c) the requirements of Part-MAR-ADR.OR and Part-MAR-ADR.OPS, and any other applicable requirements that have to be complied with as a result of the proposed change, including the way in which compliance is intended to be demonstrated; and
(d) the safety assessment required under MAR-ADR.OR.B.040(f).

GM1 MAR-ADR.OR.B.040(a);(b) Changes

CHANGES REQUIRING PRIOR APPROVAL

The following is a list of items which are granted prior approval by the MAA-NLD, as specified in the applicable Regulation.

(a) Use of alternative means of compliance as required by MAR-ADR.OR.A.015 Means of Compliance.
(b) Changes to the management and notification procedure for changes not requiring a prior approval, as required by MAR-ADR.OR.B.015(b)(4) Application for a certificate.

(c) Changes to the certification basis, or the terms of the certificate, as required by MAR-ADR.OR.B.040(a)(1) Changes.
(d) Changes to safety-critical aerodrome equipment as required by MAR-ADR.OR.B.040(a)(1) Changes.
(e) Changes significantly affecting elements of the aerodrome operator's management system as required by MAR-ADR.OR.B.040(a)(2) Changes.
(f) Changes to the level of protection of rescue and firefighting services as required by MAR-ADR.OPS.B.010(a)(1)(2) Rescue and firefighting services.
(g) Reserved.
(h) Changes to low-visibility procedures as required by MAR-ADR.OPS.B.045(b) Low Visibility Operations.
(i) Operation of aircraft with higher code letter as required by MAR-ADR.OPS.B.090(a) Use of the aerodrome by higher code letter aircraft.
(j) Changes to the flight procedures.

Moreover the MAA-NLD may require prior approval for changes to any obstacles, developments and other activities within the areas monitored by the aerodrome operator in accordance with MAR-ADR.OPS.B.075, which may endanger safety and adversely affect the operation of an aerodrome, as required by MAR-ADR.AR.C.005(e).

GM1 MAR-ADR.OR.B.040(f) Changes

ASSESSMENT OF CHANGES

(a) Safety assessment for a change
A safety assessment for a change should include:
(1) identification of the scope of the change;
(2) identification of hazards;
(3) determination of the safety criteria applicable to the change;
(4) risk analysis in relation to the harmful effects or improvements in safety related to the change;
(5) risk evaluation and, if required, risk mitigation for the change to meet the applicable safety criteria;
(6) verification that the change conforms to the scope that was subject to safety assessment, and meets the safety criteria, before the change is put into operation; and
(7) the specification of the monitoring requirements necessary to ensure that the aerodrome and its operation will continue to meet the safety criteria after the change has taken place.

(b) Scope of the safety assessment
The scope of the safety assessment should include the following elements and their interaction:
(1) the aerodrome, its operation, management, and human elements being changed;
(2) interfaces and interactions between the elements being changed and the remainder of the system;
(3) interfaces and interactions between the elements being changed and the environment in which it is intended to operate; and
(4) the full lifecycle of the change from definition to operations.

(c) Safety criteria
The safety criteria used should be defined in accordance with the procedures for the management of change contained in the aerodrome manual.
The safety criteria used should, depending on the availability of data, be specified with reference to explicit quantitative acceptable safety risk levels, recognised standards, and/or codes of practice, the safety performance of the existing system, or a similar system.

GM2 MAR-ADR.OR.B.040(f) Changes

ASSESSMENT OF CHANGES - LOCAL RUNWAY SAFETY TEAM

For the role of the Local Runway Safety Team prior to implementing changes, see also GM2 MAR-ADR.OR.D.027.

GM3 MAR-ADR.OR.B.040(f) Changes

ASSESSMENT OF CHANGES – RUNWAY SAFETY

Particular attention should be given to changes which may have an effect on runway safety. This includes the introduction of, or changes to noise mitigation or noise abatement procedures.

AMC1 MAR-ADR.OR.B.065 Termination of operation

TERMINATION OF OPERATION

In case of intended termination of the operation of the aerodrome, the aerodrome operator should notify, in writing, the MAA-NLD and the Aeronautical Information Service provider. The notification should be done in such time in advance, so as to allow for the timely publication of the changes, and their notification by the Aeronautical Information Regulation And Control (AIRAC) system in accordance with the related timeframe.
Upon the termination of the operation, the aerodrome operator should apply closed runway markings, as well as any other measure the MAA-NLD has found appropriate.

AMC1 MAR-ADR.OR.C.005(c) Aerodrome operator Responsibilities

PUBLICATION OF INFORMATION TO THE AERONAUTICAL INFORMATION PUBLICATION

A description of cases involving exemptions, derogations, cases of equivalent level of safety, special conditions, including limitations with regard to the use of the aerodrome, should be published in the (military) Aeronautical Information Publication (AIP), after coordination with the MAA-NLD.

AMC1 MAR-ADR.OR.C.020(b) Findings

GENERAL

The corrective action plan defined by the aerodrome operator should address the effects of the non-compliance, as well as its root cause.

AMC1 MAR-ADR.OR.C.040 Prevention of fire

The aerodrome operator should develop procedures and assign responsibilities for the control of smoking or activities that involve the use of fire hazard, as appropriate.
In addition, these procedures should address the adoption and use of mitigating measures when necessary activities (e.g. maintenance, etc.) which might involve fire hazard need to be authorised. Such authorised activities may not include smoking within the movement area, other operational areas of the aerodrome, or areas of the aerodrome where fuel or other flammable material are stored.

AMC1 MAR-ADR.OR.D.005(b)(1) Management system

SAFETY MANAGEMENT SYSTEM

The safety management system of an aerodrome operator should encompass safety by establishing an organisational structure for the management of safety proportionate and appropriate to the size of the aerodrome operator, and the nature and type of operations. The organisational structure should include a Safety Review Board, and depending on its organisational complexity and structure, a Safety Services Office to assist the work of the safety manager, in accordance with paragraph (a) and (b) below:

(a) Safety Services Office

(1) The safety manager (see MAR-ADR.OR.D.015 and AMC1 MAR-ADR.OR.D.015(c)) should be responsible for the operation of the Safety Services Office which should be independent and neutral in terms of the processes and decisions made regarding the delivery of services by the line managers of operational units.

(2) The function of the Safety Services Office should be to:

(i) manage and oversee the hazard identification system;

(ii) monitor safety performance of operational units directly involved in aerodrome operations;

(iii) advise senior management on safety management matters; and

(iv) assist line managers with safety management matters.

(3) Operators of multiple aerodromes should either establish a central Safety Services Office and appropriate safety departments/functions at all aerodromes or separate Safety Services Office at each aerodrome. Arrangements should be made to ensure continuous flow of information and adequate coordination.

(b) Safety Review Board

(1) The Safety Review Board should be a high level committee that considers matters of strategic safety in support of the accountable manager's safety accountability.

(2) The Safety Review Board should be chaired by the accountable manager, and be composed of heads of functional areas.

(3) The Safety Review Board should monitor:

(i) safety performance against the safety policy and objectives;

(ii) that any safety action is taken in a timely manner; and

(iii) the effectiveness of the organisation's safety management processes.

(4) The Safety Review Board should ensure that appropriate resources are allocated to achieve the established safety performance.

(5) The safety manager or any other relevant person may attend, as appropriate, Safety Review Board meetings. He/she may communicate to the accountable manager all information, as necessary, to allow decision making based on safety data.

(6) Operators of multiple aerodromes should either establish a central Safety Review Board, or separate Safety Review Boards for each aerodrome or group of aerodromes. In the case of central or group Safety Review Groups, they should ensure that all aerodromes are represented in the Safety Review Board, at the appropriate management level. Arrangements should be made to ensure continuous flow of information and adequate coordination.

In less complex aerodrome organisations/operations, the aerodrome operator should nominate a person who fulfils the role of safety manager, and who is responsible for coordinating the safety management system (see MAR-ADR.OR.D.015 and AMC1 MAR-ADR.OR.D.015(c)).

GM2 MAR-ADR.OR.D.005(b)(1) Management system

SAFETY SERVICES OFFICE — SAFETY REVIEW BOARD — SAFETY ACTION GROUP

Different titles may also be used for the Safety Services Office, the Safety Review Board, and the Safety Actions Group.

AMC1 MAR-ADR.OR.D.005(b)(2) Management system

SAFETY POLICY

(a) The safety policy should:
  (1) be endorsed by the accountable manager;
  (2) clearly identify safety as a high organisational priority with the military context of the mission always being considered, aiming to guarantee a minimum level of aviation safety with risks being as low as reasonably practicable.
  (3) reflect organisational commitments regarding safety and its proactive and systematic management;
  (4) be communicated, with visible endorsement, throughout the organisation;
  (5) include safety reporting principles; and
  (6) be periodically reviewed to ensure it remains relevant and appropriate to the organisation.
(b) The safety policy should:
  (1) include a commitment:
    (i) to improve towards the highest safety standards;
    (ii) to comply with all applicable legal requirements, meet all applicable standards, and consider best practices;
    (iii) to provide appropriate resources;
    (iv) to enforce safety as one primary responsibility of all managers and staff;
  (2) include the safety reporting procedures;
  (3) with reference to a just culture, clearly indicate which types of operational behaviours are unacceptable, and include the conditions under which disciplinary action would not apply; and
  (4) be periodically reviewed to ensure it remains relevant and appropriate.
(c) Senior management should:
  (1) continually promote the safety policy to all personnel, and demonstrate their commitment to it;
  (2) provide necessary human and financial resources for its implementation; and
  (3) establish safety objectives and performance standards.

AMC1 MAR-ADR.OR.D.005(b)(3) Management system

HAZARD IDENTIFICATION PROCESS

(a) Hazard identification should be based on a combination of reactive, proactive, and predictive methods of safety data collection. Reactive, proactive, and predictive schemes for hazard identification should be the formal means of collecting, recording, analysing, acting on, and generating feedback about hazards and the associated risks that affect safety.
(b) All reporting systems, including confidential reporting schemes, should include an effective feedback process.

AMC1 MAR-ADR.OR.D.005(b)(4) Management system

SAFETY RISK ASSESSMENT AND MITIGATION

(a) A formal safety (risk) assessment and mitigation process should be developed and maintained that ensures analysis (in terms of probability and severity of occurrence), assessment (in terms of tolerability), and control (in terms of mitigation) of risks.
(b) The levels of management who have the authority to make decisions regarding the tolerability of safety risks, in accordance with (a) above, should be specified in the aerodrome manual.

AMC1 MAR-ADR.OR.D.005(b)(5) Management system

SAFETY PERFORMANCE MONITORING AND MEASUREMENT

(a) Safety performance monitoring and measurement should be the process by which the safety performance of the aerodrome operator is verified in comparison to the safety policy and objectives, identified safety risks and the mitigation measures.
(b) This process should include the setting of safety performance indicators and safety

performance targets, and measuring the aerodrome operator's safety performance against them.

AMC1 MAR-ADR.OR.D.005(b)(6) Management system

THE MANAGEMENT OF CHANGE

The aerodrome operator should manage safety risks related to a change. The management of change should be a documented process to identify external and internal change that may have an adverse effect on safety.
It should make use of the aerodrome operator's existing hazard identification, safety (risk) assessment, and mitigation processes.

AMC1 MAR-ADR.OR.D.005(b)(7) Management system

CONTINUOUS IMPROVEMENT OF THE SAFETY MANAGEMENT SYSTEM

The aerodrome operator should continuously seek to improve its safety performance. The aerodrome operator should develop and maintain a relevant formal process. Continuous improvement should be achieved through:
(a) proactive and reactive evaluation of facilities, equipment, documentation, and procedures;
(b) proactive evaluation of an individual's performance, to verify the fulfilment of that individual's safety responsibilities; and
(c) reactive evaluations in order to verify the effectiveness of the system for control and mitigation of safety risks.

AMC1 MAR-ADR.OR.D.005(b)(8) Management system

SAFETY MANAGEMENT SYSTEM TRAINING

(a) The aerodrome operator should establish a safety management system training programme for all aerodrome operations, rescue and firefighting, and maintenance personnel, including all management personnel of the aerodrome (e.g. supervisors, managers, senior managers, and the accountable manager), regardless of their level in the aerodrome operator's organisation.
(b) The amount and level of detail of safety training should be proportionate and appropriate to the individual's responsibility and involvement in the safety management system.
(c) The safety management system training programme should be developed in accordance with AMC1 MAR-ADR.OR.D.017(a);(b), and AMC1 MAR-ADR.OPS.B.010(b);(c) and be incorporated in the training programme foreseen therein.

AMC1 MAR-ADR.OR.D.005(b)(9) Management system

SAFETY COMMUNICATION

(a) The aerodrome operator should communicate safety management system objectives and procedures to all operational personnel, and the safety management system and its application should be evident in all aspects of operations.
(b) Communication should flow between the safety manager and operational personnel throughout the organisation. The safety manager should communicate the performance of the organisation's safety management system through suitable means. The safety manager should, also, ensure that lessons learned from investigations, safety related events, or other safety related experiences, both internally and from other organisations, are distributed widely.
(c) Safety communication should aim to:
  (1) ensure that all staff are fully aware of the safety management system;
  (2) convey safety-critical information;
  (3) explain why particular actions are taken; and
  (4) explain why safety procedures are introduced or changed.

AMC1 MAR-ADR.OR.D.005(b)(10) Management system

COORDINATION OF THE AERODROME EMERGENCY RESPONSE PLAN

The coordination of the aerodrome emergency response plan, established in accordance with the requirements contained in Part-MAR-ADR.OPS, with the safety management system should ensure continuous improvement of the systems and procedures contained within the plan.

AMC1 MAR-ADR.OR.D.005(b)(11) Management system

COMPLIANCE MONITORING

(a) Compliance monitoring
  (1) The implementation and use of a compliance monitoring process should enable the aerodrome operator to monitor compliance with the relevant requirements of this Part, Part-ADR.OPS, as well as any other applicable regulatory requirements, or requirements established by the aerodrome operator.
    (i) The aerodrome operator should specify the basic structure of the compliance monitoring applicable to the activities conducted.
    (ii) The compliance monitoring should be properly implemented, maintained and continually reviewed and improved as necessary.
    (iii) Compliance monitoring should be structured according to the size of organisation and the complexity of the activities to be monitored, including those which have been subcontracted.
    (iv) Compliance monitoring should include a feedback system of findings to the accountable manager to ensure effective implementation of corrective actions as necessary.
  (2) An aerodrome operator should monitor compliance with the procedures it has designed, to ensure safe activities. In doing so, an aerodrome operator should as a minimum, and where appropriate, monitor compliance with:
    (i) privileges of the aerodrome operator;
    (ii) manuals, logs, and records;
    (iii) training standards;
    (iv) required resources; and
    (v) management system procedures and manuals.
(b) Organisational set-up
  (1) A person should be responsible for compliance monitoring.
    (i) The accountable manager, with regards to his/her direct accountability for safety, should ensure, in accordance with MAR-ADR.D.015(a), that sufficient resources are allocated for compliance monitoring. In the case the person responsible for the compliance monitoring acts also as safety manager, the accountable manager should ensure that sufficient resources are allocated to both functions, taking into account the size of the aerodrome operator, and the nature and complexity of its activities.
  (2) The independence of the compliance monitoring should be established by ensuring that audits and inspections are carried out by personnel not responsible for the function, procedure, etc. being audited.
  (3) Personnel involved in compliance monitoring should have access to any part of the aerodrome organisation, and any contracted organisation as required.
(c) Compliance monitoring documentation
  (1) Relevant documentation should include the relevant part(s) of the aerodrome operator's management system documentation.
  (2) In addition, relevant documentation should also include the following:
    (i) terminology;
    (ii) specified activity standards;
    (iii) a description of the organisation of the aerodrome operator;
    (iv) the allocation of duties and responsibilities;
    (v) procedures to ensure regulatory compliance;
    (vi) the compliance monitoring programme, reflecting:
      (A) schedule of the monitoring programme;
      (B) audit procedures;

(C) reporting procedures;
(D) follow-up and corrective action procedures; and
(E) recording system;
(vii) the training syllabus referred to in (d)(2); and
(viii) document control.

(d) Training
(1) Correct and thorough training is essential to optimise compliance in every aerodrome operator. In order to achieve significant outcomes of such training, the operator should ensure that all personnel understand the objectives as laid down in the operator's management system documentation.
(2) Those responsible for managing the compliance monitoring should receive training on this task. Such training should cover the requirements of compliance monitoring, manuals and procedures related to the task, audit techniques, reporting, and recording.
(3) Time should be provided to train the personnel involved in compliance management, and for briefing the remaining of the personnel.
(4) The allocation of time and resources should be based on the volume and complexity of the activities concerned.

(e) Compliance monitoring — audit scheduling
(1) A defined audit schedule to be completed during a specified calendar period and a periodic review cycle for each area should be established. The compliance monitoring itself should also be audited according to a defined audit schedule. The schedule should allow for unscheduled audits when trends are identified. Follow-up audits should be scheduled to verify that corrective action was carried out, and that it was effective and completed, in accordance with the policies and procedures specified in the aerodrome manual.
(2) The aerodrome, its management system key processes, procedures and its operation should be audited within the first 12 months since the date of the issuance of the certificate.
(3) After that, the aerodrome operator should consider the results of its safety (risk) assessments and of its past compliance monitoring activities, in order to adapt the calendar period within which an audit or a series of audits should be conducted, to cover the whole aerodrome, its management system key processes, procedures and its operation in a manner, and at intervals set out in the aerodrome manual. This calendar period, should be consistent with the relevant competent authority's oversight planning cycle and may be increased, up to 36 months, in coordination with the competent authority, provided that there are no level 1 findings, and subject to the aerodrome operator having a good record of rectifying findings in a timely manner.

AMC2 MAR-ADR.OR.D.005(b)(11) Management system

RESPONSIBILITY FOR COMPLIANCE MONITORING

(a) The responsibility for the compliance monitoring should:
(1) be with a person who has direct access to, and is responsible to the accountable manager;
(2) not be with one of the persons referred to in MAR-ADR.OR.D.015(b) or MAR-ADR.OR.D.015(c), except that in less complex aerodrome organisations/operations, it may also be with the accountable manager or the person referred to in MAR-ADR.OR.D.015(c).

(b) Persons allocated the responsibility for the compliance monitoring should have:
(1) adequate experience and expertise in aerodrome operations, or aerodrome maintenance, or similar area;
(2) adequate knowledge of, and experience in safety management and quality assurance;
(3) knowledge of the aerodrome manual; and
(4) comprehensive knowledge of the applicable requirements in the area of aerodromes.

AMC2 MAR-ADR.OR.D.005(c) Management system

AERODROME OPERATOR SAFETY MANAGEMENT MANUAL

(a) In cases where safety management is set out in a Safety Management Manual, it should be the key instrument for communicating the approach to safety for the aerodrome operator. The Safety Management Manual should document all aspects of safety management, including the safety

policy, objectives, procedures, and individual safety responsibilities.

(b) The contents of the Safety Management Manual should include:

(1) scope of the safety management system;
(2) safety policy and objectives;
(3) safety responsibilities of key safety personnel;
(4) documentation control procedures;
(5) safety assessment process, including hazard identification and risk management schemes;
(6) monitoring of implementation and effectiveness of safety actions, and risk mitigation measures;
(7) safety performance monitoring;
(8) safety reporting (including hazard reporting) and investigation;
(9) coordination of emergency response planning;
(10) management of change (including organisational changes with regard to safety responsibilities);
(11) safety promotion; and
(12) safety management system outputs.

GM1 MAR-ADR.OR.D.005(c) Management system

AERODROME OPERATOR MANAGEMENT SYSTEM DOCUMENTATION

It is not required to duplicate information in several manuals. The Safety Management Manual is considered to be a part of the aerodrome manual.

GM1 MAR-ADR.OR.D.007(a) Management of aeronautical data and aeronautical information

QUALITY MANAGEMENT SYSTEM FOR AERONAUTICAL DATA AND AERONAUTICAL INFORMATION PROVISION ACTIVITIES

An aerodrome operator does not need to duplicate functions and activities in order to discharge the responsibilities related to the management of aeronautical data and aeronautical information provision activities.
In this respect, the compliance monitoring may be used for the purposes of ensuring compliance with the relevant requirements for management of aeronautical data and aeronautical information provision activities.

AMC1 MAR-ADR.OR.D.007(b) Management of aeronautical data and aeronautical information

SECURITY MANAGEMENT FOR AERONAUTICAL DATA AND AERONAUTICAL INFORMATION PROVISION ACTIVITIES

(a) The security management objectives should be:
(1) to ensure the security of aeronautical data and aeronautical information received, produced, or otherwise employed so that it is protected from interference, and access to it is restricted only to those authorised; and
(b) to ensure that the security management measures meet appropriate national, EU, or international requirements for critical infrastructure and business continuity, and international standards for security management, including:
(i) ISO/IEC 17799:2005 — Information technology — Security techniques — Code of practice for information security management;
(ii) ISO 28000:2007: — Specification for security management systems for the supply chain.
(c) Regarding the ISO standards, the relevant certificates issued by an appropriately accredited organisation, are considered as an Acceptable Means of Compliance.

AMC1 MAR-ADR.OR.D.010 Contracted activities

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

(a) An aerodrome operator may contract certain activities to external organisations.
(b) A written agreement should exist between the aerodrome operator and the contracted organisation, clearly defining the contracted activities and the applicable requirements.
(c) The contracted safety related activities relevant to the agreement should be included in the aerodrome operator's safety management and compliance monitoring programmes.
(d) The aerodrome operator should ensure that the contracted organisation has the necessary authorisation, declaration, or approval when required, and commands the resources and competence to undertake the task; to this end, a prior audit of the contracted party should be conducted to ensure that the contracted organisation meets the applicable requirements, and the requirements specified by the aerodrome operator itself.

GM1 MAR-ADR.OR.D.010 Contracted activities

CONTRACTING — GENERAL

(a) Contracted activities to external organisations for the provision of services may include areas such as:
  (1) maintenance of the aerodrome and equipment;
  (2) surveying for aeronautical data;
  (3) apron management services;
  (4) training;
  (5) rescue and firefighting services;
  (6) aerodrome design, etc.
(b) In case of contracted activities, the aerodrome operator should define relevant management responsibilities within its own organisation.
(c) The ultimate responsibility for the product or service provided by contracted organisations should always remain with the aerodrome operator.

GM2 MAR-ADR.OR.D.010 Contracted activities

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

(a) Regardless of the approval status of the contracted organisation, the contracting aerodrome operator is responsible to ensure that all contracted activities are subject to hazard identification, safety (risk) assessment and mitigation, as well as compliance monitoring.
(b) When the contracted organisation is itself certified to carry out the contracted activities, the aerodrome operator's compliance monitoring should at least check that the approval effectively covers the contracted activities, and that it is still valid.

AMC1 MAR-ADR.OR.D.015(a) Personnel requirements

ACCOUNTABLE MANAGER
(a) Accountable Manager — General
  (1) The accountable manager should:
    (i) ensure that all necessary resources are available to operate the aerodrome in accordance with the applicable requirements and the aerodrome manual;
    (ii) ensure that if there is a reduction in the level of resources or abnormal circumstances which may affect safety, the required reduction in the level of operations at the aerodrome is implemented;
    (iii) establish, implement, and promote the safety policy; and
    (iv) ensure compliance with relevant applicable requirements, certification basis, and the organisation's safety management system, as well as its quality management system with regard to aeronautical data and aeronautical information provision activities.
  (2) The accountable manager should have:
    (i) an appropriate level of authority within the aerodrome operator's organisation to ensure

that activities are financed and carried out to the standard required;
(ii) knowledge and understanding of the documents that prescribe relevant aerodrome safety standards;
(iii) understanding of the requirements for competence of aerodrome management personnel, so as to ensure that competent persons are in place;
(iv) knowledge and understanding of safety, quality, and security management systems related principles and practices, and how these are applied within the organisation;
(v) knowledge of the role of the accountable manager; and
(vi) knowledge and understanding of the key issues of risk management within the aerodrome.

(b) Accountable manager — Delegation of responsibilities
(1) The technical knowledge and understanding expected by an accountable manager is high level, with particular reference to his/her own role in ensuring that standards are maintained.
(2) During periods of absence, the day-to-day responsibilities of the accountable manager may be delegated; however, the accountability ultimately remains with the accountable manager.
(3) Depending on the size and the complexity of operations, the accountable manager may delegate his/her responsibilities in the area of training, by nominating a training manager whose responsibilities should be the establishment, coordination, implementation of training programmes, and relevant record keeping of personnel training, as well as of the proficiency check programmes.

In any case, the accountability, ultimately, remains with the accountable manager.

AMC1 MAR-ADR.OR.D.015(b) Personnel requirements

NOMINATED PERSONS

(a) General
(1) A description of the functions of the nominated persons, including their names, as well as clearly defined responsibilities and authorisations, should be contained in the aerodrome manual. Nominated persons should have adequate resources available to perform their duties.
(2) The aerodrome operator should make arrangements to ensure adequate continuity of supervision in the absence of nominated persons.
(3) The person nominated by the aerodrome operator should not be nominated by another aerodrome operator, unless agreed with the MAA-NLD.
(4) Persons nominated should be foreseen to work sufficient hours to fulfil the management functions associated with the scale and complexity of the operation.
(5) A nominated person may hold more than one of the nominated posts if such an arrangement is considered suitable and properly matched to the aerodrome operator's organisation, and the complexity of its operations.

(b) Competence of nominated persons
The manager of Operational Services and the Maintenance manager should have:
(1) adequate practical experience and expertise in aerodrome operations or maintenance (or similar area) respectively;
(2) comprehensive knowledge of the applicable requirements in the area of aerodromes;
(3) appropriate level of knowledge of safety and quality management; and
(4) knowledge of the aerodrome manual.

AMC1 MAR-ADR.OR.D.015(c) Personnel requirements

SAFETY MANAGER

(a) The safety manager should be the focal point and responsible for the development, administration, and maintenance of an effective safety management system (see also AMC1 MAR-ADR.OR.D.005(b)(1)).

(b) The role of the safety manager should be to:
(1) facilitate hazard identification, risk analysis, and management;
(2) monitor the implementation and functioning of the safety management system, including the necessary safety actions;
(3) manage the safety reporting system of the aerodrome;
(4) provide periodic reports on safety performance;

(5) ensure maintenance of safety management documentation;
(6) ensure that there is safety management training available, and that it meets acceptable standards;
(7) provide advice on safety matters; and
(8) initiate and participate in internal occurrence/accident investigations.

(c) The safety manager should have:
(1) adequate practical experience and expertise in aerodrome operations, or aerodrome maintenance, or similar area;
(2) adequate knowledge of safety and quality management;
(3) adequate knowledge of the aerodrome manual; and
(4) comprehensive knowledge of the applicable requirements in the area of aerodromes.

(d) The safety manager should not be one of the persons referred to in MAR-ADR.OR.D.015(b) or AMC2 MAR-ADR.OR.D.005(b)(11). However, in the case of less complex aerodrome organisations/operations, the safety manager may be the accountable manager, or one of the persons referred to in MAR-ADR.OR.D.015(b), or AMC2 MAR-ADR.OR.D.005(b)(11), or any other person at appropriate management level, provided that he/she can act independently of other managers within the organisation of the aerodrome operator, and has direct access to the accountable manager and to appropriate management for safety matters.

AMC1 MAR-ADR.OR.D.015(d) Personnel requirements

DETERMINATION OF PERSONNEL NEEDS AND QUALIFICATIONS

(a) The aerodrome operator should determine the required personnel for the planned tasks.

(b) The aerodrome operator should determine the required personnel qualifications, in accordance with the applicable requirements (and the national and European Union legislation where applicable), and include them in the aerodrome manual. A documented system with defined responsibilities should be in place, in order to identify any needs for changes with regard to personnel qualifications.

AMC1 MAR-ADR.OR.D.015(d);(e) Personnel requirements

DISTRIBUTION OF RULES AND PROCEDURES

The aerodrome operator should have a system in place to distribute the rules and procedures to personnel to exercise their duties and responsibilities.

AMC1 MAR-ADR.OR.D.017(a);(b) Training and proficiency check programmes

TRAINING OF AERODROME PERSONNEL — GENERAL

(a) The training programme should cover all personnel:
(1) involved in the operation, maintenance, and management of the aerodrome (supervisors, managers, senior managers, and the accountable manager); and
(2) operating unescorted on the movement area, and other operational areas of the aerodrome, and which are related to the aerodrome operator
regardless of their level in the organisation.

(b) The training programme should include safety management system training whose level of detail should be appropriate to the individual's responsibility and involvement in the safety management system and should also include human and organisational factors.

(c) The training programme should consist of the following:
(1) a process to identify training standards, including:
(i) syllabi, duration, and frequency for each type of training and area of activity for the persons mentioned in point (a), including for the instructors and assessors;
(ii) method(s) for delivery of training and competency assessment; minimum performance to be achieved by trainees; and
(iii) track completion of required training;
(2) a validation process that measures the effectiveness of training;
(3) initial job-specific training;

(4) practical training;
(5) recurrent training;
(6) refresher training; and
(7) continuation training.

(d) The training programme should identify training responsibilities and contain procedures:
(1) for training and competency assessment of the trainees;
(2) to be applied in the event that personnel do not achieve or maintain the required standards.

(e) Training contents, syllabi and duration should comply with the requirements prescribed in Part-MAR-ADR.OPS.

(f) A training file should be developed for each employee, including management, and a system should be in place to assist in identifying and tracking employee training requirements, and verifying that personnel have received the required/planned training.

(g) Information related to points (c) and (d), including the identified training standards and the related syllabi and frequency, should be included in the aerodrome manual.

AMC1 MAR-ADR.OR.D.017(c);(d) Training and proficiency check programmes

TRAINING OF PERSONNEL OF OTHER ORGANISATIONS — GENERAL

With regard to the training of the personnel employed by other organisations which operate or provide services at the aerodrome, and which are allowed unescorted access to the movement area or other operational areas of the aerodrome, the provisions of AMC1 MAR-ADR.OR.D.017(a);(b) apply, except that the safety management system training may cover only the necessary elements (e.g. relevant procedures, safety reporting system, aerodrome safety programmes, etc.).

AMC1 MAR-ADR.OR.D.017(e) Training and proficiency check programmes

INITIAL TRAINING

(a) Theoretical training
(1) A suitable method (or suitable methods) for the delivery of each part of the required training should be identified and specified in the training programme.
(2) The theoretical training should be delivered at appropriate training facilities, and the delivery of the training should be supported by means and equipment which are suitable for the training area covered.
Computer-based training may also be used, where interaction of the trainee(s) with other persons is not necessary and where the training material has been prepared, reviewed and updated by an instructor nominated in accordance with AMC1 MAR-ADR.OR.D.017(h). Where provided, such training should consider human factors principles, and, as a minimum, should also cater for the possibility for the trainees to ask questions and receive clarifications, as well as to provide feedback.
(3) After the initial training, the acquired competency should be assessed. The competency assessment should be accomplished by using identified method(s), appropriate to the training element to be assessed. Assessment procedures should be established, addressing, as a minimum, location(s), identity check and invigilation, and assessment discipline. Computer-based systems may be used for the assessment of the trainees provided that:
(i) the assessment material is prepared, reviewed and updated by an assessor nominated in accordance with AMC1 MAR-ADR.OR.D.017(h); and
(ii) the assessment is conducted in a controlled facility and environment and in a manner that physically ensures the identity of the trainees during the assessment process.
(4) Training elements that require individual practical participation may be combined with practical assessments.

(b) Practical training
(1) The practical training should follow the successful completion of the theoretical training and should be provided by an instructor nominated in accordance with AMC1 MAR-ADR.OR.D.017(h). The duration of the practical training should be appropriate to the area covered.
(2) A practical competency assessment should be conducted by an assessor nominated in accordance with AMC1 MAR-ADR.OR.D.017(h), following the completion of each practical

training provided. Assessment procedures should be established, addressing, as a minimum, location(s), identity check, and assessment discipline.

AMC2 MAR-ADR.OR.D.017(e) Training and proficiency check programmes

INITIAL TRAINING PROCESS — NEW EMPLOYEES

When an aerodrome operator employs personnel mentioned in point (a) of AMC1 MAR-ADR.OR.D.017(a);(b), who have already completed a training programme with another aerodrome operator, the current employer may, when determining the training needs required for the post to be filled by that employee, decide to credit training subjects on which the individual has already completed relevant training, as they are documented in his or her training records. In any case, no credit may be given for training areas which are specific to that aerodrome.

AMC1 MAR-ADR.OR.D.017(f) Training and proficiency check programmes

RECURRENT, REFRESHER AND CONTINUATION TRAINING

(a) Recurrent training
The recurrent training may be only theoretical and should cover the areas addressed in the initial theoretical training provided. The recurrent training should be designed to review, reinforce or enhance the existing knowledge and skills of the trainees, and should also take into account the changes that have taken place in the content of the subjects covered by the initial training.
Upon completion of the recurrent training, an assessment of the trainee should be conducted.

(b) Refresher training
The refresher training may be only theoretical, and shorter than the recurrent training, and its content should take into account the length of the person's absence and the magnitude of the relevant changes that may have taken place during the period of absence of the employee.
Upon completion of the refresher training, an assessment of the trainee should be conducted (for the process of the assessment, see AMC1 MAR-ADR.OR.D.017(e)).

(c) Continuation training
Continuation training should be provided in the following cases:

(1) A person is assigned new/different tasks
In the case a person is to be assigned to different/additional tasks, an appropriate theoretical and practical training which covers any differences between his or her previous and future tasks should be completed. This differences training should be determined based on a comparison between the training required for the new tasks, and the training already completed by that person, as documented in his or her training records.
The provision of training should be followed by relevant competency assessment (for the process of the assessment, see AMC1 MAR-ADR.OR.D.017(e));

(2) A change is introduced to the operating environment of a person, which is of such nature and/or magnitude that it requires the training of the personnel (e.g. a new system to be used by the personnel concerned).
A method should be established and documented to be used for determining the need (or not) for, as well as the type(s) (theoretical, practical, or both) of, training to be provided following changes. The provision of training should be followed by a relevant competency assessment.

AMC1 MAR-ADR.OR.D.017(g) Training and proficiency check programmes

PROFICIENCY CHECKS

(a) The purpose of the proficiency check is to establish the ability of an individual to perform satisfactorily, in accordance with applicable requirements and the content of the aerodrome manual as they relate to his or her tasks.
In particular, the proficiency check of the aerodrome operator's personnel should determine the performance of an individual regarding the tasks assigned to him or her. Regarding personnel of other organisations operating or providing services at the aerodrome, the objective of the proficiency check should be the assessment of the performance of the individual with regard to the applicable operational procedures and requirements of the aerodrome.

To this end, the elements that each proficiency check should cover should be identified and documented.
A proficiency check does not need to cover all associated elements at the same time; however, all elements of a proficiency check should be covered within the period specified in MAR.ADR.OR.D.017(g).
Depending on the situation, specialty and element checked, and provided that it will not affect the quality and completeness of the proficiency check, a single proficiency check may be used to cover more than one person. The person(s) to be checked should be made aware prior to the proficiency check.
Proficiency checks may be conducted during normal and/or abnormal/emergency conditions depending on the situation and the specialty of the person being checked.

(b) The proficiency check programme should:
  (1) include a process to identify the frequency of proficiency checks, including for the instructors and assessors, and track completion of the required checks;
  (2) identify checking responsibilities and relevant checking methods and procedures;
  (3) include procedures to be applied in the event that personnel do not achieve the required standards; and
  (4) include a validation process that measures the effectiveness of the programme.

(c) Information related to the proficiency check programme should be included in the aerodrome manual.

AMC1 MAR-ADR.OR.D.017(h) Training and proficiency check programmes

INSTRUCTORS — ASSESSORS

(a) The aerodrome operator should nominate instructors and assessors to be used for the implementation of the training and proficiency check programmes. The personnel to be nominated may also include contracted instructors or organisations for individual subjects.
The aerodrome operator may also nominate personnel proposed by organisations operating or providing services at the aerodrome to be used as instructors and assessors for the implementation of the respective part of the training and proficiency check programmes of these organisations' personnel. Irrespective of the solution chosen, the aerodrome operator remains responsible for the proper implementation of the training programme and the proficiency check programme in a consistent manner, and according to the relevant procedures and standards established by the aerodrome operator.

(b) A person may be qualified and nominated both as an instructor and as an assessor by the aerodrome operator. However, such a person may not provide assessment for own instruction, courses, or material.

(c) Instructors
  (1) Theoretical instruction should be given by appropriately qualified instructors. They should have:
    (i) appropriate level and depth of knowledge in the field where instruction is to be given;
    (ii) documented ability to use appropriate instructional techniques; and
    (iii) adequate experience in the subject where instruction is to be given.
  (2) Instruction on practical skills should be given by appropriately qualified instructors who:
    (i) meet the theoretical knowledge, and the working experience requirements appropriate to the instruction being given;
    (ii) have demonstrated the ability to instruct, and to use appropriate instructional techniques;
    (iii) are proficient in instructional techniques in the areas in which it is intended to provide instruction; and
    (iv) receive relevant training, in accordance with the training programme, to ensure that the instructional competencies are maintained.

(d) Assessors
The persons who are responsible for assessing the competence and skills of the personnel should:
  (1) have demonstrated the ability to assess the performance of, and conduct tests and checks in the areas covered by the training;
  (2) receive relevant training, in accordance with the training programme, to ensure that the assessment standards are maintained up to date; and
  (3) meet the theoretical knowledge requirements appropriate to the instruction being given and

have adequate working experience in the area of instruction.

AMC1 MAR-ADR.OR.D.017(i) Training and proficiency check programmes

PERSONNEL RECORDS

(a) The aerodrome operator should use its record keeping system (see AMC1 MAR-ADR.OR.D.035) to record the following information for each person:
  (1) starting date of employment/ending date of employment (if applicable);
  (2) area of activity;
  (3) previous working experience;
  (4) qualifications;
  (5) training (before entry and subsequent); and
  (6) proficiency checks, including language proficiency as appropriate;
(b) Latest changes should be reflected into personnel records.

AMC2 MAR-ADR.OR.D.017(i) Training and proficiency check programmes

TRAINING RECORDS

(a) Training programme — general
  The records of the training sessions provided, should include as a minimum the following:
  (1) type of training, area of training and subjects covered;
  (2) names of participants/signed list of participants;
  (3) date and duration of training; and
  (4) names of the instructor and assessor.
(b) Training records of individuals
  The training records maintained for each individual should include as a minimum:
  (1) the name of the trainee;
  (2) the date(s) and the duration of the training;
  (3) the place where the training was received;
  (4) the name of the organisation that provided the training;
  (5) the subjects covered, and the methodology of the course;
  (6) any comments made by the instructor, if applicable;
  (7) the performance assessment of the trainee, as applicable; and
  (8) the name and signature of the instructor.

AMC3 MAR-ADR.OR.D.017(i) Training and proficiency check programmes

PROFFICIENCY CHECK RECORDS

The proficiency check records maintained for each individual should include as a minimum:
(a) the name of the person checked;
(b) the date(s) and the duration of the proficiency check;
(c) the methodology of the check conducted;
(d) any comments made by the assessor;
(e) the performance evaluation of the person checked; and
(f) the name and signature of the assessor.

AMC1 MAR-ADR.OR.D.020(b) Facilities requirements

Designated areas may vary and include facilities such as cargo areas, or even open-air areas. Aircraft stands should also be designated for aircrafts that carry dangerous goods.

AMC1 MAR-ADR.OR.D.027 Safety programmes

SAFETY PROGRAMMES — AERODROME SAFETY COMMITTEES

(a) The aerodrome operator should:

(1) organise, coordinate and implement programmes to promote safety at the aerodrome. Such programmes should include, but are not limited to:
  (i) runway safety, including runway incursion and excursion prevention;
  (ii) apron safety; and
  (iii) FOD prevention;
(2) coordinate and promote the exchange of information, and the joint investigation of occurrences, serious incidents, and accidents.

(b) The aerodrome operator should establish, coordinate, and lead local aerodrome safety committees, and a Local Runway Safety Team, dealing with runway safety, apron safety, and the safety of the operations at the aerodrome in general. All relevant organisations operating or providing services at the aerodrome should participate to such aerodrome safety committees and the Local Runway Safety Team.
The local aerodrome safety committees and the Local Runway Safety Team should convene regularly, identify and review local safety issues, and examine possible solutions, and need for action. Minutes of such meetings should be kept. Procedures relevant to the functioning of local aerodrome safety committees and the Local Runway Safety Team should be included in the aerodrome manual.

GM1 MAR-ADR.OR.D.027 Safety programmes

AERODROME SAFETY COMMITTEES

(a) Manoeuvring area/Apron Safety Committee
(1) The aerodrome operator should establish (a) Manoeuvring area/Apron Safety Committee(s);
(2) The Manoeuvring area/Apron Safety Committee(s) should have an advisory role to the aerodrome operator;

(b) Management of Manoeuvring area /Apron Safety Committee(s)
(1) The Manoeuvring area /Apron Safety Committee(s) should be chaired by an aerodrome operator's official, responsible for aerodrome operations; and
(2) The aerodrome operator's safety manager should act as the secretary of the Committee(s).

(c) Composition of Manoeuvring area /Apron Safety Committee(s)
Participation should include, but not limited to representatives of:
(1) aerodrome users active in flight operations;
(2) aircraft ground handling services providers;
(3) aerodrome rescue and firefighting services;
(4) aerodrome operations;
(5) aerodrome wildlife management;
(6) aerodrome maintenance; and
(7) air navigation service provider(s).

(d) Tasks
The tasks of the Manoeuvring area /Apron Safety Committee(s) should be:
(1) to receive and evaluate reports on operational safety issues;
(2) to receive reports and statistical information on accidents and incidents, and propose solutions;
(3) to advise on manoeuvring area/apron safety issues such as:
  (i) promotion of apron safety discipline;
  (ii) FOD prevention;
  (iii) developing measures for safe operations;
  (iv) considering actions to resolve manoeuvring area/apron safety problems;
  (v) apron equipment issues;
  (vi) adherence to vehicle traffic issues;
  (vii) new and/or updated safety instructions;
  (viii) personal protective clothing/equipment issues;
  (ix) methods to develop and promote apron safety awareness initiatives,
  (x) snow and ice clearance issues;
  (xi) proposed aerodrome works;
  (xii) proposed changes/developments to the movement area;
  (xiii) standard operating procedures, etc.

GM2 MAR-ADR.OR.D.027 Safety programmes

LOCAL RUNWAY SAFETY TEAM

(a) Context
As part of its runway safety programme, the aerodrome operator should establish and lead a Local Runway Safety Team and act on local runway safety issues, including runway incursion (including runway confusion) and excursion prevention.
A runway incursion is defined as 'Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft.'
A runway excursion occurs when 'An aircraft veers off or overruns the runway surface during either take-off or landing'.

(b) Local Runway Safety Team composition
Participation should include representatives from all interested parties with direct involvement in runway operations at the aerodrome, including, but is not limited, to:
(1) aerodrome operations;
(2) aerodrome engineering and maintenance;
(3) air navigation service providers;
(4) aircraft operators that operate of the aerodrome;
(5) aerodrome rescue and firefighting services;
(6) drivers having access on the manoeuvring area.

(c) Role
The role of the Local Runway Safety Team should be to advise the appropriate management on potential runway safety issues, and to recommend mitigating measures.

(d) Tasks
The Local Runway Safety Team may have the following tasks:
(1) identification of potential runway safety issues, including the need for establishment of hot spots or other problem areas at the aerodrome and the review of the relevant entries of the AIP for accuracy;
(2) developing and running local awareness campaigns, at suitable periods, including at the start of a busy season or before an unusual event, that focus on local issues, for example, producing and distributing local hot spot maps, or other guidance material considered as necessary; local awareness campaigns should be periodically refreshed to maintain interest and operational awareness of the relevant personnel;
(3) monitoring the number, type and, the severity of runway incursions; disseminating safety recommendations delivered from accident and incident investigation findings as well as other relevant lessons learned e.g. from operational experience and best risk mitigation practices; sharing good practices to prevent runway incursions or excursions;
(4) assisting in verifying that communications between air traffic controllers, or other Air Traffic Services personnel, pilots, and vehicle drivers are satisfactory, or if any improvements could be suggested;
(5) making observations on a regular basis in different weather and light conditions to assess whether all runway entrances and visual aids are adequate, correctly located and understandable by all parties concerned, with no possible ambiguity of their meaning, or identify potential aerodrome design issues;
(6) understanding the operating difficulties of personnel working in other areas, and recommending areas for improvement; when reviewing operating procedures it is necessary to ensure that the procedures employed by different companies at the aerodrome are integrated and effective, so as to minimise the risk of runway incursions. Care should be taken when examining existing or proposed runway capacity enhancing procedures or noise abatement schemes involving runway preferential systems;
(7) development of joint, initial and recurrent, training programmes and familiarisation on runway incursion and excursion prevention, for all relevant personnel (vehicle drivers and other personnel operating on the manoeuvring area, pilots, Air Traffic Services personnel); this may include visits to the manoeuvring area to increase awareness of the aerodrome layout, markings, signs, position of anemometers etc., where this is considered necessary;
(8) providing advice prior to the implementation of changes to the aerodrome, practices and procedures to identify potential for runway incursion or excursion; and

(9) assessing the effectiveness of implemented operational solutions periodically.

AMC2 MAR-ADR.OR.D.027 Safety programmes

HOT SPOTS

Once hot spots have been identified at an aerodrome, suitable strategies should be implemented to remove the hazard and, when this is not immediately possible, to manage and mitigate the risk, including the publication of HOT SPOT charts in the Aeronautical Information Publication.

AMC1 MAR-ADR.OR.D.030 Safety reporting system

SAFETY REPORTING SYSTEM

(a) Safety reporting system — General

(1) An effective safety reporting system should include, apart from aerodrome operator's personnel, aircraft operators, ground handling service providers, air navigation service providers, and any other organisation operating on the aerodrome, or providing services at the aerodrome.

(2) The safety reporting system should include voluntary reporting possibilities intended for safety hazards identified by the reporter, and that may have potential safety consequences.

(3) The aerodrome operator should identify which events are mandatory to be reported.

(4) The aerodrome operator should provide the means and the format for reporting which should be such that meets the existing reporting requirements foreseen in the applicable legislation in terms of time, format, and required information to be reported.

(5) The safety reporting system should include an acknowledgement to the reporter for the submission of the report.

(6) The reporting process should be as simple as possible, and well documented, including details as to what, how, where, whom, and when to report;

(7) Regardless of the source or method of submission, once the information is received, it should be stored in a manner suitable for easy retrieval and analysis;

(8) Access to the submitted reports should be restricted to persons responsible for storing and analysing them;

(9) Protection of the identity of the reporter should be ensured, and the procedures established by the aerodrome operator to gather additional information for analyses, or investigations should respect this principle;

(10) The safety reporting system should include a feedback system to the reporting person, on the outcome of the occurrence analysis.

(b) Wildlife hazard reporting

(1) The aerodrome operator should ensure that its safety reporting system specifically addresses the requirement for all third parties (aircraft operators, aircraft mechanics, air traffic controllers, and other Air Traffic Services personnel, etc.) and all aerodrome personnel, to report to the aerodrome operator wildlife strikes, and relevant identified hazards.

(2) The reporting of such third parties should be done irrespectively of any other requirements according to which they have to report to the Competent Authority of the aerodrome, or the state of registry of the aircraft involved, or any other Competent Authority in the context of the national occurrence reporting programme.

AMC1 MAR-ADR.OR.D.035 Record keeping

DOCUMENTATION TO BE RETAINED

(a) The system employed by the aerodrome operator for record keeping should provide for adequate procedures, storage facilities, and reliable traceability, retrievability and accessibility of the records related to the activities of the aerodrome operator that are subject to this Regulation, throughout the required retention period.

(b) Records should be kept in paper form, or in electronic format, or a combination of both. Records stored on microfilm or optical disc format are also acceptable. The records should remain legible throughout the required retention period. The retention period starts when the record has been

created or last amended.

(c) Paper systems should use robust material which can withstand normal handling and filing. Computer systems should have at least one backup system which should be updated within 24 hours of any new entry. Computer systems should include safeguards against the ability of unauthorised personnel to alter the data.

(d) All computer hardware used to ensure data backup should be stored in a different location from that containing the working data, and in an environment that ensures they remain in good condition. When hardware or software changes take place, special care should be taken that all necessary data continues to be accessible, at least, through the full retention period. In the absence of any indication, all records should be kept for a minimum period of five years.

AMC1 MAR-ADR.OR.E.005 Aerodrome manual

GENERAL

(a) The aerodrome manual may vary in detail according to the complexity of the operation, and the type of the aerodrome.
(b) The aerodrome manual or parts of it may be presented in any form, including electronic form. In all cases, the accessibility, usability, and reliability should be assured.
(c) The aerodrome manual should be such that:
  (1) all parts of the manual are consistent and compatible in form and content;
  (2) the manual can be readily amended; and
  (3) the content and amendment status of the manual is controlled and clearly indicated.
(d) The aerodrome manual should include a description of its amendment and revision process specifying:
  (1) the person(s) who may approve amendments or revisions;
  (2) the conditions for temporary revisions and/or immediate amendments, or revision required in the interest of safety; and
  (3) the methods by which all personnel and organisations are advised of changes to the aerodrome manual.
(e) The aerodrome manual may contain parts of, or refer to other controlled documents, such as aerodrome equipment manual, which are available at the aerodrome for use by the personnel.

AMC2 MAR-ADR.OR.E.005(i)(2) Aerodrome manual

LANGUAGE OF THE AERODROME MANUAL

A translated version of the relevant parts of the aerodrome manual is an acceptable means to comply with the relevant requirement. In any case, the persons who are going to use the manual should be able to read and understand it.

AMC3 MAR-ADR.OR.E.005 Aerodrome manual

AERODROME MANUAL

(a) The aerodrome manual should have the following structure, and include, at least, the following information; if an item is not applicable, the indication 'Not applicable' or 'Intentionally blank' should be inserted, along with the relevant reason:
  A. PART A — GENERAL
    0. Administration and control of the aerodrome manual including the following:
      0.1 Introduction:
        0.1.1 a statement signed by the accountable manager that the aerodrome manual complies with all applicable requirements, and with the terms of the certificate;
        0.1.2 a statement signed by the accountable manager that the aerodrome manual contains operational instructions that are to be complied with by the relevant personnel;
        0.1.3 a list and brief description of the various parts, their contents, applicability, and use;
        0.1.4 explanations, abbreviations, and definitions of terms needed for the use of the manual;
      0.2 System of amendment and revision:
        0.2.1 details of the person(s) responsible for the issuance and insertion of amendments and revisions;
        0.2.2 a record of amendments and revisions with insertion dates, and effective dates;
        0.2.3 a statement that handwritten amendments and revisions are not permitted, except in situations requiring immediate amendment, or revision in the interest of safety;
        0.2.4 a description of the system for the annotation of pages, or paragraphs and their

effective dates;
0.2.5 a list of effective pages or paragraphs;
0.2.6 annotation of changes (in the text and, as far as practicable, on charts and diagrams);
0.2.7 temporary revisions; and
0.2.8 description of the distribution system and a distribution list for the aerodrome manual, its amendments, and revisions.

1. General information

General information including the following:

1.1 purpose and scope of the aerodrome manual;
1.2 legal requirements for an aerodrome certificate and the aerodrome manual as prescribed in Part-MAR-ADR.OR;
1.3 conditions for use of the aerodrome by its users;
1.4 the obligations of the aerodrome operator; rights of the MAA-NLD and guidance to staff on how to facilitate audits/inspections by MAA-NLD personnel.

B. PART B — AERODROME MANAGEMENT SYSTEM, QUALIFICATION AND TRAINING REQUIREMENTS

2. A description of the management system, including the following:

2.1 Aerodrome organisation and responsibilities including the following: a description of the organisational structure, including the general organogram and other departments' organograms. The organogram should depict the relationship between the departments. Subordination and reporting lines of all levels of organisational structure (Departments, Sections, etc.) related to safety should be shown.
Names, authorities, responsibilities, and duties of management and nominated persons; responsibilities and duties of other operational, maintenance personnel, as well of the aerodrome safety committees and the Local Runway Safety Team and their functioning, should also be included.
2.2 A description of the safety management system, including:
2.2.1 scope of the safety management system;
2.2.2 safety policy and objectives;
2.2.3 safety responsibilities of key safety personnel;
2.2.4 documentation control procedures;
2.2.5 safety risk management process, including hazard identification and risk assessment schemes;
2.2.6 monitoring of implementation and effectiveness of safety actions, and risk mitigation measures;
2.2.7 safety performance monitoring;
2.2.8 safety reporting (including hazard reporting) and investigation
2.2.9 emergency response planning;
2.2.10 management of change (including organisational changes with regard to safety responsibilities);
2.2.11 safety promotion; and
2.2.12 safety management system outputs
2.3 A description of the compliance monitoring and related procedures.
2.4 A description of the quality management system for aeronautical data and aeronautical information provision activities and related procedures, including those for meeting the relevant safety, and security management objectives.
2.5 Procedures for reporting to the MAA-NLD including handling, notifying and reporting accidents, serious incidents, and occurrences. This section should include, at least, the following:
2.5.1 definition of accident, serious incident and occurrence and of the relevant responsibilities of all persons involved;
2.5.2 illustrations of forms to be used (or copies of the forms themselves), instructions on how they are to be completed, the addresses to which they should be sent and the time allowed for this to be done;
2.5.3 procedures and arrangements for the preservation of evidence, including

recordings, following a reportable event;

2.6 Procedures related to the use of alcohol, psychoactive substances and medicines.

2.7 Procedures for:

2.7.1 complying with safety directives;

2.7.2 reaction to safety problems; and

2.7.3 handling of safety recommendations issued by Safety Investigation Authorities.

2.8 A description of the method and procedures for recording aircraft movements, including movement and aircraft type, dates, and number of passengers.

3. Required aerodrome personnel qualifications (see GM1 MAR-ADR.OR.D.015(d)). Moreover, procedures related to:

3.1 the training programme, including the following:

3.1.1 responsibilities, frequencies, syllabi, duration of each type of training, method for delivery of training and competency assessment, minimum performance to be achieved by the trainees, and the identified training standards for all personnel involved in the operation, rescue and firefighting maintenance and management of the aerodrome, and those persons operating unescorted on the movement area and other operational areas of the aerodrome.

3.1.2 procedures:

3.1.2.1 for training and competency assessment of the trainees;

3.1.2.2 to be applied in the event that personnel do not achieve the required standards.

3.1.3 description of documentation to be stored and storage periods.

3.2 the proficiency check programme, including responsibilities and frequencies of proficiency check;

3.2.1 checking methods and procedures.

3.2.2 procedures to be applied in the event that personnel do not achieve the required standards.

3.2.3 the validation process to measure the effectiveness of the programme.

3.2.4 description of documentation to be stored and storage periods.

C. PART C — PARTICULARS OF THE AERODROME SITE

4. A description of the aerodrome site including in particular, the following information:

4.1 a plan showing the distance of the aerodrome from the nearest city, town, or other populous area;

4.2 detailed maps and charts of the aerodrome showing the aerodrome's location (longitude and latitude) and boundaries, major facilities, aerodrome reference point, layout of runways, taxiways and aprons, aerodrome visual and non-visual aids, and wind direction indicators;

4.3 a plan showing the location of any aerodrome facilities and equipment outside the boundaries of the aerodrome;

4.4 description of the physical characteristics of the aerodrome, elevations, visual and non-visual aids, as well as the information regarding the aerodrome reference temperature, strength of pavements, rescue and firefighting level of protection, ground aids and main obstacles

4.5 description of any cases of exemptions or derogations, equivalent level of safety, special conditions, and operating limitations; and

4.6 description of the types of operations that the aerodrome is approved to conduct.

D. PART D — PARTICULARS OF THE AERODROME REQUIRED TO BE REPORTED TO THE AERONAUTICAL INFORMATION SERVICE

5. The aeronautical information services available and the procedures for the promulgation of general information, including the following:

5.1 the name of the aerodrome;

5.2 the location of the aerodrome;

5.3 the geographical coordinates of the aerodrome reference point determined in terms of the World Geodetic System — 1984 (WGS-84) reference datum;

5.4 the aerodrome elevation and geoid undulation;
5.5 the elevation of each threshold and geoid undulation, the elevation of the runway end, and any significant high and low points along the runway, and the highest elevation of the touchdown zone of a precision approach runway;
5.6 the aerodrome reference temperature;
5.7 details of the aerodrome beacon; and
5.8 the name of the aerodrome operator and contact details (including telephone numbers) of the aerodrome operator at which may be contacted at all times.

6. Aerodrome dimensions and related information, inducing the following:
6.1 runway — true bearing, designation number, length, width, displaced threshold location, slope, surface type, type of runway and, for a precision approach runway, the existence of an obstacle free zone;
6.2 length, width and surface type of strip, runway end safety areas, stopways; length, width and surface type of taxiways; apron surface type and aircraft stands; clearway length and ground profile;
6.3 visual aids for approach procedures, approach lighting type and visual approach slope indicator system; marking and lighting of runways, taxiways, and aprons; other visual guidance and control aids on taxiways and aprons, location and type of visual docking guidance system; availability of standby power for lighting;
6.4 the location and radio frequency of VOR aerodrome checkpoints
6.5 the location and designation of standard taxi routes;
6.6 the geographical coordinates of each threshold, appropriate taxiway centre line points, and aircraft stands;
6.7 the geographical coordinates, and the top elevation of significant obstacles in the approach and take-off areas, in the circling area and in the surroundings of the aerodrome (in the form of charts);
6.8 pavement surface type and bearing strength using the Aircraft Classification Number — Pavement Classification Number (ACN-PCN) method;
6.9 pre-flight altimeter check locations established and their elevation;
6.10 declared distances;
6.11 contact details (telephone/telex/fax numbers and e-mail address) of the aerodrome coordinator for the removal of disabled aircraft, and information on the capability to remove disabled aircraft, expressed in terms of the largest aircraft type;
6.12 rescue and firefighting level of protection; types and amounts of extinguishing agents normally available at the aerodrome; and
6.13 exemptions or derogations from the applicable requirements, cases of equivalent level of safety, special conditions, and limitations.

E. PART E — PARTICULARS OF OPERATING PROCEDURES OF THE AERODROME, ITS EQUIPMENT, AND SAFETY MEASURES

7. Aerodrome reporting, including:
7.1 arrangements and procedures for reporting changes to the aerodrome information set out in the AIP and requesting the issue of NOTAM, including reporting changes to the MAA-NLD and recording of the reporting of changes;
7.2 procedures and frequencies for aeronautical data surveying, including areas to be surveyed.

8. Procedures for accessing the aerodrome movement area, including:
8.1 coordination with the security agencies;
8.2 prevention of unauthorised entry into the movement area;

9. Procedures for the inspection, assessment and reporting of the condition of the aerodrome movement area and other operational areas and facilities, (including runway surface friction characteristics assessments and water-depth measurements), including:
9.1 arrangements and means of communicating with the air traffic services unit during inspections;
9.2 inspection checklists, logbook, and record-keeping; and

9.3 inspection intervals and times; reporting results and follow-up actions.

10. Procedures for the inspection, and routine and emergency maintenance of visual and non-visual aids, as appropriate, and the aerodrome electrical systems, including:
10.1 inspection checklists, logbook, and record keeping; and
10.2 inspection intervals and times; reporting results and follow-up actions.

11. Operating, maintenance and repair instructions, servicing information, troubleshooting and inspection procedures of aerodrome equipment.

12. Procedures for:
12.1 maintenance of the movement area, including paved areas; unpaved runways and taxiways; runways and runway strips and aerodrome drainage;
12.2 overload operations.
13. Procedures for aerodrome works, including:
13.1 coordinating, planning, and carrying out construction and maintenance work; and
13.2 arrangements and means of communicating with air traffic services unit during the progress of such work.
14. Procedures for apron management, including:
14.1 transfer of the aircraft between air traffic services unit, and the apron management unit;
14.2 allocation of aircraft parking positions;
14.3 engine start and aircraft push-back; and
14.4 marshalling and 'follow-me' service.

15. Procedures for apron safety management, including:
15.1 protection from jet blasts and downwash;
15.2 enforcement of safety precautions during aircraft refuelling operations;
15.3 FOD prevention, including apron cleaning/sweeping;
15.4 monitoring compliance of personnel on the apron with safety procedures; and
15.5 escorting, controlling and protecting passengers on the apron, from vehicular traffic and operating aircraft, use of predetermined routes, and avoiding interference with stationary aircraft ground servicing activities.

16. Procedures for the control and limitation of the number of vehicles operating on the movement area, issuance of authorisations and temporary permits of vehicles operating on or in the vicinity of the movement area, including driver's obligations, traffic rules, right of way, speed limits, and procedures for issuing driving authorisations and permits, and enforcement procedures. Procedures for escorting vehicles occasionally used in areas where radio and transponder or equivalent is required, as well as for vehicles temporarily permitted to operate on the movement area. Procedures and responsibilities for establishing and monitoring the implementation of the maintenance programme for vehicles operating on the movement area and other operating areas.

17. Procedures for wildlife hazard management, including assessing wildlife hazards and arrangements for implementation of the wildlife control programme, and promulgation of the relevant information to the AIS; wildlife strike form.

18. Procedures for:
18.1 obstacle control and monitoring within and outside of the aerodrome boundaries, and notification to the MAA-NLD, of the nature and location of obstacles, and any subsequent addition, or removal of obstacles for action as necessary, including amendment of the AIS publications; and
18.2 monitoring and mitigating hazards related to human activities and land use, on the aerodrome and its surroundings.
Relevant inspection checklists, logbook, and record keeping; inspection intervals and times; reporting results and follow-up actions.

19. Aerodrome emergency plan including:

19.1 dealing with emergencies at the aerodrome or in its surroundings;
19.2 tests for aerodrome facilities and equipment to be used in emergencies, including their frequency; and
19.3 exercises to test emergency plans, including their frequency.

20. Rescue and firefighting, including description of facilities, equipment, personnel and procedures for meeting the firefighting requirements.

21. Removal plan of disabled aircraft, including relevant arrangements, equipment, and procedures for its implementation.

22. Procedures for ensuring the safe handling and storage of fuel and dangerous goods in the aerodrome, including:
22.1 equipment, storage areas, delivery, dispensing, handling, and safety measures;
22.2 quality and correct specification of aviation fuel; audit and inspection intervals, checklists, sampling and record keeping.

23. Low visibility operations: description of operational procedures, including coordination with air traffic services unit and apron management unit, standard taxiing routes, control of activities, and measurement and reporting of runway visual range.

24. Procedures for winter operations, including snow removal plan and procedures for its implementation as well as description of the available means and relevant arrangements.

25. Procedures for operations in adverse weather conditions.

26. Procedures for night operations.

27. Procedures for the protection of radar and other navigational aids, control of activities, and ground maintenance in the vicinity of these installations

28. Procedures for the operation of aircraft with higher code letter at the aerodrome, including taxiing routes.

29. Procedures and measures for the prevention of fire at the aerodrome.

30. Communication procedures, including: frequencies; language and phraseology to be used when communicating with the air traffic services; vehicle call signs; communication signals to be used in case of radio communication failure; communication via the air traffic services provider; and dissemination of significant information.

31. Aircraft towing procedures, including: designated routes to be used; lights to be displayed by aircraft; communication procedures; guidance to be provided; measures for ensuring safety of towing operation in adverse weather conditions, including visibility and weather phenomena in which towing is limited or not permitted.

32. Procedures for the handover of activities between aerodrome personnel, including description of the system for the provision of operational information to other organisations operating at the aerodrome.

(b) All procedures contained in the aerodrome manual should include and clearly define the roles, responsibilities, and contact details of responsible aerodrome personnel, other persons or organisations, including the contracted ones, including the MAA-NLD and other state agencies involved, as appropriate, and take into account the need for establishing direct communication during non-working hours.

GM2 MAR-ADR.OR.E.005 Aerodrome manual

CONTENTS

The numbering system described in AMC3 MAR-ADR.OR.E.005 should be maintained even if there are sections that, because of the nature of the aerodrome or the types of operation, are not applicable.

SUBPART F — APRON MANAGEMENT SERVICE (NLD-MAR-ADR.OR.F)

AMC1 MAR-ADR.OR.F.045(b)(2) Management system

SAFETY POLICY

(a) The safety policy should:
  (1) be endorsed by the accountable manager;
  (2) clearly identify safety as the highest organisational priority;
  (3) reflect organisational commitments regarding safety and its proactive and systematic management;
  (4) be communicated, with visible endorsement, throughout the organisation;
  (5) include safety reporting principles; and
  (6) be periodically reviewed to ensure it remains relevant and appropriate to the organisation.
(b) The safety policy should:
  (1) include a commitment to:
    (i) improve towards the highest safety standards;
    (ii) comply with all applicable legal requirements, meet all applicable standards, and consider best practices;
    (iii) provide appropriate resources;
    (iv) enforce safety as the primary responsibility of all managers and personnel;
  (2) include safety reporting procedures;
  (3) with reference to just culture, clearly indicate which types of operational behaviours are unacceptable, and include the conditions under which disciplinary action would not apply; and
  (4) be periodically reviewed to ensure it remains relevant and appropriate to the organisation.
(c) Senior management should:
  (1) continually promote the safety policy to all personnel, and demonstrate their commitment to it;
  (2) provide the necessary human and financial resources for its implementation; and
  (3) establish safety objectives and performance standards.

AMC1 MAR-ADR.OR.F.045(b)(3) Management system

HAZARD IDENTIFICATION PROCESS

(a) The organisation responsible for the provision of AMS should coordinate the hazard identification process with the aerodrome operator and, where necessary, the air traffic services (ATS) provider.
(b) Hazard identification should be based on a combination of reactive, proactive, and predictive methods of safety data collection. Reactive, proactive, and predictive schemes for hazard identification should be the formal means of collecting, recording, analysing, acting on, and generating feedback about hazards and the associated risks that affect safety.
(c) All reporting systems, including confidential reporting schemes, should include an effective feedback process.

AMC1 MAR-ADR.OR.F.045(b)(4) Management system

SAFETY RISK ASSESSMENT AND RISK MITIGATION

(a) A formal safety risk assessment and risk-mitigation process should be developed and maintained that ensures risk analysis (in terms of probability and severity of occurrence), risk assessment (in terms of tolerability), and risk control (in terms of mitigation).
(b) The levels of management that have the authority to make decisions regarding the tolerability of safety risks, in accordance with (a) above, should be specified in the management manual. The

decisions should be coordinated with the aerodrome operator and, where necessary, the air traffic services (ATS) provider.

AMC1 MAR-ADR.OR.F.045(b)(5) Management system

SAFETY PERFORMANCE MONITORING AND MEASUREMENT

(a) Safety performance monitoring and measurement should be the process by which the safety performance of the organisation responsible for the provision of AMS is verified in comparison to the established safety policy and objectives, identified safety risks and the risk-mitigation measures.
(b) This process should include the setting of safety performance indicators and safety performance targets, and measuring the organisation's safety performance against them.
(c) The safety performance indicators and targets should be agreed with the aerodrome operator and should not contravene the safety performance indicators and targets of the aerodrome operator and, where applicable, the air traffic services (ATS) provider.

AMC1 MAR-ADR.OR.F.045(b)(6) Management system

CHANGE MANAGEMENT

The organisation responsible for the provision of AMS should manage the safety risks related to a change. The management of a change should be a documented process to identify external and internal changes that may have an adverse effect on safety.
The management of a change should make use of the organisation's existing hazard identification, safety risk assessment, and mitigation processes.

AMC1 MAR-ADR.OR.F.045(b)(7) Management system

CONTINUOUS IMPROVEMENT OF THE SAFETY MANAGEMENT SYSTEM

The organisation responsible for the provision of AMS should continuously seek to improve its safety performance. The organisation should develop and maintain a relevant formal process in this regard. Continuous improvement should be achieved through:
(a) the proactive and reactive evaluation of facilities, equipment, documentation and procedures;
(b) the proactive evaluation of an individual's performance to verify they fulfil their safety responsibilities; and
(c) reactive evaluations to verify the effectiveness of the system as regards the control and mitigation of safety risks.

AMC1 MAR-ADR.OR.F.045(b)(8) Management system

SAFETY MANAGEMENT SYSTEM TRAINING

(a) The organisation responsible for the provision of AMS should establish a safety management system training programme for all personnel involved in the provision of AMS, including all management staff (e.g. supervisors, managers, senior managers, and the accountable manager), regardless of their position in the hierarchy of the organisation.
(b) The amount and level of detail of the safety management system training should be proportionate and appropriate to the individual's responsibilities and involvement in the safety management system of the organisation.
(c) The safety management system training programme should be developed in accordance with AMC1 MAR-ADR.OR.D.017(a);(b) and be incorporated in the training programme foreseen therein.

AMC1 MAR-ADR.OR.F.045(b)(9) Management system

SAFETY COMMUNICATION

(a) The organisation responsible for the provision of AMS should communicate the safety management

system objectives and procedures to all operational personnel, and the safety management system and its application should be evident in all aspects of the organisation's operations.

(b) There should be a communication flow between the safety manager and the operational personnel throughout the organisation. The safety manager should communicate the performance of the organisation's safety management system via suitable means. The safety manager should also ensure that lessons learned from investigations, safety-related events or other safety-related experience, both internally and from other organisations, are distributed widely within the organisation.

(c) Safety communication should aim to:
  (1) ensure that all staff are fully aware of the organisation's safety management system;
  (2) convey safety-critical information;
  (3) explain why particular actions are taken; and
  (4) explain why safety procedures are introduced or changed.

AMC1 MAR-ADR.OR.F.045(b)(10) Management system

COMPLIANCE MONITORING

(a) Compliance monitoring
  (1) The implementation and use of a compliance-monitoring process should enable the organisation responsible for the provision of AMS to monitor the organisation's compliance with the relevant requirements of this Part, of Part-ADR.OPS, as well as with any other applicable regulatory requirements, or requirements established by the aerodrome operator or the air traffic services (ATS) provider.
  (2) The compliance-monitoring process should be properly implemented, maintained and continually reviewed and improved, as necessary.
  (3) Compliance monitoring should include a system to feed findings back to the accountable manager to ensure the effective implementation of corrective actions, as necessary.
  (4) The organisation responsible for the provision of AMS should monitor the consistent application of its procedures, and compliance with the applicable procedures of the aerodrome operator and of the ATS provider to ensure that the activities are performed safely. In doing so, the AMS provider should, as a minimum, and where appropriate, monitor compliance with:
    (i) its privileges;
    (ii) the manuals, logs, and records;
    (iii) the training standards;
    (iv) the required resources;
    (v) the management system procedures and manuals; and
    (vi) the activities of the organisation carried out under the supervision of the person nominated in accordance with point MAR-ADR.OR.F.065(a)(2).

(b) Organisational set-up
  (1) To ensure that the organisation continues to meet the requirements of this Part and of other applicable parts, the accountable manager should designate a person responsible for compliance monitoring.
  (2) Compliance monitoring should be an independent function. If the person responsible for compliance monitoring has also another function, that person's independence should be established by ensuring that audits and inspections are carried out by personnel that are not responsible for the function, procedure, etc., being audited.
  (3) Staff involved in compliance monitoring should have access to any part of the organisation and, as necessary, to any contracted organisation.

(c) Compliance-monitoring documentation
  (1) Relevant documentation should include the relevant part(s) of the organisation's management system documentation.
  (2) In addition, relevant documentation should also include the following:
    (i) terminology;
    (ii) specified activity standards;
    (iii) a description of the organisation;
    (iv) the allocation of duties and responsibilities;
    (v) procedures to ensure regulatory compliance;
    (vi) the compliance-monitoring programme which reflects:

(A) the schedule of the monitoring programme;
(B) audit procedures, including an audit plan that is implemented, maintained and continually reviewed and improved;
(C) reporting procedures;
(D) follow-up and corrective action procedures; and
(E) the recording system;
(vii) the training syllabus referred to in point (d)(2) below; and
(viii) document control.

(d) Training
(1) Proper and thorough training is essential to optimise compliance. In order to achieve optimum outcome of such training, the AMS provider should ensure that all personnel understand the objectives as laid down in the AMS provider's management system documentation.
(2) The staff member responsible for managing compliance monitoring should receive training in this task. Such training should cover the compliance-monitoring requirements, the manuals and procedures related to the task, audit techniques, reporting, and recording.
(3) The time should be provided to train the staff involved in compliance management, and for briefing the rest of the staff.
(4) The allocation of time and resources should be based on the volume and complexity of the activities concerned.

(e) Compliance monitoring — audit scheduling
(1) Defined audit schedules to be completed during a specified period as well as a periodic review cycle for each audited area should be established. The compliance monitoring itself should also be audited according to a defined audit schedule. The schedule should allow for unscheduled audits when non-compliance data shows an increasing trend. Follow-up audits should be scheduled to verify that corrective action has been carried out, and that it has been effective and completed, in accordance with the policies and procedures specified in the aerodrome manual.
(2) The management system's key processes, procedures and the operation of the organisation responsible for the provision of AMS should be audited within the first 12 months from the date on which the declaration was first registered.
(3) Following that, the organisation responsible for the provision of AMS should consider the results of its safety (risk) assessments and of its past compliance-monitoring activities in order to adapt the period within which an audit or a series of audits should be conducted, to cover its management system's key processes, procedures and operations in a manner and at intervals set out in the management system manual. This period should be consistent with the relevant Competent Authority's oversight planning cycle and may be extended up to 36 months, in coordination with the Competent Authority, provided that there are no level 1 findings, and subject to the organisation responsible for the provision of AMS having a good record of addressing findings in a timely manner.

AMC2 MAR-ADR.OR.F.045(b)(10) Management system

RESPONSIBILITY FOR COMPLIANCE MONITORING

(a) The responsibility for compliance monitoring should:
(1) lie with a person that has direct access and is responsible to the accountable manager;
(2) not lie with a person that is nominated in accordance with point MAR-ADR.OR.F.065(a)(2).

(b) Depending on the size of the organisation and the type and complexity of its operations, the task of compliance monitoring may be performed by the accountable manager provided they have demonstrated they have the related competence as defined in point (d) below.

(c) If the same person acts both as compliance-monitoring manager and as safety manager, the accountable manager, with regard to their direct accountability as regards safety, should ensure that sufficient resources are allocated to both functions, taking into account the size of the organisation and the type and complexity of its operations.

(d) Persons that are allocated the responsibility for compliance monitoring should have:
(1) adequate experience and expertise in aerodrome operations or in the provision of apron management services (AMS) or air traffic services (ATS);
(2) adequate knowledge of and experience in safety management and quality assurance;
(3) knowledge of the aerodrome manual and as regards the organisation responsible for the

provision of AMS, of its management manual; and
(4) comprehensive knowledge of the applicable requirements in the area of aerodromes, AMS or ATS.

AMC1 MAR-ADR.OR.F.045(c) Management system

MANAGEMENT SYSTEM DOCUMENTATION

The organisation responsible for the provision of AMS should ensure that the key processes of its documented management system include a process for making personnel aware of their responsibilities, as well as its amendment procedure.
The documented management system of the organisation responsible for the provision of AMS should include at least the following information:
(a) a statement signed by the accountable manager confirming that the organisation will continuously work in accordance with the applicable requirements, with the requirements of the aerodrome operator and of the air traffic services (ATS) provider, and with the organisation's documented management system;
(b) the organisation's scope of activities;
(c) the titles and names of the persons referred to in point MAR-ADR.OR.F.065 and in AMC2 MAR-ADR.OR.F.045(b)(10);
(d) an organisation chart showing the lines of responsibility between the nominated persons;
(e) the procedures specifying how the organisation ensures compliance with the applicable requirements;
(f) the amendment procedure for the organisation's management system documentation; and
(g) the safety management system outputs.

AMC2 MAR-ADR.OR.F.045(c) Management system

SAFETY MANAGEMENT MANUAL

(a) For cases where safety management is set out in a safety management manual, it should be the key instrument for communicating the approach of the organisation responsible for the provision of AMS to safety. The safety management manual should document all aspects of safety management, including the safety policy, its objectives, procedures, and the safety responsibilities of individuals.
(b) The safety management manual should include the following:
(1) the scope of the safety management system;
(2) the safety policy and its objectives;
(3) the safety responsibilities of key safety personnel;
(4) the documentation control procedures;
(5) the safety assessment process, including hazard identification and risk management schemes;
(6) the monitoring of implementation and the effectiveness of the safety actions and riskmitigation measures;
(7) safety performance monitoring;
(8) safety reporting (including hazard reporting) and investigation;
(9) the change management (including organisational changes with regard to safety responsibilities);
(10) safety promotion; and
(11) safety management system outputs.

AMC1 MAR-ADR.OR.F.055 Safety reporting system

SAFETY REPORTING SYSTEM

(a) The safety reporting system should include the personnel of the organisation which are responsible for the provision of AMS.
(b) The safety reporting system should include the possibility for voluntary reporting intended for safety hazards identified by the reporter which may have potential negative consequences on safety.

(c) The organisation responsible for the provision of AMS should identify which events are mandatory to be reported.
(d) The organisation responsible for the provision of AMS should provide the means and the format for reporting, which should be such that they meet the existing reporting requirements established in the applicable legislation in terms of time, format, and required information to be reported.
(e) The safety reporting system should include the acknowledgement to the reporter of the successful submission of the report.
(f) The reporting process should be as simple as possible, and well documented, including details on what, how, where, whom, and when to report.
(g) Regardless of the means or method of submission of the report, once the information is received, it should be stored in a manner suitable for easy retrieval and analysis.
(h) Access to the submitted reports should be restricted to personnel responsible for storing and analysing them.
(i) The reporter's identity should be protected, and this principle should be included in the procedures established by the organisation responsible for the provision of AMS for gathering additional information for further analyses or investigations.
(j) The safety reporting system should include a feedback process to inform the reporter on the outcome of the occurrence analysis.

AMC1 MAR-ADR.OR.F.055(a) Safety reporting system

GENERAL

The organisation responsible for the provision of AMS should establish procedures to be used for reporting to the MAA-NLD and to any other organisation required, which should include the following:
(a) the description of the applicable requirements for reporting;
(b) the description of the reporting mechanism, including reporting forms, means, and deadlines;
(c) the personnel responsible for reporting; and
(d) the description of the mechanism and of personnel responsibilities for identifying root causes, and the actions that may be needed to be taken to prevent similar occurrences from happening in the future, as appropriate.

AMC1 MAR-ADR.OR.F.065(a)(1) Personnel requirements

ACCOUNTABLE MANAGER

(a) Accountable manager — General
  (1) The accountable manager should:
    (i) ensure that all necessary resources are available to deliver the services in accordance with the applicable requirements and the aerodrome manual;
    (ii) ensure that if there is a reduction in the level of resources or if there are abnormal circumstances which may affect safety, the required reduction in the level of operations at the aerodrome is implemented in cooperation with the aerodrome operator and the air traffic services (ATS) provider;
    (iii) establish, implement and promote the safety policy; and
    (iv) ensure compliance with the relevant applicable requirements and the organisation's safety management system.
  (2) The accountable manager should have:
    (i) an appropriate level of authority within the organisation to ensure that its activities are financed and carried out to the standard required;
    (ii) knowledge and an understanding of the documents that prescribe aerodrome and ATS safety standards;
    (iii) an understanding of the requirements as regards the competencies of management personnel so as to ensure that competent persons occupy key management functions;
    (iv) knowledge and an understanding of safety and quality management systems related principles and practices and how these are applied within the organisation;
    (v) knowledge of the role of the accountable manager; and
    (vi) knowledge and an understanding of the key risk management issues as regards aerodrome operations.

(b) Accountable manager — Delegation of responsibilities

(1) A high level of technical knowledge and understanding is expected from an accountable manager, and in particular with reference to their own role in ensuring that standards are maintained.

(2) During periods of absence, the responsibilities of the accountable manager for the day-to-day operations may be delegated; however, the accountability ultimately remains with the accountable manager.

(3) Depending on the size and the complexity of the organisation's operations, the accountable manager may delegate their responsibilities in the area of training by nominating a training manager whose responsibilities should be the establishment, coordination, implementation of training programmes, and relevant record keeping of personnel training as well as of the proficiency check programmes.
In any case, the accountability ultimately remains with the accountable manager.

AMC1 MAR-ADR.OR.F.065(a)(2) Personnel requirements

NOMINATED PERSON RESPONSIBLE FOR THE MANAGEMENT AND SUPERVISION OF OPERATIONAL SERVICES RELATED TO APRON MANAGEMENT — OPERATIONS MANAGER

(a) General

(1) A description of the functions of the operations manager, i.e. the person responsible for the management and supervision of operational services related to apron management, should be contained in the management manual. This person should be given the necessary and adequate resources to perform their duties.

(2) The organisation responsible for the provision of AMS should make arrangements to ensure adequate supervision continuity in the absence of the operations manager.

(3) The operations manager should be foreseen to work sufficient hours to fulfil the management functions, considering the scale and complexity of the operation.

(4) The operations manager may hold more than one post if such an arrangement is considered suitable and it properly matches the structure of the organisation responsible for the provision of AMS and the complexity of its operations.

(b) Competence

The operations manager should have:

(1) good practical experience and the appropriate expertise in aerodrome operations, apron management and/or air traffic services (ATS);

(2) comprehensive knowledge of the applicable requirements in the area of aerodromes, apron management and/or ATS;

(3) appropriate knowledge about safety and quality management; and

(4) knowledge of the aerodrome manual and the organisation's management system manual.

AMC1 MAR-ADR.OR.F.065(a)(3) Personnel requirements

SAFETY MANAGER

(a) The safety manager should be the focal point and responsible for the effective development, coordination, administration and maintenance of a safety management system.

(b) The role of the safety manager should be to:

(1) facilitate hazard identification, risk analysis and risk management;

(2) monitor the implementation and functioning of the safety management system, including the necessary safety actions;

(3) manage the safety reporting system of the organisation responsible for the provision of AMS;

(4) coordinate with the aerodrome operator and the air traffic services (ATS) provider as regards their safety management systems;

(5) produce periodic reports on the safety performance of the organisation;

(6) ensure the maintenance of the safety management documentation;

(7) ensure the availability of a safety management training and that it meets established standards;

(8) provide advice on safety matters; and

(9) initiate and participate in internal occurrence/incident/accident investigations.

(c) The safety manager should have:
  (1) relevant practical experience and the appropriate expertise in aerodrome operations, apron management and/or ATS;
  (2) appropriate knowledge about safety and quality management;
  (3) knowledge of the aerodrome manual and the organisation's management system manual; and
  (4) comprehensive knowledge of the applicable requirements in the area of aerodromes, apron management and/or ATS.
(d) The safety manager should not be the person referred to in point MAR-ADR.OR.F.065(a)(2). However, depending on the size of the organisation and the type and complexity of its operations, the safety manager may be the accountable manager, or any other person with an operational role within the organisation, provided that they can act independently of other managers within the organisation, and have direct access to the accountable manager and to the appropriate management level for safety matters.

AMC1 MAR-ADR.OR.F.065(a)(4) Personnel requirements

DETERMINATION OF PERSONNEL REQUIRED FOR PLANNED TASKS AND PERSONNEL QUALIFICATIONS

The organisation responsible for the provision of AMS should determine:
(a) the personnel that are required for the planned tasks;
(b) the required personnel qualifications in accordance with the applicable requirements (and the national and European Union legislation, where applicable), and include them in the management system manual; a documented system with defined responsibilities should be in place to identify any need for changes with regard to personnel qualifications.

AMC1 MAR-ADR.OR.F.080 Record keeping

DOCUMENTATION TO BE RETAINED
(a) The record-keeping system used by the organisation responsible for the provision of AMS should provide for adequate procedures, storage facilities, as well as the reliable traceability, retrievability and accessibility of the records related to its activities that are subject to this Regulation throughout the required retention period.
(b) The records should be kept in paper or electronic format, or a combination of both. It is also acceptable to keep records stored in microfilms or optical discs. The records should remain legible throughout the required retention period. The retention period starts when the record is created or last amended.
(c) For paper-based systems, robust material should be used which can withstand normal handling and filing.
(d) Electronic systems should have at least one backup system which should be updated every 24 hours or each time a new entry is made. Electronic systems should include safeguards against the possibility for unauthorised personnel to alter the data.
(e) All computer hardware used to ensure data backup should be stored in a location different from that containing the working data, and in an environment that ensures they remain in good condition. When hardware or software changes take place, special care should be taken that all necessary data continues to be accessible, at least throughout the retention period. In the absence of any indication of the retention period, all records should be kept for a minimum period of 5 years.

AMC1 MAR-ADR.OR.F.095 Management system manual

GENERAL

(a) The management system manual may vary in terms of level of detail according to the complexity and the size of the organisation.
(b) The management system manual or parts of it may be presented in any form, including the electronic form. In all cases, the accessibility, usability and reliability of the management system manual should be ensured.
(c) The management system manual should be developed such that:

(1) all its parts are consistent and compatible in terms of content and format;
(2) it can be readily amended; and
(3) its content and amendment status are controlled and clearly indicated.

(d) The management system manual should include a description of its amendment and revision process specifying:
(1) the person(s) that may approve amendments or revisions;
(2) the conditions for temporary revisions and/or immediate amendments, or revision(s) required in the interest of safety; and
(3) the methods by which all personnel and organisations are advised of the changes made to it.

(e) The management system manual may contain parts of, or refer to, other controlled documents, which are available in the organisation for use by its personnel.

AMC2 MAR-ADR.OR.F.095 Management system manual

CONTENT AND STRUCTURE

(a) The management system manual should have the following structure and should include, at least, the following information (*if an item is not applicable, 'Not applicable' or 'Intentionally left blank' should be indicated, along with the relevant justification*):

A. PART A — GENERAL

0. Administration and control of the management system manual, including the following:

0.1 Introduction:

0.1.1 a statement, signed by the accountable manager, declaring that the management system manual complies with the applicable requirements and the content of the declaration;

0.1.2 a list and brief description of the various parts, their contents, applicability and use; and

0.1.3 explanations, abbreviations and definitions of terms required for the use of the management system manual.

0.2 System for amendments and revisions:

0.2.1 details of the person(s) responsible for the issue and insertion of amendments and revisions;

0.2.2 a record of the amendments and revisions with insertion dates and effective dates;

0.2.3 a statement that handwritten amendments and revisions are not permitted;

0.2.4 a description of the system for the annotation of pages or paragraphs and their effective dates;

0.2.5 a list of effective pages or paragraphs;

0.2.6 annotation of changes (in the text and, as far as practicable, in diagrams); and

0.2.7 description of the distribution system and a distribution list for the management system manual, its amendments and its revisions.

1. General information

General information, including the following:

1.1 purpose and scope of the management system manual;

1.2 the legal requirements for an organisation responsible for the provision of AMS to submit to the MAA-NLD a declaration and a management system manual as prescribed in Part-ADR.OR; and

1.3 the obligations of the organisation responsible for the provision of AMS, the rights of the MAA-NLD, and guidance for the personnel of the organisation responsible for the provision of AMS on how to facilitate audits/inspections conducted by the MAA-NLD's personnel.

B. PART B — MANAGEMENT SYSTEM, AMS PERSONNEL QUALIFICATIONS AND TRAINING REQUIREMENTS

2. A description of the management system, including the following:

2.1 Organisational structure and responsibilities, including the following: a description of the organisational structure, including the general organogram and the departments'

organograms. The organogram should depict the relationship between the departments. Subordination and reporting lines of all levels of the organisational structure (departments, sections, etc.) related to safety should be shown.
Names, authority, responsibilities and duties of management, nominated persons, operational staff and safety committees should also be included.

2.2 A description of the safety management system, including:
- 2.2.1 the scope of the safety management system;
- 2.2.2 the safety policy and its objectives;
- 2.2.3 the safety responsibilities of key safety personnel;
- 2.2.4 the documentation control procedures;
- 2.2.5 the safety risk management process, including hazard identification and risk assessment schemes;
- 2.2.6 monitoring of the implementation and the effectiveness of the safety actions and risk-mitigation measures;
- 2.2.7 safety performance monitoring;
- 2.2.8 safety reporting (including hazard reporting) and investigation;
- 2.2.9 change management (including organisational changes with regard to safety responsibilities);
- 2.2.10 safety promotion; and
- 2.2.11 safety management system outputs.

2.3 A description of compliance monitoring and the related procedures.

2.4 Procedures for reporting to the MAA-NLD and the aerodrome operator, including procedures for handling, notifying and reporting accidents, serious incidents and occurrences. This section should include, at least, the following:
- 2.4.1 the definition of 'accident', 'serious incident' and 'occurrence', as well as the definition of the relevant responsibilities for all persons involved;
- 2.4.2 illustrations of the forms (or copies of the forms) to be used, instructions on how they are to be completed, the addresses (postal or electronic) to which they should be sent, and the time allowed for this to be done; and
- 2.4.3 procedures and arrangements for retaining evidence, including recordings, following a reportable event.

2.5 Procedures related to the use of alcohol, psychoactive substances and medicines by personnel involved in the provision of AMS.

2.6 Procedures with regard to:
- 2.6.1 compliance with safety directives;
- 2.6.2 reaction to safety problems; and
- 2.6.3 the handling of safety recommendations issued by safety investigation authorities.

3. Required qualifications and responsibilities for AMS personnel.

AMC1 MAR-ADR.OR.F.095(g)(1) Management system manual

LANGUAGE OF THE MANUAL

A translated version of the relevant parts of the manual is an acceptable means to comply with the relevant requirement. In any case, the persons that are going to use the manual, should be able to read and understand it.

AMC1 MAR-ADR.OPS.A.005 Aerodrome data

(a) Data relevant to the aerodrome and available services should include, but may not be limited to, items in the following list:
  (1) aerodrome reference point;
  (2) aerodrome and runway elevations;
  (3) aerodrome reference temperature;
  (4) aerodrome dimensions and related information;
  (5) strength of pavements;
  (6) pre-flight altimeter check location;
  (7) declared distances;
  (8) condition of the movement area and related facilities;
  (9) disabled aircraft removal;
  (10) rescue and firefighting; and
  (11) visual approach slope indicator systems.

(b) The aerodrome operator should measure and report to the aeronautical information services obstacles and terrain data in Area 3, and in Area 2 (the part within the aerodrome boundary) in degrees, minutes, seconds and tenths of seconds. In addition, the top elevation, type, marking and lighting (if any) of obstacles should be reported to the aeronautical information services.

(c) Electronic obstacle data for all obstacles in Area 2 (the part within the aerodrome boundary) that are assessed as being a hazard to air navigation should be provided.

(d) Electronic terrain and obstacle data should be provided for:
  (1) Area 2a, for those that penetrate the relevant obstacle data collection surface;
  (2) penetrations of the take-off flight path area obstacle identification surfaces; and
  (3) penetrations of the aerodrome obstacle limitation surfaces.

(e) Electronic terrain and obstacle data should be provided for Area 4 for terrain and obstacles that penetrate the relevant obstacle data collection surface, for all runways where precision approach Category II or III operations have been established and where detailed terrain information is required by operators to enable them to assess the effect of terrain on decision height determination by use of radio altimeters.

(f) The aerodrome operator should establish arrangements with the Air Traffic Services providers and the entity responsible for the provision of obstacles and terrain data outside of the aerodrome boundary.

GM1 MAR-ADR.OPS.A.005 Aerodrome data

AERODROME REFERENCE POINT

(a) The aerodrome reference point should be located near the initial or planned geometric centre of the aerodrome and normally should remain where first established.

(b) The aerodrome reference point should be measured and reported to the aeronautical information services in degrees, minutes, and seconds.

AERODROME AND RUNWAY ELEVATIONS

The following should be measured and reported to the aeronautical information services:

(a) The aerodrome elevation and geoid undulation at the aerodrome elevation position to the accuracy of one-half metre or foot;

(b) For non-precision approaches, the elevation and geoid undulation of each threshold, the elevation of the runway end and any significant high and low intermediate points along the runway, to the accuracy of one-half metre or foot;

(c) For precision approach runway, the elevation and geoid undulation of the threshold, the elevation of the runway end and the highest elevation of the touchdown zone, to the accuracy of one-quarter metre or foot.

AERODROME REFERENCE TEMPERATURE

(a) The aerodrome reference temperature should be determined in degrees Celsius.
(b) The aerodrome reference temperature should be the monthly mean of the daily maximum temperatures for the hottest month of the year (the hottest month being that which has the highest monthly mean temperature), averaged over a period of five (5) years.

AERODROME DIMENSIONS AND RELATED INFORMATION

The following data are measured or described, as appropriate, for each facility provided on the aerodrome:
(a) Runway
    (1) true bearing to one-hundredth of a degree;
    (2) designation number;
    (3) length;
    (4) width;
    (5) displaced threshold location to the nearest metre or foot;
    (6) longitudinal slope;
    (7) surface type;
    (8) type of runway; and
    (9) for a precision approach runway category I, the existence of an obstacle free zone when provided.
(b) Strip/Runway End Safety Area/Stopway
    (1) Length, width to the nearest metre or foot;
    (2) Surface type; and
    (3) Arresting system – location (which runway end) and description.
(c) Taxiway
    (1) Designation;
    (2) Width; and
    (3) Surface type.
(d) Apron
    (1) Surface type; and
    (2) Aircraft stands.
(e) The boundaries of the air traffic control service;
(f) Clearway
    (1) length to the nearest metre or foot; and
    (2) ground profile.
(g) Visual aids for approach procedures, marking and lighting of runways, taxiways and aprons, other visual guidance and control aids on taxiways and aprons, including runway holding positions, intermediate holding positions and stopbars, and location and type of visual docking guidance systems;
(h) Location and radio frequency of any VOR aerodrome checkpoint;
(i) Location and designation of standard taxi-routes;
(j) Distances to the nearest metre or foot of localiser and glide path elements comprising an instrument landing system (ILS) or azimuth and elevation antenna of a microwave landing system (MLS) in relation to the associated runway extremities;
(k) The geographical coordinates of:
    (1) each threshold;
    (2) appropriate taxiway centre line points; and
    (3) each aircraft stand;
    are measured and reported to the aeronautical information services in degrees, minutes, seconds and hundredths of seconds.

STRENGTH OF PAVEMENTS

(a) The bearing strength of a pavement intended for aircraft of apron (ramp) mass greater than 5 700 kg should be made available using the aircraft classification — pavement classification number (ACN–PCN) method, by reporting all of the following information:
    (1) the pavement classification number (PCN);

(2) pavement type for ACN-PCN determination;
(3) subgrade strength category;
(4) maximum allowable tire pressure category or maximum allowable tire pressure value; and
(5) evaluation method.

(b) For the purposes of determining the ACN, the behaviour of a pavement should be classified as equivalent to a rigid or flexible construction;

(c) Information on pavement type for ACN-PCN determination, subgrade strength category, maximum allowable tire pressure category and evaluation method, should be reported using the following codes:
(1) Pavement type for ACN-PCN determination:
(i) Rigid pavement: Code R;
(ii) Flexible pavement: Code F;
(2) Subgrade strength category:
(i) High strength: characterised by K = 150 MN/m3 and representing all K values above 120 MN/m3 for rigid pavements, and by CBR = 15 and representing all CBR values above 13 for flexible pavements — Code A;
(ii) Medium strength: characterised by K = 80 MN/m3 and representing a range in K of 60 to 120 MN/m3 for rigid pavements, and by CBR = 10 and representing a range in CBR of 8 to 13 for flexible pavements — Code B;
(iii) Low strength: characterised by K = 40 MN/m3 and representing a range in K of 25 to 60 MN/m3 for rigid pavements, and by CBR = 6 and representing a range in CBR of 4 to 8 for flexible pavements — Code C;
(iv) Ultra low strength: characterised by K = 20 MN/m3 and representing all K values below 25 MN/m3 for rigid pavements, and by CBR = 3 and representing all CBR values below 4 for flexible pavements — Code D;
(3) Maximum allowable tire pressure category:
(i) Unlimited: no pressure limit — Code W;
(ii) High: pressure limited to 1.75 MPa — Code X;
(iii) Medium: pressure limited to 1.25 MPa — Code Y;
(iv) Low: pressure limited to 0.50 MPa — Code Z;
(4) Evaluation method:
(i) Technical evaluation: representing a specific study of the pavement characteristics and application of pavement behaviour technology — Code T;
(ii) Using aircraft experience: representing a knowledge of the specific type and mass of aircraft satisfactorily being supported under regular use — Code U;

(d) The bearing strength of a pavement intended for aircraft of apron (ramp) mass equal to or less than 5 700 kg, should be reported by reporting the following information:
(1) maximum allowable aircraft mass; and
(2) maximum allowable tire pressure.

PRE-FLIGHT ALTIMETER CHECK LOCATION

(a) One or more pre-flight altimeter check locations should be established.

(b) The elevation of a pre-flight altimeter check location should be given as the average elevation, rounded to the nearest metre or foot, of the area on which it is located. The elevation of any portion of a pre-flight altimeter check location should be within 3 m (10 ft) of the average elevation for that location.

(c) Pre-flight check location could be located on an apron. Locating a pre-flight altimeter check location on an apron enables an altimeter check to be made prior to obtaining taxi clearance and eliminates the need for stopping for that purpose after leaving the apron. Normally an entire apron could serve as a satisfactory altimeter check location.

DECLARED DISTANCES

(a) The following distances should be calculated to the nearest metre or foot for a runway and reported to the aeronautical information services and Air Traffic Services:
(1) Take-off run available (TORA);
(2) Take-off distance available (TODA);
(3) Accelerate stop distance available (ASDA); and

(4) Landing distance available (LDA).

(b) The take-off run available (TORA), take-off distance available (TODA), accelerate stop distance available (ASDA) and landing distance available (LDA) should be calculated according to the following (all declared distances are illustrated for operations from left to right):

(1) Where a runway is not provided with a stopway or a clearway and the threshold is located at the extremity of the runway, the four declared distances should normally be equal to the length of the runway

Figure 1

(2) When a runway is provided with a clearway (CWY), then the TODA will include the length of clearway.

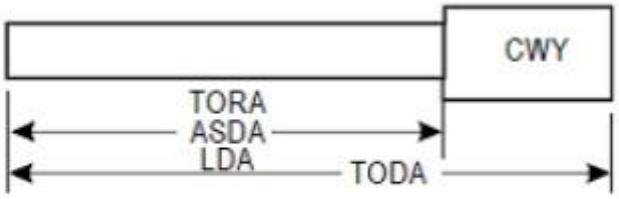


Figure 2

(3) Where a runway is provided with a stopway (SWY), then the ASDA will include the length of stopway.

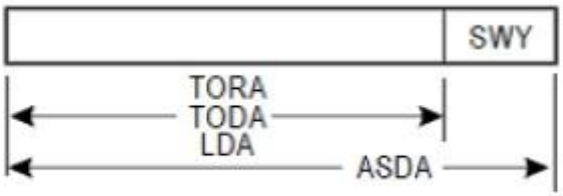


Figure 3

(4) Where a runway has a displaced threshold, then the LDA will be reduced by the distance the threshold is displaced. A displaced threshold affects only the LDA for approaches made to that threshold; all declared distances for operations in the reciprocal direction are unaffected.

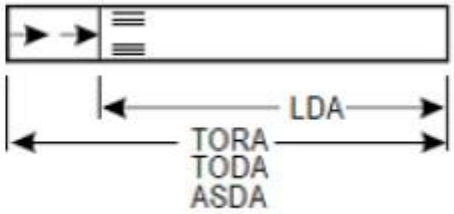


Figure 4

(5) Where a runway is provided with more than one of the clearway, stopway, or having a displaced threshold, then more than one of the declared distances will be modified. The modification will follow the same principle as in (1)–(4)

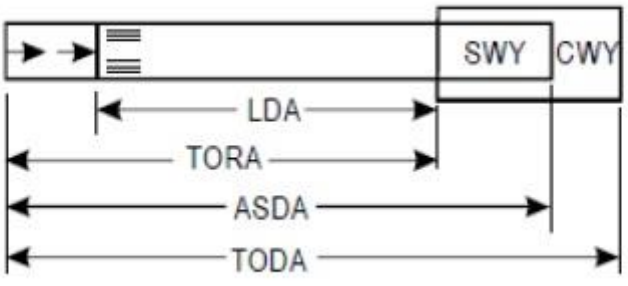


Figure 5

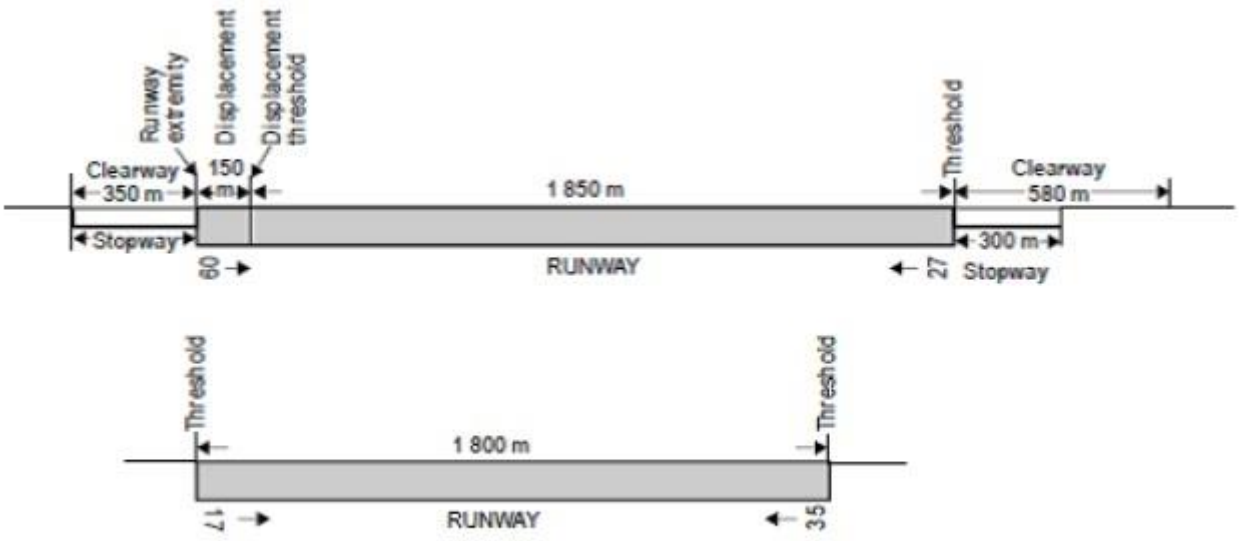


Figure 6

(c) The information on declared distances should be provided according to the following table:

RUNWAY	TORA	ASDA	TODA	LDA
	m	m	m	m
09	2 000	2 300	2 580	1 850
27	2 000	2 350	2 350	2 000
17	NU	NU	NU	1 800
35	1 800	1 800	1 800	NU

Table 1

If a runway direction cannot be used for take-off or landing, or both because it is operationally forbidden, then this should be declared and the words 'not usable' or the abbreviation 'NU' entered.

(d) When intersection take-offs are performed, the datum line from which the reduced runway declared distances for take-off are determined, should be defined by the intersection of the downwind edge as shown in the figure below:

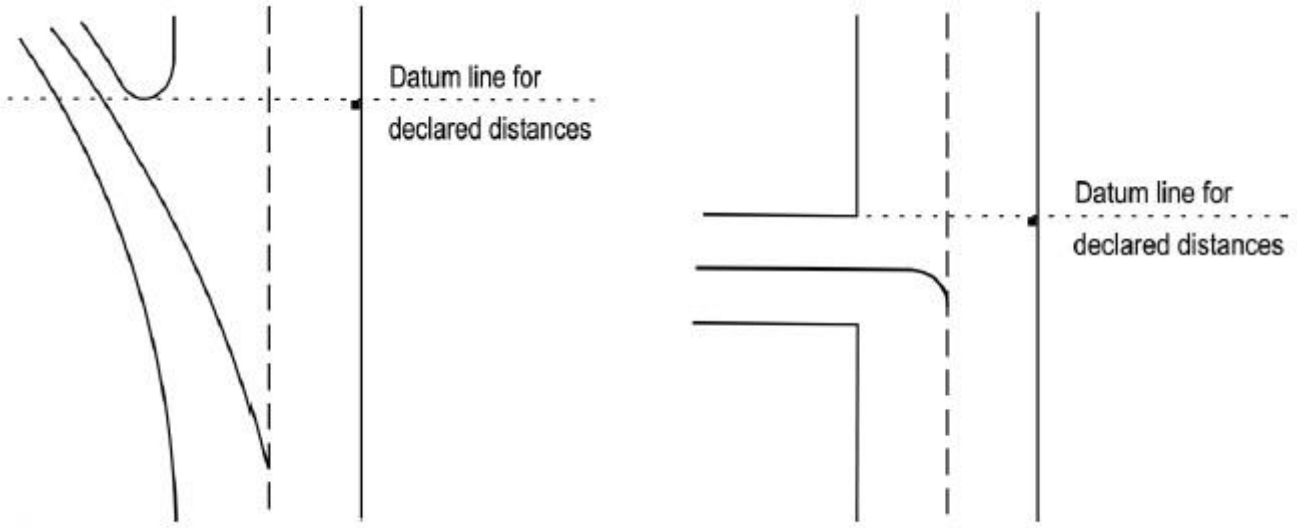


Figure 7

CONDITION OF THE MOVEMENT AREA AND RELATED FACILITIES

The condition of the movement area and the operational status of related facilities need to be

monitored and reported, on matters of operational significance affecting aircraft and aerodrome operations, particularly in respect of the following:
(a) construction or maintenance work;
(b) rough or broken surfaces on a runway, a taxiway or an apron;
(c) other temporary hazards, including parked aircraft;
(d) failure or irregular operation of part or all the aerodrome visual aids; and
(e) failure of the normal or secondary power supply.

DISABLED AIRCRAFT REMOVAL

(a) The contact details (telephone/telex number(s), email address, etc.) of the office of the aerodrome coordinator of operations for the removal of an aircraft disabled on or adjacent to the movement area should be made available on request to aircraft operators.
(b) Information concerning the capability to remove an aircraft disabled on or adjacent to the movement area should be made available.
(c) The capability to remove a disabled aircraft may be expressed in terms of the largest type of aircraft which the aerodrome is equipped to remove.

RESCUE AND FIREFIGHTING

(a) Information concerning the level of protection provided at an aerodrome for aircraft rescue and firefighting purposes during the hours of operation should be made available.
(b) The level of protection normally available at the aerodrome should be expressed in terms of the category of the rescue and firefighting services and in accordance with the types and amounts of extinguishing agents normally available at the aerodrome.
(c) Changes in the level of protection normally available at the aerodrome for rescue and firefighting should be notified to the appropriate air traffic services units and aeronautical information services units to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been corrected, the above units should be advised accordingly.
(d) Changes in the level of protection from that normally available at the aerodrome could result from a change in the availability of extinguishing agents, equipment to deliver the agents or personnel to operate the equipment, etc.
(e) A change in the level of protection is expressed in terms of the new category of the rescue and firefighting services available at the aerodrome.

VISUAL APPROACH SLOPE INDICATOR SYSTEMS

The following information concerning a visual approach indicator system is made available:
(a) associated runway designation number;
(b) type of system; for a PAPI or APAPI installation, the side of the runway on which the lights are installed, i.e. left or right, is given;
(c) where the axis of the system is not parallel to the runway centre line, the angle of displacement and the direction of displacement, i.e. left or right, is indicated;
(d) nominal approach slope angle(s); and
(e) minimum eye height(s) over the threshold of the on-slope signal(s).

GM2 MAR-ADR.OPS.A.005(a) Aerodrome data

SURVEYING REQUIREMENTS FOR RUNWAY THRESHOLDS, TAXIWAYS AND AIRCRAFT STANDS

(a) Thresholds
  (1) For surveying purposes, threshold positions must be taken as being at the geometric centre of the runway and at the beginning of the paved surface, i.e. the beginning of that portion of the runway usable for landing. Where thresholds are marked by appropriate threshold markings (e.g. displaced thresholds), these must be taken as the threshold points. Where threshold lighting is surveyed, the locations must be described on the diagram accompanying the report. Where there is no threshold lighting, an appropriate point for survey in accordance with the following figures must be selected.

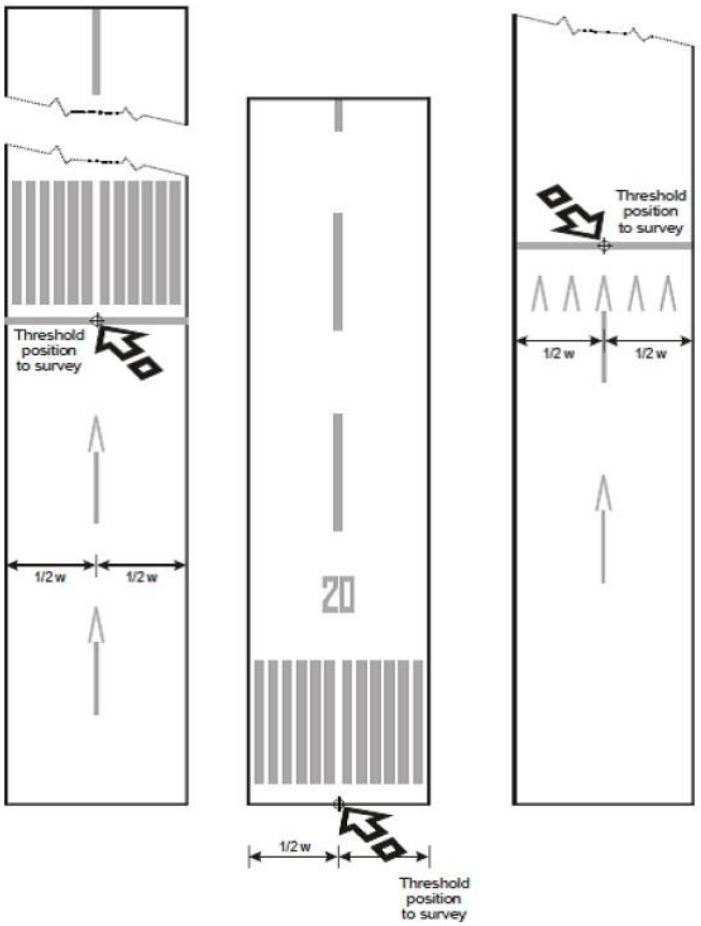


Figure 1

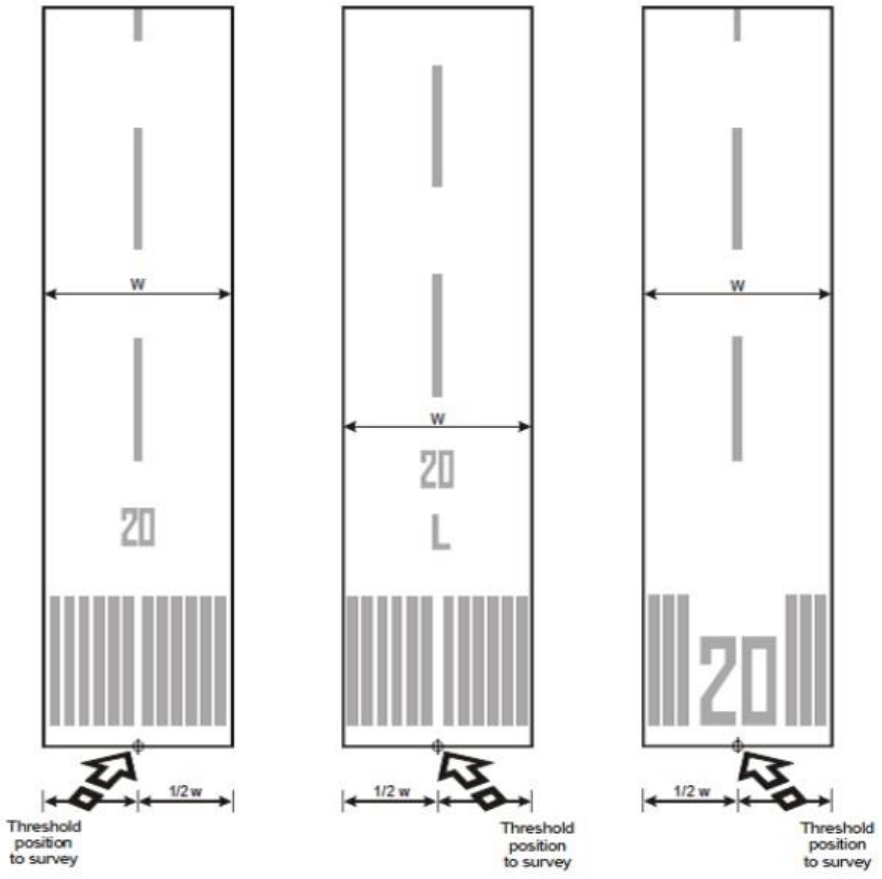


Figure 2

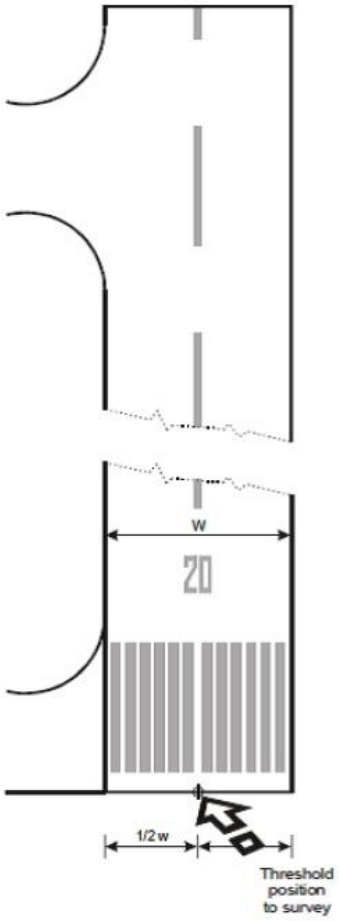


Figure 3

(2) If the runway has only one threshold certified for landing, the runway end position must be surveyed. For surveying purposes, the runway end position (flight path alignment point) must be taken as being at the geometric centre of the runway and at the end of the paved surface, i.e. the end of that portion of the runway usable for landing.

(b) Taxiways and stand/checkpoints — General

(1) Except as provided in (c) (1) below, for surveying purposes the centre (mid-width) of the taxiway centre line marking, apron taxilane marking or the aircraft stand guide line marking must be taken as the reference data.

(2) The points of commencement and ends of straight sections of taxiways, apron taxilanes and aircraft stand point guidance lines markings must be surveyed. Sufficient additional points must be surveyed to maintain the required accuracy along the lines.

(3) For curved sections of taxiways, apron taxilanes and aircraft stand guide line markings, the commencement and end of the curved section centre line must be surveyed together with the position of the centre point of the arc and its radius. In the case of a compound curve, the centre and radius of each arc and the commencement and end of each of the arcs must be surveyed. Where this is impracticable in the field, a series of sequential points must be surveyed along the curved section of the centre line with a maximum arc to chord distance not exceeding 0.25 m for taxiways and 0.10 m for apron taxilanes and aircraft stand guide line markings. Sufficient points must be surveyed to maintain the required accuracy along the lines. The surveyor must, in processing the data, conduct a graphical inspection of the survey points to ensure collinearity.

(c) Taxiways

(1) To permit uninterrupted transition from the actual runway centre line to the taxiway centre line and to provide the required continuity of guidance for the aircraft navigation data base, differentiation must be made between the surface markings and the actual path the aircraft must follow. Therefore, for the guidance of aircraft entering or exiting the runway for take-off or landing, the following must be surveyed:

(i) the point at which the radius of turn, prescribed by the appropriate authority for each taxiway, is tangential to the runway centre line, and the point at which that radius of turn

joins the taxiway centre line marking at a tangent;
(ii) the point that prescribes the centre of the arc; and
(iii) the radius of the arc.
Where this is impracticable in the field, a series of sequential points must be surveyed along the curved section of the centre line of taxiways.

(2) Where taxiway centre line marking is provided on a runway that is part of a standard taxi route, or a taxiway centre line is not coincident with runway centre line, the following points must be surveyed:
(i) the point on the taxiway marking at which the taxiway enters the runway;
(ii) the points at which the taxiway deviates from a straight line;
(iii) the intersection of the taxiway centre line marking and boundary of each 'block' that has been published as part of the aerodrome movement and guidance control system; and
(iv) the point on the taxiway marking at which the taxiway exits the runway.

(3) In defining taxiways, the following points must be surveyed at the centre of the centre line marking of each taxiway, as appropriate:
(i) intermediate holding positions and runway holding positions (including those associated with the intersection of a runway with another runway when the former runway is part of a standard taxi route) and for points established for the protection of sensitive areas for radio navigation aids;
(ii) taxiway intersection markings;
(iii) intersection of other taxiways, including taxiways described in point (c) (2) above;
(iv) intersections of 'blocks' defined for surface movement, guidance and control systems;
(v) commencement and end of selectable taxiway lighting systems provided as part of the surface movement, guidance and control systems, where different from subparagraph (iv) above; and

(d) Aircraft stand points

(1) In defining the aircraft stands, the following points must be surveyed at the centre of the guide line marking of the aircraft stands, as appropriate:
(i) taxilane centre lines;
(ii) lead-in line(s);
(iii) turning line;
(iv) straight section of the turning line;
(v) nose wheel stopping position;
(vi) true heading of the alignment bar; and
(vii) lead-out line(s).

(2) Where aircraft stands are utilized by more than one aircraft type and different guide line markings exist, a diagram must be prepared by the surveyor showing the arrangement of the markings in use, together with an indication of the points surveyed. Where all the stands at an aerodrome/heliport are marked uniformly, only a single diagram needs to be prepared.

The points that should be surveyed for a taxiway or an aircraft stand, are shown in the following diagrams:

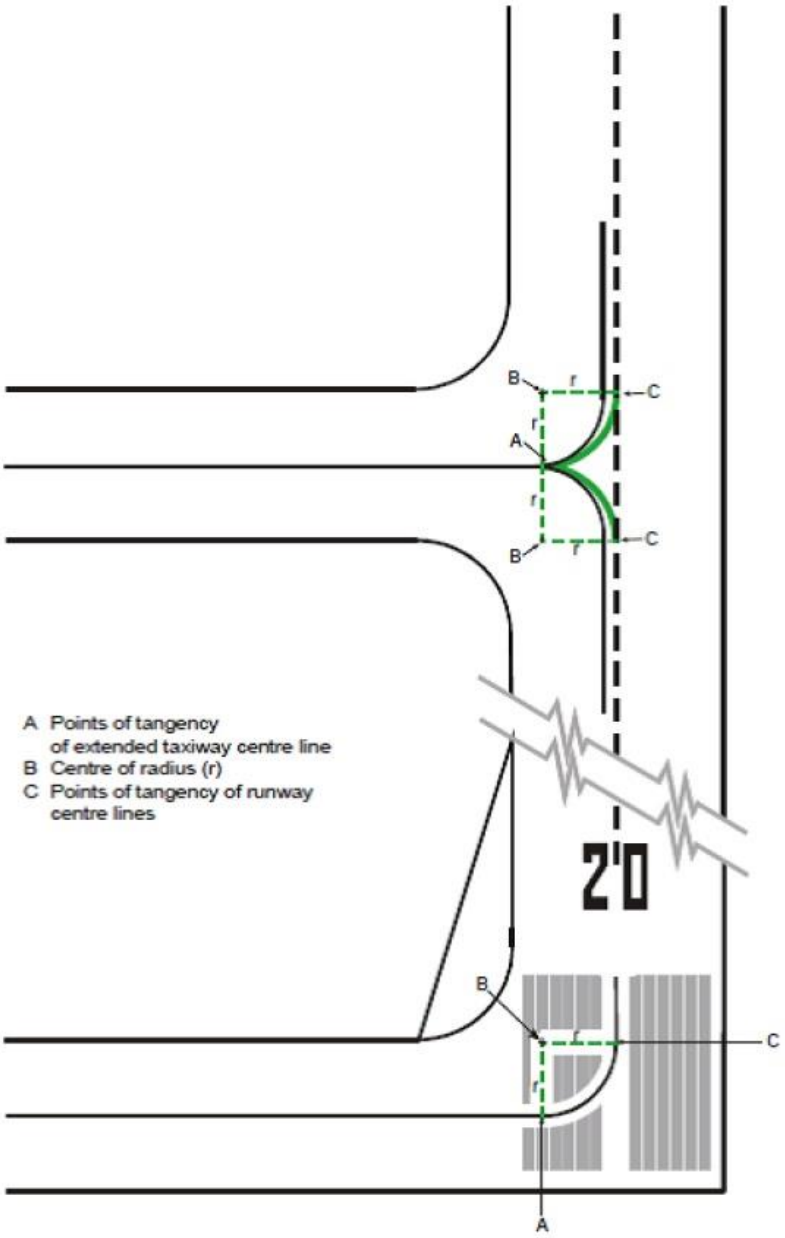


Figure 4 - Runway and taxiway intersections to be surveyed

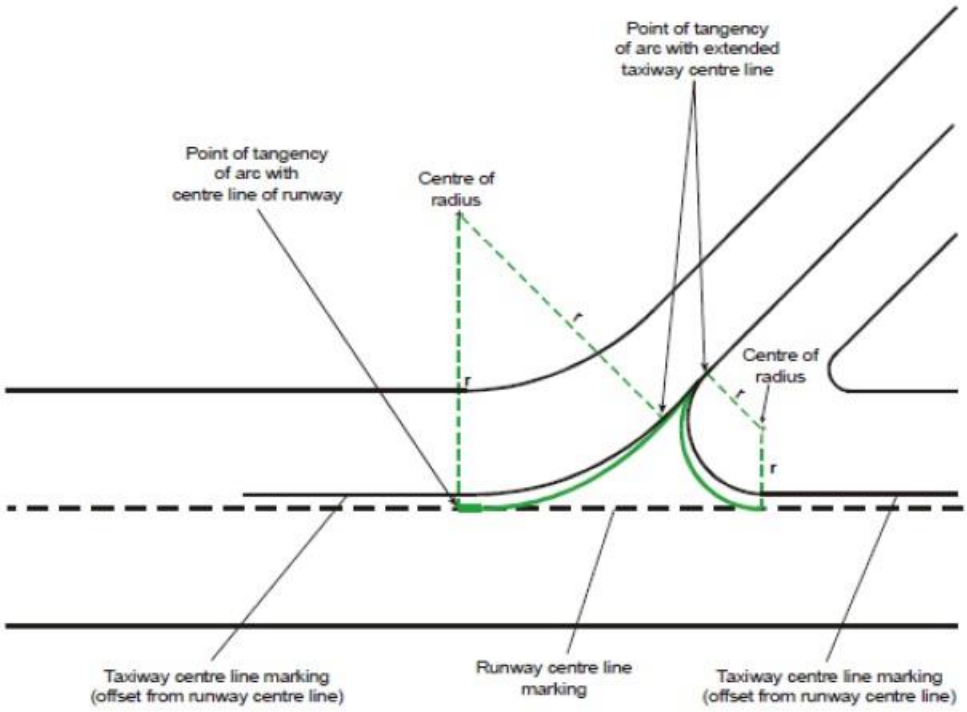


Figure 5 - Runway and taxiway intersections to be surveyed

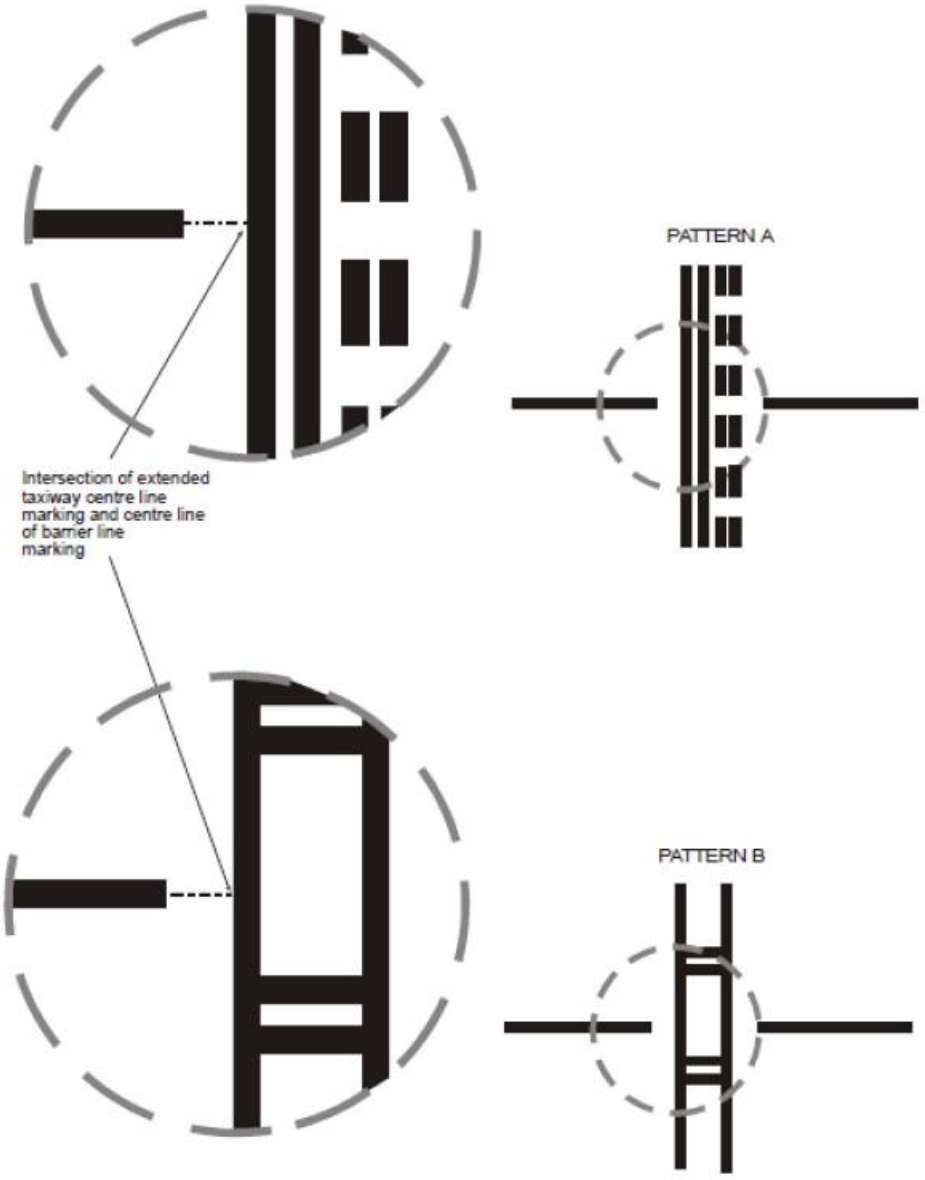


Figure 6 - Runway holding positions to be surveyed

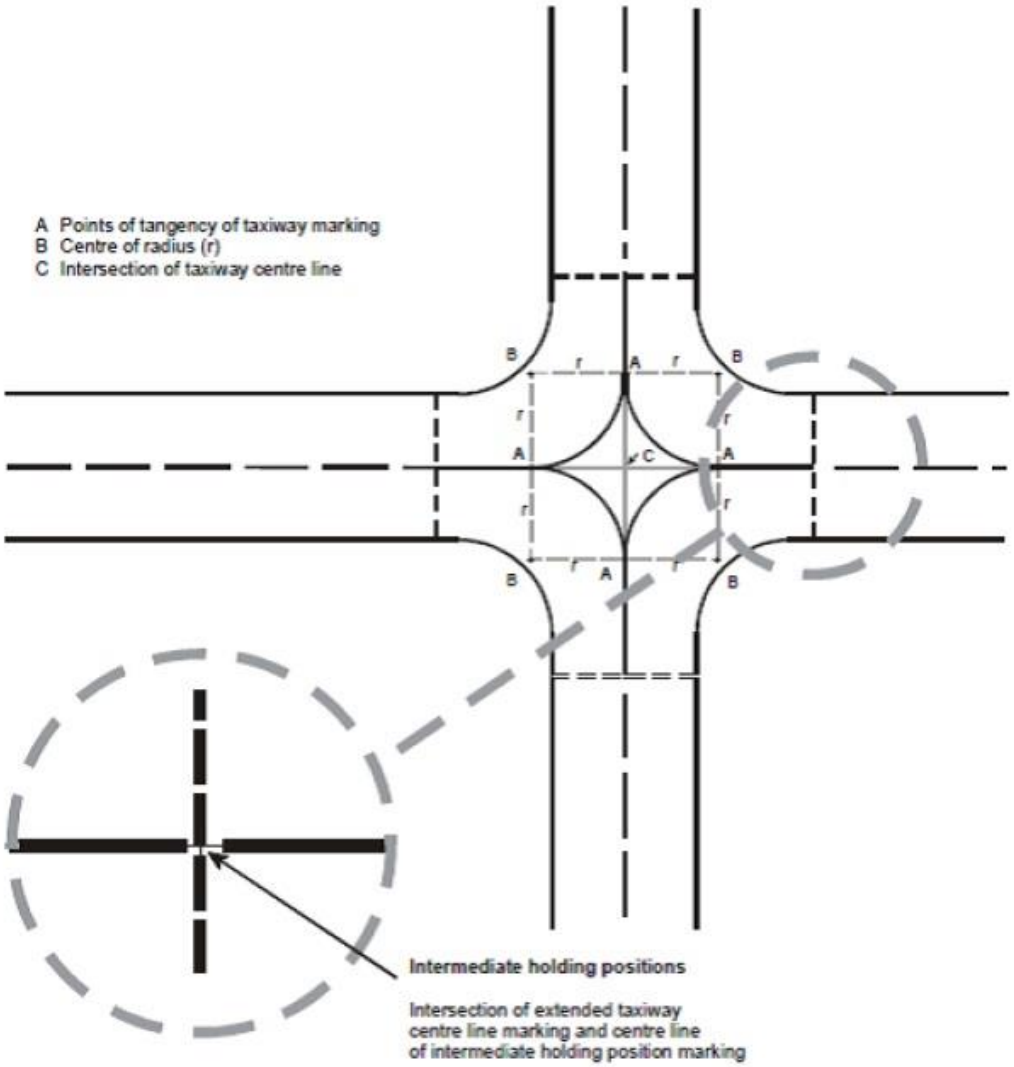


Figure 7 - Taxiway intersections to be surveyed

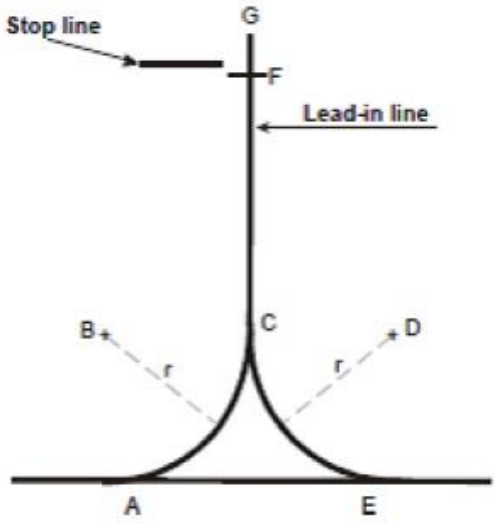


Figure 8 - Simple nose wheel lead-in line

Position	Description of point to be surveyed
A	Point of tangency of centre of lead-in marking with centre of taxilane marking

B	Centre of arc of lead-in line and radius
C	Point of tangency with centre of lead-in line marking
D	Centre of arc of lead-in line and radius
E	Point of tangency of centre of lead-in marking with centre of taxilane marking
F	Nose wheel position of parked aircraft
G	End of lead-in line marking

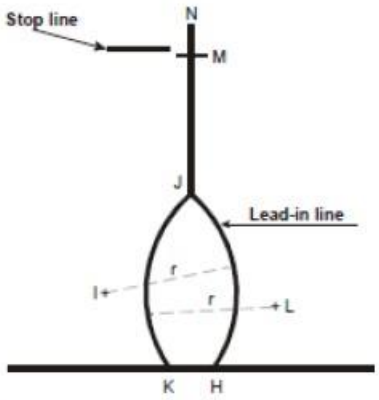


Figure 9 - Offset nose wheel lead-in line

Position	Description of point to be surveyed
H	Intersection of centre of lead-in line marking and centre of taxilane marking
I	Centre of arc of lead-in line and radius
J	Centre of commencement of straight section of lead-in line
K	Intersection of centre of lead-in line marking and centre of taxilane marking
L	Centre of arc of lead-in line and radius
M	Nosewheel position of parked aircraft
N	End of lead-in line marking

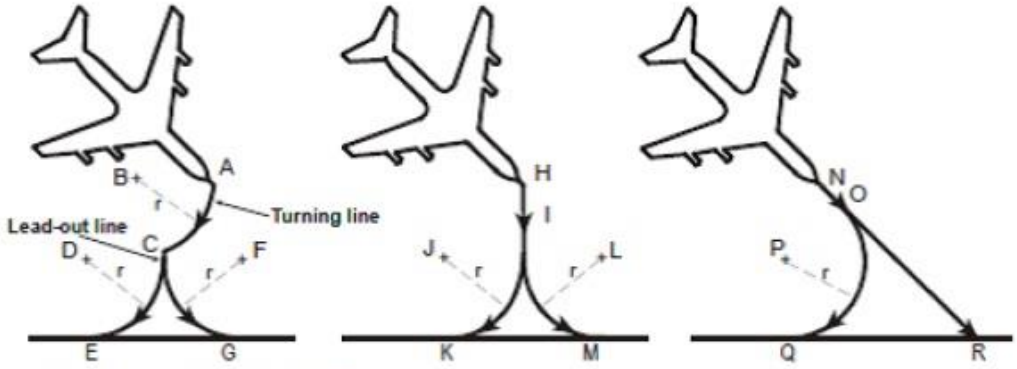


Figure 10 - Simple nose wheel lead-out lines

Position	Description of point to be surveyed
A	Centre of commencement of turning line marking
B	Centre of arc of turning line and radius
C	Centre of intersection of turning line marking and lead-out line marking
D	Centre of arc of lead-out line and radius
E	Point of tangency of centre of lead-out line marking and taxilane marking
F	Centre of arc of lead-out line and radius
G	Point of tangency of centre of lead-out line marking and taxilane marking
H	Commencement of lead-out line
I	Centre of commencement of curved section of lead-out line
J	Centre of arc of lead-out line and radius
K	Point of tangency of centre of lead-out line marking and taxilane marking

L	Centre of arc of lead-out line and radius
M	Point of tangency of centre of lead-out line marking and taxilane marking
N	Point of tangency of centre of lead-out line marking and taxilane marking
O	Centre of commencement of curved section of lead-out line
P	Centre of arc of lead-out line and radius
Q	Point of tangency of centre of lead-out line marking and taxilane marking
R	Intersection of centre of lead-out line marking and taxilane marking

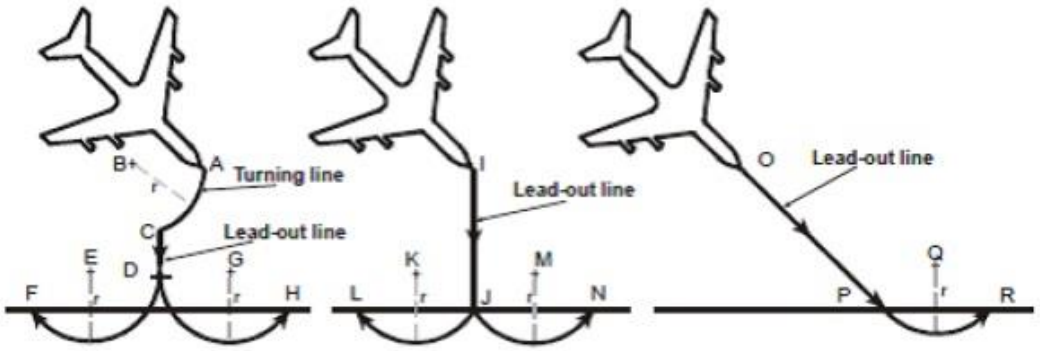


Figure 11 - Offset nose wheel lead-out lines

Position	**Description of point to be surveyed**
A	Centre of commencement of turning line marking
B	Centre of arc of turning line and radius
C	Centre of intersection of turning line marking and lead-out line marking
D	Centre of end of straight section of lead-out line marking
E	Centre of arc of lead-out line and radius
F	Intersection of centre of lead-out line marking and taxilane marking
G	Centre of arc of lead-out line and radius
H	Intersection of centre of lead-out line marking and taxilane marking
I	Commencement of lead-out line
J	Centre of commencement of curved section of lead-out line
K	Centre of arc of lead-out line and radius
L	Intersection of centre of lead-out line marking and taxilane marking
M	Centre of arc of lead-out line and radius
N	Intersection of centre of lead-out line marking and taxilane marking
O	Commencement of lead-out line
P	Centre of commencement of curved section of lead-out line
Q	Centre of arc of lead-out line and radius
R	Intersection of centre of lead-out line marking and taxilane marking

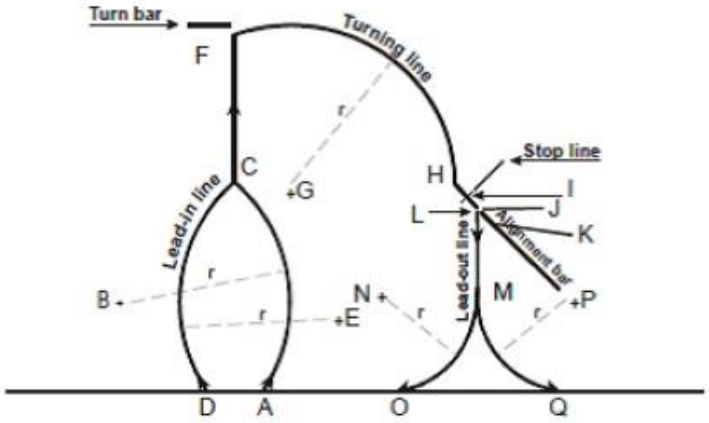


Figure 12 - Turning lines

Position	Description of point to be surveyed
A	Intersection of centre of lead-in line marking and centre of taxilane marking
B	Centre of arc of lead-in line and radius
C	Centre of commencement of straight section of lead-in line
D	Intersection of centre of lead-in line marking and centre of taxilane marking
E	Centre of arc of lead-in line and radius
F	End of straight section of lead-in line marking/commencement of turning line marking
G	Centre of arc of turning line and radius
H	Centre of commencement of straight section of turning line marking
I	Nose wheel position of parked aircraft
J	Centre of end of straight section or turning line marking
K	True bearing of alignment bar
L	Commencement of lead-out line
M	Centre of commencement of curved section of lead-out line
N	Centre of arc of lead-out line and radius
O	Point of tangency of centre of lead-out line marking and taxilane marking
P	Centre of arc of lead-out line and radius
Q	Point of tangency of centre of lead-out line marking and taxilane marking

GM4 MAR-ADR.OPS.A.005(a) Aerodrome data

COVERAGE AREAS FOR TERRAIN AND OBSTACLE DATA PROVISION

(a) The coverage areas for sets of electronic and obstacle data should be specified as follows:
  (1) Area 1: the entire territory of the State;
  (2) Area 2: within the aerodrome surroundings, sub-divided as follows:
    (i) Area 2a: a rectangular area around a runway that comprises the runway strip plus any clearway that exists;
    (ii) Area 2b: an area extending from the ends of Area 2a in the direction of departure, with a length of 10 km and a splay of 15 per cent to each side;
    (iii) Area 2c: an area extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a; and
    (iv) Area 2d: an area outside the Areas 2a, 2b and 2c up to a distance of 45 km from the aerodrome reference point, or to an existing TMA boundary, whichever is nearest.
  (3) Area 3: the area bordering an aerodrome movement area that extends horizontally from the edge of a runway to 90 m from the runway centre line, and 50 m from the edge of all other parts of the aerodrome movement area
  (4) The area extending 900 m prior to the runway threshold, and 60 m each side of the extended runway centre line in the direction of the approach on a precision approach runway, Category II or III;

(b) A graphical representation of the terrain data collection surfaces for Areas 1 and 2 is shown in the following figure:

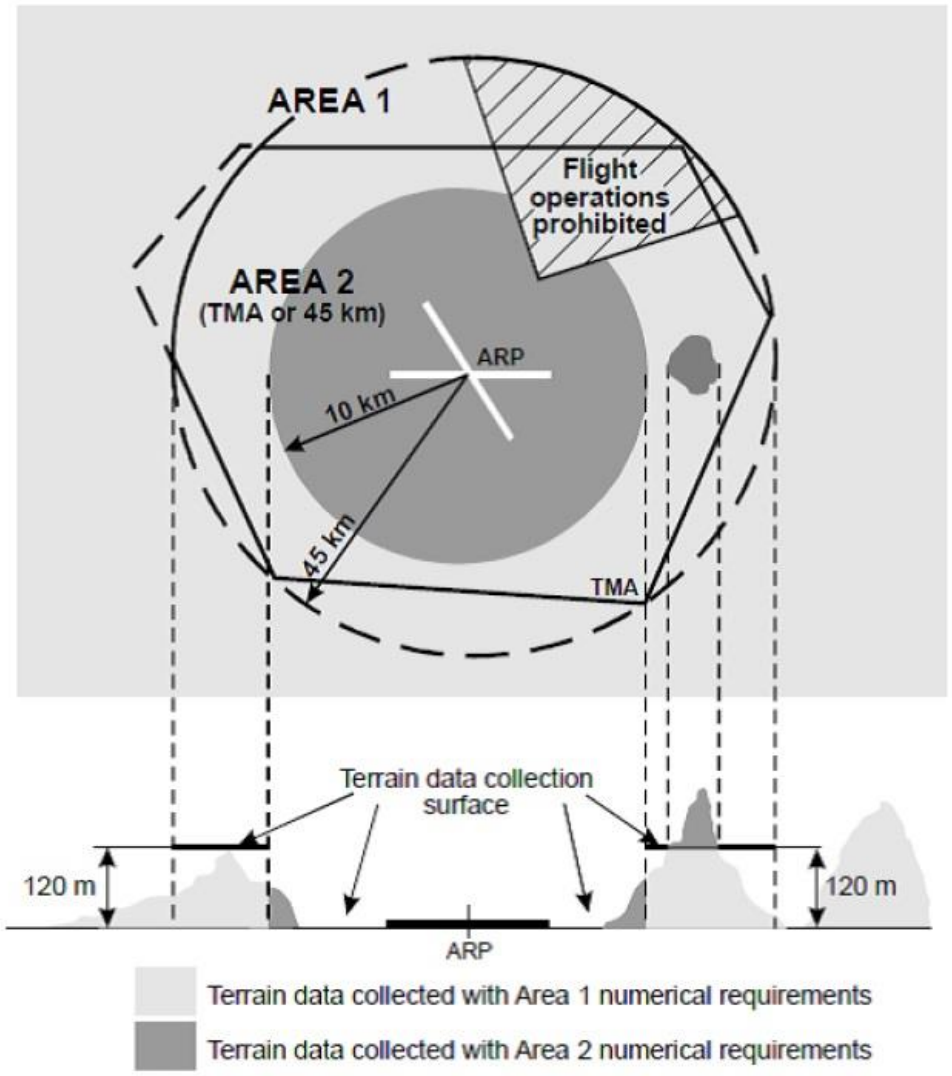


Figure 1 - Terrain data collection surfaces — Area 1 and Area 2

(1) Within the area covered by a 10-km radius from the ARP, terrain data should comply with the Area 2 numerical requirements;
(2) In the area between 10 km and the TMA boundary or 45-km radius (whichever is smaller), data on terrain that penetrates the horizontal plane 120 m above the lowest runway elevation, should comply with the Area 2 numerical requirements;
(3) In the area between 10 km and the TMA boundary or 45-km radius (whichever is smaller), data on terrain that does not penetrate the horizontal plane 120 m above the lowest runway elevation, should comply with the Area 1 numerical requirements;
(4) In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, terrain data should comply with the Area 1 numerical requirements.

(c) A graphical representation of the obstacle data collection surfaces for Areas 1 and 2 is shown in the following figure:

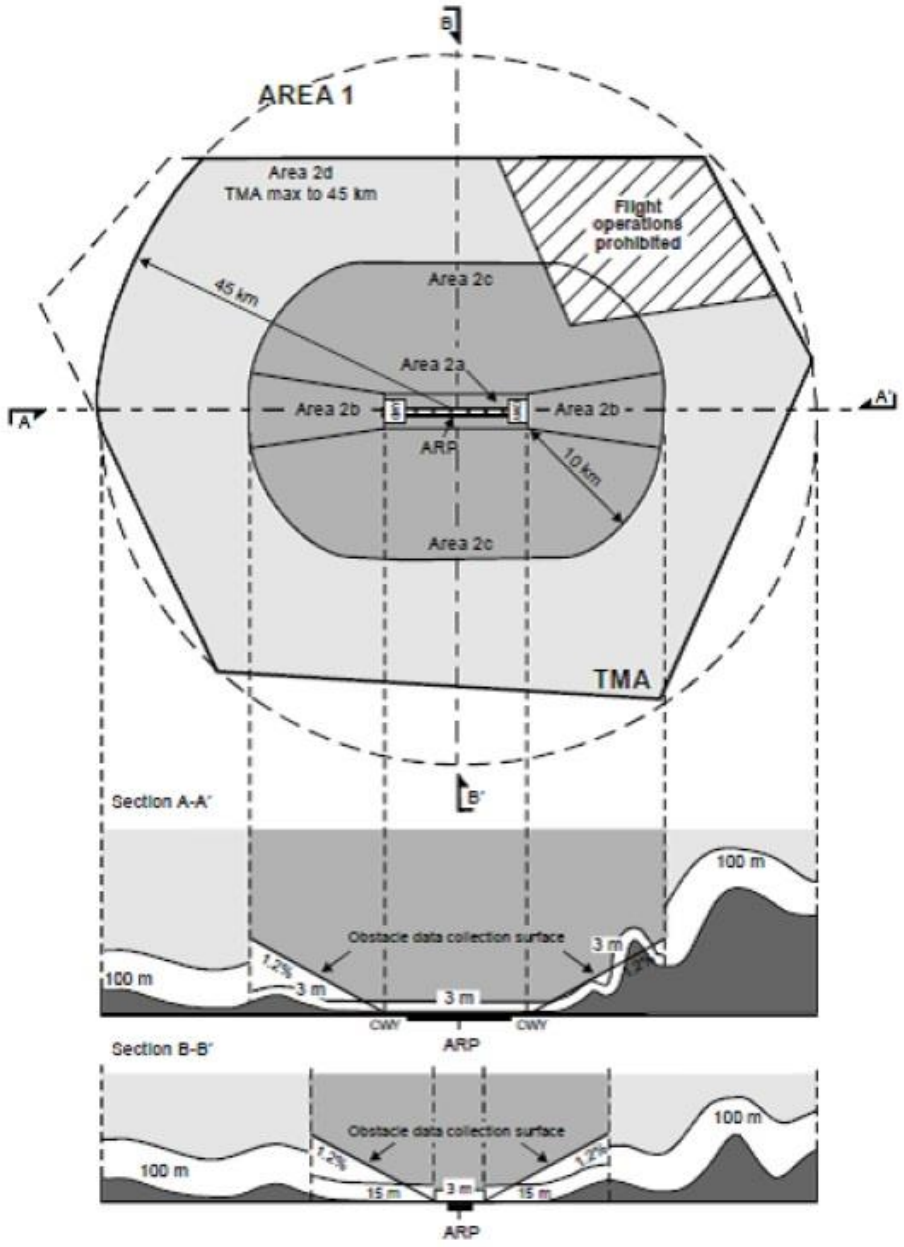


Figure 2 - Obstacle data collection surfaces — Area 1 and Area 2

(1) Obstacle data should be collected and recorded in accordance with the Area 2 numerical requirements;
   (i) The Area 2a obstacle collection surface should have a height of 3 m above the nearest runway elevation measured along the runway centre line, and for those portions related to a clearway, if one exists, at the elevation of the nearest runway end;
   (ii) The Area 2b obstacle collection surface has an 1.2 % slope extending from the ends of Area 2a at the elevation of the runway end in the direction of departure, with a length of 10 km and a splay of 15 % to each side;
   (iii) The Area 2c collection surface has an 1.2 % slope extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a. The initial elevation of Area 2c should be the elevation of the point of Area 2a at which it commences; and
   (iv) The Area 2d obstacle collection surface has a height of 100 m above ground.

(2) In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, obstacle data should be collected and recorded in accordance with the Area 1 requirements;

(3) Data on every obstacle within Area 1 whose height above the ground is 100 m or higher should be collected and recorded in the database in accordance with the Area 1 numerical requirements specified in Table 2.

(d) A graphical representation of the terrain and obstacle data collection surfaces for Area 3 is shown in the following figure:

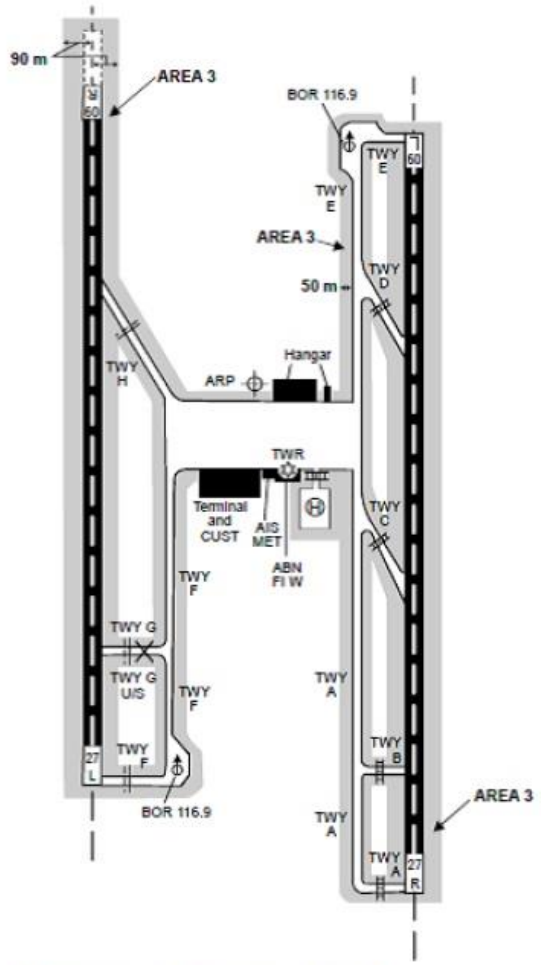


Figure 3 - Terrain and obstacle data collection surface — Area 3

(1) The data collection surface for terrain and obstacles extends a half metre (0.5 m) above the horizontal plane passing through the nearest point on the aerodrome movement area;

(2) Terrain and obstacle data in Area 3 should comply with the numerical requirements specified in Tables 1 and 2, respectively;

(e) A graphical representation of the obstacle data collection surfaces for Areas 4 is shown in the following figure:

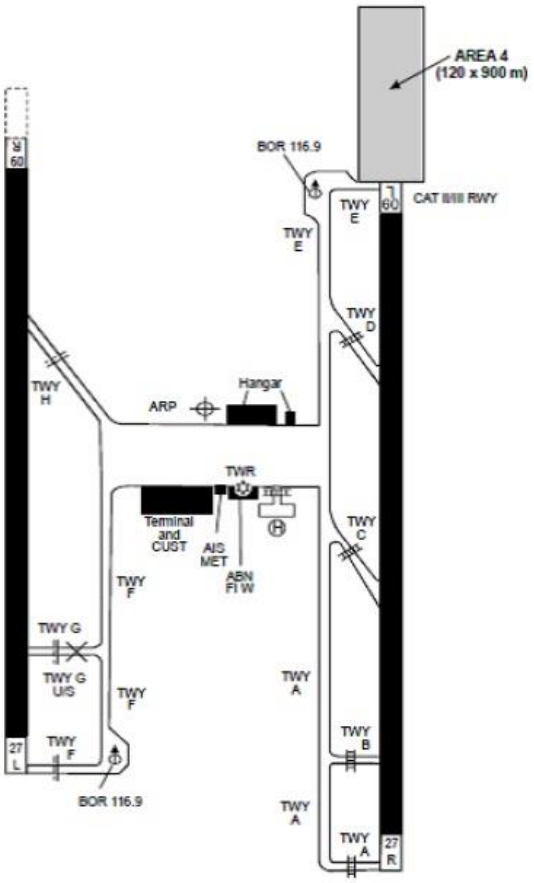


Figure 4 - Terrain and obstacle data collection surface — Area 4

(1) Terrain data in Area 4 should comply with the numerical requirements specified in Table 1;
(2) The horizontal extent of Area 2 covers Area 4. More detailed obstacle data may be collected in Area 4 in accordance with Area 4 numerical requirements for obstacle data specified in Table 2.
(3) Where the terrain at a distance greater than 900 m (3000 ft) from the runway threshold is mountainous or otherwise significant, the length of Area 4 should be extended to a distance not exceeding 2000 m (6500 ft) from the runway threshold.

	Area 1	**Area 2**	**Area 3**	**Area 4**
Post spacing	3 arc seconds (approx. 90 m)	1 arc seconds (approx. 30 m)	0.6 arc seconds (approx. 20 m)	0.3 arc seconds (approx. 9 m)
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level	90 %	90 %	90 %	90 %
Data classification Integrity level	Routine	Essential	Essential	Essential
Maintenance period	as required	as required	as required	as required

	Area 1	**Area 2**	**Area 3**	**Area 4**
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level	90 %	90 %	90 %	90 %
Data classification Integrity level	Routine	Essential	Essential	Essential
Maintenance period	as required	as required	as required	as required

AMC1 MAR-ADR.OPS.A.010 Data quality requirements

GENERAL REQUIREMENTS

The aerodrome operator should implement the procedures to:
(a) monitor data relevant to the aerodrome and available services originating from the aerodrome operator, and promulgated by the relevant air traffic services providers;
(b) notify the relevant aeronautical information services, and air traffic services providers of any changes necessary to ensure correct and complete data relevant to the aerodrome, and available services.

AMC2 MAR-ADR.OPS.A.010 Data quality requirements

FORMAL ARRANGEMENTS

(a) Organisations concerned
The aerodrome operator should have formal arrangements with public or private entities providing:
(1) air navigation services;
(2) services for the origination and provision of survey data;
(3) procedure design services;
(4) electronic terrain data; and
(5) electronic obstacle data,
with which it exchanges aeronautical data and/or aeronautical information.
(b) Content of formal arrangements
Such formal arrangements should include the following minimum content:
(1) aeronautical data to be provided;
(2) the quality requirements for each data item supplied according to the aeronautical data catalogue;
(3) the method(s) for demonstrating that the data provided conforms with the specified requirements;
(4) the action to be taken in the event of discovery of a data error, or inconsistency in any data provided;
(5) the following minimum criteria for notification of data changes:
(i) criteria for determining the timeliness of data provision based on the operational or safety significance of the change;
(ii) any prior notice of expected changes; and
(iii) the means to be adopted for notification;
(6) the party responsible for documenting data changes;
(7) data exchange details such as format or format change process;
(8) any limitations on the use of data;
(9) requirements for the production of data origination quality reports;
(10) metadata to be provided; and
(11) contingency requirements concerning the continuity of data provision.

AMC1 MAR-ADR.OPS.A.015 Coordination between aerodrome operators and providers of aeronautical information services

REPORTING

(a) The aerodrome operator should report on matters of operational significance or affecting aircraft and aerodrome operations in order to take appropriate action, particularly in respect of the following:
(1) construction or maintenance work;
(2) rough or broken surfaces on a runway, a taxiway, or an apron;
(3) snow, slush ice or frost on a runway, a taxiway, or an apron;
(4) water on a runway, a taxiway, or an apron;
(5) snow banks or drifts adjacent to a runway, a taxiway, or an apron;

(6) anti-icing or de-icing liquid chemicals, or other contaminants on a runway, a taxiway, or an apron;
(7) other temporary hazards, including parked aircraft;
(8) failure or irregular operation of part or all of the aerodrome visual aids; and
(9) failure of the normal or secondary power supply.

(b) A change in the level of protection normally available at an aerodrome for rescue and firefighting should be expressed in terms of the new category available at the aerodrome. When such a change has been corrected, the air traffic services provider and the aeronautical information services providers should be advised accordingly. The highest category of the aeroplane accommodated should be in accordance with the remaining level of protection.

(c) The aerodrome operator should observe the predetermined, internationally agreed AIRAC effective dates in addition to 14-day postage time when submitting the raw information/data to aeronautical information services that affect charts and/or computer-based navigation systems which qualify to be notified by the aeronautical information regulation and control (AIRAC) system.

AMC1 MAR-ADR.OPS.A.020(b) Common reference systems

VERTICAL REFERENCE SYSTEM

(a) The aerodrome operator should use the Earth Gravitational Model — 1996 (EGM-96), as the global gravity model.

(b) When a geoid model other than the EGM-96 model is used, a description of the model used, including the parameters required for height transformation between the model and EGM-96, should be provided in the aeronautical information publication (AIP).

AMC1 MAR-ADR.OPS.A.035 Data verification and validation

VALIDATION AND VERIFICATION

(a) The processes implemented to carry out validation and verifications should define the means used to:
(1) verify received data and confirm that the data has been received without corruption;
(2) preserve data quality and ensure that stored data is protected from corruption; and
(3) confirm that originated data has not been corrupted prior to being stored.

(b) Those processes should define the:
(1) actions to be taken when data fails a verification or validation check; and
(2) tools required for the verification and validation process.

GM1 MAR-ADR.OPS.A.035 Data verification and validation

VALIDATION AND VERIFICATION — GENERAL

(a) Validation
(1) Validation is the activity where a data element is checked as having a value that is fully applicable to the identity ascribed to the data element, or where a set of data elements are checked as being acceptable for their intended use.
(2) The application of validation techniques considers the entire aeronautical data chain. This includes the validation performed by prior data chain participants and any requirements levied on the data supplier.
(3) Examples of validation techniques include:
(i) Validation by application
One method of validation is to apply data under test conditions. In certain cases, this may not be practical. Validation by application is considered to be the most effective form of validation. For example, flight inspection of final approach segment data prior to publication can be used to ensure that the published data is acceptable.
(ii) Logical consistency
Logical consistency validates by comparing two different data sets or elements and identifying inconsistencies between values based on operative rules (e.g. business rules).
(iii) Semantic consistency

Semantic consistency validates by comparing data to an expected value or range of values for the data characteristics.

(iv) Validation by sampling

Validation by sampling evaluates a representative sample of data and applies statistical analysis to determine the confidence in the data quality.

(b) Verification

(1) Verification is a process for checking the integrity of a data element whereby the data element is compared to another source, either from a different process or from a different point in the same process. While verification cannot ensure that the data is correct, it can be effective to ensure that the data has not been corrupted by the data process.

(2) The application of verification techniques considers only the portion of the aeronautical data chain controlled by the organisation. Yet, verification techniques may be applied at multiple phases of the data processing chain.

(3) Examples of verification techniques include:

(i) Feedback

Feedback testing is the comparison between the output and input state of a data set.

(ii) Independent redundancy

Independent redundancy testing involves processing the same data through two or more independent processes and comparing the data output of each process.

(iii) Update comparison

Updated data can be compared to its previous version. This comparison can identify all data elements that have changed. The list of changed elements can then be compared to a similar list generated by the supplier. A problem can be detected if an element is identified as changed on one list and not on the other.

AMC1 MAR-ADR.OPS.A.057(a)(1) Origination of NOTAM

GENERAL

The procedures should as a minimum:

(a) define the ways and means that the aerodrome operator may use to request the issuance of a NOTAM, in accordance with the arrangements that the aerodrome operator has with the aeronautical information service (AIS) provider(s). The procedures should clearly indicate the names of the aerodrome operator's personnel that have the authority to originate a NOTAM, and which should be included in the arrangements with the AIS provider.

(b) contain instructions regarding the:

(1) cases when a NOTAM should be originated by the aerodrome operator;

(2) cases when a NOTAM should not be originated by the aerodrome operator; and

(3) completion of the NOTAM form (including the use of relevant electronic applications, if applicable) by the personnel designated by the aerodrome operator as NOTAM originators; and

(c) specify the cases in which coordination with the MAA-NLD is needed prior to the origination of the NOTAM, and the way to inform the MAA-NLD about the issuance of a NOTAM.

AMC1 MAR-ADR.OPS.A.057(a)(2);(3) Origination of NOTAM

INITIAL TRAINING FOR AERODROME PERSONNEL INVOLVED IN NOTAM ORIGINATION AND OTHER AERODROME PERSONNEL

(a) The theoretical part of the training of a person to be designated as a NOTAM originator should, as a minimum, cover the following areas:

(1) regulatory framework governing NOTAM origination and issuance, and its relationship with other aeronautical data products, including:

(i) cases when the origination of a NOTAM is required;

(ii) cases when a NOTAM should not be originated.

(2) NOTAM form completion, including word abbreviations and phrase contractions applicable to NOTAMs;

(3) NOTAM types and understanding of NOTAM;

(4) use of electronic applications for initiating a NOTAM (if applicable); and

(5) aerodrome procedures for origination and internal dissemination of a NOTAM.

(b) The theoretical training should be followed by an assessment of the trainees (see AMC1 MAR-ADR.OR.D.017(e).
(c) Following the successful completion of the theoretical training, the practical part of the training should, as a minimum, include familiarisation with the origination of NOTAM and implementation of the relevant aerodrome operating procedures for the persons to be designated as NOTAM originators. Upon completion of the practical training, and the successful competency assessment of the trainee in practical terms, the person may be designated as a NOTAM originator.
(d) For other aerodrome personnel, whose duties require only the understanding of a NOTAM, the theoretical part of the training should be adjusted to their needs and need not include (a)(4) and (a)(5) above, while the practical training should include practical examples to assess the level of their understanding. Both the theoretical and the practical training should be followed by an assessment of the person concerned (see AMC1 MAR-ADR.OR.D.017(e)).

AMC1 MAR-ADR.OPS.A.065(a) Reporting of the runway surface condition

REPORTING

The aerodrome operator should disseminate an RCR through the aeronautical information services and air traffic services, when the runway is wholly or partly contaminated by standing water, snow, slush, ice or frost, or is wet associated with the clearing or treatment of snow, slush, ice or frost. When the runway is wet, not associated with the presence of standing water, snow, slush, ice or frost, the assessed information should be disseminated using the RCR through the air traffic service.

AMC2 MAR-ADR.OPS.A.065(a) Reporting of the runway surface condition

RUNWAY CONDITION REPORT

(a) The RCR should consist of the:
(1) aeroplane performance calculation section; and
(2) situational awareness section.
The information should be included in an information string in the following order:
(3) aeroplane performance calculation section:
(i) aerodrome location indicator;
(ii) date and time of assessment;
(iii) lower runway designation number;
(iv) RWYCC for each runway third;
(v) per cent coverage contaminant for each runway third;
(vi) depth of loose contaminant for each runway third;
(vii) condition description for each runway third; and
(viii) width of runway to which the RWYCCs apply if less than the published width.
(4) Situational awareness section:
(i) reduced runway length;
(ii) drifting snow on the runway;
(iii) loose sand on the runway;
(iv) chemical treatment on the runway;
(v) snowbanks on the runway;
(vi) snowbanks on the taxiway;
(vii) snowbanks adjacent to the runway;
(viii) taxiway conditions;
(ix) apron conditions; and
(x) plain-language remarks.

AMC1 MAR-ADR.OPS.A.065(b);(c) Reporting of the runway surface condition

SIGNIFICANT CHANGES

A change in the runway surface condition used in the RCR should be considered significant whenever there is any:
(a) change in the RWYCC;

(b) change in the contaminant type;
(c) change in reportable contaminant coverage according to Table 1;
(d) change in contaminant depth according to Table 2; and
(e) other information, for example a SPECIAL AIR-REPORT of runway braking action, which according to assessment techniques used, is known to be significant.

Assessed per cent	**Reported per cent**
10-25	25
26-50	50
51-75	75
76-100	100

Table 1: Percentage of coverage for contaminants

Contaminant	Valid values to be reported	Significant change
STANDING WATER	04, then assessed value	3 mm
SLUSH	03, then assessed value	3 mm
WET SNOW	03, then assessed value	5 mm
DRY SNOW	03, then assessed value	20 mm

Table 2: Depth assessments for contaminants

Note 1: For STANDING WATER, 04 (4 mm) is the minimum depth value at and above which the depth should be reported. From 3 mm and below, the runway third should be considered WET.
Note 2: For SLUSH, WET SNOW and DRY SNOW, depths up to and including 3 mm should be reported as 03 (3 mm).
Note 3: Above 4 mm for STANDING WATER and above 3 mm for SLUSH, WET SNOW and DRY SNOW, an assessed value should be reported and a significant change relates to the observed change from this assessed value.

Appendix 1

Delegated Regulation (EU) 2020/2148

Priority indicator	→
Address	
	«=
Date and time of filing	→
Originator's indicator	«=(

Message series, number and identifier	
NOTAM containing new information	..... NOTAMN (series and number/year)
NOTAM replacing a previous NOTAM	..... NOTAMR..... (series and number/year) (series and number/year of NOTAM to be replaced)
NOTAM cancelling a previous NOTAM	..... NOTAMC..... (series and number/year) (series and number/year of NOTAM to be cancelled) «=

Qualifiers									
	FIR	NOTAM Code	Traffic	Purpose	Scope	Lower limit	Upper limit	Coordinates, Radius	
Q)	/	Q /	/	/	/	/	/		«=
Identification of ICAO Location Indicators in which the facility, airspace or condition reported on is located								A) →	

Period of validity			
From *(date-time group)*	B)	→	
To *(PERM or date-time group)*	C)	EST* PERM*	«=
Time schedule *(if applicable)*	D)	→	
			«=

Text of NOTAM; Plain-language entry (using ICAO abbreviations)	
E)	«=
Lower limit	F) →
Upper limit	G))«=
Signature	

*Delete as appropriate

Appendix 2

(COM heading)	(Priority indicator	(Addresses)	<≡
	(Date and time of filing)	(Originator's indicator)	<≡
(Abbreviated heading)	(SWAA* SERIAL NUMBER) S W * *	(LOCATION INDICATORS)	DATE-TIME OF ASSESSMENT (OPTIONAL GROUP) <≡(
SNOWTAM →	(Serial number) <≡		

Aeroplane performance calculation section			
(AERODROME LOCATION INDICATORS)	M	A)	<≡
(DATE/TIME OF ASSESSMENT *(Time of completion of assessment in UTC)*)	M	B)	→
(LOWER RUNWAY DESIGNATION NUMBER)	M	C)	→
(RUNWAY CONDITION CODE (RWYCC) ON EACH RUNWAY THIRD) (From Runway Condition Assessment Matrix (RCAM) 0, 1, 2, 3, 4, 5 or 6)	M	D)	// →
(PER CENT COVERAGE CONTAMINANT FOR EACH RUNWAY THIRD)	C	E)	// →
DEPTH (mm) OF LOOSE CONTAMINANT FOR EACH RUNWAY THIRD)	C	F)	// →
(CONDITION DESCRIPTION OVER TOTAL RUNWAY LENGTH (Observed on each runway third, starting from threshold having the lower runway designation number) COMPACTED SNOW DRY DRY SNOW DRY SNOW ON TOP OF COMPACTED SNOW DRY SNOW ON TOP OF ICE FROST ICE SLIPPERY WET SLUSH SPECIALLY PREPARED WINTER RUNWAY STANDING WATER WATER ON TOP OF COMPACTED SNOW WET WET ICE WET SNOW WET SNOW ON TOP OF COMPACTED SNOW WET SNOW ON TOP OF ICE	M	G)	// →
(WIDTH OF RUNWAY TO WHICH THE RUNWAY CONDITIONS CODES APPLY, IF LESS THAN THE PUBLISHED WIDTH)	O	H)	<≡≡
Situational awareness section			
(REDUCED RUNWAY LENGTH, IF LESS THAN THE PUBLISHED LENGTH (m))	O	I)	→
(DRIFTING SNOW ON THE RUNWAY)	O	J)	→
(LOOSE SAND ON THE RUNWAY)	O	K)	→
(CHEMICAL TREATMENT ON RUNWAY)	O	L)	→
(SNOWBANKS ON THE RUNWAY) (If present, distance from runway centreline (m) followed by 'L', 'R' or 'LR' as applicable))	O	M)	→
(SNOWBANKS ON A TAXIWAY)	O	N)	→
(SNOWBANKS ADJACENT TO THE RUNWAY)	O	O)	→
(TAXIWAY CONDITIONS)	O	P)	→
(APRON CONDITIONS)	O	R)	→
(MEASURED FRICTION COEFFICIENT)	O	S)	→
(PLAIN-LANGUAGE REMARKS)	O	T)	) <<≡

NOTES:
1. *Enter ICAO nationality letters as given in ICAO Doc 7910, Part 2 or otherwise applicable aerodrome identifier.
2. Information on other runways, repeat from B to H.
3. Information in the situational awareness section repeated for each runway, taxiway and apron. Repeat as applicable, when reported.
4. Words in brackets () not to be transmitted.
5. For letters A) to T), refer to the *Instructions for the completion of the SNOWTAM format, paragraph 1, item b).*

GM1 ADR.OPS.A.070 Information on the aerodrome lighting system

GENERAL

EFVS technology relies on the infrared heat signature provided by incandescent lights. The replacement of incandescent lights with LED lights may render the use of EFVS not possible. This information is important to aircraft operators to assess the suitability of the runway in order to conduct EFVS operations.

AMC1 ADR.OPS.A.085 Information on visual segment surface (VSS) penetration

INFORMATION ON OBSTACLES FOR VISUAL SEGMENT SURFACE (VSS) PENETRATION

If the VSS is penetrated, the information to be provided to the AIS provider, to publish it under AD 2.25, should clearly indicate the name of the affected procedure and the procedure minima affected. Apart from this, information about the obstacles that penetrate the VSS should be provided to the responsible AIS provider to publish it under 'AD 2.10 Aerodrome obstacles'.

SUBPART B — AERODROME OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS (MAR-ADR.OPS.B)

GM1 MAR-ADR.OPS.B.001 Provision of services

SERVICES

The services included in Part B of this Annex, need to be provided at an aerodrome. In some cases, these services are not directly provided by the aerodrome operator, but by another organisation or State entity or combination of both. However, the aerodrome operator, being responsible for the operation of the aerodrome should have arrangements and interfaces with these organisations or entities to ensure that these services are provided according to the legal requirements. The method described above meets with the intention of an integrated Safety Management System that helps the aerodrome operator to ensure the safety objective of the service provision is being met. In completing this action, the aerodrome operator should hereby been seen to discharge its responsibility by employing the procedures mentioned above, furthermore, the aerodrome operator should not be understood to be directly responsible or liable for non-compliances by another entity involved in the arrangement.

AMC1 MAR-ADR.OPS.B.003(a) Handover of activities — provision of operational information

HANDOVER OF OPERATIONAL ACTIVITIES — PERSONNEL BRIEFING

(a) The aerodrome operator procedures for the handover of operational activities should as a minimum:
  (1) cover the change of a shift within the same function (e.g. between RFFS personnel), as well as the case where a task is handed over to another person within the same shift, and the cases where an activity is handed over between different functions (e.g. from maintenance to operations);
  (2) address the case when a planned activity (e.g. light maintenance) is not completed at the time of a planned shift change; or any other non-regular activity is in place; and
  (3) allow for the preparation of both outgoing and incoming personnel.
(b) The briefing should be in a manner that allows effective two-way communication between the outgoing and incoming personnel, during which all task-relevant information necessary for the incoming personnel is provided to them, both verbally and in writing. In the case of posts which are not continually manned, or aerodromes with interrupted working hours, the briefing may be in writing, while ensuring that additional information may be provided to the incoming personnel in case of such need.
(c) The briefing of drivers and other operational personnel operating on the manoeuvring area should, as a minimum, include:
  (1) the runway(s) in use;
  (2) any significant works areas in place, or being established or removed that day;
  (3) conditions of stop bars, if applicable, that may be inoperable making a taxiway unusable for runway entry or crossing; and
  (4) if low-visibility procedures are in force.

AMC1 MAR-ADR.OPS.B.005(b) Aerodrome Emergency Planning

GENERAL

(a) The aerodrome operator should ensure that the aerodrome emergency plan includes the ready availability of, and coordination with, appropriate specialist rescue services to be able to respond to emergencies where an aerodrome is located close to water and/or swampy areas, and where a significant portion of approach or departure operations takes place over these areas.
(b) The aerodrome operator should ensure that an assessment of the approach and departure areas within 1000 m of the runway threshold is carried out to determine the options available for intervention.

AMC2 MAR-ADR.OPS.B.005(b) Aerodrome Emergency Planning

AERODROME EMERGENCY PLAN DOCUMENT

The aerodrome operator should include, at least, the following in the aerodrome emergency plan document:
(a) Types of emergencies planned for;
(b) Agencies involved in the plan, and details of the aerodrome and local emergency planning arrangements and forums;
(c) Responsibility and role of each agency, the emergency operations centre, and the command post for each type of emergency;
(d) Information on names and telephone numbers of offices or people to be contacted in the case of a particular emergency; and
(e) A grid map of the aerodrome and its immediate surroundings, approximately at a distance of 8 km from the centre of the aerodrome.

AMC1 MAR-ADR.OPS.B.005(c) Aerodrome Emergency planning

AERODROME EMERGENCY EXERCISE

The aerodrome operator should ensure that the emergency plan is tested with:
(a) a full-scale aerodrome emergency exercise at intervals not exceeding two years; and
(b) partial emergency exercises in the intervening year to ensure that any deficiencies found during the full-scale aerodrome emergency exercise have been corrected and reviewed thereafter, or after an actual emergency, so as to correct any deficiency found during such exercises or actual emergency.
(c) a full-scale emergency exercise will have all parties involved including 'Veiligheidsregio'. It may be conducted as a tabletop/staff exercise, however shall be conducted as a live exercise at intervals not exceeding 4 years.

GM1 MAR-ADR.OPS.B.010(a)(1) Rescue and firefighting services

AVAILABILITY AND SCOPE OF RESCUE AND FIREFIGHTING SERVICES

Public or private organisations, suitably located and equipped, could be designated to provide the rescue and firefighting service. The fire station housing these organisations should normally be located on the aerodrome, although an off-aerodrome location is not precluded, provided that the response time can be met. The principal objective of rescue and firefighting services is to save lives in the event of an aircraft accident or incident occurring at, or in the immediate surroundings of, the aerodrome. The rescue and firefighting service is provided to create and maintain survivable conditions, to provide egress routes for occupants, and to initiate the rescue of those occupants unable to make their escape without direct aid. The rescue may require the use of equipment and personnel other than those assessed primarily for rescue and firefighting purposes. Ambulance and medical services are out of the scope of rescue and firefighting services as described in MAR-ADR.OPS.B.010. The role and responsibilities of ambulance and medical services during an emergency situation should be included in the aerodrome emergency plan (AEP).

AMC1 MAR-ADR.OPS.B.010(a)(2) Rescue and firefighting services

COMMUNICATION AND ALERTING SYSTEMS

The aerodrome operator should ensure that:
(a) a discrete communication system is provided linking a fire station with the control tower, any other fire station on the aerodrome, and the rescue and firefighting vehicles;
(b) an alerting system for rescue and firefighting personnel, capable of being operated from that station, is provided at the fire station, any other fire station on the aerodrome, and the aerodrome control tower;
(c) means are provided for communication between the rescue and firefighting service and the flight crew of an aircraft in emergency;
(d) communication means are provided to ensure the immediate summoning of designated personnel

not on standby duty;
(e) communication means are provided to ensure two-way communication with the rescue and firefighting vehicles in attendance at an aircraft accident or incident.
(f) communications during emergencies should be recorded;
(g) communication means are provided between rescue and firefighting crew members.

AMC2 MAR-ADR.OPS.B.010(a)(2) Rescue and firefighting services

RFFS LEVEL OF PROTECTION

(a) The aerodrome operator should ensure that:
(1) the level of protection normally available at an aerodrome is determined and expressed in terms of the category of the rescue and firefighting services (RFF aerodrome category) as described below and in accordance with the types, amounts, and discharge rates of extinguishing agents normally available at the aerodrome; and
(2) the aerodrome category for rescue and firefighting is determined according to Table 1, based on the longest aeroplanes normally using the aerodrome and their fuselage width. If, after selecting the category appropriate to the longest aeroplane's overall length, that aeroplane's fuselage width is greater than the maximum width in Table 1, column 3, for that category, then the category for that aeroplane should actually be one category higher.

Aerodrome category for rescue and fire fighting		
Aerodrome Category (1)	Aeroplane overall length (2)	Maximum fuselage width (3)
1	0 m up to but not including 9 m	2 m
2	9 m up to but not including 12 m	2 m
3	12 m up to but not including 18 m	3 m
4	18 m up to but not including 24 m	4 m
5	24 m up to but not including 28 m	4 m
6	28 m up to but not including 39 m	5 m
7	39 m up to but not including 49 m	5 m
8	49 m up to but not including 61 m	7 m
9	61 m up to but not including 76 m	7 m
10	76 m up to but not including 90 m	8 m

Table 1

(i) Due to inherent hazards associated with fighter aircraft (ejection seats, fuel capacity, armaments, advanced composites and aerospace materials), fighter aircraft less than 90 feet (28 meter) in length classify as a category 5 aircraft.
(1) The level of protection of actual Quick Reaction Alert (QRA) movements of fighter aircraft outside regular opening hours may be reduced to category 4.
(3) Reserved
(b) Notwithstanding (a), the aerodrome operator may, during anticipated periods of reduced activity (e.g. specific periods of the year or day), reduce the rescue and firefighting level of protection available at the aerodrome. In this case:
(1) the level of protection should be no less than that needed for the highest category of aeroplane planned to use the aerodrome during that time, irrespective of the number of movements; and
(2) the periods of aerodrome operation with reduced rescue and firefighting level of protection should be published in the aeronautical information publication (AIP) or through notice to airmen (NOTAM).
(c) The level of protection required for all-cargo, mail, ferry, training, test, positioning and end-of-life aeroplane operations, including those carrying dangerous goods, but excluding explosives class 1.1 & 1.2, may be reduced in accordance with Table 2 as follows:
(1) only aircrew is allowed on board;
(2) number of aircrew on board is lower than 9;
(3) persons on board shall reside in or near the cockpit section during take-off and landing.

Aerodrome category	**RFF level of protection required**

1	1
2	2
3	3
4	4
5	5
6	5
7	6
8	6
9	7
10	7

Table 2

(d) Reserved
(e) Unforeseen circumstances leading to temporary reduction of the aerodrome rescue and firefighting level of protection are considered as unplanned events that result in unavailability of facilities, equipment and resources.
(f) For emergency landings and occasions when in the pilot's-in-command opinion, a diversion or hold may create a more significant hazard, operation of aeroplanes whose required category is higher than the level of protection provided by the aerodrome should be permitted regardless of the rescue and firefighting level of protection available.

AMC3 MAR-ADR.OPS.B.010(a)(2) Rescue and firefighting services

NUMBER OF RFFS VEHICLES AND RESCUE EQUIPMENT

(a) The aerodrome operator should ensure that:
(1) the minimum number of rescue and firefighting vehicles at the aerodrome to effectively deliver and deploy the agents specified for the aerodrome category will be in accordance with the following table; and

Aerodrome category	**Rescue and firefighting vehicles**
1	1
2	1
3	1
4	1
5	2
6	2
7	2
8	3
9	3
10	3

Table 1

(2) rescue equipment commensurate with the level of aircraft operations is provided on the rescue and firefighting vehicles.
(b) If the aerodrome is located near a water/swampy area, or other difficult environment, or a significant portion of the approach/departure operations takes over these areas, the aerodrome operator should coordinate the availability of suitable rescue equipment and services.

AMC4 MAR-ADR.OPS.B.010(a)(2) Rescue and firefighting services

EXTINGUISHING AGENTS

The aerodrome operator should ensure that:
(a) both principal and complementary extinguishing agents are provided at the aerodrome;
(b) principal extinguishing agent includes:
(1) a foam meeting the minimum ICAO performance level B; or
(2) a foam meeting the minimum ICAO performance level C; or

(3) a combination of these agents.

(c) the complementary extinguishing agent is a dry chemical powder suitable for extinguishing hydrocarbon fires, or any other alternate agent having equivalent firefighting capability;

(1) Extinguishing agents for combustible metal fires shall be provided in portable fire extinguishers that are rated for Class D fires in accordance with NFPA 10. At least one nominal 9 kg extinguisher shall be carried on each vehicle.

(d) the amounts of water for foam production, and of the complementary agents provided on the rescue and firefighting vehicles are in accordance with the determined aerodrome category and Table 1,

Minimum usable amounts of extinguishing agents							
Airport Category	Response Phases	Foam ICAO Performance level B		Foam ICAO Performance Level C **OR** Aqueous Film Forming Foam (MILSPEC)		Complementary agents	
		Water	Discharge Capability	Water	Discharge Capability	Quantity	Discharge
		L	L/min	L	L/min	Kg	Kg/sec
1	Q1 Q2 Q3 **Q total**	600 0 0 **600**	600	450 0 0 **450**	450	45	2,25
2	Q1 Q2 Q3 **Q total**	787 213 0 **1,000**	787	591 159 0 **750**	591	90	2,25
3	Q1 Q2 Q3 **Q total**	1,500 450 1,100 **3,050**	1,500 110	1,077 323 1,100 **2,500**	1,077 110	135	2,25
4	Q1 Q2 Q3 **Q total**	2,468 1,432 2,250 **6,150**	2,468 225	1,772 1,028 2,250 **5,050**	1,772 225	135	2,25
5	Q1 Q2 Q3 **Q total**	4,514 3,386 4,750 **12,650**	4,514 475	3,257 2,443 4,750 **10,450**	3,257 475	205	2,25
6	Q1 Q2 Q3 **Q total**	6,525 6,525 4,750 **17,800**	6,525 475	4,700 4,700 4,750 **14,150**	4,700 475	205	2,25
7	Q1 Q2 Q3 **Q total**	8,297 10,703 4,750 **23,750**	8,297 475	5,983 7,717 4,750 **18,450**	5,983 475	205	2,25
8	Q1 Q2 Q3 **Q total**	10,992 16,708 9,450 **37,150**	10,992 945	7,983 12,063 9,450 **29,450**	7,983 945	410	4,5
9	Q1 Q2 Q3 **Q total**	13,722 23,328 9,450 **46,500**	13,722 945	9,907 16,843 9,450 **36.200**	9,907 945	410	4,5
10	Q1 Q2 Q3 **Q total**	16,759 31,841 18,900 **67,500**	16,759 1,890	12,103 22,997 18,900 **54,000**	12,103 1,890	410	4,5

Table 1

except that for aerodrome categories 1 and 2, up to 100 % of the water may be substituted with complementary agent.

Note 1: The amounts of water specified for foam production are predicated on an application rate of 5.5 L/min/m2 for a foam meeting performance level B and 3.75 L/min/m2 for a foam meeting performance level C.
Note 2: When any other complementary agent is used, the substitution ratios need to be checked.

(da) the quantity of foam concentrates separately provided on vehicles for foam production is in proportion to the quantity of water provided and the foam concentrate selected;
(e) the amount of foam concentrate provided on a vehicle should be sufficient to produce, at least, two loads of foam solution;
(f) when a combination of different performance level foams are provided at the aerodrome, the total amount of water to be provided for foam production should be calculated for each foam type and the distribution of these quantities should be documented for each vehicle and applied to the overall rescue and firefighting requirement;
(g) the discharge rate of the foam solution is not less than the rates shown in Table 1;
(h) the complementary agents comply with the appropriate specifications of the International Organisation for Standardisation (ISO) ;
(i) the discharge rate of complementary agents is not less than the values shown in Table 1;
(j) a reserve supply of foam concentrate equivalent to 200 % of the quantities identified in Table 1 is maintained on the aerodrome for vehicle replenishment purposes. Foam concentrate carried on fire vehicles in excess of the quantity identified in Table 1 can contribute to the reserve;
(k) a reserve supply of complementary agent equivalent to 100% of the quantity identified in Table 1 is maintained on the aerodrome for vehicle replenishment purposes and sufficient propellant gas is included to utilize this reserve complementary agent. Complementary agent(s) carried on fire vehicles in excess of the quantity identified in Table 1 may contribute to the reserve;
(l) for Category 1 and 2 aerodromes that have replaced up to 100% of the water with complementary agent a reserve supply of complementary agent of 200% is maintained;
(m) where a major delay in the replenishment of the supplies is anticipated, the amount of reserve supply is increased as determined by a risk assessment;
(n) a water need analysis is conducted to determine the availability of sufficient quantities of water for fire fighting;
(o) quantities of water and foam concentrate are recalculated and the amount of water and foam concentrate for foam production and the discharge rates for foam solution are increased accordingly, where operations by aeroplanes larger than the average size in a given category are planned;
(oa) Where the level of protection is reduced in accordance with AMC2 MAR-ADR.OPS.B.010(a)(2), a recalculation of quantities of extinguishing agents should be computed based on the largest aeroplane in the reduced category;
(ob) For all-cargo, mail, training, test, positioning and end-of-life aeroplane operations, including those carrying dangerous goods, the recalculation of quantities of extinguishing agents should be based on the largest aeroplane in the category specified in Table 2 of AMC2 MAR-ADR.OPS.B.010(a)(2);and
(p) arrangements are in place to manage extinguishing agents in terms of selection, storage, maintenance, and testing.

AMC5 MAR-ADR.OPS.B.010(a)(2) Rescue and firefighting services

RESPONSE TIME

The aerodrome operator should ensure that:
(a) rescue and firefighting service achieves a response time not exceeding three minutes with an operational objective of not exceeding two minutes from the time of the initial call to the rescue and firefighting services, to any point of each operational runway, in optimum visibility and surface conditions, and be in a position to apply foam at a rate of, at least, 50 % of the discharge rate specified in AMC4 MAR-ADR.OPS.B.010 Table 1;

(b) response times to any other part of the movement area, in optimum visibility and surface conditions, are calculated and included in the Aerodrome Emergency Plan;
(c) any vehicle, other than the first responding vehicle(s), required to achieve continuous agent application of the amount of extinguishing agents specified in Table 1 of AMC4 MAR-ADR.OPS.B.010 arrives no more than one minute after the first responding vehicle(s); and
(d) suitable guidance, equipment and/or procedures for rescue and firefighting services are provided, to meet the operational objective, as nearly as possible, in less than optimum conditions of visibility, especially during low visibility operations.

AMC6 MAR-ADR.OPS.B.010(a)(2) Rescue and firefighting services

PERSONNEL

The aerodrome operator should ensure that:
(a) during flight operations and, at least, 15 minutes after the departure of last flight, sufficient trained personnel is detailed and readily available to ride the rescue and firefighting vehicles, and to operate the equipment at maximum capacity;
(b) personnel is deployed in a way that ensures the minimum response times can be achieved, and continuous agent application at the appropriate rate can be fully maintained considering also the use of hand lines, ladders, and other rescue and firefighting equipment normally associated with aircraft rescue and firefighting operations;
(c) all responding rescue and firefighting personnel are provided with protective clothing and respiratory equipment to enable them to perform their duties in an effective manner; and
(d) any other duties carried out by rescue and firefighting personnel do not compromise the response, or their safety.
(e) The minimum number of RFF-personnel for the corresponding level of protection is listed in Table 1. The RFF-service is responsible for the exterior firefighting and the initial interior firefighting. This implies that the minimum level of staffing involves personnel for both tasks.

Airport Category	On Scene Commander	Driver	Monitor operator/ Lead firefighter	RFF Firefighter	Total
1	-	1	1	-	2
2	-	1	1	-	2
3	-	1	1	1	3
4	-	1	1	1	3
5	1	2	2	2	7
6	1	2	2	2	7
7	1	2	2	2	7
8	1	3	3	3	10
9	1	3	3	4	11
10	1	3	3	4	11

Note 1: The number of RFF-personnel does not include the dispatcher.

AMC7 MAR-ADR.OPS.B.010(a)(2) Rescue and firefighting services

HELICOPTER OPERATIONS

(a) Aerodromes and heliports shall be categorized for RFF services in accordance with Table1:

Aerodromes Category	Overall Length of Fuselage up to (but not including)	Maximum Width of Fuselage up to (but not including)
H0	8m	1.5m
H1	12m	2m
H2	16m	2.5m

H3	20m	3m

Table 1

Note 1: Fuselage length = Actual fuselage length measured from outside of the cabin.
Note 2: Fuselage width = Actual fuselage width measured from outside of the cabin (does not include landing gear).

The aerodrome category for a given helicopter shall be based on the fuselage length of the helicopter and the fuselage width. If, after selecting the category appropriate to the helicopter's fuselage length, the helicopter's fuselage width is greater than the maximum width given in Table 9, then the category for that aerodrome shall be the next one higher. However, should specific calculations be used, the agent calculated shall be the amount required.

(b) The amounts of water for foam production, and of the complementary agents provided on the rescue and firefighting vehicles are in accordance with the determined aerodrome category and Table 2:

Minimum usable amounts of extinguishing agents							
Aerodrome Category	Response Phases	Foam ICAO Performance level B		Foam ICAO Performance Level C **OR** Aqueous Film Forming Foam (MILSPEC)		Complementary agents	
		Water	Discharge Capability	Water	Discharge Capability	Dry Chemical Powder	Gaseous Media
		L	L/min	L	L/min	Kg	Kg
H0	Q1 Q2 Q3 **Q total**	320 320 1.125 **1.765**	320 225	235 235 1.125 **1.595**	235 225	23	9
H1	Q1 Q2 Q3 **Q total**	527 527 1.125 **2.179**	527 225	386 386 1.125 **1.897**	386 225	23	9
H2	Q1 Q2 Q3 **Q total**	763 763 1.125 **2.651**	763 225	560 560 1.125 **2.244**	560 225	45	18
H3	Q1 Q2 Q3 **Q total**	1.030 1.030 1.125 **3.185**	1030 225	755 755 1.125 **2.635**	755 225	90	36

Table 2

(c) The minimum number of ARFF personnel and vehicles for aerodromes is listed in Table 3. The ARFF-service is responsible for the exterior and initial interior firefighting. This implies that the minimum level of staffing involves personnel for both tasks.

Aerodrome Category	ARFF Vehicles	On Scene Commander	Driver	Monitor operator/ Lead firefighter	ARFF Firefighter	Total
H0	1	-	1	1	1	3
H1	1	-	1	1	1	3
H2	1	-	1	1	1	3
H3	2	1	2	2	2	7

Table 3:

Note 1: The total number of ARFF-personnel does not include the dispatcher.
Note 2: If the number of aircrew on board a helicopter in category H3 is lower than 7, the minimum number of ARFF personnel and vehicles may be reduced to H2, providing the minimum usable amount of extinguishing agents in accordance with H3 is available.

AMC1 MAR-ADR.OPS.B.010(a)(4) Rescue and firefighting services

MEDICAL STANDARDS FOR RFFS PERSONNEL

The aerodrome operator should ensure that appropriate medical standards are met by RFFS personnel.

AMC1 MAR-ADR.OPS.B.010(c) Rescue and firefighting services

RULES AND PROCEDURES

(a) The aerodrome operator should ensure that rescue and firefighting personnel are aware of the rules and procedures relevant to operation of the aerodrome and the relationship of their duties and responsibilities to the aerodrome operation as a whole.
(b) Proficiency checks should verify that rescue and firefighting personnel are aware of the rules and procedures relevant to their duties and responsibilities.

AMC1 MAR-ADR.OPS.B.010(d) Rescue and firefighting services

TRAINING OF RESCUE AND FIREFIGHTING PERSONNEL

The training of rescue and firefighting personnel may include training in, at least, the following areas:
(a) aerodrome familiarisation;
(b) aircraft familiarisation;
(c) rescue and firefighting personnel safety;
(d) emergency communications systems on the aerodrome, including aircraft fire-related alarms;
(e) use of the fire hoses, nozzles, turrets, and other appliances;
(f) application of the types of extinguishing agents required;
(g) emergency aircraft evacuation assistance;
(h) firefighting operations;
(i) adaptation and use of structural rescue and firefighting equipment for aircraft rescue and firefighting;
(j) dangerous goods;
(k) familiarisation with fire fighters' duties under the aerodrome emergency plan;
(l) low visibility procedures;
(m) human performance, including team coordination;
(n) protective clothing and respiratory protection;
(o) composite materials; and
(p) recognition of aircraft ballistic parachute systems during emergency operations.

AMC2 MAR-ADR.OPS.B.010(d) Rescue and firefighting services

TRAINING PROGRAMME OF RFFS PERSONNEL — GENERAL

The aerodrome operator should ensure that:
(a) rescue and firefighting personnel actively participate in live fire drills commensurate with the types of aircraft, and type of rescue and firefighting equipment in use at the aerodrome, including pressure-fed jet fuel fire drills or any other type of fuel, provided that they apply the same extinguishing techniques as for jet fuel; and
(b) the rescue and firefighting personnel training programme includes training in human performance, including team coordination.

AMC1 MAR-ADR.OPS.B.015 Monitoring and Inspection of movement area and related facilities

GENERAL

(a) The aerodrome operator should establish a monitoring and inspection program of the movement area which is commensurate with the traffic expected at the aerodrome in order to identify any default or potential hazards to the safety of aircraft or aerodrome operations.
(b) Inspections of the movement area covering items such as the presence of FOD, the status of visual aids, wildlife and current surface conditions, should be carried out each day, at least, once where the code number is 1 or 2, and, at least, twice where the code number is 3 or 4.
(c) Inspections covering other items such as other lighting systems required for the safety of aerodrome operations, pavements and adjacent ground surfaces, drainage and storm water collection systems, fencing and other access control devices, the movement area environment inside the aerodrome boundary and outside the aerodrome boundary within line of sight, should be carried out, at least, weekly.
(d) The aerodrome operator, during excessive weather events (excessive heat, freeze and thaw periods, following a significant storm, etc.) should be conducting extra inspections of paved areas to check for pavement blow-ups and debris that could damage aircraft, or cause pilots to lose directional control.
(e) The aerodrome operator should keep a log for all routine and non-routine inspections of the movement area and related facilities.

AMC2 MAR-ADR.OPS.B.015 Monitoring and inspection of movement area and related facilities

REQUIREMENTS AND PROCEDURES FOR MOVEMENT AREA INSPECTIONS

(a) The aerodrome operator should designate the personnel responsible for carrying out movement area inspections.
(b) The aerodrome operator should ensure that all vehicles on the manoeuvring area are in radio contact with the appropriate air traffic services either directly or through an escort.
(c) In order to prevent runway incursions, the aerodrome operator should have procedures in place, which have been coordinated with the air traffic services unit, for conducting runway inspections, communication procedures, actions in case of radio communication or transponder failure or vehicle breakdown, stop bars crossing, including in cases of stop bar unserviceability, runway crossings, etc. Runway inspections should be conducted in the opposite direction to that being used for landing or taking off and without interruption, unless it is operationally impossible. The inspection procedures should also cater for the temporary suspension of runway operations to allow a full runway inspection to be carried out without interruption, and should address the need to effectively inspect unidirectional lights.
(d) The aerodrome operator should ensure that personnel conducting movement area inspections should be trained in, at least, the following areas:
    (1) aerodrome familiarisation, including aerodrome markings, signs, and lighting;
    (2) Aerodrome Manual;
    (3) Aerodrome Emergency Plan;
    (4) Notice to Airmen (NOTAM) initiation procedures;

(5) aerodrome driving rules;
(6) procedures for radiotelephony, phraseology and ICAO phonetic alphabet;
(7) aerodrome inspection procedures and techniques;
(8) procedures for reporting inspection results and observations;
(9) air traffic services procedures on the movement area; and
(10) low-visibility procedures.

(e) Personnel conducting runway surface condition assessments, in addition to the training specified in point (d) above, should be trained in, at least, the following areas:
(1) procedures for completion/initiation of RCR;
(2) type of runway contaminants and reporting;
(3) assessment and reporting of runway surface friction characteristics;
(4) use, calibration and maintenance of runway friction measurement device, where applicable;
(5) awareness of uncertainties related to point (4) above; and
(6) awareness of the impact of runway surface condition assessment on aircraft performance.

(f) Following the successful completion of the theoretical training, the practical part of the training to be provided should take into account the individual needs of the trainees, and should include the practical application of the theoretical training. After the completion of the practical training, a competency assessment should take place (see AMC1 MAR-ADR.OR.D.017(e)).

GM1 MAR-ADR.OPS.B.015 Monitoring and inspection of movement area and related facilities

PAVEMENTS AND ADJACENT GROUND SURFACES INSPECTION

(a) Movement Area Inspection
The following should be observed during an inspection of paved areas:
(1) general cleanliness with particular attention to material which could cause engine ingestion damage. This may include debris from runway maintenance operations, or excessive grit remaining after runway gritting;
(2) presence of contaminants such as snow, slush, ice, wet ice, wet snow on ice or frost, water, anti-icing or de-icing chemicals, mud, dust, sand, volcanic ash, oil, rubber deposits which may impair the runway surface friction characteristics; particular attention should be given to the simultaneous presence of snow, slush, ice, wet ice, wet snow on ice with anti-icing or de-icing chemicals;
(3) signs of damage to the pavement surface including cracking and spall of concrete, condition of joint sealing, cracking and looseness of aggregate in asphalt surfaces, or break-up of friction courses;
(4) after rain, flooded areas should be identified and marked, if possible, to facilitate later resurfacing;
(5) damage of light fittings;
(6) cleanliness of markings;
(7) the condition and fit of pit covers; and
(8) the extremities of the runway should be inspected for early touchdown marks; blast damage to approach lights, marker cones and threshold lights; cleanliness and obstacles in the runway end safety area.

(b) Adjacent ground surfaces inspection

(c) The following may be observed during the inspection:
(1) the general state of ground cover vegetation ensuring, in particular, that excessive length is not obscuring lights, signs, markers, etc.;
(2) any developing depressions should be noted and plotted;
(3) any unreported aircraft wheel tracks should be carefully plotted and reported;
(4) the condition of signs and markers;
(5) the general bearing strength of grass areas, particularly those close to aircraft pavement surface;
(6) waterlogged grass areas; and
(7) FOD and wildlife.

GM2 MAR-ADR.OPS.B.015 Monitoring and inspection of movement area and related facilities

OBSTACLES

(a) All authorised obstacles should be checked for proper lighting and marking.
(b) Any unauthorised obstacles should be reported to the designated persons or organisations immediately.

AMC1 MAR-ADR.OPS.B.016(a) Foreign object debris control programme

FOD CONTROL PROGRAMME — GENERAL

The FOD control programme should be actively supported by the senior management of the aerodrome operator and of the other organisations operating or providing services at the aerodrome. The aerodrome operator should designate an individual within the aerodrome organisation to manage the aerodrome's FOD control programme.

AMC1 MAR-ADR.OPS.B.016(b)(1) Foreign object debris control programme

FOD PREVENTION

(a) Personnel awareness
Personnel should be kept aware through appropriate activities of the existence of the FOD control programme, and should be actively encouraged to identify and report potential FOD hazards, act to remove observed FOD, and propose solutions to mitigate related safety risks.
(b) Personnel training
The FOD training programme should aim at increasing the personnel awareness of the causes and effects of FOD damage and to promote their active participation in eliminating FOD during the performance of daily work routines.
(1) The theoretical part of the initial FOD training programme should cover the following areas:
(i) safety of aircraft, personnel and passengers as they relate to FOD;
(ii) overview of the FOD control programme in place at the aerodrome;
(iii) causes and principal contributing factors of FOD creation;
(iv) the consequences of ignoring FOD, and/or the incentives for preventing FOD;
(v) practising 'clean-as-you-go' work habits and the general cleanliness and inspection standards of work areas;
(vi) FOD detection procedures, including the proper use of detection technologies (if applicable);
(vii) requirements and procedures for the regular inspection and cleaning of movement areas;
(viii) FOD removal procedures;
(ix) proper care, use, and stowage of material and component or equipment items used around aircraft while in servicing, maintenance or on aerodrome surfaces;
(x) control of debris in the performance of work assignments;
(xi) control over personal items and equipment;
(xii) proper control/accountability and care of tools and hardware;
(xiii) how to report FOD incidents or potential incidents; and
(xiv) continuous vigilance for potential sources of FOD.
The theoretical training should be followed by an assessment of the trainees (see AMC1 MAR-ADR.OR.D.017(e).
(2) Following the successful completion of the theoretical training, the practical part of the training to be provided should take into account the individual needs of the trainees, according to the responsibilities/tasks of the personnel, and, as a minimum, should include familiarisation with the tools/equipment used for the removal/containment/prevention of FOD, and the implementation of the relevant aerodrome operating procedures related to the programme. Following the completion of the practical training, a competency assessment should take place (see AMC1 MAR-ADR.OR.D.017(e)).

AMC1 MAR-ADR.OPS.B.016(b)(2) Foreign object debris control programme

FOD PREVENTION — MEASURES

The aerodrome operator should identify activities that may be associated with the generation of FOD, as well as measures that should be taken in order to prevent this from happening. A record of the analysis made should be maintained.

AMC1 MAR-ADR.OPS.B.016(b)(3) Foreign object debris control programme

FOD DETECTION, REMOVAL, CONTAINMENT AND DISPOSAL

(a) The aerodrome operator should include the procedures for FOD detection in the aerodrome manual. The procedures should, where necessary, be coordinated with the air traffic services provider and should:
  (1) ensure that FOD detection is part of the established inspection schedule of the movement area, and that:
    (i) periodic FOD inspections on foot are carried out to increase the effectiveness of detection, and to inspect areas inaccessible by vehicle (such as grass areas);
    (ii) additional inspections are carried out:
      (A) in construction areas;
      (B) immediately after any aircraft or vehicle accident or incident;
      (C) following any material spill;
      (D) during, and after, extreme weather events (e.g. excessive heat, freeze and thaw periods, following a significant storm, etc.);
  (2) ensure that an inspection of an aircraft stand is carried out prior to the arrival and departure of an aircraft, in order to detect and remove any FOD present;
  (3) ensure that cabin waste is properly secured and removed from the aircraft, and any waste from aircraft maintenance activities is removed upon completion of the activities;
  (4) ensure that FOD detection is performed in a timely manner and that it includes the identification of the FOD source and its location;
  (5) ensure that aerodrome personnel are notified to remove detected FOD from the manoeuvring area, and describe how the air traffic services provider is notified to take appropriate action;
  (6) describe clearly when runway or taxiway operations have to be suspended, and the coordination required with the air traffic services provider;
  (7) ensure that FOD is removed as soon as possible after detection. FOD removal should be included in the tasks of all personnel operating on the aerodrome; and
  (8) describe the actions required to notify aircraft operators of any aircraft parts identified.
(b) The aerodrome operator should provide designated FOD containers and ensure that they are:
  (1) visibly placed on the apron and other areas, for the storage of debris;
  (2) well marked, easy to identify and access, properly secured, and frequently emptied.

AMC1 MAR-ADR.OPS.B.016(c) Foreign object debris control programme

FOD ANALYSIS — CONTINUOUS IMPROVEMENT

(a) All FOD identified and collected on the aerodrome should be recorded, analysed and evaluated. To record the location of the FODs, a grid map of the aerodrome should be used. When needed, an investigation should be carried out to identify the source of the FOD. The sources of FOD, including their location and the activities generating FOD on the aerodrome, should be identified, recorded and analysed to identify trends and problem areas as well as to focus the efforts of the FOD control programme. Relevant records, including of the actions taken, should be maintained.
(b) The FOD control programme should be periodically reviewed to assess and continually improve its effectiveness. The programme should be updated based on the feedback received, data analysis results and trends identified through the evaluation of FOD collected at the aerodrome.

AMC1 MAR-ADR.OPS.B.020 Wildlife strike hazard reduction

GENERAL

The aerodrome operator should:
(a) participate in the national wildlife strike hazard reduction programme;
(b) establish procedures to record and report to the appropriate authority wildlife strikes to aircraft occurred at the aerodrome, in close cooperation with organisations operating, or providing services at the aerodrome;
(c) ensure that wildlife hazard assessments are made by competent personnel; and
(d) establish, implement and maintain a wildlife risk management programme.

GM1 MAR-ADR.OPS.B.020 Wildlife strike hazard reduction

WILDLIFE RISK ASSESSMENT

(a) The aerodrome operator should:
(1) conduct a risk assessment using strike data for each species, as well as information on the presence of species, the number of individuals, and their biology, and update this regularly;
(2) take into account the number of strikes for each species and the severity of damage arising from those strikes; and
(3) target actions on those species which are present with the highest frequency and create the greatest damage.
(b) Wildlife risk assessments should be made by qualified personnel.

GM2 MAR-ADR.OPS.B.020 Wildlife strike hazard reduction

WILDLIFE RISK MANAGEMENT PROGRAMME

The wildlife risk management programme may cover an area of approximately 13 km (7 NM) from the aerodrome reference point, and should include, at least, the following elements:
(a) assignment of personnel:
  (1) a person who is accountable for developing and implementing the wildlife risk programme;
  (2) a person who oversees the daily wildlife control activities, and analyses the collected data and carries out risk assessments in order to develop and implement the wildlife risk management programme; and
  (3) trained and qualified staff who detect and record the birds/wildlife, and assess the bird/wildlife hazard, and expel hazardous birds/wildlife;
(b) a process to report, collect, and record data of struck and living birds/wildlife;
(c) a process to analyse the data and to assess the bird/wildlife hazard to develop mitigation, proactive, and reactive measures. This should include a risk assessment methodology;
(d) a process of habitat and land management both on, and in its surroundings, whenever possible, in order to reduce the attractiveness of the area to birds/wildlife;
(e) a process to remove hazardous birds/wildlife;
(f) a process for liaison with non-aerodrome agencies and local landowners, etc. to ensure the aerodrome is aware of developments that may contribute to creating additional bird hazards within the surrounding of the aerodrome's infrastructure, vegetation, land use and activities (for example crop harvesting, seed planting, ploughing, establishment of land or water features, hunting, etc. that might attract birds/wildlife).

GM3 MAR-ADR.OPS.B.020 Wildlife strike hazard reduction

TRAINING FOR WILDLIFE CONTROL

(a) The aerodrome wildlife control personnel should receive formal training prior to their initial engagement as wildlife controllers.
(b) Training for aerodrome wildlife control should be documented and records of it should be retained to satisfy periodic reviews, audits, and competence checks;
(c) Training of aerodrome wildlife control personnel should be conducted by qualified aerodrome wildlife control personnel, or specialists with proven experience in this field.
(d) Wildlife control initial training should, at least, address the following general areas:
  (1) an understanding of the nature and extent of the aviation wildlife management problem, and local hazard identification;

(2) an understanding of the national and local regulations, standards, and guidance material related to aerodrome wildlife management programs (use of best-practice models);
(3) appreciation of the local wildlife ecology and biology, including (where applicable) the importance of good airfield grass management policies, and the benefits they can deliver to wildlife control;
(4) the importance of accurate wildlife identification and observations, including the use of field guides;
(5) local and national laws and regulations relating to rare and endangered species, and species of special concern, and the aerodrome operators policies relating to them;
(6) wildlife strike remains collection, and identification policies and procedures;
(7) long-term (passive) control measures, including on and off aerodrome habitat management, including identification of wildlife attractions, vegetation policies, air navigation aids protection, and drainage system, and water body management practicalities;
(8) short-term (active) tactical measures, using well established effective wildlife removal, dispersal, and control techniques;
(9) documentation of wildlife activities and control measures, and reporting procedures (the aerodrome wildlife management plan);
(10) firearms and field safety, including the use of personal protective equipment; and
(11) wildlife strike risk assessment and risk management principles, and how these programs integrate with the aerodrome's safety management system.

(e) Wildlife control staff should be fully aware of the conditions and terms of the operations of the aerodrome environment. Where this is not relevant, the wildlife control personnel should receive appropriate training, including:
(1) aerodrome airside driver training, including aerodrome familiarisation, air traffic control communications, signs and marking, navigational aids, aerodrome operations, and safety and other matters the aerodrome operator deems appropriate; and
(2) aircraft familiarisation, including aircraft identification, aircraft engine design, and impact of wildlife strikes on aircraft systems.

(f) It should be ensured that wildlife control staff maintains competence in the role. This could be achieved either by regular refresher training or another system of monitoring, acceptable to the appropriate authority. The maintenance of competence should include the areas in (d) and (e) above, and also include:
(1) reviewing firearms safety;
(2) changes in the local environment;
(3) changes in risk management policy;
(4) recent wildlife events at the aerodrome;
(5) improvements in active and passive measures; and
(6) any other matters the aerodrome operator deems appropriate.

GM4 MAR-ADR.OPS.B.020 Wildlife strike hazard reduction

RECORDING AND REPORTING OF WILDLIFE STRIKES AND OBSERVED WILDLIFE

(a) It is necessary to maintain a record of all wildlife activity or 'bird/wildlife log'. The log should include, at least, the following information:
(1) numbers, species, and location of birds/wildlife seen; and
(2) actions taken to disperse birds/wildlife, and the results of these actions.

(b) The log should be completed at regular intervals by the wildlife control staff.

(c) The log should be analysed to identify which species represent a hazard, at which times of day or year, or under which weather conditions, etc.

(d) The aerodrome operator should have a system in place to collect bird/wildlife strike reports in close cooperation with data owners, like aircraft operators, air navigation service providers, aircraft engine maintenance departments, etc.

AMC1 MAR-ADR.OPS.B.024(a)(5) Authorisation of vehicle drivers

TRAINING OF DRIVERS ON THE USE OF VEHICLES

(a) A driver needs to receive specific training on the use of any vehicle or equipment, he or she will be

using during his or her duties, e.g. special vehicle, tug, high loader, coach, etc. Upon completion of this training, the responsible organisation should provide the relevant records to the aerodrome operator.

(b) If the driver is to be assigned a new vehicle type following the issuance of the authorisation, the process of point (a) should be repeated prior to allowing the driver to operate the new vehicle.

AMC1 MAR-ADR.OPS.B.024(b) Authorisation of vehicle drivers

TRAINING OF DRIVERS — GENERAL

(a) The training programme that drivers need to follow should depend on the areas where they need to be operating. The following two training programmes should be developed:

(1) General driving training programme

This training should cover the needs of all drivers operating on the apron area and other operational areas of the aerodrome. The successful completion of this training grants a driver the right to operate unescorted a vehicle on aprons and other operational areas of the aerodrome, except on the manoeuvring area.

(i) Based on military operational considerations, operating a vehicle on taxitracks, excluding those used for take-offs and landings, may be included in the general driving training programme.

(2) Manoeuvring area training programme

This training should cover the additional specific needs of the drivers who will be operating on the manoeuvring area. A driver is granted the right to operate unescorted on the manoeuvring area subject to the:

(i) provisions of MAR-ADR.OPS.B.024(a)(4) and AMC3 MAR-ADR.OPS.B.024(b);
(ii) successful completion of the general driving training programme; and
(iii) successful completion of the manoeuvring area training programme.

(b) Each of the above-mentioned training programmes (general driving training programme and manoeuvring area training programme) should consist of the following parts:

(1) Theoretical training

The theoretical training should be of a defined and adequate duration, supported by suitable educational means and material.

The theoretical training should be followed by an assessment of the trainees (see AMC1 MAR-ADR.OR.D.017(e)). Once the theoretical part has been successfully completed, the driver should undertake practical training.

(2) Practical training

During the phase of the practical training, which needs to be of a defined and adequate duration, the trainees should be provided with adequate practical training and familiarisation with the aerodrome facilities and its procedures by the nominated instructors, in day and, if relevant, night conditions.

Following the delivery of the practical training, the competence of the trainees should be assessed, in practical terms, by the nominated assessors (see AMC1 MAR-ADR.OR.D.017(e)). This assessment should aim at assessing the ability of the trainees to apply, in practice, the knowledge and skills they have acquired through the theoretical and practical training.

(3) Upon the successful completion of the practical training, and provided that the driver has received training on the use of a vehicle (see AMC1 MAR-ADR.OPS.B.024(a)(5)), a driving authorisation should be issued.

AMC2 MAR-ADR.OPS.B.024(b) Authorisation of vehicle drivers

DRIVING TRAINING PROGRAMMES

(a) General driving training programme

(1) The theoretical part of the general driving training programme should, as a minimum, cover the following areas:

(i) Driving authorisation framework, including:
(A) issuance, validity, conditions of use;
(B) control and audit of its issue;
(C) driving violations and enforcement procedures;

(D) relationship with the national driver licensing system;
(E) national requirements related to general vehicle driving licences;
(F) national Competent Authority guidance for movement area driving; and
(G) roles of various organisations:
(a) the role of the aerodrome operator in setting and maintaining standards;
(b) the Competent Authority's role and its responsibilities;
(c) the role of the national and/or local police, and their involvement with airside driving; and
(d) the role of any other enforcement authorities dealing with vehicles, driving, health, and safety

(ii) Personal responsibilities, including:
(A) requirements concerning fitness to drive (medical standards);
(B) use of personal protective equipment (e.g. high-visibility clothing and hearing protection);
(C) general driving standards;
(D) no-smoking; use of psychoactive substances and medicines, including requirements on alcohol consumption;
(E) implementation of 'sterile-cab' concept, by avoiding disturbing and distracting activities while driving;
(F) responsibilities with respect to FOD and fuel/oil spillage; and
(G) the responsibility to ensure that a vehicle is suitable for the task and is used correctly.

(iii) Vehicle standards, including:
(A) condition and maintenance standards at the aerodrome and/or national level;
(B) the requirement to display obstruction lights and company insignia;
(C) the requirement for, and content of, daily vehicle inspections;
(D) vehicle fault reporting and rectification;
(E) requirements for the issue and display of vehicle authorisations;
(F) serviceability of all essential communication systems with air traffic services and base operations; and
(G) maintaining the vehicle's cabin free of loose and distracting articles/items, as per the 'sterile-cab' concept.

(iv) Aerodrome rules and procedures, including:
(A) rules of the air, and air traffic services procedures applicable to aerodromes as they relate to vehicles, particularly rights of way;
(B) aerodrome regulations, procedures and instructions pertaining to vehicle operations;
(C) definition of movement areas, manoeuvring areas and aprons;
(D) methods used to disseminate general information and instructions to drivers;
(E) methods used to disseminate information regarding works in progress; and
(F) reporting of occurrences the driver is involved in or witnesses.

(v) General aerodrome layout, including:
(A) the general geography of the aerodrome;
(B) aviation terminology used such as runway, taxiway, apron, roads, crossings, runway-holding points;
(C) all aerodrome signs, markings and lighting for vehicles and aircraft, including their meaning;
(D) specific reference to signs, markings and lighting used to guard runways and critical areas; and
(E) specific reference to any controlled/uncontrolled taxiway crossing procedures.

(vi) Hazards of general movement area driving, including:
(A) speed limits, prohibited areas, and no parking requirements;
(B) the danger zones around aircraft;
(C) engine suction/ingestion and blast, propellers, and helicopters;
(D) aircraft refuelling;
(E) FOD and spillages;
(F) vehicle reversing;
(G) staff and passengers walking across aprons;
(H) air bridges and other services such as fixed electrical ground power;
(I) the general aircraft turnaround process;
(J) aircraft emergency stop and fuel cut-off procedures;

(K) hazardous cargo;
(L) vehicle-towing requirements and procedures;
(M) driving at night; and
(N) driving in adverse weather conditions, particularly low visibility.

(vii) Human performance, including:
(A) basic concepts of human factors;
(B) basic aviation psychology, including:
(a) attention and vigilance;
(b) perception;
(c) memory;
(d) human error;
(e) decision-making;
(f) avoiding and managing errors;
(g) human behaviour; and
(h) human overload and underload.

(viii) Emergency procedures, including:
(A) actions and responsibilities in a crisis situation (any accident or serious incident occurring on the aerodrome);
(B) action in the event of a vehicle accident;
(C) specific action in the event of a vehicle striking an aircraft;
(D) action in the event of fire;
(E) action in the event of an aircraft accident/incident; and
(F) action in the event of personal injury.

(ix) Communications, including:
(A) radio procedures and phraseologies to be used (other than with air traffic services);
(B) light signals used by air traffic services;
(C) procedures to be used by vehicle drivers if lost or uncertain of their position;
(D) local emergency telephone numbers;
(E) how to contact the local aerodrome unit;
(F) portable radio, including:
(a) correct use of radios;
(b) effective range and battery life;
(c) screening/shielding effects on the aerodrome;
(d) use of correct call signs, as applicable; and
(e) safety while using radios, including procedures and instructions regarding the use of portable radios and hand-held microphones while driving a vehicle.

(2) The practical part of the general driving training programme should, as a minimum, include the following visual familiarisation of the aerodrome:
(i) airside service roads, taxiway crossings, and any restrictions during low-visibility conditions;
(ii) aprons and stands;
(iii) surface paint markings for vehicles and aircraft;
(iv) surface paint markings that delineate the boundary between aprons and taxiways;
(v) signs, markings and lighting used on the taxiway that indicate the runways ahead;
(vi) parking areas and restrictions;
(vii) speed limits and regulations; and
(viii) hazards during aircraft turnarounds and aircraft movements

(b) Manoeuvring area training programme

(1) The theoretical part of the manoeuvring area training programme should, as a minimum, cover the following areas:
(i) Air traffic services, including:
(A) the aerodrome's air traffic services function and area of responsibility;
(B) the ground movement control function and area of responsibility;
(C) normal and emergency procedures used by air traffic services relating to aircraft;
(D) normal handover/transfer points for vehicles;
(E) air traffic services call signs, vehicle call signs; and
(F) demarcation of responsibilities between air traffic services and apron management unit, if applicable.
(ii) Personal responsibilities, including:

(A) fitness to drive with particular emphasis on eyesight and colour perception;
(B) correct use of personal protective equipment;
(C) responsibilities with respect to FOD; and
(D) responsibilities with respect to escorting other vehicles on the manoeuvring area.

(iii) Vehicle standards, including:
(A) responsibility for ensuring the vehicle used is fit for the purpose and task and appropriately marked and lighted;
(B) requirements for daily inspection prior to operating on the manoeuvring area;
(C) particular attention to the display of obstruction and general lights; and
(D) serviceability of all essential communication systems with air traffic services and base operations.

(iv) Aerodrome layout, including:
(A) particular emphasis on signs, markings and lighting used on the manoeuvring area;
(B) special emphasis on signs, markings and lighting used to protect the runway;
(C) description of equipment essential to air navigation such as instrument landing systems (ILS);
(D) description of sensitive, critical or other protected zones areas related to ILS or other navigation aid antennae and the related markings and signs;
(E) description of ILS protected areas, and their relation to runway-holding points;
(F) description of runway instrument/visual strip, cleared and graded area; and
(G) description of lighting used on the manoeuvring area with particular emphasis on those related to low-visibility operations.

(v) Hazards of manoeuvring area driving, including:
(A) engine suction/ingestion and blast, vortex, propellers, and helicopter operations;
(B) requirements and procedures for driving at night;
(C) requirements and procedures for operations in low visibility and other adverse weather conditions;
(D) right of way of vehicles, aircraft, towed aircraft, and rescue and firefighting vehicles in an emergency.

(vi) Emergency procedures, including:
(A) actions to be taken in the event of a vehicle accident/incident on the manoeuvring area;
(B) actions to be taken in the event of an aircraft accident/incident on the manoeuvring area;
(C) actions to be taken if FOD or other debris is found on runways and taxiways; and
(D) local emergency telephone numbers.

(vii) Communication procedures, including:
(A) air traffic services frequencies used and areas of applicability;
(B) language to be used when communicating with the air traffic services;
(C) procedure to be used by vehicle drivers if lost or uncertain of their position on the manoeuvring area;
(D) procedure for a vehicle breakdown on runways and taxiways and notifying the air traffic services unit of such events; and
(E) radio communication failure:
(a) procedure in the event of a radio communication or transponder or equivalent equipment failure while a vehicle is on the manoeuvring area; and
(b) procedures for light signals and other communication means that can be used by the air traffic services unit to pass instructions to a vehicle driver on the manoeuvring area.

(viii) Aircraft familiarisation, including:
(A) knowledge of aircraft types and ability to identify all types normally operating at the aerodrome;
(B) knowledge of aircraft call signs; and
(C) knowledge of aircraft terminology relating to engines, fuselage, control surfaces, undercarriage, lights, vents, etc.

(2) The practical part of the manoeuvring area training programme should, as a minimum, include the following visual familiarisation of the aerodrome:
(i) all runways (including access and exit routes), holding areas, taxiways and aprons;
(ii) all signs, surface markings and lighting associated with runways, holding positions, CAT I, II, and III operations;

(iii) all signs, surface markings and lighting associated with taxiways;
(iv) specific markings that demarcate the boundary between aprons and manoeuvring areas;
(v) navigation aids such as ILS, sensitive, critical, or other protected areas, antennae, RVR equipment, and other meteorological equipment;
(vi) hazards of operating around aircraft landing, taking off or taxiing; and
(vii) any used naming convention for particular areas or routes.

AMC3 MAR-ADR.OPS.B.024(b) Authorisation of vehicle drivers

RADIOTELEPHONY

(a) Any driver who will be operating on the manoeuvring area should undertake and complete a radiotelephony training, demonstrating both theoretical knowledge and practical competency in voice communication procedures.
(b) Theoretical training
The theoretical training should emphasise on the following areas:
(1) Categories of messages
Message categories and priorities; an understanding of distress, alerting, control and information messages.
(2) Use of phonetic alphabet
Correct pronunciation and transmission of letters, words and numbers.
(3) Use of standard phraseology
(i) emphasis on the need for drivers to use standard phraseology; and
(ii) the need for caution with certain phrases such as 'cleared' and 'go ahead'.
(4) Use of call signs for aircraft, air traffic services, and vehicles
(i) understanding of terminology and acronyms used by air traffic services and pilots;
(ii) knowledge of the airline call signs used at the aerodrome; and
(iii) knowledge of the vehicle call signs used at the aerodrome.
(5) Read-back procedures
The need for vehicle drivers to use standard read back, in the same manner as pilots, for instructions such as 'enter/cross the runway', and if conditional clearances are used.
(6) Test procedures including readability scale
Understanding and use of the readability scale from 1 to 5.
(7) Transmitting techniques and use of radiotelephony
(i) understanding the reasons for listening out prior to transmitting;
(ii) use of standard phraseology and ICAO air-ground radiotelephony communication procedures;
(iii) words and sounds to be avoided;
(iv) correct positioning of microphones to avoid voice distortion;
(v) avoidance of 'clipped' transmissions;
(vi) awareness of regional accents and variations of speech; and
(vii) speed of delivery of RTF phraseology.
(c) Practical training
In this phase, the training should cover the use of fixed and portable radio communication devices, and the practical use of the theoretical knowledge acquired in the previous phase of the training, through the implementation of the aerodrome's communication procedures.
The practical training on radiotelephony may be provided in the course of an overall practical training, which involves the training on the use of vehicles or specialised vehicle/equipment associated with the driver's task, or training on the operating procedures of the aerodrome, etc.

AMC1 MAR-ADR.OPS.B.024(d) Authorisation of vehicle drivers

TEMPORARILY PERMITTING THE DRIVING OF VEHICLES

When permitting temporarily the driving of a vehicle, the period for which the permit is valid and the areas in which the driver will be allowed to operate under escort should be specified.
The escort of a vehicle whose driver has been issued a temporary driving permit should only be performed by the aerodrome operator directly or through a contracted organisation.

AMC1 MAR-ADR.OPS.B.024(e) Authorisation of vehicle drivers

PROCEDURES FOR ISSUANCE OF DRIVING AUTHORISATIONS AND TEMPORARILY PERMITTING DRIVING OF VEHICLES, AND RELEVANT MONITORING ACTIVITIES

(a) The aerodrome operator should clearly identify responsibilities for:
  (1) issuing driving authorisations and temporary driving permits;
  (2) ensuring that the prerequisites for maintaining a driving authorisation valid continue to be met;
  (3) monitoring the compliance of the drivers with the driving rules applicable at the aerodrome, and taking appropriate action as the case may be. Such actions should include the possibility of suspension of revocation of the driving authorisation or of temporary driving permit.

(b) Issuing such authorisations, temporarily permitting the driving of vehicles and ensuring that the prerequisites for maintaining a driving authorisation valid should be a controlled activity.

(c) Irrespective of the organisational set-up chosen, it should be ensured that information regarding drivers who:
  (1) do not continue to meet the requirements for maintaining the validity of the relevant driving authorisation; or
  (2) violate the driving requirements,
  is forwarded to the aerodrome unit(s) responsible for the issuance/revocation of the driving authorisations, in a timely manner, to take appropriate action depending on the case.

(d) The established procedures should clearly indicate how cases of violations of the applicable driving requirements at the aerodrome are dealt with. They should especially take into account the seriousness of each violation and also address cases of repeated violations of the applicable driving requirements. The cases where a driver should be required to undergo additional training should also be addressed in the procedures.

AMC1 MAR-ADR.OPS.B.026(a)(1);(3) Authorisation of vehicles

EQUIPAGE OF VEHICLES — GENERAL

(a) An updated copy of the movement area chart of sufficient size, including hot spots, as well the visual aids configuration on the aerodrome, and areas to be safeguarded, should be readily available in the driver's cabin of a vehicle intended to be operated in the manoeuvring area. If a vehicle is not to be operated in the manoeuvring area, the copy of the chart may be customised to provide only relevant information of the area in which the vehicle is to be operated, along with information of the adjacent areas, to improve the situational awareness of the driver.

(b) The aerodrome operator, in coordination with the air traffic services provider and, if applicable, the apron management services provider, if different, should assess in which areas of the aerodrome, except the manoeuvring area, a vehicle needs to be equipped with a radio.
  The radio with which the vehicle is equipped should allow two-way communication with the air traffic services unit frequency, but also any other unit that the driver of the vehicle may need to establish contact with.
  Updated information regarding the frequencies of each unit should be readily available in the driver's cabin, as well as the frequencies that may need to be used at different areas of the aerodrome. Moreover, the call-sign of the vehicle should be available at a prominent place.

AMC1 MAR-ADR.OPS.B.026(c)(1) Authorisation of vehicles

GENERAL

A vehicle authorisation should be carried/displayed at a prominent place on the vehicle.

AMC1 MAR-ADR.OPS.B.026(e) Authorisation of vehicles

ESCORTING OF VEHICLES
The escorting of a vehicle should only be performed by the aerodrome operator directly or through a contracted organisation. The aerodrome operator should establish procedures for the escorting of vehicles, which as a minimum should contain:

(a) under which minimum visibility conditions escorting of a vehicle may be performed on the manoeuvring area;
(b) communication means and procedures between the escorting and the escorted vehicle(s);
(c) escorting procedures when more than one vehicle is to be escorted; and
(d) procedures for ensuring that drivers of the escorted vehicles comply with the instructions provided by the air traffic services unit.
The procedures should be coordinated with the air traffic services unit.

AMC1 MAR-ADR.OPS.B.026(f) Authorisation of vehicles

PROCEDURES FOR ISSUANCE OF VEHICLE AUTHORISATIONS, TEMPORARILY PERMITTING THE OPERATION OF VEHICLES, ASSIGNING CALL SIGNS AND RELEVANT MONITORING ACTIVITIES

(a) The procedures should clearly identify responsibilities for:
  (1) issuing vehicle authorisations, temporarily permitting the operation of a vehicle and assigning call signs to vehicles;
  (2) ensuring that the prerequisites for maintaining a vehicle authorisation valid continue to be met; and
  (3) monitoring the compliance of vehicles with the relevant requirements, and taking of appropriate action depending on the case. Such actions should include the possibility of suspension and revocation of a vehicle authorisation or a permission for the temporary operation of a vehicle.
(b) Issuing vehicle authorisations, temporarily permitting the operation of vehicles and ensuring that the prerequisites for maintaining a vehicle authorisation valid should be a controlled activity.
(c) Irrespective of the organisational set-up chosen to monitor the compliance of vehicles with the applicable requirements, a close cooperation should be established with the organisational unit(s):
  (1) responsible for the implementation of the maintenance programme of its own vehicles (see MAR-ADR.OPS.C.007); and
  (2) monitoring the implementation of the maintenance programme of the vehicles of organisations operating or providing services at the aerodrome.
  It should be ensured that information regarding vehicles which do not continue to meet the relevant requirements is forwarded to the responsible aerodrome unit(s) (if different) to take appropriate action.
(d) The established procedures should clearly indicate how cases of violations of the applicable requirements are dealt with, taking also into account the significance of each violation.

AMC1 MAR-ADR.OPS.B.027(h)(2) Operation of vehicles

DISTURBING AND DISTRACTING ACTIVITIES WHILE DRIVING

When driving, a 'sterile-cab concept' should be implemented. In line with this, drivers should not be involved in non-essential activities that may affect their attention, situational awareness or judgement.
Such activities include but are not limited to the following:
(a) texting with mobile phones or other devices;
(b) making or answering phone calls;
(c) listening to music or making use of media;
(d) being involved in activities that require the lowering of the radio volume, if the vehicle is radio equipped; and
(e) non-essential conversations with other persons that are in the driver's cabin, or over the radio.
Moreover, the vehicle's cabin should be kept free of loose and distracting articles/items.

AMC1 MAR-ADR.OPS.B.028 Aircraft towing

AIRCRAFT TOWING PROCEDURES

(a) The aerodrome operator should identify and designate the routes that may be used for towing operations, taking into account the aircraft characteristics and its compatibility with the design characteristics of the aerodrome and its operation.

(b) The procedures should, as a minimum, cover the following:
(1) request for and authorisation of the towing operation;
(2) manoeuvring procedures, including turning direction(s), when exiting a stand, and limitations to aircraft types as applicable;
(3) measures to control other traffic on the apron area during the manoeuvring of the towed aircraft;
(4) coordination with the air traffic services unit and the apron management services unit, if different, taking into account their areas of responsibility;
(5) communication procedures to be applied during towing procedures;
(6) ensuring the display of lights of the aircraft to be towed, as per the requirements of SERA.3215;
(7) cases where guidance (e.g. marshaller and/or wing-walker) is needed in order to ensure aircraft clearance from obstacles;
(8) runway crossing, if applicable;
(9) cases where the use of a 'follow-me' service is required; and
(10) the safety measures to be taken to execute towing operation in adverse weather phenomena (slush, ice, etc.) or visibility conditions, and cases and conditions where such an operation is limited or not permitted.

AMC1 MAR-ADR.OPS.B.029(b) Language proficiency

RATING SCALE
The following table describes the different levels of language proficiency:

LEVEL	PRONUNCIATION Assumes a dialect or accent intelligible to the aeronautical community	STRUCTURE Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
Expert (Level 6)	Pronunciation, stress, rhythm, and intonation, though possibly influenced by the first language or regional variation, almost never interfere with ease of understanding.	Both basic and complex grammatical structures and sentence patterns are consistently well controlled.	Vocabulary range and accuracy are sufficient to communicate effectively on a wide variety of familiar and unfamiliar topics. Vocabulary is idiomatic, nuanced and sensitive to register.	Able to speak at length with a natural, effortless flow. Varies speech flow for stylistic effect, for example to emphasise a point. Uses appropriate discourse markers and connectors spontaneously.	Comprehension is consistently accurate in nearly all contexts and includes comprehension of linguistic and cultural subtleties.	Interacts with ease in nearly all situations. Is sensitive to verbal and non-verbal cues, and responds to them appropriately.

Extended (Level 5)	Pronunciation, stress, rhythm, and intonation, though influenced by the first language or regional variation, rarely interfere with ease of understanding.	Basic grammatical structures and sentence patterns are consistently well controlled. Complex structures are attempted but with errors which sometimes interfere with meaning.	Vocabulary range and accuracy are sufficient to communicate effectively on common, concrete, and work-related topics. Paraphrases consistently and successfully. Vocabulary is sometimes idiomatic.	Able to speak at length with relative ease on familiar topics, but may not vary speech flow as a stylistic device. Can make use of appropriate discourse markers or connectors.	Comprehension is accurate on common, concrete, and work-related topics and mostly accurate when the speaker is confronted with a linguistic or situational complication or an unexpected turn of events. Is able to comprehend a range of speech varieties (dialect or accent) or registers.	Responses are immediate, appropriate, and informative. Manages the speaker or listener relationship effectively.
Operational (Level 4)	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding.	Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.	Vocabulary range and accuracy are usually sufficient to communicate effectively on common, concrete, and work-related topics. Can often paraphrase successfully when lacking vocabulary particularly in unusual or unexpected circumstances.	Produces stretches of language at an appropriate tempo. There may be occasional losses of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers and connectors. Fillers are not distracting.	Comprehension is mostly accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.	Responses are usually immediate, appropriate, and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking, confirming, or clarifying.
Pre-operational (Level 3)	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation and frequently interfere with ease of understanding.	Basic grammatical structures and sentence patterns associated with predictable situations are not always well controlled. Errors frequently interfere with meaning.	Vocabulary range and accuracy are often sufficient to communicate effectively on common, concrete, and work-related topics but range is limited and the word choice often inappropriate. Is often unable to paraphrase successfully when lacking vocabulary.	Produces stretches of language, but phrasing and pausing are often inappropriate. Hesitations or slowness in language processing may prevent effective communication. Fillers are sometimes distracting.	Comprehension is often accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. May fall to understand a linguistic or situational complication or an unexpected turn of events.	Responses are sometimes immediate, appropriate, and informative. Can initiate and maintain exchanges with reasonable ease on familiar topics and in predictable situations. Generally inadequate when dealing with an unexpected turn of events.

Elementary (Level 2)	Pronunciation, stress, rhythm, and intonation are heavily influenced by the first language or regional variation and usually interfere with ease of understanding.	Shows only limited control of few simple memorised grammatical structures and sentence patterns.	Limited vocabulary range consisting only of isolated words and memorised phrases.	Can produce very short, isolated, memorised utterances with frequent pausing and a distracting use of fillers to search for expressions and articulate less familiar words.	Comprehension is limited to isolated, memorised phrases when they are carefully and slowly articulated.	Response time is slow, and often inappropriate. Interaction is limited to simple routine exchanges.
Pre-Elementary (Level 1)	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.

Note: Operational level (Level 4) is the minimum required proficiency level for radiotelephony communication.
Levels 1 through 3 describe pre-elementary, elementary and pre-operational levels of language proficiency respectively, all of which describe a level below the language proficiency requirement.
Levels 5 and 6 describe extended and expert levels at levels of proficiency more advanced than the minimum required standard.

AMC1 MAR-ADR.OPS.B.029(e) Language proficiency

GENERAL

(a) The language competence assessment should be designed to reflect a range of tasks undertaken by vehicle drivers but with special focus on the knowledge of the language rather than knowledge of the operational procedures.
(b) The assessment should determine the applicant's ability to:
  (1) communicate effectively using standard radiotelephony phraseology;
  (2) deliver and understand messages in plain language in both usual and unusual situations that necessitate departure from standard radiotelephony phraseology; and
  (3) deal with an unexpected turn of events and solve apparent misunderstandings.

AMC2 MAR-ADR.OPS.B.029(e) Language proficiency

ASSESSMENT

(a) The assessment should comprise the following three elements:
  (1) listening: assessment of comprehension;
  (2) speaking: assessment of pronunciation, fluency, structure and vocabulary; and
  (3) interaction.
(b) The switch between phraseology and plain language should be assessed in relation to listening and speaking proficiency.
(c) When the assessment is not conducted in a face-to-face situation, appropriate technologies should be used for the assessment of the person's abilities to listen and speak, and to enable interactions.
(d) The assessment may also be conducted during training activities or during proficiency checks, with prior notification given to the person concerned.
(e) The assessment should be conducted using the rating scale in AMC1 MAR-ADR.OPS.B.029(b).

AMC3 MAR-ADR.OPS.B.029(e) Language proficiency

LANGUAGE PROFICIENCY ASSESSORS

(a) Persons responsible for language competency assessment ('assessors') should be suitably trained,

including in the requirements specific to the language proficiency assessment, and qualified. They should be either aviation specialists or language specialists with additional aviation-related training.

(b) Language proficiency assessors should undergo regular refresher training on language assessment skills.

(c) The assessors should not conduct language proficiency assessments of persons to whom they have provided language training, or whenever, for any other reason, their objectivity may be affected.

AMC4 MAR-ADR.OPS.B.029(e) Language proficiency

CRITERIA FOR THE ACCEPTABILITY OF LANGUAGE ASSESSMENT ORGANISATIONS

(a) If the language assessment organisation also provides language training, there should be a clear and documented separation between the two activities.

(b) The language assessment organisation should employ a sufficient number of qualified interlocutors and language proficiency assessors to administer the tests.

(c) The assessment documentation should include at least the following:
  (1) assessment objectives;
  (2) assessment layout, timescale, technologies used, assessment samples, voice samples;
  (3) assessment criteria and standards (at least for the operational, extended and expert level of the rating scale mentioned in AMC1 MAR-ADR.OPS.B.029(b);
  (4) documentation demonstrating the assessment validity, relevance and reliability for the operational, extended and expert level;
  (5) procedures to ensure that language assessments are standardised within the organisation and across the aerodrome organisations;
  (6) assessment procedures and responsibilities:
    (i) preparation of individual assessment;
    (ii) administration: location(s), identity check and invigilation, assessment discipline, confidentiality/security;
    (iii) reporting and documentation provided to the aerodrome operator or to the applicant, including sample certificate; and
    (iv) retention of documents and records.

(d) The assessment documentation and records should be kept for a period of 5 years after expiry of assessment and made available to the MAA-NLD upon request.

AMC1 MAR-ADR.OPS.B.029(f) Language proficiency

LANGUAGE TRAINING

(a) Language training should contain communication in a job-related context particularly to handle abnormal and emergency situations and conduct non-routine coordination with air traffic controllers, colleagues and other technical staff.

(b) Emphasis should be placed on listening comprehension, speaking interaction and vocabulary building.

AMC1 MAR-ADR.OPS.B.030 Surface movement guidance and control system

PARAMETERS TO BE CONSIDERED FOR THE DESIGN AND OPERATION OF A SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM

A surface movement guidance and control system should take into account:

(a) the density of air traffic;

(b) the visibility conditions under which operations are intended;

(c) the need for pilot orientation;

(d) the complexity of the aerodrome layout; and

(e) movements of vehicles.

GM1 ADR.OPS.B.030(a) Surface movement guidance and control system

GENERAL

The SMGCS is an appropriate combination of visual aids, non-visual aids, procedures, control, regulation and information facilities. Systems range from a very simple SMGCS at small aerodromes, with light air traffic operating in good-visibility conditions, to complex systems necessary at large aerodromes with heavy air traffic operating in low-visibility conditions. The system selected for an aerodrome will be appropriate to the operational environment in which the aerodrome will operate.

AMC1 ADR.OPS.B.030(a)(3) Surface movement guidance and control system

USE OF VISUAL AIDS FOR SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM (SMGCS)

Where an SMGCS is provided by selective switching of stop bars and taxiway centre line lights, the following should apply:

(a) taxiway routes, which are indicated by illuminated taxiway centre line lights, are capable of being terminated by an illuminated stop bar;
(b) the control circuits are so arranged that when a stop bar located ahead of an aircraft is illuminated, the appropriate section of taxiway centre line lights beyond it is suppressed; and
(c) the taxiway centre line lights are activated ahead of an aircraft when the stop bar is suppressed.

GM1 ADR.OPS.B.030(a)(3) Surface movement guidance and control system

SURFACE MOVEMENT RADAR AND OTHER SURVEILLANCE EQUIPMENT

(a) Surface movement radar or any other suitable surveillance equipment for the manoeuvring area is used at an aerodrome intended for use in runway visual range (RVR) conditions less than a value of 350 m.
(b) Surface movement radar or any other suitable surveillance equipment for the manoeuvring area may also be used at an aerodrome other than that in (a), when the traffic density and operating conditions are such that regularity of traffic flow cannot be maintained by alternative procedures and facilities.

AMC1 MAR-ADR.OPS.B.030(b) Surface movement guidance and control system

STANDARD TAXI ROUTES

(a) Where established, such routes should:
  (1) cover aircraft taxiing between runways, aprons, and maintenance areas (if available);
  (2) be direct, simple and, where practicable, designed to avoid conflicts with the routes of other aircraft or vehicles and capable of being used in all weather conditions;
  (3) be identified by designators distinctively different from those of the runways and air traffic services routes; and
  (4) be adequate and suitable for the largest aircraft likely to use them, taking as a minimum into account its interaction with the aerodrome facilities, navigation aids, aerodrome surfaces, jest blast effects, and the operation of other aircraft.
(b) Where standard taxi routes are provided, details of such routes should be published in the AIP and shown on aerodrome charts, or ground movement chart, depending on the complexity of the movement area, available aids and facilities.
  Where a route includes taxiing between different areas of responsibility, (e.g. areas under control of air traffic services and the apron management services), the transition points should be indicated on either the aerodrome chart or ground movement chart.

AMC1 MAR-ADR.OPS.B.030(c) Surface movement guidance and control system

USE OF AIRCRAFT TRANSPONDER

The transponder operating procedures and the relevant information that need to be sent to the

aeronautical information services provider for publication in the AIP should include:

— the phases and areas of the aerodrome at which the transponder needs to be used when an aircraft is on the movement area of the aerodrome; and
— measures to prevent causing false ACAS II Resolution Advisories to airborne aircraft in the vicinity of the aerodrome.

Such information should be published in the local aerodrome regulations in the AIP, following coordination with the MAA-NLD. Until the publication of the information in the AIP, the aerodrome operator may additionally request the broadcast of relevant information via the local automated terminal information service (ATIS).

AMC1 MAR-ADR.OPS.B.031(b)(4) Communications

RADIO COMMUNCIATION FAILURE

(a) The signals to be used in case of radio communication failure between air traffic services and vehicles or pedestrians authorised to operate on the manoeuvring area should have the following meaning:

LIGHTS SIGNAL FROM AIR TRAFFIC SERVICES	MEANING
Green flashes	Permission to cross landing area or to move onto taxiway
Steady red	Stop
Red flashes	Move off the landing area or taxiway and watch out for aircraft
White flashes	Vacate manoeuvring area in accordance with local instructions

(b) In emergency conditions or if the signals in point (a) are not observed, the signal given below will be used for runways or taxiways equipped with a lighting system and should have the following meaning:

LIGHT SIGNAL	MEANING
Flashing runway or taxiway lights	Vacate the runway and observe the tower for light signal

(c) Care should be taken to ensure that the procedures address the case where, due to the prevailing visibility conditions, the light signals may not be seen by the driver or the pedestrian authorised to operate on the manoeuvring area.
(d) In case of agreement with the air traffic services provider to use other/additional communication means in the event of radio communication feature (e.g. mobile phones), the procedures should also cover the necessary practical details (e.g. telephone numbers to be used), as well as the order of the use of the agreed solutions.

AMC1 MAR-ADR.OPS.B.033(a) Control of pedestrians

GENERAL

(a) The procedures to prevent unauthorised access to the movement area and other operational areas of the aerodrome of persons who are not allowed to have access to such areas should be coordinated with the appropriate authority responsible for security.
(b) In case passengers are embarking/disembarking on the apron, or if no transportation means is used for their transfer to/from the terminal building or from one stand to the other, then, apart from the need to ensure that passengers are always escorted, the procedures should, amongst others, include measures to ensure that:
(1) passengers do not pass under aircraft wings or beneath fuel vents, or close to the propellers or

rotors of the aircraft they are boarding/disembarking or those of aircraft on adjacent stands;
(2) passengers remain clear of vehicular traffic around the aircraft, electrical cables, fuel hoses and other equipment;
(3) passengers use predetermined routes while moving from/to or across the apron; and
(4) passengers and any other persons on the apron are protected from the effects of engine jet-blast or downwash during their presence on the apron, including by restricting aircraft engine use.

Depending on the configuration of the apron, physical moveable barriers may also be used to indicate the desired route to follow and facilitate the control and movement of passengers on the apron. When not in use, such equipment should be properly stowed to ensure that it does not become a source of FOD.

AMC1 MAR-ADR.OPS.B.033(b) Control of pedestrians

PERSONNEL OPERATING ON THE MANOEUVRING AREA

(a) Personnel allowed access to the manoeuvring area without the use of a vehicle should be equipped at least with personal protective equipment, suitable charts of the aerodrome, a radio for two-way communication on the appropriate air traffic services frequency (and other means of communication as per the radio-communication failure procedure — see AMC1 MAR-ADR.OPS.B.031(b)(4)) with the air traffic services unit, and other appropriate means to conduct their duties suitable to the situation and local conditions.
(b) The procedures should, as a minimum, provide information as to:
(1) which personnel can enter the manoeuvring area and for which purposes;
(2) the points from which entry to the manoeuvring area can take place;
(3) the hours and minimum visibility conditions that such an entry is allowed;
(4) communication with the air traffic services unit prior to entering the manoeuvring area and afterwards;
(5) communication with the respective unit of the aerodrome operator;
(6) actions to be taken in the event of radio communication failure (see AMC1 MAR-ADR.OPS.B.031(b)(4)); and
(7) right of way between vehicles, pedestrians and aircraft.
(c) The procedures should be coordinated with the air traffic services unit.

AMC1 MAR-ADR.OPS.B.035(a) Operations in winter conditions

AERODROME SNOW PLAN

The aerodrome snow plan should reflect the exposure of the aerodrome to winter conditions and should include the following:
(a) the Snow Committee members and the person in charge of the winter operation, with a chain of command giving a breakdown in duties;
(b) methods of communication between aerodrome operations, air traffic services, and the MET provider;
(c) the equipment available for snow clearance and surface treatment. This should include equipment for ploughing, sweeping, and blowing snow and application of materials;
(d) priority of surfaces to be cleared, and clearance limits for aircraft using the aerodrome;
(e) collection of information for RCR and dissemination of this information;
(f) designated snow dumping or melting areas;
(g) an alerting system in order that sufficient warning is given to all bodies concerned;
(h) the manpower available, including staff for equipment maintenance arrangements for shifts, and call-out procedures;
(i) deployment of equipment and tactical approaches to be used;
(j) general principles to be followed in deciding when to close runways for snow clearance and designation of management personnel authorised to take the decision;
(k) methods of assessing and reporting the surface conditions; and
(l) criteria for the suspension of runway operations.

AMC2 MAR-ADR.OPS.B.035(a) Operations in winter conditions

ESTABLISHMENT OF PRIORITIES

The aerodrome operator should establish the order of priority for snow, slush and ice clearance, from the movement area, in consultation with the air traffic services, rescue and firefighting services and aircraft operators.

AMC1 MAR-ADR.OPS.B.035(a)(1) Operations in winter conditions

USE OF MATERIALS FOR DE/ANTI-ICING OF PAVED SURFACES

(a) The aerodrome operator should use materials to remove or to prevent the formation of ice and frost on aerodrome pavements or to improve runway surface friction characteristics when conditions indicate that their use could be effective. Caution should be exercised in the application of the materials so as not to create more slippery conditions.
(b) The aerodrome operator should, as far as practicable, avoid harmful effects on environment, aircraft or pavements when using chemicals to remove snow, slush, or ice from operational surfaces.

AMC1 MAR-ADR.OPS.B.035(a)(2) Operations in winter conditions

REMOVAL OF CONTAMINANTS

The aerodrome operator should ensure that:
(a) snow, slush, and ice are removed from the surface of a paved runway, as rapidly and completely as possible, to minimise accumulation;
(b) operational taxiways are kept clear of snow slush or ice to the extent necessary to enable aircraft to be taxied to and from an operational runway; and
(c) those parts of the apron which are intended to be used by aircraft are kept clear of snow, slush or ice, to the extent necessary to enable aircraft to manoeuvre safely, or where appropriate, to be towed or pushed.
(d) Snow, slush and ice removal may be limited in designated areas, for specific military training purposes.

AMC1 MAR-ADR.OPS.B.037(a) Assessment of runway surface condition and assignment of runway condition code

RUNWAY CONDITION ASSESSMENT MATRIX (RCAM)

The aerodrome operator should use the following RCAM in order to assign the RWYCC:

Runway condition assessment matrix (RCAM)			
Assessment criteria		**Downgrade assessment criteria**	
RWYCC	**Runway surface description**	**Aeroplane deceleration or directional control observation**	**Special air-report of runway braking action**
6	DRY	-	-
5	— FROST — WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth)	Braking deceleration is normal for the wheel braking effort AND directional control is normal	GOOD

	Up to and including 3 mm depth: — SLUSH — DRY SNOW — WET SNOW		
4	— SPECIALLY PREPARED WINTER RUNWAY **-15°C and lower outside temperature** — COMPACTED SNOW	Braking deceleration OR directional control is between good and medium	GOOD TO MEDIUM
3	— SLIPPERY WET — DRY SNOW or WET SNOW (any depth) ON TOP OF COMPACTED SNOW **More than 3 mm depth:** — DRY SNOW — WET SNOW **Higher than -15°C outside air temperature:** — COMPACTED SNOW	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced	MEDIUM
2	**More than 3 mm:** — STANDING WATER — SLUSH	Braking deceleration OR directional control is between medium and poor	MEDIUM TO POOR
1	— ICE	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced	POOR
0	— WET ICE — WATER ON TOP OF COMPACTED SNOW — DRY SNOW or WET SNOW ON TOP OF ICE	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain	LESS THAN POOR

Aerodromes which never experience or never report snow and ice conditions, may use the following simplified form of RCAM:

Runway condition assessment matrix (RCAM)			
Assessment criteria		**Downgrade assessment criteria**	
RWYCC	**Runway surface description**	**Aeroplane deceleration or directional control observation**	**Special air-report of runway braking action**
6	DRY	-	-
5	— WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth)	Braking deceleration is normal for the wheel braking effort AND directional control is normal	GOOD
4		Braking deceleration OR directional control is between good and medium	GOOD TO MEDIUM
3	— SLIPPERY WET	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced	MEDIUM
2	**More than 3 mm:** — STANDING WATER	Braking deceleration OR directional control is between medium and poor	MEDIUM TO POOR
1		Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced	POOR
0		Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain	LESS THAN POOR

GM1 MAR-ADR.OPS.B.037(a) Assessment of runway surface condition and assignment of runway condition code

AVAILABLE MEANS USED TO DETERMINE THE RWYCC

(a) The visual inspection of the movement area to assess the surface condition is the core method to determine the RWYCC. An overall assessment however implies more than that. The continuous monitoring of the development of the situation and the prevailing weather conditions is essential to ensure safe flight operations. Other aspects to be considered in the assessment result are the outside air temperature, the surface temperature, the dew point, the wind speed and direction, the effect of surface treatment, control and deceleration of the inspection vehicle, the special air-reports of braking action, the output from friction measuring devices, the weather forecast, etc. Due to interaction between them, a deterministic method on how these factors affect the RWYCC to be reported cannot be precisely defined.

(b) The RCAM supports the classification of runway surface conditions by their effect on aeroplane braking performance using a set of criteria identified and quantified based on the best industry knowledge, built upon dedicated flight testing and in-service experience. The thresholds at which a

criterion changes the classification of a surface condition are intended to be reasonably conservative, without being excessively pessimistic.

(c) The following describes why the primary classification criteria in the RCAM have been set this way, and why it is important for aerodrome personnel to monitor and accurately report conditions when operating close to the boundaries of each RWYCC:

(1) Percentage of coverage with contamination in each runway third

A runway is considered contaminated whenever the extent of the coverage is more than a quarter of the surface of at least one third of the runway. It is important to note that whenever coverage is assessed to be below the 25 per cent threshold in each third, the computation assumption made by flight crew will be a dry runway (uniformly bare of moisture, water and contamination). It has been demonstrated that in conditions of contamination just below the reporting threshold but concentrated in the most unfavourable location, this assumption of dry runway still provides positive stop margins.

(2) Type of contaminant

Different contaminants affect the contact area between tyre and runway surface, where the stopping force is generated, in different ways. A water film of any depth leads to the partial (viscous aquaplaning) or total separation (dynamic aquaplaning) of the tyre from the surface. The smaller the surface, the smaller the force of adhesion, the less braking is available. Therefore, the maximum braking force decreases at higher speed and depends on contaminant depth. Other fluid contaminants have a similar effect. Hard contaminants, such as ice or compacted snow, prevent the contact between tyre and runway surface completely and at any speed, effectively providing a new surface that the tyre rolls on. A deterministic classification of the stopping performance can be made only for the contaminants listed in the RCAM. For other reportable contaminants (oil, mud, ash, etc.), a large variance in the aeroplane performance effect exists, or insufficient data is available to permit a deterministic classification. An exception is rubber contamination, for which in-service data indicates that an assumption of RWYCC 3 provides a satisfactory performance margin. Runway surface treatments with sand, grit or chemicals may be very effective or even detrimental depending on the conditions of the application, and no credit can be attributed to such treatment without verification and validation.

(3) Depth of the contamination

The industry accepts that the threshold for the effect of depth of fluid contaminants on aeroplane performance is at 3 mm. Below this threshold, any type of fluid contaminant can be removed from the tyre/runway contact zone either by forced drainage or by compressing it into the macrotexture of the surface, thus allowing adhesion between tyre and surface to exist, albeit on less than the full footprint surface area. This is the reason why contamination depths up to 3 mm are expected to provide similar stopping performance as a wet runway. It should be noted that the physical effects causing reduced friction forces begin to take effect from very small film thickness, therefore damp conditions are considered to provide no better braking action than a wet runway. Aerodrome personnel need to be aware of the fact that the capability to generate friction in wet (or with thin layers of fluid contaminants) conditions is very dependent upon the inherent qualities of the runway surface (friction characteristics) and may be less than normally expected on poorly drained, polished or rubber contaminated surfaces. Above the 3 mm threshold, the impact on friction forces is more significant, leading to classification in lower RWYCCs. Above this depth, and depending on the density of the fluid, additional drag effects start to apply, due to displacement or compression of the fluid and impingement on the airframe of the aeroplane. These latter effects depend on the depth of the fluid and affect the ability of the aeroplane to accelerate for take-off.

(4) Surface or air temperature

It is self-evident that close to the freezing point significant changes in surface conditions can occur very quickly. Surface temperature is more significant for the relevant physical effects, and surface and air temperature may be significantly different due to latency and radiation. However, surface temperature may not be readily available, and it is acceptable to use air temperature as a criterion for the contaminant classification. The threshold for the classification of compacted snow in RWYCC 4 (below OAT -15 degrees) or RWYCC 3 (above this temperature) is based on historical North American operational practice and may be very conservative, therefore other assessment means should be used to support the classification. Such assessment means should be based upon specific rationale, specific procedures and substantiating aeroplane data.

GM2 MAR-ADR.OPS.B.037(a) Assessment of runway surface condition and assignment of runway condition code

ICE is considered to be untreated ice that covers the runway macrotexture.

AMC1 MAR-ADR.OPS.B.037 (a);(b) Assessment of runway surface condition and assignment of runway condition code

ASSIGNMENT OF RUNWAY CONDITION CODE

(a) The aerodrome operator should:
  (1) assign a RWYCC 6, if 25 per cent or less area of a runway third is wet or covered by contaminant;
  (2) describe in the plain-language remarks part of the situational awareness section of the RCR the location of the area that is wet or covered by the contaminant, if the distribution of the contaminant is not uniform;
  (3) assign a RWYCC based on the contaminant that will most likely affect the aeroplane's performance, if multiple contaminants are present and the total coverage is more than 25 per cent but no single contaminant covers more than 25 per cent of any runway third;
  (4) not upgrade an assigned RWYCC 5, 4, 3, or 2; and
  (5) not upgrade beyond RWYCC 3 an assigned RWYCC 1 or 0.
(b) The aerodrome operator may upgrade an assigned RWYCC 1 or 0 when all available means of assessing runway slipperiness, including properly operated and calibrated measuring devices, if available, have been used to support the decision.
(c) The aerodrome operator, when RWYCC 1 or 0 is upgraded, should assess the runway surface frequently during the period the higher RWYCC is in effect, to ensure that the runway surface condition does not deteriorate below the assigned code.
(d) The aerodrome operator, if sand or other runway treatments are used to support upgrading of the RWYCC, should assess the runway surface frequently to ensure the continued effectiveness of the treatment.
(e) The aerodrome operator should appropriately downgrade the RWYCC taking into consideration all available means of assessing runway slipperiness, including special air-reports.
(f) The aerodrome operator, when the primary assignment of the RWYCC in accordance with RCAM does not reflect the prevailing conditions accurately, and is supported by other observations, experience and local knowledge, should downgrade or upgrade the RWYCC. In this case:
  (1) the RWYCC should be the downgraded or upgraded RWYCC following the overall assessment;
  (2) the description of the runway surface contaminant will reflect the actual condition; and
  (3) in the plain language remarks section of the RCR, the terms 'UPGRADED' or 'DOWNGRADED' should be used.

GM1 MAR-ADR.OPS.B.037(b) Assessment of runway surface condition and assignment of runway condition code

SINGLE AND MULTIPLE CONTAMINANTS

When single or multiple contaminants are present, the RWYCC for any third of the runway is determined as follows:
(a) When the runway third contains a single contaminant, the RWYCC for that third is based directly on that contaminant in the RCAM as follows:
(1) If the contaminant coverage for that third is less than 10 per cent, a RWYCC 6 is to be generated for that third, and no contaminant is to be reported. If all thirds have less than 10 per cent contaminant coverage, no report is generated; or
(2) If the contaminant coverage for that third is greater than or equal to 10 per cent and less than or equal to 25 per cent, a RWYCC 6 is to be generated for that third and the contaminant reported at 25 per cent coverage; or
(3) If the contaminant coverage for that third is greater than 25 per cent, the RWYCC for that third is based on the contaminant present.

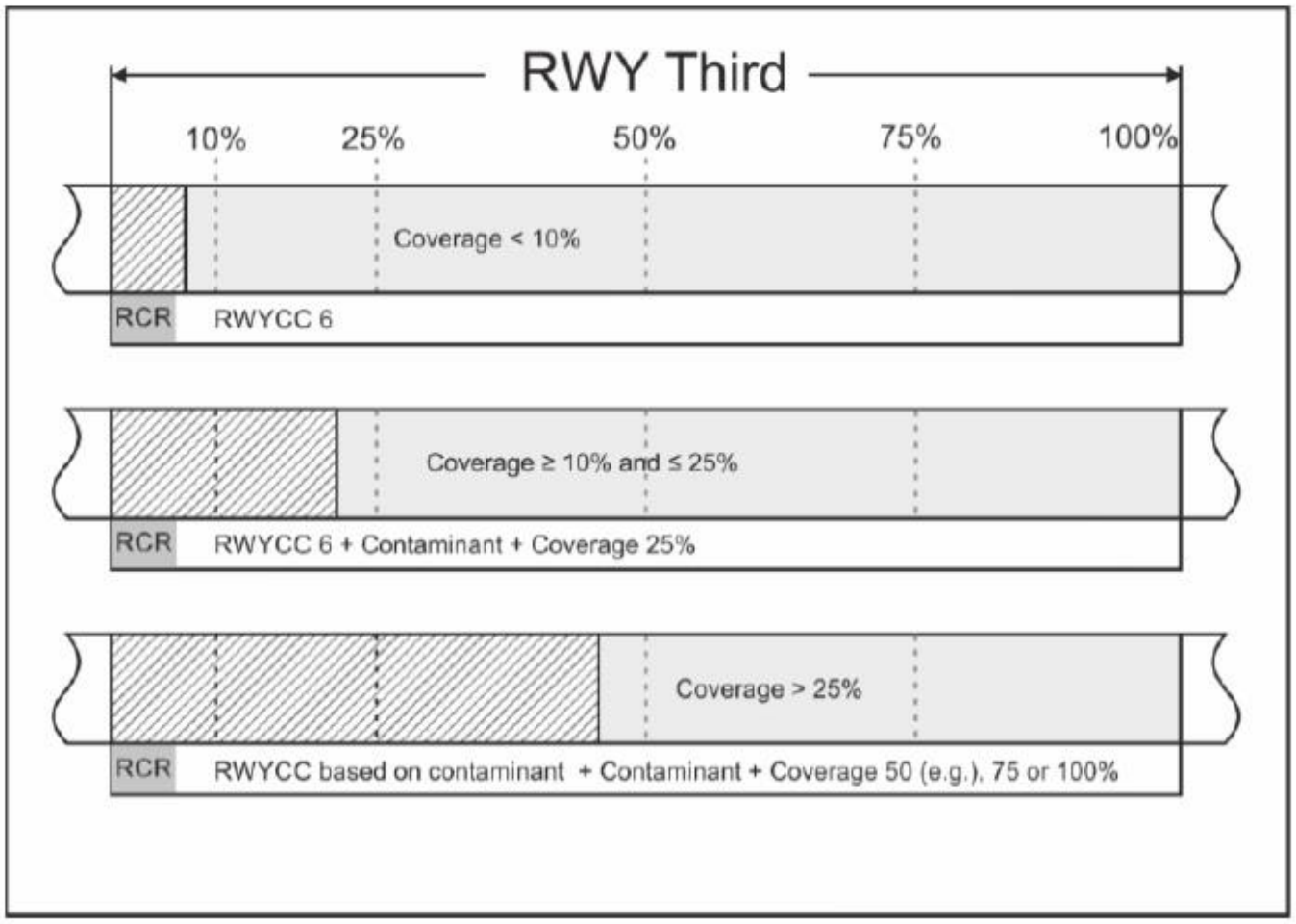


Figure 1: Single contaminant

(b) If multiple contaminants are present where the total coverage is more than 25 per cent but no single contaminant covers more than 25 per cent of any runway third, the RWYCC is based upon the judgement of the runway inspector, considering what contaminant will most likely be encountered by the aeroplane and its likely effect on the aeroplane's performance. Typically, this would be the most widespread contaminant, but this is not an absolute.
(c) The structure of the RCAM is ranking the contaminants in the column 'Runway surface description' from top to bottom and is having the most slippery contaminants at the bottom. However, this ranking is not an absolute, as the RCAM by design is landing oriented and if judged in a take-off scenario, the ranking could be different due to drag effects of loose contaminants.

GM2 MAR-ADR.OPS.B.037(b) Assessment of runway surface condition and assignment of runway condition code

DOWNGRADING AND UPGRADING

(a) The RCAM allows making an initial assessment based on visual observation of contaminants on the runway surface: their type, depth and coverage, as well as the outside air temperature. Downgrading and upgrading is an integral part of the assessment process and essential to developing relevant reports of the prevailing runway surface condition.
(b) Examples of aspects to be considered in assessing the runway slipperiness for the downgrade process:
  (1) Prevailing weather conditions
    (i) stable sub-freezing temperature
    (ii) dynamic conditions
    (iii) active precipitation.
  (2) Observations

(3) Measurements
(i) friction measurements
(ii) vehicle behaviour
(iii) shoe scraping
(4) Experience (local knowledge)
(5) Special air-reports

(c) When the complete removal of contaminants cannot be achieved, but the RWYCC initially assigned does not reflect the real surface condition, the aerodrome personnel may apply the upgrade procedures. Upgrading is applicable only when the initial RWYCC is 0 or 1. Upgrading can only occur up to RWYCC 3.

(d) When upgrading RWYCC 0 and 1, a preponderance of evidence needs to exist pointing towards the higher RWYCC.

(e) When a friction measuring device is used for upgrading purposes, a preponderance of evidence needs to exist. In order to upgrade a RWYCC 0 or 1 to no higher than RWYCC 3, the friction measuring device needs to demonstrate an equivalent friction to that of a wet runway (RWYCC 5) or higher.

AMC1 MAR-ADR.OPS.B.037(c) Assessment of runway surface condition and assignment of runway condition code

USE OF SPECIAL AIR-REPORT

(a) The aerodrome operator should:
(1) re-assess the runway surface condition if RWYCC 2 or better has been reported and two consecutive special air-reports of POOR runway braking action are received; and
(2) re-assess the runway surface condition and consider the suspension of operations on that runway when one pilot has reported a LESS THAN POOR runway braking action.

(b) The aerodrome operator may use a special air-report of runway braking action for upgrading purposes only if it is used in combination with other information qualifying for upgrading.

AMC1 MAR-ADR.OPS.B.040 Night Operations

GENERAL

The aerodrome operator for aerodromes operated at night should, in collaboration with air traffic services provider, ensure that visual aids are installed, operated, and maintained to permit aircraft operations to be performed safely.

AMC1 ADR.OPS.B.045(a)(1) Low-visibility procedures

LOW-VISIBILITY TAKE-OFF (LVTO) WITH AN RVR LESS THAN 125 M

In addition to the low-visibility procedures which are required for LVTOs, the following should also apply to LVTOs with an RVR less than 125 m:
(1) if an ILS signal is used for lateral guidance, the ILS localiser signal meets the requirements for category III operations including the availability of a standby transmitter; and
(2) if an ILS signal is used, the low-visibility procedures should include protection of the ILS-sensitive area.

GM1 ADR.OPS.B.045(a)(1) Low-visibility procedures

RUNWAY CENTRE LINE LIGHTS

The specifications for the required runway centre line lights are contained in CS CS-ADR-DSN.M.690.

AMC1 ADR.OPS.B.045(a)(2) Low-visibility procedures

SUITABILITY OF RUNWAYS — APPROACH AND LANDING OPERATIONS

(a) CAT II instrument approach operations may be conducted on a precision approach category II or III runway, using a CAT II instrument approach procedure.
(b) CAT III instrument approach operations may be conducted on a precision approach category III runway, using a CAT III instrument approach procedure.
(c) SA CAT I approach operations may be conducted in accordance with the following:
  (1) the runway is a precision approach category I runway and an obstacle free zone (OFZ) is established;
  (2) a CAT I instrument approach procedure that includes an OCH based on a radio altimeter is used;
  (3) where an ILS/MLS is used, it is not promulgated with any restrictions affecting its usability and is not offset from the extended runway centre line;
  (4) where a GBAS landing system (GLS) is used, it is not promulgated with any restrictions affecting its usability and should not be offset from the extended centre line;
  (5) the glide path angle is 3.0°;
  (6) the pre-threshold terrain is surveyed and either a precision approach terrain chart (ICAO Annex 4, Chapter 6) is published in the AIP or the required information is included in the aerodrome terrain and obstacle chart – ICAO (Electronic) (ICAO Annex 4, Chapter 5).
(d) SA CAT II approach operations may only be conducted in accordance with the following:
  (1) the runway is a precision approach category I runway and an OFZ is established, and for operations with an RVR of less than 400 m, runway centre line lights are installed;
  (2) a CAT II instrument approach procedure is used;
  (3) where an ILS/MLS is used, it is not offset from the extended runway centre line and no restrictions affecting its usability are published in the AIP;
  (4) where a GLS is used, it is not offset from the extended runway centre line and no restrictions affecting its usability are published in the AIP;
  (5) where an ILS is used, it is certified to class II/D/2;
  (6) the pre-threshold terrain is surveyed and either a precision approach terrain chart (ICAO Annex 4, Chapter 6) has been published or the required information is included in the aerodrome terrain and obstacle chart – ICAO (Electronic) (ICAO Annex 4, Chapter 5).
(e) The switch-over times of the different lighting elements on runways supporting SA CAT I/II approach operations should be as follows:

ELEMENT	SWITCH-OVER TIME
Approach lighting system	15 sec
Runway edge light	1 sec
Visual approach slope indicators	15 sec
Runway threshold light	1 sec
Runway end light	1 sec
Stopway end	1 sec
Stopway edge	15 sec
Obstacle light	15 sec

(f) The switch-over time for runway edge lights may be increased to 15 sec if runway centre line lights are provided. In this case, the switch-over time for runway centre line lights should be 1 sec.

AMC1 ADR.OPS.B.045(a)(3) Low-visibility procedures

SUITABILITY OF RUNWAYS FOR EFVS APPROACH AND LANDING OPERATIONS

(a) An EFVS-A operation may be conducted on a runway if: (1) it is served by a straight-in instrument approach procedure in accordance with Part-FPD of Regulation (EU) 2017/373;
  (1) an OFZ is established or a VSS is not penetrated by obstacles, and an instrument departure procedure is established;
  (2) the touchdown zone (TDZ) RVR is available;
  (3) low-visibility procedures are in effect;
  (4) the switch-over time for runway edge, threshold and end lights meets the specifications in CS

ADR-DSN.S.880 for CAT II/III runways.

(b) An EFVS-L operation may be conducted on a runway when, in addition to point (a):
  (1) an aerodrome obstacle chart – ICAO Type A is published in the AIP; and
  (2) a precision approach terrain chart – ICAO is published in the AIP.

AMC1 MAR-ADR.OPS.B.045(b) Low Visibility Procedures

GENERAL

(a) When low-visibility procedures (LVPs) are in effect:
  (1) persons and vehicles operating on an apron should be restricted to the essential minimum;
  (2) the critical and sensitive areas of ILS/MLS/GLS should be safeguarded.

(b) The aerodrome operator should, in coordination with air traffic services, establish low-visibility taxi routes.

AMC2 ADR.OPS.B.045(b) Low-visibility procedures

CRITERIA FOR THE PREPARATION OF LVPs

When establishing the RVR and cloud ceiling values below which LVPs should be prepared, the aerodrome operator should consider:

(a) the aerodrome layout and its complexity;
(b) the location of the control tower;
(c) the facilities and equipment available; and
(d) the density of traffic.

AMC1 ADR.OPS.B.045(c) Low-visibility procedures

EQUIPMENT FAILURES TO BE REPORTED AND EFFECTS ON FLIGHT OPERATIONS

The following equipment failures should be reported if the system is degraded or unserviceable or if back-up procedures cannot provide the same level of service:

EQUIPMENT FAILURE TO BE REPORTED – LOW-VISIBILITY DEPARTURE OPERATIONS		
SYSTEM CONSIDERED	**FAILURE TO BE REPORTED**	**EFFECT ON FLIGHT OPERATIONS**
ILS (Where used for guided take-off)	ILS localiser downgraded to CAT II	No take-off guidance. Guided take-off not allowed
	ILS localiser downgraded to CAT I	No take-off guidance. Guided take-off not allowed
	ILS out of service	No take-off guidance. Guided take-off not allowed
MLS (Where used for guided take-off)	MLS downgraded to CAT II	No take-off guidance. Guided take-off not allowed
	MLS downgraded to CAT I	No take-off guidance. Guided take-off not allowed
	MLS out of service	No take-off guidance. Guided take-off not allowed
GBAS (Where used for guided take-off)	GBAS downgraded to CAT II	No take-off guidance. Guided take-off not allowed
	GBAS downgraded to CAT I	No take-off guidance. Guided take-off not allowed
	GBAS out of service	No take-off guidance. Guided take-off not allowed
RVR	Touchdown RVR system unserviceable	Restrictions depending on flight operations rules
	Other RVR systems unserviceable	Restrictions depending on flight operations rules
LIGHTING SYSTEMS	Runway lighting unserviceable	Restrictions depending on flight operations rules

EQUIPMENT FAILURE TO BE REPORTED – LOW-VISIBILITY DEPARTURE OPERATIONS		
SYSTEM CONSIDERED	**FAILURE TO BE REPORTED**	**EFFECT ON FLIGHT OPERATIONS**
	Runway centre line lighting unserviceable	Restrictions depending on flight operations rules
	Runway edge lighting unserviceable	Restrictions depending on flight operations rules
	Taxiway lighting system unserviceable	Restrictions depending on flight operations rules
ANCILLARY	Stop bars unserviceable	No effect if runway protection is ensured by other means
	Ceilometer unserviceable	No effect
	Anemometer unserviceable	No effect if other sources available; otherwise restrictions depending on flight operations rules

EQUIPMENT FAILURE TO BE REPORTED – APPROACH AND LANDING OPERATIONS		
SYSTEM CONSIDERED	**FAILURE TO BE REPORTED**	**EXPECTED EFFECT ON FLIGHT OPERATIONS**
ILS	ILS downgraded to CAT II	Flight operations limited to CAT II
	ILS downgraded to CAT I	Flight operations limited to CAT I
	ILS out of service	Restricted to non-precision approach (or other precision approach aid if available)
	Outer marker unserviceable	No limitation if replaced by published equivalent position; otherwise, restricted to non-precision approach
	Glide path out of service	Restricted to non-precision approach (e.g. localiser only)
MLS	MLS downgraded to CAT II	Flight operations limited to CAT II
	MLS downgraded to CAT I	Flight operations limited to CAT I
	MLS out of service	Restricted to non-precision approach (or other precision approach aid if available)
GBAS	GBAS downgraded to CAT II	Flight operations limited to CAT II
	GBAS downgraded to CAT I	Flight operations limited to CAT I
	GBAS out of service	Restricted to non-precision approach (or other precision approach aid if available)
DME	DME (as alternative to marker beacons) unserviceable	No limitation if replaced by published equivalent position; otherwise restricted to non-precision approach

EQUIPMENT FAILURE TO BE REPORTED – APPROACH AND LANDING OPERATIONS		
SYSTEM CONSIDERED	**FAILURE TO BE REPORTED**	**EXPECTED EFFECT ON FLIGHT OPERATIONS**
RVR	Touchdown RVR system unserviceable	Restriction depending on flight operations rules
	Other RVR systems unserviceable	Restriction depending on flight operations rules
LIGHTING SYSTENMS	Approach lighting unserviceable	Restriction depending on flight operations rules
	Runway lighting unserviceable	Restriction depending on flight operations rules
	Runway centre line lighting unserviceable	Restriction depending on flight operations rules
	Runway edge lighting unserviceable	Restriction depending on flight operations rules
	TDZ lighting unserviceable	Restriction depending on flight operations rules
	Taxiway lighting system unserviceable	Restriction depending on flight operations rules
ANCILLARY	Stop bars unserviceable	No effect if runway protection is ensured by other means
	Ceilometer unserviceable	No effect
	Anemometer unserviceable	No effect if other sources available; otherwise, restriction depending on flight operations rules

AMC1 MAR-ADR.OPS.B.050 Operations in adverse weather conditions

PROCEDURES

The aerodrome operator should, together with the air traffic services and other relevant parties operating at the aerodrome, establish and implement procedures required to mitigate the risk of operation of the aerodrome under adverse weather conditions such as strong winds, heavy rain, and thunderstorms, including the suspension of operations on the runway(s) if deemed necessary.

AMC1 MAR-ADR.OPS.B.055 Fuel quality

GENERAL

The aerodrome operator should verify, either by itself or through arrangements with third parties, that organisations involved in storing and dispensing of fuel to aircraft, implement procedures to:

(a) maintain the installations and equipment for storing and dispensing the fuel in such condition so as not to render unfit for use in aircraft;
(b) mark such installations and equipment in a manner appropriate to the grade of the fuel;
(c) take fuel samples at appropriate stages during the storing and dispensing of fuel to aircraft, and maintain records of such samples; and
(d) use adequately qualified and trained staff in storing, dispensing, and otherwise handling fuel on the aerodrome.

AMC1 MAR-ADR.OPS.B.065 Visual Aids and Aerodrome Electrical Systems

GENERAL

(a) The aerodrome operator should establish a monitoring system of aerodrome ground lights so as to inform the air traffic services provider when safe operation is no longer possible.
(b) The aerodrome operator should establish procedures for the operation of visual aids and, in coordination with the air traffic services provider, procedures to be implemented in the event of unserviceability of stop bars. The procedures should cover the situation where the stop bars cannot be turned off because of a technical problem, and the measures to be taken should not undermine the principle that a lit stop bar must not be crossed.
(c) The aerodrome operator should establish procedures for the provision and removal of temporary markings, lights and signs.

GM1 MAR-ADR.OPS.B.067 Arrestor gear

GENERAL

To ensure the safety of aerodrome operations in case arrestor gear is installed, the following topics should be addressed:
(a) Nose gear interference
To minimize potential damage to the nose gear deflectors, airplanes with such attachments should slow-taxi over the cable, avoiding the donuts. Normal procedure is for the rubber donuts to be approximately 6 ft (1.8 m) apart, starting 3 ft (0.91 m) from the runway centerline on runways 200 ft (61 m) or less in width.
(b) Trampling of arrestor gear
If an aircraft operator considers the trampling, or rolling over, of a cable to be too rough on the airplane, the arrestor gear may be removed from the runway.
(c) Adjustments to declared distances
Some airlines that operate on runways with arresting cables have reduced the available runway length by the distance from the operational end of the runway, or threshold, to the cable.
(d) Runway availability
An airplane following a military aircraft could experience a delay in landing if the military aircraft engages the arresting gear.

GM2 MAR-ADR.OPS.B.067 Arrestor gear

DISSEMENATION OF INFORMATION

(a) It is a national responsibility to define and promulgate within their own services, arresting system operating limitations for their own specific aircraft types.
(b) Information related to the arrestor gear should be published in the relevant en-route and flight planning documents that will define:
(1) Type and nomenclature.
(2) Location on runway.
(3) Direction of use.
(4) Readiness status (e.g. permanently installed, 10 minutes on request etc).

AMC1 MAR-ADR.OPS.B.070 Aerodrome works safety

GENERAL

(a) The procedures should be appropriate to the volume and nature of operations at the aerodrome.
(b) Construction or maintenance work on the movement area, or work affecting aerodrome operations should be planned, established, implemented, or approved by the aerodrome operator.
(c) The scope of work, physical extent, and time period should be notified to the relevant parties concerned. If such work will render limitations to the use of a particular runway, additional measures should be implemented to ensure safety. In case the works necessitate the temporary change of the declared distances of the runway, a recalculation of the declared distances should

be performed, in accordance with an established procedure, and the relevant information should be provided to the MAA-NLD, the air traffic services and aeronautical information services unit, before the implementation of the new declared distances. The aerodrome operator should also request the broadcast of relevant information via the local ATIS.

(d) Roles and responsibilities for operations and tasks associated with the reduction of runway length available and the work in progress (WIP) are clearly understood and complied with.

(e) The aerodrome operator should put in place appropriate measures to monitor the safety of the aerodrome and aircraft operations during aerodrome works such that timely corrective action is taken when necessary to assure continued safe operations.

(f) The aerodrome operator should ensure the works site is returned to operational use in a safe and timely manner by ensuring:
   (1) the works site is cleared of personnel, vehicles, and plant in a safe and timely manner;
   (2) The works-affected area is inspected for operational serviceability in accordance with the hand-back procedures; and
   (3) relevant authorities or organisations are notified of the restoration of aerodrome serviceability in accordance with procedures, using suitable means of communication.

AMC2 MAR-ADR.OPS.B.070 Aerodrome works safety

RUNWAY PAVEMENT OVERLAYS

The aerodrome operator should ensure that:

(a) when a runway is to be returned temporarily to an operational status before resurfacing is complete, the longitudinal slope of the temporary ramp, measured with reference to the existing runway surface or previous overlay course, should be:
   (1) 0.5 to 1.0 %for overlays up to and including 5 cm in thickness; and
   (2) not more than 0.5 % for overlays more than 5 cm in thickness.

(b) Runway overlaying proceeds from one end of the runway towards the other end so that based on runway utilisation, most aircraft operations will experience a down ramp.

(c) The entire width of the runway is overlaid during each work session.

(d) Before a runway being overlaid is returned to a temporary operational status, a runway centre line marking, conforming to the applicable specifications included in the aerodrome certification basis of the aerodrome, should be provided.

(e) The location of any temporary threshold should be identified by a 3.6 m wide transverse stripe.

AMC3 MAR-ADR.OPS.B.070 Aerodrome works safety

MARKING AND LIGHTING OF UNSERVICEABLE AREAS

(a) The aerodrome operator should ensure that:
   (1) unserviceability markers are displayed whenever any portion of a taxiway, apron, or holding bay is unfit for the movement of aircraft but it is still possible for aircraft to bypass the area safely;
   (2) on a movement area used at night, unserviceability lights should be used; and
   (3) Unserviceability markers and lights are placed at intervals sufficiently close so as to delineate the unserviceable area.

(b) Unserviceability markers should consist of conspicuous upstanding devices such as flags, cones, or marker boards.

(c) Unserviceability markers and lights should meet the specifications described in CS MAR-ADR.DSN.R.870.

AMC4 MAR-ADR.OPS.B.070 Aerodrome works safety

CLOSED RUNWAYS AND TAXIWAYS, OR PARTS THEREOF

The aerodrome operator should ensure that:

(a) a closed marking as defined in CS CS-ADR-DSN.R.855(c) is displayed on a temporarily closed runway, or taxiway, or a portion thereof, except that such a marking may be omitted when the closing is of short duration and adequate warning by air traffic services is provided;

(b) lighting on a closed runway or taxiway, or a portion thereof is not operated, except as required for maintenance purposes; and
(c) in addition to closed markings, when the runway, taxiway, or portion thereof is closed and is intercepted by a usable runway or taxiway which is used at night, unserviceability lights as defined in CS CS-ADR-DSN.R.870(c) should be placed across the entrance to the closed area at intervals not exceeding 3 m; and
(d) a closed runway or taxiway marking as defined in CS CS-ADR-DSN.R.855(c), or displayed on new runways and taxiways that are still under construction.

GM2 MAR-ADR.OPS.B.070 Aerodrome works safety

MINOR CONSTRUCTION/MAINTENANCE WORK

(a) A system of work permits should be established for minor works on the movement area.
(b) The objectives of the work permits should be such that:
  (1) no work is taking place on the movement area without the knowledge of aerodrome operator's staff and air traffic services;
  (2) permitted times of work are strictly followed; and
  (3) all individuals taking part in the work are briefed in detail on the following:
    (i) precise areas in which work may be done;
    (ii) the routes to be followed to and from the working area;
    (iii) the R/T procedures to be used;
    (iv) the safety precautions to be observed , the maintenance of a listening watch and the use of look-outs; and
    (v) the reporting procedure to be followed on completion of work.
(c) At the conclusion of work, aerodrome operator's staff, or other appropriate staff, should inspect the working area to ensure that it has been left in a satisfactory condition.

GM3 MAR-ADR.OPS.B.070 Aerodrome works safety

MAJOR CONSTRUCTION/MAINTENANCE WORK

(a) Before the commencement of any substantial work on the movement area, a liaison group comprising representatives from the aerodrome operator, air traffic services, apron management services, if applicable, and subcontractors' agents should be established.
(b) The group could meet, as often as considered necessary, to review progress, and consider the need for any change in working practices to meet operational requirements.
(c) As far as practicable, working areas should be blocked off from the active parts of the movement area by the erection of physical barriers.
(d) Consideration should be given to the marking and lighting of barriers.
(e) The lights of taxiways leading into working areas should be permanently 'off'.
(f) Before works commence, the following should be established:
  (1) the hours of work;
  (2) the authorised routes;
  (3) the communications facilities to be used;
  (4) the permitted heights of vehicles and equipment, and the limitations to be placed on operating heights of cranes; and
  (5) any limitation to be placed on use of electrical equipment which might cause interference with navigational facilities or aircraft communications.
(g) Contractors should be briefed for possible hazards to personnel working on aerodromes, in particular the jet blast problem and noise.
(h) Where contractors work on or traverse aircraft pavement areas, these areas should be inspected thoroughly before they are opened again for aircraft use, with particular attention to the presence of debris and the general cleanliness of the surface.
(i) Where aircraft are constantly using areas open to contractors, inspections at frequent intervals are required to ensure the continuing operational safety of the aerodrome.
(j) Adequate marking arrangements should be provided for crane jibs when extra conspicuity is considered desirable.
(k) If work is of prolonged duration, a constant watch is required to ensure that the marking and

lighting of obstacles and unserviceable areas does not degrade below acceptable limits.

(l) The effect of tall cranes on ILS and radar, in conjunction with those responsible for electronic landing aids and steps taken to reduce limitations to the minimum, should be considered.

GM5 MAR-ADR.OPS.B.070 Aerodrome works safety

USE OF TEMPORARY RUNWAY MARKINGS

(a) Circumstances may occur when it is not practicable to install permanent markings, for example during runway resurfacing. In order to provide sufficient visual guidance to aircraft, the following markings should be considered:
  (1) runway centre line;
  (2) taxiway centre line lead on/off;
  (3) runway edge line;
  (4) runway threshold; and
  (5) touchdown zone and aiming point markings.

(b) Centre line and edge marking widths can be replaced by temporary markings of reduced width from 0.9 m to 0.6 m, if required.

(c) Touchdown zone and aiming point markings should be painted as soon as possible after the resurface of the runway.

(d) Threshold markings should be painted as soon as possible, using temporary materials before making them permanent.

AMC1 MAR-ADR.OPS.B.075 Safeguarding of aerodromes

GENERAL

(a) The aerodrome operator should have procedures to monitor the changes in the obstacle environment, marking and lighting, and in human activities or land use on the aerodrome and the areas around the aerodrome, as defined in coordination with the MAA-NLD. The scope, limits, tasks and responsibilities for the monitoring should be defined in coordination with the relevant air traffic services providers, and with the MAA-NLD and other relevant authorities, and should ensure the protection of the sight lines from the established air traffic control tower, apron management services unit, and watch-room of the RFFS station(s), from permanent or temporary obstacles or activities.

(b) The limits of the aerodrome surroundings that should be monitored by the aerodrome operator are defined in coordination with the MAA-NLD and should include the areas that can be visually monitored during the inspections of the manoeuvring area.

(c) The aerodrome operator should have procedures to mitigate the risks associated with changes on the aerodrome and its surroundings identified with the monitoring procedures. The scope, limits, tasks, and responsibilities for the mitigation of risks associated to obstacles or hazards outside the perimeter fence of the aerodrome should be defined in coordination with the relevant air traffic services providers, and with the MAA-NLD and other relevant authorities.

(d) The risks caused by human activities and land use which should be assessed and mitigated should include:
  (1) obstacles and the possibility of induced turbulence;
  (2) the use of hazardous, confusing, and misleading lights;
  (3) the dazzling caused by large and highly reflective surfaces;
  (4) sources of non-visible radiation, or the presence of moving, or fixed objects which may interfere with, or adversely affect, the performance of aeronautical communications, navigation and surveillance systems; and
  (5) non-aeronautical ground light near an aerodrome which may endanger the safety of aircraft and which should be extinguished, screened, or otherwise modified so as to eliminate the source of danger.

AMC1 MAR-ADR.OPS.B.080(a) Marking and lighting of vehicles and other mobile objects

MARKING OF VEHICLES

(a) Vehicles to be marked should be coloured or display flags as follows:
  (1) Red or yellowish green colour should preferably be used for marking emergency vehicles and yellow colour for service vehicles.
  (2) When flags are used to mark vehicles, they should:
    (i) be displayed around, on top of, or around the highest edge of the vehicle. Flags should not increase the hazard presented by the vehicle they mark;
    (ii) not be less than 0.9 m on each side and should consist of a chequered pattern, each square having sides of not less than 0.3 m. The colours of the pattern should contrast each with the other and with the background against which they will be seen. Orange and white, or alternatively red and white should be used, except where such colours merge with the background.

LIGHTING OF VEHICLES

(b) Lighting of vehicles should be as follows:
  (1) Low-intensity obstacle lights, Type C, should be displayed on vehicles;
  (2) Low-intensity obstacle lights, Type C, displayed on vehicles associated with emergency or security should be flashing blue and those displayed on other vehicles should be flashing yellow;
  (3) Low-intensity obstacle lights, Type D, should be displayed on follow-me vehicles.
(c) Low-intensity obstacle lights, Types C and D should be in accordance with the specifications contained in Table Q-1, CS CS-ADR-DSN.U.930 and Figure U-1A or U-1B of CS CS-ADR-DSN, as appropriate.

AMC2 MAR-ADR.OPS.B.080(a) Marking and lighting of vehicles and other mobile objects

MARKING OF MOBILE OBJECTS OTHER THAN VEHICLES

(a) Mobile objects, other than vehicles, to be marked should be coloured or display flags as follows:
  (1) When they are marked by colour, conspicuous colours should be used.
  (2) When they are marked by flags, the flags should:
    (i) be displayed around, on top of, or around the highest edge of the object. Flags should not increase the hazard presented by the object they mark; and
    (ii) not be less than 0.9 m on each side and should consist of a chequered pattern, each square having sides of not less than 0.3 m. The colours of the pattern should contrast each with the other and with the background against which they will be seen. Orange and white, or alternatively red and white should be used, except where such colours merge with the background.

LIGHTING OF MOBILE OBJECTS OTHER THAN VEHICLE

(b) Lighting of mobile objects, other than vehicles, should be as follows:
  (1) Low-intensity obstacle lights, Type C, should be displayed on mobile objects;
  (2) Low-intensity obstacle lights on objects with limited mobility, such as aerobridges, shall be fixed-red, and as a minimum be in accordance with the specifications for low-intensity obstacle lights, Type A, in Table Q-1 of CS-ADR-DSN. The intensity of the lights shall be sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general levels of illumination against which they would normally be viewed.

AMC1 MAR-ADR.OPS.B.090 Use of the aerodrome by higher code letter aircraft

ELEMENTS TO BE ASSESSED

When assessing the possibility of operation of aircraft whose code letter is higher than the code letter of the aerodrome reference code or NATO AOS code, the aerodrome operator should, amongst other

issues, assess the impact of the characteristics of the aircraft on the aerodrome, its facilities, equipment and its operation, and vice versa.
Aircraft characteristics to be assessed include, but are not limited to:
(a) fuselage length;
(b) fuselage width;
(c) fuselage height;
(d) tail height;
(e) wingspan;
(f) wing tip vertical clearance;
(g) cockpit view;
(h) distance from the pilot's eye position to the nose landing gear and to the main landing gear;
(i) outer main gear wheel span;
(j) wheelbase;
(k) main gear steering system;
(l) landing gear geometry;
(m) engine data;
(n) flight performance; and
(o) technology evolution.

GM1 MAR-ADR.OPS.B.090 Use of the aerodrome by higher code letter aircraft

ELEMENTS TO BE ASSESSED

Further guidance on this issue is contained in ICAO Circular 305-AN/177 and ICAO Circular 301-AN/174 and NATO BiSC 85-5.
In any case, the elements that have to be taken into account for the safety assessment are, without prejudice to other assessments that may have to be conducted, in accordance with other applicable requirements contained in Part-ADR.OPS.
Such assessments should include, but are not limited to:
(a) the aircraft mass, tire pressure and ACN values — with regard to overload operations; and
(b) maximum passenger and fuel carrying capacity — with regard to level of RFFS protection to be provided and the aerodrome emergency planning.

AMC1 MAR-ADR.OPS.C.005 General

MAINTENANCE PROGRAMME

(a) The aerodrome operator should ensure that the maintenance programme:
  (1) specifies the aerodrome facilities, systems, installations and equipment subject to maintenance;
  (2) contains the necessary information for its timely and correct implementation including but not limited to:
    (i) the type of inspections/checks to be carried out (e.g. visual inspection, cleaning of equipment, equipment stability/alignment, calibration, etc.) for each facility, system, installation and equipment, taking also into account factors such as their location and meteorological phenomena;
    (ii) the frequency of inspections/checks for each facility, system, installation and equipment;
    (iii) the tools and equipment required for each type of inspection/check; and
    (iv) the periodic replacement of parts that may be required in accordance with the maintenance instructions of the manufacturer of the respective facility, system, installation and equipment, as appropriate.
(b) The aerodrome operator should ensure that arrangements are in place for timely corrective maintenance actions. Such arrangements should cover the cases of maintenance needs that are:
  (1) identified either during preventive maintenance activities; or
  (2) raised at any other time (e.g. due to equipment malfunction or failure).

AMC1 MAR-ADR.OPS.C.007(a) Maintenance of vehicles

MAINTENANCE OF VEHICLES — GENERAL

The maintenance of the vehicles may be performed by the aerodrome operator or by a contracted organisation. The maintenance programme should be individual for each vehicle, depending on its function and characteristics. The maintenance programme should take into account the following:
(a) regulatory requirements (e.g. certification of pressure vessels, hoses, roadworthiness certificates);
(b) the manufacturer's maintenance recommendations;
(c) local environmental conditions (e.g. heat versus cold winters);
(d) the need to ensure the serviceability of the equipment installed on the vehicle (e.g. radio, transponders or equivalent systems); and
(e) regular performance test results, if appropriate.

AMC1 MAR-ADR.OPS.C.007(a)(1) Maintenance of vehicles

PREVENTIVE MAINTENANCE

(a) As part of the preventive maintenance programme, the aerodrome operator should determine the items that need to be checked daily, prior to the operation of the vehicle. As a minimum, the following items should be checked on a daily basis, prior to the operation of a vehicle:
  (1) malfunction/warning indications;
  (2) steering wheel;
  (3) lighting system;
  (4) braking system;
  (5) communication systems, including transponder (or equivalent) if applicable;
  (6) tyre condition;
  (7) external mirrors;
  (8) windscreen wipers (as appropriate);
  (9) items that need to be secured on the vehicle;
  (10) leaks; and
  (11) new external damages to the vehicle.
(b) A feedback mechanism should be established to ensure that any defects identified are communicated to the unit responsible for the maintenance of the vehicle.

AMC1 MAR-ADR.OPS.C.007(b)(1) Maintenance of vehicles

MAINTENANCE PROCEDURES — GENERAL

Maintenance procedures should be established to ensure a standardised manner in which vehicles are maintained and should cover as a minimum:
(a) activities to be undertaken to ensure that disruption to aerodrome services (e.g. RFFS) is minimised;
(b) the frequency of maintenance services;
(c) activities to be undertaken at each type of maintenance service (e.g. visual check, inspections, measurements, etc.);
(d) arrangements for technical support from the manufacturer;
(e) spare parts that should be kept on site;
(f) procedures to ensure the safety of maintenance personnel;
(g) environmental procedures, including appropriate disposal procedures for old parts, and other material; and
(h) documentation and reporting of any defects that have been identified by operational and/or maintenance personnel.

AMC1 MAR-ADR.OPS.C.007(b)(2) Maintenance of vehicles

MAINTENANCE FACILITIES — GENERAL

If maintenance services and/or facilities are provided by a contracted organisation (located at the aerodrome or elsewhere), the aerodrome operator should have in place arrangements, to allow the timely maintenance of the vehicles in order to avoid disruptions to aerodrome operations.
Irrespective of the solution chosen, the aerodrome operator should ensure:
(a) the adequacy of the facilities for the maintenance activities and the storage of spare parts and other material;
(b) the provision of tools and equipment necessary for the maintenance activities, especially for RFFS vehicles and related equipment;
(c) the availability of maintenance documentation; and
(d) the provision of appropriate and adequate training to the personnel involved in maintenance activities.

AMC1 MAR-ADR.OPS.C.007(b)(3) Maintenance of vehicles

MAINTENANCE RECORDS

The maintenance records, as a minimum, should include the following:
(a) maintenance type (preventive/corrective);
(b) items checked/repaired;
(c) maintenance date (entry/exit date to/from the workshop); and
(d) name of the person that conducted the inspection/repair.

AMC1 MAR-ADR.OPS.C.007(c) Maintenance of vehicles

MAINTENANCE OF VEHICLES — OTHER ORGANISATIONS

The aerodrome operator should establish and implement an audit programme and/or control mechanism that allows ensuring compliance of the organisations operating or providing services at the aerodrome.
A feedback mechanism should be established with the aerodrome unit responsible for authorising the operation of vehicles as per MAR-ADR.OPS.B.026, to enable it to take appropriate action.

AMC2 MAR-ADR.OPS.C.007(c) Maintenance of vehicles

MAINTENANCE OF VEHICLES — OTHER ORGANISATIONS

(a) The maintenance programme should be individual for each vehicle, depending on its function and characteristics. The maintenance programme should take into account the following:
  (1) applicable regulatory requirements;
  (2) the manufacturer's maintenance recommendations;
  (3) local environmental conditions (e.g. heat versus cold winters);
  (4) the need to ensure the serviceability of the equipment installed on the vehicle (e.g. radio, transponders); and
  (5) regular performance test results, if appropriate.
(b) With regard to maintenance procedures, they should include at least specify:
  (1) the frequency of the maintenance services;
  (2) activities to be undertaken at each type of maintenance service (e.g. visual check, inspections, etc.); and
  (3) environmental procedures, including appropriate disposal procedures for old parts and other material.
(c) With regard to preventive maintenance, AMC1 MAR-ADR.OPS.C.007(a)(1) applies.
(d) With regard to record-keeping, AMC1 MAR-ADR.OPS.C.007(b)(3) applies.

AMC1 MAR-ADR.OPS.C.010 Maintenance of pavements, other ground surfaces, and drainage

GENERAL

(a) Mud, dust, sand, oil, rubber deposits, and other pollutants should be removed, as rapidly and completely as possible, to minimise accumulation.
(b) Taxiways and aprons should be kept clear of pollutants to the extent necessary to enable aircraft to be taxied to and from an operational runway.
(c) Drainage systems and storm water collection systems should be periodically checked and, if necessary cleaned or maintained, to ensure efficient water run-off.
(d) The surface of a paved runway should be evaluated when constructed or resurfaced to determine that the surface friction characteristics achieve the design objectives.

GM1 MAR-ADR.OPS.C.010(b)(1) Pavements, other ground surfaces, and drainage

OVERLOAD OPERATIONS

(a) Overloading of pavements can result either from loads too large, or from a substantially increased application rate, or both. Loads larger than the defined (design or evaluation) load shorten the design life, whilst smaller loads extend it. With the exception of massive overloading, pavements in their structural behaviour are not subject to a particular limiting load above which they suddenly or catastrophically fail. Behaviour is such that a pavement can sustain a definable load for an expected number of repetitions during its design life. As a result, occasional minor overloading is acceptable, when expedient, with only limited loss in pavement life expectancy, and relatively small acceleration of pavement deterioration. For those operations in which magnitude of overload and/or the frequency of use do not justify a detailed analysis, the following criteria are suggested:
  (1) for flexible pavements, occasional movements by aircraft with ACN not exceeding 10 % above the reported PCN should not adversely affect the pavement;
  (2) for rigid or composite pavements, in which a rigid pavement layer provides a primary element of the structure, occasional movements by aircraft with ACN not exceeding 5 % above the reported PCN should not adversely affect the pavement;
  (3) if the pavement structure is unknown, the 5 % limitation should apply; and
  (4) the annual number of overload movements should not exceed approximately 5 % of the total annual aircraft movements.
(b) Such overload movements should not normally be permitted on pavements exhibiting signs of distress or failure. Furthermore, overloading should be avoided during any periods of thaw following frost penetration, or when the strength of the pavement or its subgrade could be

weakened by water. Where overload operations are conducted, the aerodrome operator should review the relevant pavement condition regularly, and should also review the criteria for overload operations periodically since excessive repetition of overloads can cause severe shortening of pavement life, or require major rehabilitation of pavement.

AMC1 MAR-ADR.OPS.C.010(b)(3) Maintenance of pavements, other ground surfaces and drainage

MAINTENANCE PLANNING AND MINIMUM STANDARDS

(a) When friction measuring devices are used in order to evaluate the condition of the runway surface for maintenance purposes, the maintenance planning and minimum friction levels should be according to the following table:

	65 km/h		95 km/h	
	Minimum	**Maintenance planning**	**Minimum**	**Maintenance planning**
Airport Surface Friction Tester	0.50	0.60	0.34	0.47
Dynatest Consulting Inc. Dynatest Runway Friction Tester	0.50	0.60	0.41	0.54
Findlay, Irvine, Ltd Griptester Friction Meter	0.43	0.53	0.24	0.36
Halliday Technologies RT3	0.45	0.55	0.42	0.52
Moventor Oy Inc. BV-11 Skiddometer	0.50	0.60	0.34	0.47
Mu Meter	0.42	0.52	0.26	0.38
NAC Dynamic Friction Tester	0.42	0.52	0.28	0.38
Norsemeter RUNAR (operated at fixed 16 % slip)	0.45	0.52	0.32	0.42
Automatic Friction Measuring Device (Instrument de Mesure Automatique de Glissance) – IMAG	0.30	0.40	0.20	0.30

Table 1

(b) Other friction measuring devices can be used, provided they have been correlated with, at least, one test equipment mentioned in the table above.
(c) Measurements at or below the maintenance planning level trigger a complete survey of the texture, contaminant and drainage state of the affected runway third.
(d) A complete survey should ensure that the runway surface is able to create enough grip by the aeroplane tyre to ensure adequate aeroplane stopping and crosswind capability for the desired operation on a wet runway. This is achieved by ensuring that:
  (1) exposed texture can indent the tyre rubber; and
  (2) water drains from the runway pavement.
(e) In order to achieve the objectives of point (d), an inspection of the surface friction characteristics should, as a minimum, ensure:
  (1) the presence of exposed microtexture by touching the aggregates, if the polished or rubber coated extends to 100 m in the zone used by aeroplanes;
  (2) the presence of macrotexture;
  (3) that grooves, if present, are open and within set limits according to their design;
  (4) that porous friction course, if present, drains according to its design; and
  (5) that slopes are above minimum design specifications.

AMC1 MAR-ADR.OPS.C.010(b)(4) Maintenance of pavements, other ground surfaces and drainage

PERIODIC ASSESSMENTS OF RUNWAY SURFACE FRICTION CHARACTERISTICS

The aerodrome operator when establishing a plan of periodic assessments of runway surface friction

characteristics, should take into consideration the number of jet aircraft movements per runway end, the weight of the aircraft, the type and age of the surface of the runway as well as climatic conditions.

AMC2 MAR-ADR.OPS.C.010(b)(4) Maintenance of pavements, other ground surfaces and drainage

TREND MONITORING OF RUNWAY SURFACE FRICTION CHARACTERISTICS

The aerodrome operator should monitor the trend of degradation of runway surface friction characteristics that is caused by:
(a) rubber deposits;
(b) surface polishing; and
(c) poor drainage.

AMC3 MAR-ADR.OPS.C.010(b)(4) Maintenance of pavements, other ground surfaces and drainage

FUNCTIONAL FRICTION EVALUATIONS WITH CONTINUOUS FRICTION MEASURING DEVICES

The aerodrome operator when conducting functional friction evaluations with continuous friction measuring device, should:
(a) for friction evaluations on runways at 65 km/h, begin recording the data 150 m from the threshold end to allow for adequate acceleration distance and terminate approximately 150 m from the opposite end of the runway to allow for adequate distance to safely decelerate the vehicle;
(b) for friction evaluations on runways at 95 km/h, begin recording the data 300 m from the threshold end to allow for adequate acceleration distance and terminate approximately 300 m from the opposite end of the runway to allow for adequate distance to safely decelerate the vehicle; and
(c) conduct the surveys at a distance from the runway centre line that is representative of the wheel span of the aeroplanes operating on the runway.
The aerodrome layout or other circumstances may dictate other distances in order to ensure the personal safety of the operator of the friction measuring device.

AMC4 MAR-ADR.OPS.C.010(b)(4) Maintenance of pavements, other ground surfaces and drainage

RUNWAY SURFACE FRICTION CHARACTERISTICS EVALUATION WITHOUT FRICTION MEASURING DEVICES

(a) The evaluation should be conducted for the full width and length of the pavement and should focus on:
    (1) slopes;
    (2) texture; and
    (3) drainage.
(b) The area symmetrical from the centre line representative of the wheel span of the aeroplanes operating on the runway should be inspected with special focus on:
    (1) rubber deposits;
    (2) polishing of aggregates; and
    (3) amount of exposed texture.

AMC1 MAR-ADR.OPS.C.015(a);(f) Maintenance of visual aids and electrical systems

ELECTRICAL SYSTEMS

(a) Schedules of routine maintenance of the individual elements of the aerodrome’s electrical systems should be based on manufacturers' instructions, adjusted to the aerodrome operator's experience regarding the frequency of malfunctions.
(b) The maintenance programme should, as a minimum, include the following:
    (1) power cables and distributors in field;
    (2) transformers and regulators;

(3) transformer stations for electric power supply;
(4) relay and switch cabinets;
(5) control cables, monitoring units and control desk;
(6) secondary power supply; and
(7) fixed ground power supply for aircraft,
and should contain the frequency of the scheduled maintenance activities and the elements that should be checked during each inspection.

(c) Checklists to be used during the scheduled maintenance activities should be developed by the aerodrome operator.

(d) The relevant procedures should cover the maintenance activities for each area, including the way such activities should be implemented.

GM1 MAR-ADR.OPS.C.015(b) Maintenance of visual aids and electrical systems

LIGHTING SYSTEMS — ALLOWABLE PERCENTAGES OF SERVICEABLE LIGHTS

The allowable percentages of serviceable lights are shown in Table 1 below.

Light type	CAT II/III approach	CAT I approach	RVR<550 m take-off	RVR>550 m take-off
Approach inner 450 m	95 %	85 %	-	-
Approach outer 450 m	85 %	85 %	-	-
Runway threshold	95 %	85 %	-	-
Runway centre line	95 %	85 %	95 %	85 %
Runway edge	95 %	85 %	95 %	85 %
Runway end	75 %	85 %	75 %	85 %
Touchdown zone	90 %	(85 %)a	-	-
Note (a): If touchdown zone lights are available. ***Note (b): The table covers only the lighting systems for which the requirement provides for a percentage.***				

Table 1: Allowable percentages of serviceable lights

AMC1 MAR-ADR.OPS.C.015(b);(f) Maintenance of visual aids and electrical systems

LIGHTING SYSTEMS

GROUND CHECKS

(a) As part of the maintenance programme, the lighting system maintenance activities should include ground checks. During the daily checks, the lighting systems should be checked at least for light failures, breakage or gross misalignment and correct operation of the intensity control system. The maintenance programme should identify the frequency of other checks that need to be performed throughout the year, as well as their content. Moreover, irrespective of the runway type, the aerodrome operator should ensure the serviceability of the lights by conducting photometric measurements, at appropriate intervals, as part of the maintenance programme.

(b) Ground checks of visual approach slope indicator systems (VASIS) should determine their alignment and serviceability. The alignment of VASIS should be checked at defined intervals, taking into account environmental conditions (e.g. rain, drought, etc.) that may affect the stability of the system, using an appropriate intensity setting. Additional checks should be conducted following an aircraft occurrence. Errors in excess of one minute of arc should be corrected. The maintenance programme should also cover the obstacle protection surface of the VASIS to ensure that it is clear of all obstacles.
The serviceability of VASIS should be checked on each runway inspection. With regard to serviceability of the precision approach path indicator (PAPI) and abbreviated precision approach path indicator (APAPI), a unit should be considered to be unserviceable if more than one light is unserviceable and the unit consists of three or more lights; or at least one light is unserviceable and the unit consists of less than three lights. In addition, whenever a red filter does not produce the correct colour light beam, is missing, or is damaged, all the lights associated with that filter should be extinguished until the red filter is rectified.

(c) For a precision approach runway category II or III:

(1) The system of preventive maintenance employed should include at least the following checks:
   (i) visual inspection and in-field measurement of the intensity, beam spread and orientation of lights included in the approach and runway lighting systems;
   (ii) control and measurement of the electrical characteristics of each circuitry included in the approach and runway lighting systems; and
   (iii) control of the correct functioning of light intensity settings used by air traffic control.
(2) In-field measurement of intensity, beam spread and orientation of lights included in approach and runway lighting systems should be undertaken by measuring all lights, as far as practicable, to ensure conformance with the appropriate figure in CS CS-ADR-DSN.U.940.
(3) Measurement of intensity, beam spread and orientation of lights included in approach and runway lighting systems should be undertaken using an appropriate measuring unit of sufficient accuracy to analyse the characteristics of the individual lights.
(4) The frequency of measurement should be based on traffic density, the local pollution level, the reliability of the installed lighting equipment and the continuous assessment of the results of the in-field measurements but, in any event, should not be less than twice a year for in-pavement lights and not less than once a year for other lights.

FLIGHT CHECKS

(d) As part of the maintenance programme of the lighting systems, flight check of the approach, runway and taxiway lighting systems, VASIS, aerodrome beacon, and the light intensity control system should be carried out at regular intervals, at least on a yearly basis, to ensure that the pattern is correct and that lights are operating properly. Special flight checks should be arranged in case of major maintenance of, or changes to, such systems, as well as before the commissioning of new systems, both at day and night.

AMC1 MAR-ADR.OPS.C.015(d) Maintenance of visual aids and electrical systems

REMOVAL OF MARKINGS

Whenever, for maintenance or other purposes (e.g. relocation of markings, redesign of pavements), a marking on the movement area is not needed any longer, the marking should be physically removed. In no case should a non-needed marking be painted over.
The removal of the marking may be accomplished by using various techniques, but irrespectively of the technique used, it should not cause damage to the pavement or parts of the lighting systems.
In order to eliminate the visual appearance of the removed marking(s) on the pavement, the physical removal of any old marking(s) should include a predetermined larger size and shape of the area occupied by the marking(s), that encompasses the old marking(s), and by grouping adjacent markings together into a larger rectangular removal area.

AMC1 MAR-ADR.OPS.C.015(d);(f) Maintenance of visual aids and electrical systems

MARKINGS AND SIGNS

(a) Markings
   A system of preventive maintenance of visual aids should be employed to ensure marking system reliability, both day and night. All markings should be inspected thoroughly at least semiannually, depending on local weather conditions, and corrective action should be taken in case of need, such as peeling, discolourment, fading, or accumulation of deposits.
(b) Signs
   Maintenance should ensure integrity and perfect legibility of the information provided by the signs. Checks for each sign should be both scheduled (daily, annual) and unscheduled, and should take into account the instructions of the manufacturer.

SUBPART D — APRON MANAGEMENT OPERATIONS (NLD-MAR-ADR.OPS.D)

AMC1 MAR-ADR.OPS.D.005 Apron boundaries

PUBLICATION OF THE APRON BOUNDARIES

A graphical illustration of the apron boundaries should be shown in the Aerodrome Chart — ICAO.

AMC1 MAR-ADR.OPS.D.010(a)(2);(b)(2) Coordination of aircraft entry to / exit from the apron

DESIGNATED AIR–GROUND COMMUNICATION FACILITIES

(a) Depending on the aerodrome layout, traffic density and availability of radio frequencies, air–ground communication facilities allocated to air traffic services (ATS) may also be used at the apron.
(b) The following information should be provided for publication in the aeronautical information publication (AIP) in regard to air–ground communication facilities used at the apron:
  (1) service designation;
  (2) call sign;
  (3) channel(s)/frequency(ies);
  (4) hours of operation; and
  (5) remarks.

AMC1 MAR-ADR.OPS.D.015(a) Management of aircraft movements on the apron

AIRCRAFT GUIDANCE

Instructions to aircraft should be given either by:
(a) issuing verbal instructions on a predetermined air–ground communication facility; or
(b) using a 'FOLLOW ME' vehicle; or
(c) appropriate marshalling hand signals; or
(d) instructions by loadmasters dedicated to the aircraft; or
(e) any combination of the above.

AMC1 MAR-ADR.OPS.D.015(c) Management of aircraft movement on the apron

PROTECTION OF ROUTES TO BE FOLLOWED BY A MOVING AIRCRAFT (TAXI ROUTES)

The protection of the taxi route of a moving aircraft should be provided by:
(a) segregating taxi routes from vehicular traffic and pedestrian movement;
(b) designating dedicated areas for the parking of vehicles and equipment; and
(c) minimising the crossing of apron taxiways, and when this is not possible because of the apron layout, by allowing crossing only at designated and clearly marked locations.

AMC1 MAR-ADR.OPS.D.025(a)(3) Aircraft stand allocation

COMMUNICATION OF THE ASSIGNED AIRCRAFT STAND TO THE PERSONNEL DIRECTLY RESPONSIBLE FOR THE MANOEUVRING OF THE AIRCRAFT

The information on the stand assigned to arriving aircraft should be communicated to the personnel responsible for the manoeuvring of arriving aircraft:
(a) through a radio frequency; or
(b) through data link communication; or
(c) with a 'FOLLOW ME' vehicle; or
(d) with marshalling hand signals; or
(e) with a visual docking guidance system; or
(f) any combination of the above.

GM1 MAR-ADR.OPS.D.025(b)(1) Aircraft stand allocation

CONSIDERATION OF AIRCRAFT CHARACTERISTICS FOR AIRCRAFT STAND ALLOCATION

The following aircraft characteristics are to be considered for the allocation of a stand:

(a) Fuselage length

The fuselage length is relevant for:

(1) the dimension of the movement area (taxiway holding bays and aprons), passenger gates and terminal areas; and

(2) the clearance at the aircraft stand.

(b) Sill height

The sill height is relevant for:

(1) the operational limits of the passenger boarding bridges (including the number of passenger boarding bridges needed);

(2) the mobile steps; and

(3) the access of vehicles for passengers with reduced mobility (PRM).

(c) Tail height

The tail height is relevant for:

(1) de-icing/anti-icing facilities; and

(2) protection of the aerodrome's obstacle limitation surfaces.

(d) Wingspan

The wingspan is relevant for:

(1) the dimensions of aprons and holding bays;

(2) the stand selection; and

(3) the clearance at the aircraft stand.

(e) Wing tip vertical clearance

The wing tip vertical clearance is relevant for apron and holding bay clearances with height-limited objects.

(f) Cockpit view

The relevant geometric parameters to assess the cockpit view are the cockpit height, the cockpit cut-off angle, and the corresponding obscured segment. The cockpit view is relevant for maintaining a view of the stand entry guidance.

(g) Engine characteristics

The engine characteristics include engine geometry and engine airflow characteristics, which may affect aerodrome infrastructure, as well as aircraft groundhandling and the operations taking place in adjacent areas which are likely to become affected from jet blast.

(1) The engine geometry aspects are the following:

(h) the number of engines;

(i) the location of the engines (span and length);

(ii) the vertical clearance of the engines; and

(iii) the vertical and horizontal extension of possible jet blast.

(2) The engine airflow characteristics are the following:

(i) idle and breakaway thrust; and

(ii) inlet suction effects at ground level.

GM1 MAR-ADR.OPS.D.025(b)(2) Aircraft stand allocation

PARKING AIDS

The following are considered parking aids:

(a) a visual or an advanced visual docking guidance system;

(b) a marshaller.

AMC1 MAR-ADR.OPS.D.035(a) Aircraft parking

MONITORING OF AIRCRAFT STAND

The monitoring of an aircraft during its arrival to the assigned stand should be conducted either by assigned personnel at the stand or through cameras in order to verify that clearance distances are

maintained.

AMC1 MAR-ADR.OPS.D.035(b) Aircraft parking

GUIDANCE OF AIRCRAFT DURING PARKING MANOEUVRES

Either of the following means should be used to guide an aircraft during parking manoeuvres:
(a) a visual or an advanced visual docking guidance system; or
(b) a marshaller(s); or
(c) loadmasters.

AMC2 MAR-ADR.OPS.D.035(b) Aircraft parking

OPERATION OF VISUAL AND ADVANCED VISUAL DOCKING GUIDANCE SYSTEMS

The procedure for the operation of visual and advanced visual docking guidance systems should:
(a) require the activation of the docking guidance system only when the stand is considered safe for use by the arriving aircraft and the involved personnel in charge of parking operations are present;
(b) require the activation of the docking guidance system before the aircraft arrives at the stand;
(c) require to check the suitability of the docking guidance system for the type of aircraft the use of the stand is intended for; and
(d) include emergency procedures to inform the flight crew when the parking operation has to be discontinued.

AMC3 MAR-ADR.OPS.D.035(b) Aircraft parking

PROCEDURE FOR THE PROVISION OF MARSHALLING SERVICES

(a) The procedure for marshalling services, established by the aerodrome operator, should require the provision of marshalling services where visual or advanced visual docking guidance systems do not exist or are unserviceable, or where guidance to aircraft parking is required to avoid a safety hazard.
(b) The procedure should include comprehensive written instructions for marshallers, including:
    (1) the need for the marshaller to ensure, before making the authorised hand signals, that the area within which the aircraft will be guided is clear of obstacles which the aircraft, in complying with their hand signals, might otherwise hit;
    (2) the circumstances where one or more marshallers may be used and the circumstances when wing walkers are necessary; and
    (3) the action to be taken in the event of an emergency or incident involving an aircraft and/or a vehicle during marshalling.

AMC1 MAR-ADR.OPS.D.035(c) Aircraft parking

INSPECTION OF VISUAL/ADVANCED VISUAL DOCKING GUIDANCE SYSTEMS

Where a visual/advanced visual docking guidance system is provided, the aerodrome operator should ensure that the stopping guidance element is calibrated and is clearly and unambiguously indicated to all selected aircraft. The visual/advanced visual docking guidance system should be regularly checked for accuracy. Such systems should be subjected to daily serviceability checks whose results should be recorded.

AMC1 MAR-ADR.OPS.D.050(a)(2) Alerting of emergency services

MEANS TO ALERT THE EMERGENCY SERVICES

The following means should be available to alert the emergency services:
    (1) radios; or
    (2) telephones; or

(3) emergency buttons; or
(4) any combination of the above.

AMC1 MAR-ADR.OPS.D.055(a) Jet blast precautions

INFORMATION ON HAZARDS

Information on the hazards caused by jet blast and propeller slipstream should be provided to the apron users through:
(a) safety training; or
(b) safety promotion; or
(c) a combination of the above.

AMC1 MAR-ADR.OPS.D.055(d) Jet blast precautions

PUBLICATION OF REQUEST FOR MINIMUM THRUST

The request to pilots for minimum thrust at specific locations at the apron should be published in the aeronautical information publication (AIP). If necessary, information signs may be installed at these locations.

AMC1 MAR-ADR.OPS.D.080(a)(1);(2) Training and proficiency check programme of marshallers and 'FOLLOW-ME' drivers

TRAINING FOR MARSHALLERS

(a) As part of the training programme, the initial training for marshallers should cover, at least, the following aspects:
(1) the role and responsibilities of the marshaller;
(2) the visual signals included in STANAG 3117;
(3) aircraft characteristics, both physical and operational, which relate to the manoeuvring of aircraft within the confines of the apron;
(4) safety procedures around the aircraft and particularly around the engines;
(5) emergency procedures in the event of an accident or an incident at the apron;
(6) low-visibility procedures;
(7) driving at the apron;
(8) emergency stop procedures for visual or advanced visual docking guidance systems, if applicable; and
(9) aircraft stand configuration and layout.
(b) Marshallers should be briefed or, if required, trained in new procedures or in changes to existing procedures.

AMC1 MAR-ADR.OPS.D.080(a)(2);(b)(2)(i) Training and proficiency check programme of marshallers and 'FOLLOW-ME' drivers

TRAINING FOR 'FOLLOW-ME' VEHICLE DRIVERS

(a) As part of the training programme, the initial training for 'FOLLOW ME' drivers should cover, at least, the following aspects:
(1) the role and responsibilities of the 'FOLLOW-ME' driver;
(2) the content of AMC2 MAR-ADR.OPS.B.025 'Operation of vehicles';
(3) 'FOLLOW-ME' specific communication procedures, including radiotelephony procedures;
(4) the visual signals included in STANAG3117;
(5) aircraft taxiing speed and appropriate aircraft–vehicle spacing;
(6) specific procedures for guiding aircraft and/or vehicles;
(7) aircraft characteristics, both physical and operational;
(8) 'FOLLOW-ME' specific procedures for low-visibility operations;
(9) emergency procedures in the event of an accident or an incident; and
(10) the operation of 'FOLLOW-ME' vehicles and their equipment.

(b) 'FOLLOW-ME' vehicle drivers should be briefed or, if required, trained in new procedures or in changes to existing procedures.

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

(a) The intent of the reference code is to provide a simple method for interrelating the numerous specifications concerning the characteristics of aerodromes so as to provide a series of aerodrome facilities that are suitable for the aeroplanes that are intended to operate at the aerodrome. The code is not intended to be used for determining runway length or pavement strength requirements. The code is composed of two elements which are related to the aeroplane performance characteristics and dimensions.

(b) Element 1 is a number based on the aeroplane reference field length, and element 2 is a letter based on the aeroplane wingspan. The code letter or number within an element selected for design purposes is related to the critical aeroplane characteristics for which the facility is provided. When applying CS-ADR-DSN text, the aeroplanes which the aerodrome is intended to serve, are first identified and then the two elements of the code.

(c) In addition to the reference code, other aircraft characteristics, such as aircraft length and tail height, may also have an impact on the design of an aerodrome. Additionally, some characteristics of a piece of infrastructure are directly related to one element of the code (wingspan or wheel span) but are not impacted by other. The aerodrome designer should consider all the relationships between aircraft characteristics and aerodromes and piece of infrastructures characteristics.

(d) It is not intended that the specifications deriving from the aerodrome reference code limit or regulate the operation of an aircraft.

(e) It is recognised that not all areas of the aerodrome should need to correspond to the critical aeroplane that determines the Aerodrome Reference Code. Elements of the aerodrome infrastructure that do not meet the requirements of the Aerodrome Reference Code for the design aeroplane should be designated with an appropriate code letter for its dimensions. Limitations should be identified to aircraft size permitted or operating limitations. ICAO, Annex 14 does not provide sufficient flexibility for infrastructure intended for different sizes of aircraft. It only addresses the 'design aircraft'. This enables all areas of the aerodrome to reflect the aerodrome reference code.

(f) Further guidance on aerodrome reference code and on planning for aeroplanes with wingspans greater than 80 m is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways, and Part 2, Taxiways, Aprons and Holding Bays.
Additional guidance on determining the runway length is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.
Note: References to the ICAO documents provided in CS-ADR-DSN are made for additional guidance. Changes in the CS-ADR-DSN regarding the aerodrome reference code are not yet fully reflected in these documents.

(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.

GM2 CS-ADR-DSN.A.005 Aerodrome reference code (ARC)

(a) In addition to the aerodrome reference code, a NATO Aircraft Operating Surface (AOS) group code can be determined in accordance with the characteristics of the operations for which an aerodrome facility is primarily intended.

(b) The NATO AOS group code should be determined from Table A-2, by selecting the code which corresponds to the NATO aircraft type for which the facility is primarily intended.

AOS groups:	**Aircraft:**	**Type of operations:**
RWA	Rotary Wing Aircraft	All forms of helicopters.

TFA, to include UAV	Tactical Fighter Aircraft	Fixed wing, manned aircraft primarily employed for Air Defence and Bomber (air-to-surface attacks) but also for Electronic Warfare (EW), Suppression of Enemy Air Defence (SEAD) as well as Tactical Air Reconnaissance, these roles may also be provided by the use of Unmanned Aerial Vehicles
TTA , to include MPA	Tactical Transport Aircraft, to include Maritime Patrol Aircraft	Fixed wing aircraft with relatively short take-off and landing characteristics, primarily employed for the transport of personnel (including paratroopers) and cargo over short/medium distances
AGS	Alliance Ground Surveillance Aircraft	Unmanned aircraft assigned to airborne ground surveillance and/or control.
AEW	Airborne Early Warning & Control Aircraft	Larger aircraft assigned to airborne surveillance, command and control.
STA, to include AAR	Strategic Transport Aircraft, to include Air-to-Air Refuelling Aircraft	Long range wide bodied aircraft for the transport of personnel and cargo up to 300000kg max. Take-off weight.
STA+	Strategic Transport Aircraft, Heavy	Long range large bodied aircraft for the transport of personnel and cargo equal to or above 300000kg max. Take-off weight.
SBA	Strategic Bomber Aircraft	Long range aircraft for delivery of bombs and missiles

Table A-2

(c) To provide an aircraft pavement suitable for the dual function of transit to/from the runway and to provide a military emergency runway (normally parallel to the main runway and usable and accountable as taxiway) for operational redundancy with military aircraft. This facility will not have the complete characteristics of a fully operational runway. Exceptional considerations may apply.
(d) Requirements for military emergency runways are published by NATO in BiSC85-05.

GM1 CS-ADR-DSN.B.030 Runway threshold

(a) Additional distance should be provided to meet the requirements of the runway end safety area as appropriate.
(b) Where this displacement is due to an unserviceable runway condition, a cleared and graded area of at least 60 m in length should be available between the unserviceable area and the displaced threshold.
(c) Guidance Material on the survey requirements for aerodromes is provided in the ICAO World Geodetic system – 1984 (WGS-84) Manual, notably in Section 5.3. However, this guidance does not accurately define the survey locations for the runway edge or the runway threshold because, in both cases, the measurement point is not the centre of the relevant paint marking.
(d) Location of threshold:
  (1) The threshold is normally located at the extremity of a runway if there are no obstacles penetrating above the approach surface. In some cases, however, due to local conditions it may be desirable to displace the threshold permanently (see below). When studying the location of a threshold, consideration should also be given to the height of the ILS reference datum, and/or MLS approach reference datum, and the determination of the obstacle clearance limits. Specifications concerning the height of the ILS reference datum and MLS approach reference datum are given in ICAO Annex 10, Volume I.
  (2) In determining that no obstacles penetrate above the approach surface, account should be taken of mobile objects (vehicles on roads, trains, etc.) at least within that portion of the approach area within 1 200 m longitudinally from the threshold and of an overall width of not less than 150 m.
(e) Displaced threshold:
  (1) If an object extends above the approach surface and the object cannot be removed, consideration should be given to displacing the threshold permanently.
  (2) To meet the obstacle limitation objectives of the certification specifications prescribed in Chapter H, the threshold should ideally be displaced down the runway for the distance necessary to provide that the approach surface is cleared of obstacles.
  (3) However, displacement of the threshold from the runway extremity should inevitably cause reduction of the landing distance available, and this may be of greater operational significance than penetration of the approach surface by marked and lighted obstacles. A decision to displace the threshold, and the extent of such displacement, should, therefore, have regard to an optimum balance between the considerations of clear approach surfaces and adequate landing distance. In deciding this question, account should need to be taken of the types of aeroplanes which the runway is intended to serve, the limiting visibility and cloud base conditions under which the runway should be used, the position of the obstacles in relation to the threshold and extended centre line, and, in the case of a precision approach runway, the significance of the obstacles to the determination of the obstacle clearance limit.
  (4) Notwithstanding the consideration of landing distance available, the selected position for the threshold should not be such that the obstacle-free surface to the threshold is steeper than 3.3 % where the code number is 4 or steeper than 5 % where the code number is 3.
  (5) In the event of a threshold being located according to the criteria for obstacle-free surfaces in the preceding paragraph, the obstacle marking requirements of Chapter Q should continue to be met in relation to the displaced threshold.
  (6) Depending on the length of the displacement, the RVR at the threshold could differ from that at the beginning of the runway for take-offs. The use of red runway edge lights with photometric intensities lower than the nominal value of 10 000 cd for white lights increases that phenomenon.

GM1 CS-ADR-DSN.B.035 Length of the runway and declared distances

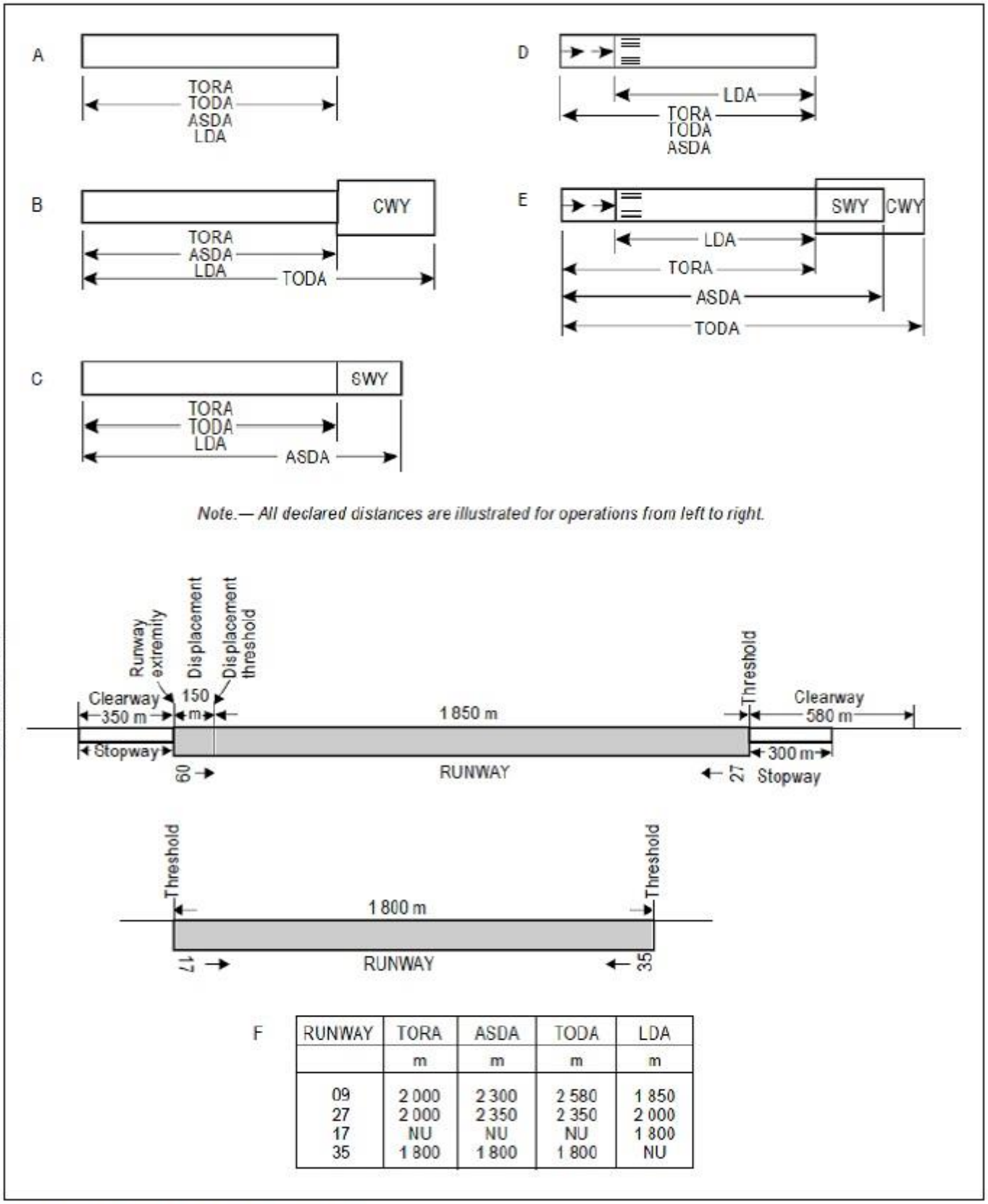
(a) Length of the runway:
  (1) This specification does not necessarily mean providing for operations by the critical aeroplane at its maximum mass.
  (2) Both take-off and landing requirements need to be considered when determining the length of runway to be provided and the need for operations to be conducted in both directions of the

runway.

(3) Local conditions that may need to be considered include elevation, temperature, runway slope, humidity, and the runway surface characteristics.

(4) When performance data on aeroplanes for which the runway is intended, are not known, guidance on the determination of the actual length of a primary runway by application of general correction factors is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.

(5) Except as provided in GM1 CS-ADR-DSN.B.040, the actual runway length to be provided for a runway should be adequate to meet the operational requirements of the aeroplanes for which the runway is intended, and should be not less than the longest length determined by applying the corrections for local conditions to the operations and performance characteristics of the relevant aeroplanes.



RUNWAY	TORA	ASDA	TODA	LDA
	m	m	m	m
09	2 000	2 300	2 580	1 850
27	2 000	2 350	2 350	2 000
17	NU	NU	NU	1 800
35	1 800	1 800	1 800	NU

Figure GM-B-1. Illustration of declared distances

GM1 CS-ADR-DSN.B.040 Runways with stopways, or clearways

Where a runway is associated with a stopway or clearway, an actual runway length less than that resulting from application of GM1 CS-ADR-DSN.B.035 as appropriate, may be considered satisfactory but, in such a case, any combination of runway, stopway, and clearway provided should permit

compliance with the operational requirements for take-off and landing of the aeroplanes the runway is intended to serve.

GM1 CS-ADR-DSN.B.045 Width of runways

(a) The combinations of code numbers and OMGWSs for which widths are specified have been developed for typical aeroplane characteristics.
(b) Factors affecting runway width are given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.
(c) See CS CS-ADR-DSN.B.125 to CS CS-ADR-DSN.B.145 concerning the provision of runway shoulders, in particular for code F aeroplanes with four (or more) engines.

GM2 CS-ADR-DSN.B.045 Width of runways

(a) For military purposes, the following runway width requirements may apply for each AOS group:

AOS Groups	**Width [m]**
RWA	22,5
TFA*, to include UAV* & TTA* , to include MPA	30
AGS, AEW, STA, to include AAR	45
STA+ , SBA	60
*Required width for emergency runways is 22,5m	

Table B-2

GM1 CS-ADR-DSN.B.050 Minimum distance between parallel non-instrument runways

(a) Except that for independent parallel approaches, combinations of minimum distances and associated conditions other than those specified in the PANS-ATM (Doc 4444) may be applied when it is determined that such combinations would not adversely affect the safety of aircraft operations.
(b) Procedures for wake turbulence categorisation of aircraft and wake turbulence separation minima are contained in the Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM), Doc 4444, Chapter 4, 4.9 and Chapter 5, 5.8, respectively.

GM1 CS-ADR-DSN.B.065 Longitudinal slopes changes on runways

(a) Slope changes are so designed as to reduce dynamic loads on the undercarriage system of the aeroplane. Minimising slope changes is especially important on runways where aircraft move at high speeds.
(b) For precision approach runways, slopes in a specified area from the runway end, and including the touchdown area, are so designed that they should correspond to the characteristics needed for such type of approach.

GM1 CS-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.

GM1 ADR-DSN.B.075 Distance between slope changes on runways

The following example illustrates how the distance between slope changes is to be determined (see Figure GM-B-2):

D for a runway where the code number is 3 should be at least:
15 000 (|x – y| + |y – z|) m
|x – y| being the absolute numerical value of x – y
|y – z| being the absolute numerical value of y – z
Assuming x = +0.01
y = –0.005
z = +0.005
then |x – y| = 0.015
then |y – z| = 0.01

To comply with the specifications, D should be not less than:
15 000 (0.015 + 0.01) m,
that is, 15 000 × 0.025 = 375 m

When a runway is planned that should combine the extreme values for the slopes and changes in slope permitted, as prescribed in CS CS-ADR-DSN.B.060 to CS CS-ADR-DSN.B.080, a study should be made to ensure that the resulting surface profile should not hamper the operation of aeroplanes.

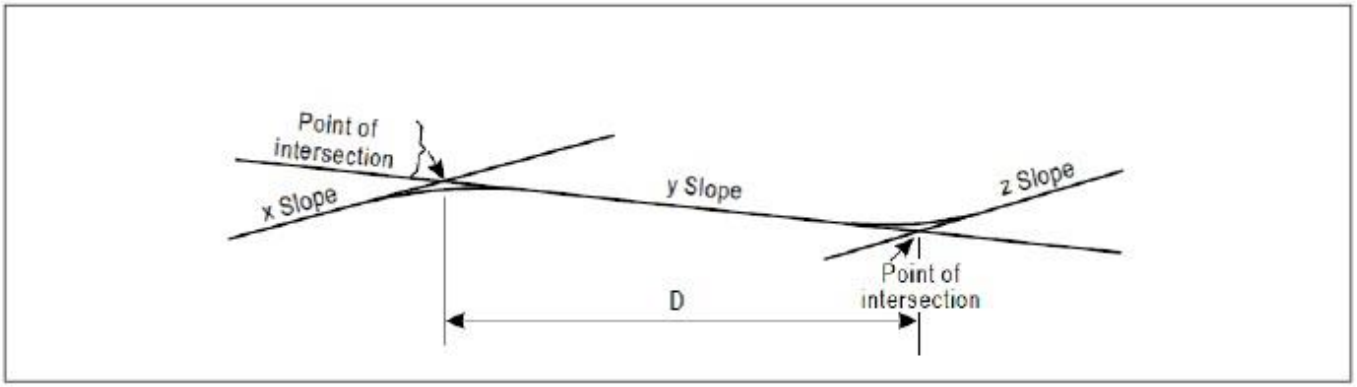


Figure GM-B-2. Profile on centre line of runway

GM1 CS-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-MAR.ADR.OPS.A.005.
(c) The military load demand requirements on aircraft pavements are classified, in accordance with aircraft types which will use the pavements, in distinctive Aircraft Operating Surfaces (AOS) groups as specified in BiSC 85-5: 3-5c

GM1 CS-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 aeroplane and thus may be wider than the associated runway shoulders.

GM1 CS-ADR-DSN.B.125 Runway shoulders

(a) Runway shoulders should be considered because strong crosswinds may result in significant deviation from the runway centre line. In the case of some large aircraft, the wing-mounted engines may overhang the runway edge and there is a risk of jet blast eroding the surface adjacent to the runway. This can cause dust and the possible ingestion of debris by the engines.
(b) Further guidance on runway shoulders is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.
(c) Mitigation measures that can be considered are to provide the runway with inset runway edge lights (in lieu of elevated lights, to protect aeroplane from ingestion) and additional runway centre line guidance.

(d) NATO requires Anti-Foreign Object Damage (FOD) shoulders on each side of the runway. Within each shoulder, a transition paved strip adjacent to the runway is required to provide 50% of the runway load bearing capacity. The remaining width of the shoulder is non load bearing. Standard width of 30 m, including the 7,5 m paved strip abutting against the runway pavement.

GM1 CS-ADR-DSN.B.140 Strength of runway shoulders

(a) Runway shoulders should be so prepared as to be capable of supporting the aeroplanes using the runway without causing structural damage to those aeroplanes. They should also be capable of supporting vehicles such as firefighting appliances. In some cases, whilst the bearing strength of the natural ground may be sufficient, special preparation may be necessary to avoid erosion and the possible ingestion of debris by engines.
(b) Guidance on characteristics and treatment of runway shoulders:
  (1) The shoulder of a runway or stopway should be prepared or constructed so as to support an aeroplane and minimise any hazard to an aeroplane running off the runway or stopway. Some guidance is given in the following paragraphs on certain special problems which may arise, and on further measures to avoid the ingestion of loose stones or other objects by turbine engines.
  (2) In some cases, the bearing strength of the natural ground in the strip may be sufficient, without special preparation, to meet the requirements for shoulders. Where special preparation is necessary, the method used should depend on local soil conditions and on the mass of the aeroplanes the runway is intended to serve. Soil tests should help in determining the best method of improvement (e.g. drainage, stabilisation, surfacing and light paving).
(c) Attention should also be paid when designing shoulders to prevent the ingestion of stones or other objects by turbine engines. Similar considerations apply here to those discussed for the margins of taxiways both as to the special measures that may be necessary and as to the distance over which such special measures, if required, should be taken. Further guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1 Runways, and Part 2, Taxiways, Aprons and Holding Bays.
(d) Where shoulders have been treated specially, either to provide the required bearing strength or to prevent the presence of stones or debris, difficulties may arise because of a lack of visual contrast between the runway surface and that of the adjacent strip. Such difficulties can be overcome either by providing a good visual contrast between the surfacing of the runway and of the strip, or by providing a runway side stripe marking.
(e) Additional guidance on strength of runway shoulders is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.

GM1 CS-ADR-DSN.B.145 Surface of runway shoulders

(a) Where a runway shoulder is not paved, additional surface treatment or inspections may be necessary, especially for runways that accept operations by 4-engined aircraft with a code letter D or larger.
(b) Shoulders for runways where the code letter is E normally should be paved.
(c) If movements of 4-engined aircraft with a code letter D take place, the need for fully paved width shoulders should be assessed by local hazard analysis. Where the runway shoulder is not paved, it may be possible to contain the risk from erosion or from the ingestion of debris. In such cases:
  (1) The runway shoulder should be stabilised and the ground is prepared so that there is full grass coverage with no loose gravel or other material. This may include additional materials if the bearing strength and surface of the ground are not sufficient.
  (2) A programme of inspections of the shoulders and runway may be implemented to confirm their continuing serviceability, and ensure that there is no deterioration that could create a risk of foreign object debris (FOD), or otherwise hazard aircraft operations.
  (3) A programme of sweeping may be required before and after movements, should debris be drawn onto the runway surface.
(d) Additional guidance on surface of runway shoulders is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.

GM1 CS-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.

(b) When the threshold or end of the landing distance do not coincide with the ends of a runway, the runway strip enclosing the runway and any associated stopway should extend to the lengths specified in CS CS-ADR-DSN.B.155 at the widths specified in CS CS-ADR-DSN.B.160, based on the threshold, end of landing distance or end of stopway, as appropriate.

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

(a) Within the graded portion of the runway strip, measures should be taken to prevent an aeroplane's wheel when sinking into the ground, from striking a hard vertical face. Special problems may arise for runway light fittings or other objects mounted in the strip or at the intersection with a taxiway or another runway. In the case of constructions within the graded portion of the runway strip, such as intersecting runways or taxiways, where the surface should also be flush with the strip surface, they should be delethalised, that is, so constructed as to avoid presenting a buried vertical face to aircraft wheels in soft ground conditions in any direction from which an aircraft is likely to approach. A vertical face can be eliminated by chamfering from the top of those constructions to not less than 30 cm below the strip surface level. Other objects situated within the graded portion of the runway strip, the functions of which do not require them to be at surface level, should be buried to a depth of not less than 30 cm. Where this is not feasible, to eliminate a buried vertical surface, a slope should be provided which extends from the top of the construction to not less than 30 cm below ground level. The slope can be created by using a mixture of compacted gravel or asphalt or crushed aggregates and soil.

(b) Consideration should be given to the location and design of drains on a runway strip to prevent damage to an aeroplane accidentally running off a runway. Suitably designed drain covers may be required.

(c) Guidance on the design of drain covers is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.

(d) Where open-air or covered storm water conveyances are installed, consideration should be given in order to ensure that their structure does not extend above the surrounding ground so as not to be considered an obstacle.

(e) Particular attention needs to be given to the design and maintenance of an open-air storm water conveyance in order to prevent wildlife attraction, in particular birds. The open-air storm water conveyance may be covered by a net, if required. Further guidance is given in ICAO Doc 9137, Airport Services Manual, Part 3, Wildlife Control and Reduction.

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

(a) For a precision approach runway, where the code number is 3 or 4, it may be desirable a greater width of that portion of a strip to be graded should be considered. Figure GM-B-4 shows the shape and dimensions of a wider strip that may be considered for such a runway. This strip has been designed using information on aircraft running off runways. The portion to be graded extends to a distance of 105 m from the centre line, except that the distance is gradually reduced to 75 m from the centre line at both ends of the strip, for a length of 150 m from the runway end.

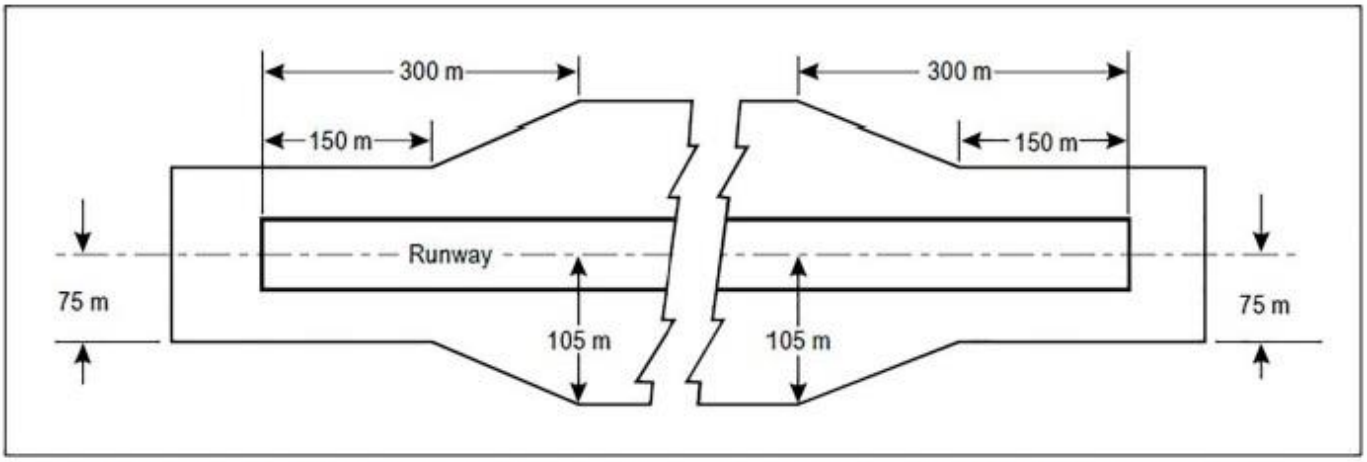


Figure GM-B-4. Graded portion of a strip including a precision approach runway where the code number is 3 or 4

(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) Additional guidance on grading is given in ICAO Doc 9157, Aerodrome Design Manual Part 1, Runways.
(d) 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.
(e) Guidance on protection against aeroplane engine blast is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2.

GM1 CS-ADR-DSN.B.185 Transverse slopes on runway strips

(a) Where required for proper drainage, an open-air storm water conveyance may be allowed in the non-graded portion of a runway strip and should be placed as far as practicable from the runway.
(b) The aerodrome RFF procedure should take into account the location of open-air storm water conveyances within the non-graded portion of a runway strip.

GM1 CS-ADR-DSN.B.190 Strength of runway strips

Since the graded portion of a strip is provided to minimise the hazard to an aircraft running off the runway, it should grant sufficient strength in such a manner as to prevent the collapse of the nose landing gear of the aircraft. The surface should be prepared in such a manner as to provide drag to an aircraft and below the surface, it should have sufficient bearing strength to avoid damage to the aircraft. To meet these divergent needs, the following guidelines are provided for preparing the strip. It is noted, that a depth of 15 cm is a depth to which the nose gear may sink without collapsing. Therefore, it is recommended that the soil at a depth of 15 cm below the finished strip surface should be prepared to have a sufficient stability, demonstrated by bearing strength of California Bearing Ratio (CBR) value of 15 to 20. The intention of this is to prevent the nose gear from damage. The top 15 cm may be of lesser strength which would facilitate deceleration of aircraft. There are also other methods for soil investigation. In case of a deeper sinking than 15 cm, the maximum wheel sinking without collapsing should be examined by using different methods of soil investigation.

GM1 CS-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 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).

GM1 CS-ADR-DSN.B.205 Radio altimeter operating area

(a) In order to accommodate aeroplanes making auto-coupled approaches and automatic landings (irrespective of weather conditions), it is desirable that slope changes be avoided or kept to a minimum, on a rectangular area at least 300 m long before the threshold of a precision approach runway. The area should be symmetrical about the extended centre line, 120 m wide. When special circumstances so warrant, the width may be reduced to no less than 60 m if a safety assessment indicates that such reduction would not affect the safety of operations of aircraft. This is desirable because these aeroplanes are equipped with a radio altimeter for final height and flare guidance, and when the aeroplane is above the terrain immediately prior to the threshold, the radio altimeter should begin to provide information to the automatic pilot for auto-flare. Where slope changes cannot be avoided, the rate of change between two consecutive slopes should not exceed 2 % per 30 m.

(b) With a radio altimeter operating area in the pre-threshold area of a precision approach runway the margin to calculate the decision altitude should be smaller and the usability of the adjacent runway may be enhanced.

(c) Further guidance on radio altimeter operating area is given in ICAO Doc 9365, Manual of All-Weather Operations, Section 5.2. Guidance on the use of radio altimeter is given in the ICAO, PANS-OPS, Volume II, Part II, Section 1.

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

(a) General

(1) A runway end safety area should provide an area long and wide enough, and suitable to contain overruns and undershoots resulting from a reasonably probable combination of adverse operational factors. On a precision approach runway, the ILS localiser is normally the first upstanding obstacle, and the runway end safety area should extend up to this facility. In other circumstances, the first upstanding obstacle may be a road, a railroad, or other constructed or natural feature. The provisions of a runway end safety area should take such obstacle into consideration.

(2) Whatever length of RESA is provided, it is important to ensure that likelihood of, and potential impacts arising from an overrun are minimised as far as reasonably practicable.

(3) It is recognised that achieving the recommended distance could present challenges. Therefore, the aim of this guidance is to identify the types of aerodrome activities that can be undertaken to reduce the likelihood and consequences of an overrun occurring, and to decide on appropriate actions and it is suggested that aerodrome operators assess their RESA provisions.

(4) The overrun is a complex risk to assess because there are a number of variables, such as prevailing weather, type of aeroplane, the landing aids available, runway characteristics and available distances, the surrounding environment, and human factors. Each of these can have a significant contribution to the overall hazard; furthermore, the nature of the hazard and level of risk should be different for each aerodrome and even for each runway direction at any one aerodrome. The aerodrome may address some, and these are included below. Additionally, aircraft operating procedures may impact but the aerodrome may have little ability to influence these. This should not prevent aerodromes from working with aircraft operators so that the operations are conducted so as to minimise the likelihood of an overrun occurring.

(5) Noting the requirement for a runway end safety area (RESA) consideration should be given to providing an area long enough to contain overruns and undershoots resulting from a reasonably probable combination of adverse operational factors. Therefore, aerodromes should try to maximise the length of RESA available on all applicable runways. When considering the RESA distance required for individual circumstances, aerodromes operators should take into account factors, such as:

(i) the runway length and slope, in particular the general operating lengths required for take-off and landing versus the runway distances available, including the excess of available length over that required;

(ii) current RESA provision (length & width – how much the RESA complies with the recommended distance) and options to increase or improve this;

(iii) the nature and location of any hazard beyond the runway end, including the topography and obstruction environment in and beyond the RESA and outside the runway strip;

(iv) the type of aeroplane and level of traffic at the aerodrome, and actual or proposed changes to either;

(v) aircraft performance limitations arising from runway and RESA length – high performance aircraft, operating at high loads and speeds have greater length requirements than smaller, low-performance aircraft, the relationship between required balanced field length and available distances;

(vi) navigation aids available (PBN, instrument or visual - if an ILS is only available on one runway direction, a downwind approach and landing may be necessary in poor weather) and the availability of vertical guidance ;

(vii) friction and drainage characteristics of the runway, which impact on runway susceptibility to surface contamination and aeroplane braking action;

(viii) traffic density, which may lead to increased pressure to vacate so increased speed;

(ix) aerodrome weather patterns, including wind shear;

(x) aerodrome overrun history; and

(xi) overrun/undershoot causal factors.

(b) Assessment of runway end safety areas

(1) The RESA assessment should help the aerodrome operator identify the hazards and appropriate actions to reduce the risk. A range of measures may be available, singly or in combination, to reduce the risks of an overrun occurring or becoming an accident. Measures

aimed at reducing the likelihood of an overrun/undershoot include:

(i) improving runway surfaces and friction measurement, particularly when the runway is contaminated — know your runways and their condition and characteristics in precipitation;

(ii) ensuring that accurate and up-to-date information on weather, the runway state and characteristics, is notified and passed to flight crews in a timely way, particularly when flight crews need to make operational adjustments;

(iii) improving an aerodrome management's knowledge, recording, prediction and dissemination of wind data, including wind shear, and any other relevant weather information, particularly when it is a significant feature of an aerodrome's weather pattern;

(iv) upgrading visual and instrument landing aids to improve the accuracy of aeroplane delivery at the correct landing position on runways (including the provision of Instrument Landing PBN approach systems, location of aiming point and harmonisation with PAPIs);

(v) formulating, in consultation with aeroplane operators, adverse weather and any other relevant aerodrome operating procedures or restrictions, and promulgating such information appropriately; and

(vi) working with aircraft operators to optimise the operation.

(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:

(i) relocation, shifting or realignment of the runway — it may be possible to construct additional pavement at the start of take-off end to make more pavement available to retain the declared distances. The start and end of declared distances can be moved towards the downwind (start of take-off) end, thereby retaining the declared distance and creating space for a longer RESA, as shown in GM1 CS-ADR-DSN.B.035;

(ii) in the case where undershoot RESA is limited and the runway has a displaced landing threshold, examine whether the threshold can be moved (downwind) to increase the RESA and/or runway length;

(iii) reducing runway declared distances in order to provide the necessary RESA may be a viable option where the existing runway length exceeds that required for the existing or projected design aircraft. If the take-off distance required for the critical aircraft operating at the aerodrome is less than the take-off distance available, there may be an opportunity to reduce the relevant runway declared distances. Where provision of a runway end safety area would be particularly prohibitive to implement consideration would have to be given to reducing some of the declared distances of the runway for the provision of a runway end safety area and/or installation of an arresting system;

(iv) increasing the length of a RESA, and/or minimising the obstruction environment in the area beyond the RESA. Means to increase the RESA provision include land acquisition, improvements to the grading, realigning fences or roads to provide additional area;

(v) installing an arresting system 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;

(vi) improving the slopes in the RESA to minimise or remove downward slopes; and

(vii) providing paved RESA with known friction characteristics.

(3) A runway meant for take-off and landing in both directions should have 2 RESAs extending for the required distance beyond the end of the strip extending from the runway end. Depending of the position of the threshold on a runway, the RESA related to the reverse runway should protect aircraft undershooting the threshold. Assessments of overruns and undershoots have shown that the likelihood of an undershoot is approximately four times less than for an overrun. Additionally, the undershoot rate shows that the likelihood of an event is further reduced by the availability of precision approach aids, especially those with vertical guidance. Therefore, on a precision approach runway consideration may include whether to reduce the minimum length of RESA towards the length of the runway strip before the runway.

(4) It is recognised that improving RESAs is often difficult. However, it is important to note that incremental gains should be obtained wherever possible, as any gain is valuable. Therefore, whenever a runway project involves construction, consideration should also be given to improving the RESA.

(5) The above lists are not in any particular order, are not exhaustive, and should complement action by aeroplane operators, designers and aviation regulators.

(6) RESA provision should be considered by the Local Runway Safety Team.

(c) Arresting systems on runway end safety areas

(1) Arresting systems can be predictable and effective in arresting aeroplane overruns.

(2) 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.

(3) 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.

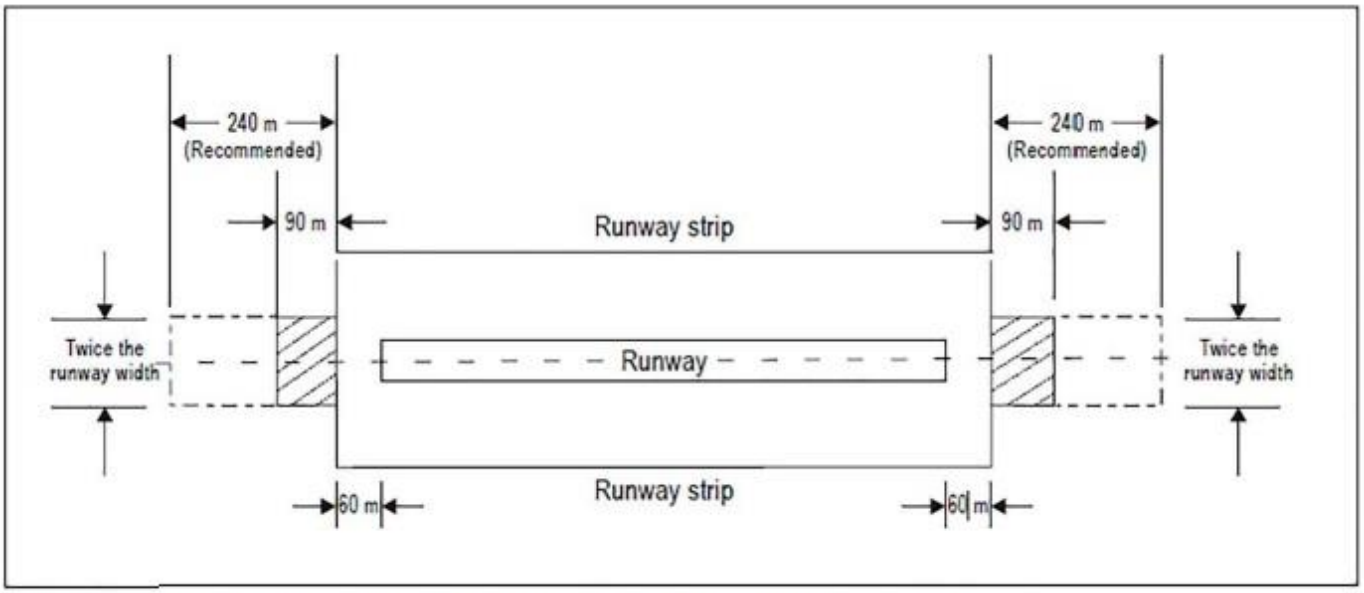


Figure GM-C-1. Runway end safety area for a runway where the code number is 3 or 4

GM1 CS-ADR-DSN.C.215 Dimensions of runway end safety areas

It is accepted that many aerodromes were constructed before requirements for RESAs were introduced. For applicable runways where the RESA does not extend to the recommended distance, as part of their Safety Management System, aerodromes should assess the risk and implement appropriate and suitable mitigation measures as necessary.

GM1 CS-ADR-DSN.C.225 Clearing and grading of runway end safety areas

(a) The surface of the runway end safety area should be prepared but does not need to be prepared to the same quality as the runway strip.

(b) Guidance on clearing and grading of runway end safety areas is given in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.

GM1 CS-ADR-DSN.C.230 Slopes on runway end safety areas

Where clearway is provided, the slope on the RESA should be amended accordingly.

GM1 CS-ADR-DSN.C.235 Strength of runway end safety areas

(a) A runway end safety area should be so prepared or constructed as to reduce the risk of damage to an aeroplane undershooting or overrunning the runway, enhance aeroplane deceleration, and facilitate the movement of rescue and firefighting vehicles.
(b) Guidance on the strength of a runway end safety area is given in the GM1 CS-ADR-DSN.B.190 Strength of runway strips and in ICAO Doc 9157, Aerodrome Design Manual, Part 1, Runways.

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;
    (ix) paint;
    (x) 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.

GM1 CS-ADR-DSN.D.240 Taxiways general

(a) Taxiways should be provided to permit the safe and expeditious surface movement of aircraft. Sufficient entrance and exit taxiways for a runway should be provided to expedite the movement of aeroplanes to and from the runway and provision of rapid exit taxiways considered when traffic volumes are high.

(b) Design of runway and taxiway infrastructure that either prevents aircraft entering or crossing a runway or mitigates the risk of an aircraft runway incursion collision should be considered both in the development of any new infrastructure and as a retrospective enhancement to existing infrastructure especially in hot-spot areas (areas where risk appraisal or incident data demonstrates a higher risk). This guidance may be considered as part of a runway incursion prevention programme and to help ensure that runway incursion aspects are addressed in any new design proposal.

(c) The initial approach should be to reduce the number of available entrances to the runway, so that the potential for entry to the runway at an unintended location is minimised. Taxiway entry, crossing and runway exit taxiways should be clearly identified and promulgated, using taxiing guidance signs, lighting and pavement markings.

(d) Many aerodromes have more than one runway, notably paired parallel runways (two runways on one side of the terminal apron), which create a difficult problem in that either on arrival or departure an aircraft is required to cross a runway. The potential for runway crossings should be eliminated or at least be as low as reasonably practicable. This may be achieved by constructing a 'perimeter taxiway' to enable aircraft to get to the departure runway or to the apron without either crossing a runway, or conflicting with an approaching or departing aircraft.

(e) A perimeter taxiway is ideally designed according to the following criteria:

(1) Sufficient space is required between the landing threshold and the taxiway centre line where it crosses under the approach path, to enable the critical aeroplane to pass under the approach without violating the approach surface.

(2) The extent of the jet blast impact of aircraft taking off is considered when determining the location of a perimeter taxiway.

(3) The requirement for RESA, as well as possible interference with the ILS or other navigation aids is also taken into account: the perimeter taxiway is located behind the localiser antenna, not between the localiser antenna and the runway, due to the potential for severe ILS disturbance, noting that this is harder to achieve as the distance between the localiser and the runway increases. Likewise, perimeter roads are provided where possible.

(4) Appropriate measures should be considered in order to assist pilots to distinguish between aircraft that are crossing the runway and those that are safely on a perimeter taxiway.

(f) Taxiways crossing runways should be provided at low energy locations, preferably at the runway ends. Where runway crossings cannot be eliminated, they should only be done on taxiways at right angles to a runway. This will afford the flight crew an unobstructed view of the runway, in both directions, to confirm that the runway and approach is clear of conflicting traffic before proceeding across.

(g) The runway/taxiway junction configuration should be simple, for example with single taxiway entrances; this is particularly relevant for taxiways crossing runways.

(h) The main design principles for entry and exit taxiways are:

(1) Taxiways should be perpendicular to the runway centre line if possible.

(2) The taxiway angle should be such that the crew of an aircraft at a taxiway holding position (if any) should be able to see an aircraft using or approaching the runway. Where the taxiway angle is such that this clear view, in both directions is not possible, consideration is given to provide a perpendicular portion of the taxiway immediately adjacent to the runway to allow for a full visual scan prior to entering (or crossing).

(3) Rapid exit taxiways are designed to be runway exits. Whilst it may be an operational practice at some airports to allow smaller aircraft the option of departing at a mid-point on the runway from one of these rapid exit taxiways, the geometry of the taxiway/runway intersection does not allow the crew to properly scan the runway in both directions to confirm that there is no conflicting traffic. This practice should thus be eliminated and from the design point of view, all signage and markings should deter any aircraft from using these rapid exit taxiways for any purpose other than what they are designed for (exiting the runway after landing). However,

this may be mitigated by the addition of a fillet so that aircraft can manoeuvre to see down the approach. Note that aircraft on an angled taxiway may have a greater likelihood of causing ILS interference.

(4) A clear separation of pavement between a rapid exit taxiway and other non-rapid taxiways entering or crossing a runway should be provided. This design principle prevents two taxiways from overlapping with each other and creating an excessive paved area that would confuse pilots entering a runway.

(5) Limiting the options available to pilots on each entrance or exit helps to avoid confusion. Therefore, avoid dual or multiple taxiway entrances at one location, as Y-shaped connectors present opportunities for runway incursions and for aircraft vacating the runway to enter the wrong taxiway. Limiting the options available to pilots on each entrance or exit helps to avoid confusion.

(6) Runway/taxiway separations should be sufficient to permit space for effective RETs.

(7) Avoid designs which include crossing a runway to access a taxiway.

(8) Provide clear separation between high speed (RET) and taxi speed runway exits; if RETs are provided have a series in a row without other entrances.

(9) Where the aerodrome has more than one runway, ensure that runway ends are not too close together; if this is not possible ensure that they are clearly identified as separated. This may be achieved through visual aids, taxiway design and the taxiway naming convention.

(10) Surface colour should not create confusion:
(i) Have different colours for runway and taxiways.
(ii) Avoid a mix of concrete & asphalt.

(11) Wide taxiway entrances onto runways should be broken up with islands or barriers or painting taxiway edges with continuous edge markings to indicate unusable pavement. Avoid long holding position lines and excess paved areas which reduce the effectiveness of signs and markings. Use standard taxiway widths, suitable for a wide range of aeroplane, including the largest type expected to use the aerodrome.

(12) Avoid multi-taxiway intersections and reduce the number of taxiways at any intersection as far as possible.

(13) As far as practicable, it is preferable to redesign rather than reconfigure or repaint where possible – design errors out and reduce potential for human error.

(14) Consistent design of runway entrances – same visual aids at each, both taxiways and service road accesses.

(15) It is always preferable for safety reasons to have a taxiway parallel to the runway all along the runway, even if capacity constraints do not make it necessary.

(i) Aerodrome infrastructure can also be used to support design, whether by the systems installed or by their operating characteristics. Examples include:

(1) Stopbars and runway guard lights should be provided at all entrances, and preferably illuminated H24 and in all weather conditions. Runway incursions do not happen only under restricted visibilities. In fact, more incursions happen when the weather is good.

(2) Avoid confusion between CAT I and CAT III holding positions. This may be achieved in some circumstances by combining both holding positions.

(j) 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 construction of unusable pavement and as well as the painting of 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.

(k) CS 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.

GM1 CS-ADR-DSN.D.245 Width of taxiways

(a) The width of the taxiway should be measured at the edge of the paved surface, or where the taxiway edge is marked, at the outside edge of the taxiway edge marking.

(b) Additional guidance on width of taxiways is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays.
(c) When (portions of) taxiways are used by military and civil aircraft, traffic for the respective categories should be limited according to the mentioned characteristics.

GM2 CS-ADR-DSN.D.245 Width of taxiways

A straight portion of a taxiway, intended for military use, is expected to have a width according to NATO AOS code:

AOS Group	Width [m]
RWA, TFA	12
TTA, MPA	15
AEW, AGS, STA, STA+, AAR, SBA	22,5
*Aircraft with a larger wheel track will require wider taxiways, e.g. B-52G	

GM1 CS-ADR-DSN.D.250 Taxiways curves

(a) The location of taxiway centre line markings and lights is specified in CS CS-ADR-DSN.L.555 and CS CS-ADR-DSN.M.710.
(b) Compound curves may reduce or eliminate the need for extra taxiway width.
(c) An example of widening taxiways to achieve the wheel clearance specified is illustrated in Figure GM-D-1. Guidance on the values of suitable dimensions is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays.
(d) Further guidance on taxiway curves of military aircraft is given in BiSC85-5 Item 3 2. c. (3) Curve and Fillet Radii.

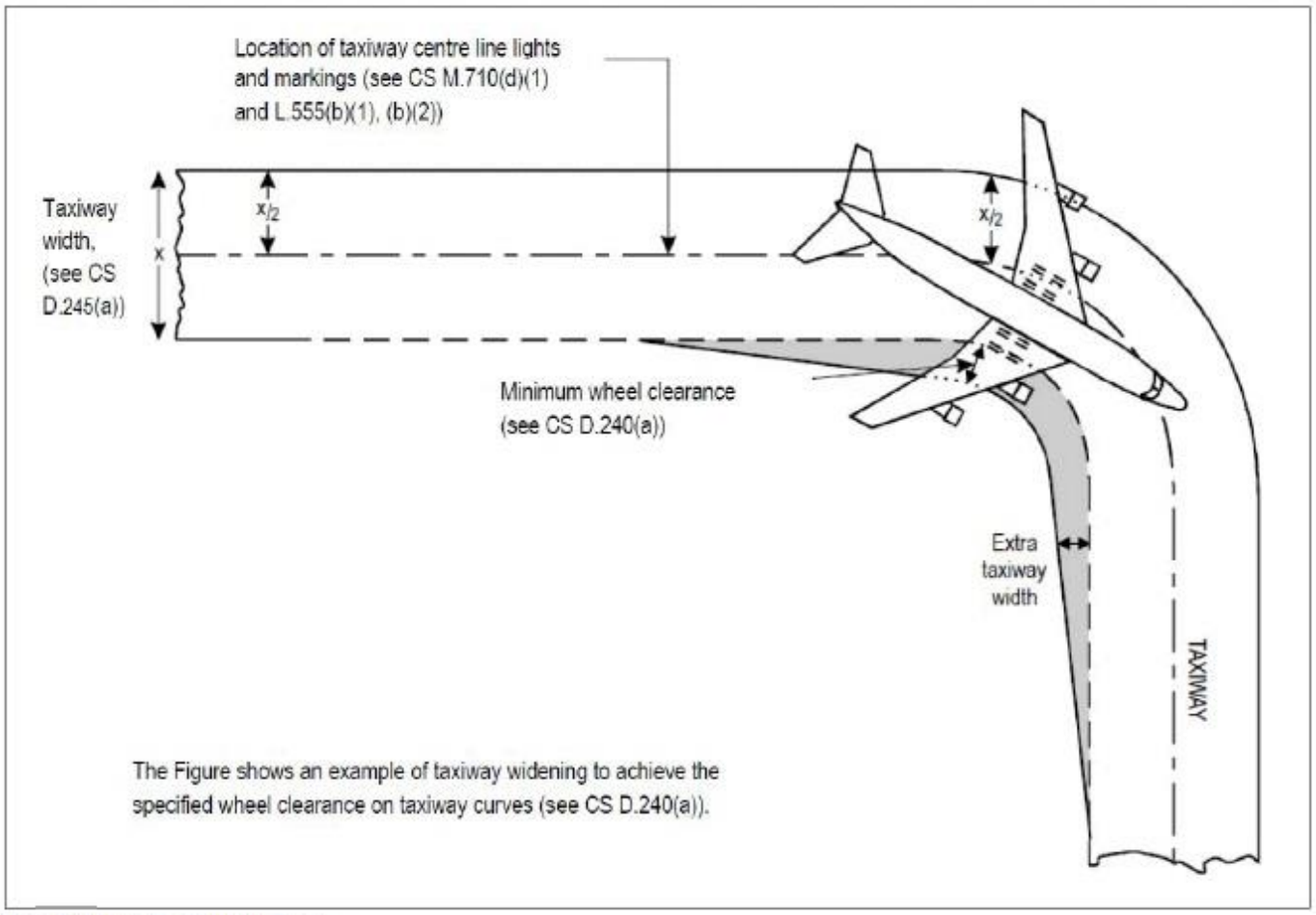


Figure GM-D-1. Taxiway curve

GM1 CS-ADR-DSN.D.260 Taxiway minimum separation distance

(a) Guidance on factors which may be considered in the safety assessment is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays.
(b) ILS and MLS installations may also influence the location of taxiways due to interferences to ILS and MLS signals by a taxiing or stopped aircraft. Information on critical and sensitive areas surrounding ILS and MLS installations is contained in ICAO, Annex 10, Volume I, Attachments C and G (respectively).
(c) The separation distances, as prescribed in Table D-1, column (10), do not necessarily provide the capability of making a normal turn from one taxiway to another parallel taxiway. Guidance for this condition is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays.
(d) The separation distance between the centre line of an aircraft stand taxilane and an object, as prescribed in Table D-1, column (13), may need to be increased when jet exhaust wake velocity may cause hazardous conditions for ground servicing.
(e) It may be permissible to operate with lower separation distances at an existing aerodrome if a safety assessment indicates that such lower separation distances would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.
(f) The separation distances, as prescribed in Table D-1, may have to be increased on taxiway curves to accommodate the wing sweep of the critical aeroplane or on dual parallel taxiways when, as for example, used as bypass taxiways.
(g) The requirements for apron taxiways regarding strip width, separation distances, etc., are the same as for any other type of taxiway.

GM1 CS-ADR-DSN.D.285 Strength of taxiways

(a) Due consideration is to be given to the fact that a taxiway should be 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.

GM1 CS-ADR-DSN.D.300 Taxiways on bridges

If aeroplane engines overhang the bridge structure, protection of adjacent areas below the bridge from engine blast may be required.

GM1 CS-ADR-DSN.D.320 Objects on taxiway strips

(a) Consideration should be given to the location and design of drains on a taxiway strip to prevent damage to an aeroplane accidentally running off a taxiway. Suitably designed drain covers may be required.
(b) The detailed requirements for siting objects on taxiway strips are in CS CS-ADR-DSN.T.915.
(c) Where open-air or covered storm water conveyances are installed, consideration should be given in order to ensure that their structure does not extend above the surrounding ground so as not to be considered an obstacle.
(d) Particular attention needs to be given to the design and maintenance of an open-air storm water conveyance in order to prevent wildlife attraction, in particular birds. The open-air storm water conveyance may be covered by a net, if required. Further guidance is given in ICAO Doc 9137, Airport Services Manual, Part 3, Wildlife Control and Reduction.
(e) Guidance on the design of drain covers is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays.

GM1 CS-ADR-DSN.D.330 Slopes on taxiway strips

(a) Where required for proper drainage, an open-air storm water conveyance may be allowed in the non-graded portion of a taxiway strip and should be placed as far as practicable from the taxiway.
(b) The locations of open-air storm water conveyances within the non-graded portion of a taxiway strip should be so designed to permit unobstructed access for rescue and firefighting services (RFFS).

GM1 CS-ADR-DSN.D.335 Holding bays, runway-holding positions, intermediate holding positions, and road-holding positions

(a) At low levels of aerodrome activity (less than approximately 50 000 annual operations), there is normally little need to make deviations in the departure sequence. However, for higher activity levels, aerodromes with single taxiways and no holding bays or other bypasses provide aerodrome control units with no opportunity to change the sequence of departures once the aircraft have left the apron. In particular, at aerodromes with large apron areas, it is often difficult to arrange for aircraft to leave the apron in such a way that they should arrive at the end of the runway in the sequence required by air traffic services units.
(b) The provision of an adequate number of holding bay spaces or other bypasses, based upon an analysis of the current and near-term hourly aircraft departure demand, should allow a large degree of flexibility in generating the departure sequence.
The space required for a holding bay depends on the number of aircraft positions to be provided, the size of the aircraft to be accommodated, and the frequency of their utilisation. The dimensions should allow for sufficient space between aircraft to enable them to manoeuvre independently.
(c) Emergency access roads are not intended for use for the functions of aerodrome service roads. However, they should be provided by different access controls which should be clearly visible for all service ground traffic.
(d) Further guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays and ICAO Doc 4444, Procedures for Air Navigation Services — Air Traffic Management.

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

(a) Care should be taken so that propeller wash and jet blast from holding aircraft do not interfere with aircraft operations, cause damage to vehicles, or injure people.
(b) Generally, when used to allow flexible departure sequencing, the most advantageous location for a holding bay is adjacent to the taxiway serving the runway end. Other locations along the taxiway are satisfactory for aircraft performing pre-flight checks or engine run-ups, or as a holding point for aircraft awaiting departure clearance.
(c) An aircraft taxiing could endanger aircraft operations when the aircraft is too close to the runway during take-off and landings. It is so advised to check if the aircraft taking off or landing could be hinder. For this OLS and specially approach surfaces, take-off climb surfaces and OFZ are the first aspects to consider. An aircraft taxiing could also endanger aircraft operations when the aircraft location and orientation are so that the aircraft interfere with navigation aids. It is specific to instrument runways and especially important for precision approach runways. The non-penetration of critical/sensitive areas is the first check. The areas within which this degradable interference of course or path signals are possible need to be defined and recognised. For the purposes of developing protective zoning criteria for ILS, these areas are critical areas and sensitive areas. The ILS critical area is an area of defined dimensions about the localizer and glide path antennas where vehicles, including aircraft, are excluded during all ILS operations. The critical area is protected, since the presence of vehicles and/or aircraft inside the critical area boundaries would cause unacceptable disturbance to the ILS signal. The ILS sensitive area is an area extending beyond the critical area where the parking and/or movement of vehicles, including aircraft, is controlled to prevent the possibility of unacceptable interference to the ILS signal during ILS operations.
(d) For all runways, it should be verified that 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 is so that a holding aircraft or vehicle should not infringe the approach surface and/or

take-off climb surface.

(e) If the affected runway is used under precision approach procedures, it should be also verified that 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 is so that a holding aircraft or vehicle should not infringe the obstacle-free zone and the critical/sensitive areas of precision approach navigation aids (e.g. ILS/MLS).

(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 specified in Table D-2 could be further increased 5 m for every metre the bay or position is higher than the threshold.

(g) An aircraft taxiing could also endanger aircraft operation when the aircraft is too close to other taxiing aircraft. For this, separation distances or margins between taxiing aircraft or taxiways should be considered.

(h) In radiotelephony phraseologies, the expression 'holding point' is used to designate the runway-holding position.

(i) Further guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays.

GM1 CS-ADR-DSN.E.350 Size of aprons

(a) The total apron area should be adequate to permit safe and expeditious handling of aerodrome traffic at its maximum anticipated density.
(b) The amount of area required for a particular apron layout depends upon the following factors:
  (1) the size and manoeuvrability characteristics of the aircraft using the apron;
  (2) the volume of traffic using the apron;
  (3) clearance requirements;
  (4) type of ingress and egress to the aircraft stand;
  (5) basic terminal layout or other aerodrome use;
  (6) aircraft ground activity requirements; and
  (7) taxiways and apron service roads.
(c) Passenger aircraft services that are carried out during the time the aircraft is parked in a stand position include: galley; toilet and potable water service; baggage handling; fuelling; provision of air conditioning, oxygen, electrical power supply and starting air; and aircraft towing. Most of these functions have a vehicle and/or equipment associated with them, or have some type of fixed installation established to conduct these services. Further guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays, paragraph 3.4.6.
(d) Consideration should be given to providing sufficient area on the starboard side of the aircraft to support the level of activity that take place in the turnaround operation. Further guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays, paragraph 3.4.6.

GM1 CS-ADR-DSN.E.355 Strength of aprons

(a) Apron pavement protection against fuel: On aircraft stands, pavement surface in bituminous concrete and joints between concrete slabs should be protected from fuel effects.
(b) Fuel on bituminous concrete provokes a disintegration of the concrete which becomes a kind of dark powder. On aircraft stands, it is not rare to have fuel on the pavement surface, due to leakage from aircraft or refuelling devices or due to a wrong move during refuelling. Therefore, if the aircraft stand pavement is in bituminous concrete, a specific protection is considered. Such protection is:
  (1) a surface protection consisting in an overlay with a material inert against fuel; or
  (2) a product incorporated in the mass of the bituminous concrete during its fabrication, protecting aggregates and binder.
(c) The first solution has the disadvantages to be fragile against stamping effects due to aircraft at the stand but is very useful for existing pavement protection.
(d) Taking into account the stamping due to aircraft at stands and the weakness of bituminous concrete against fuel, the aircraft stand pavements are often in cement concrete, which offers a much better resistance to stamping and to fuel. Nevertheless, joints between cement concrete slabs could be also damaged by fuel. According to the location of such joints regarding aircraft location and refuelling devices location, it is preferable to manufacture such joints in a material resistant to the fuel.
(e) The method for reporting the bearing strength of the pavement is available in MAR.ADR.OPS.A.005.
(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.

GM1 CS-ADR-DSN.E.360 Slopes on aprons

(a) The design of slopes should direct spilled fuel away from building and apron service areas. Where such slopes are unavoidable, special measures should be taken to reduce the fire hazard resulting from fuel spillage.
(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 stands, should specifically take into account the impact

of the slopes on the aircraft 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 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 or of the push-back device.

(c) Where the slope limitation of 1 % on the stands cannot be achieved, the slope should be kept as shallow as possible and should be such that the operation of the aircraft and vehicles is not compromised.

GM1 CS-ADR-DSN.E.365 Clearance distances on aircraft stands

(a) Reduced separation at the gate is possible where azimuth guidance by a visual docking guidance system is provided, in combination with additional mitigation measures, such as:
  (1) good condition of marking and signage;
  (2) maintenance of visual docking systems.

(b) On aircraft stands, where reduced clearance distances are applied:
  (1) Guidance by a visual docking guidance system should be provided.
  (2) All objects for which reduced clearances apply should be properly marked or lighted (see Chapter Q Visual Aids for Denoting Obstacles).
  (3) Aircraft stands where reduced clearance distances apply should be identified and the information published in the AIP.
  (4) For code letters D, E or F, an aircraft stand equipped with a visual docking guidance system the minimum clearance of 4.5 metres may be applied between an aircraft entering or exiting the stand and any adjacent building, aircraft on another stand or other objects.
  (5) For code letter C an aircraft stand equipped with a visual docking guidance system the minimum clearance of 3 metres may be applied between an aircraft entering or exiting the stand and any adjacent building, aircraft on another stand or other objects if a safety assessment indicates that such reduction would not affect the safety of operations of aircraft.

(c) Any aircraft passing behind an aircraft parked on an aircraft stand should keep the required clearance distances defined in Table D-1.

(d) The following (more stringent) clearance distances are published by NATO for AOS groups:

AOS Group	**Clearance [m]**
RWA	1x rotor diameter
TFA	6
TTA, MPA (wingspan ≤ 30m)	9
TTA, MPA (wingspan > 30m)	15
AEW, AGS, STA, STA+, SBA	15

GM1 CS-ADR-DSN.G.380 Location

(a) The de-icing/anti-icing facilities should be so located as to ensure that the holdover time of the anti-icing treatment is still in effect at the end of taxiing, and when take-off clearance of the treated aeroplane is given.
(b) To further maximise departure flow rates for all aeroplanes, the location and size of de-icing/anti-icing facilities should be such that they allow for bypass taxiing during de-icing/anti-icing operations. Additional guidance is given in ICAO Doc 9640, Manual of aircraft ground de-icing/anti-icing operations, paragraph 8.5(e).
(c) Remote de-icing/anti-icing facilities located near departure runway ends or along taxiways are recommended when taxi times from terminals or off-terminal de-icing/anti-icing locations frequently exceed holdover times.
(d) Remote facilities compensate for changing weather conditions when icing conditions or blowing snow are expected to occur along the taxi-route taken by the aeroplane to the runway meant for take-off.
(e) The 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.
(f) The jet blast effects caused by a moving aeroplane on other aeroplanes receiving the anti-icing treatment or taxiing behind should have to be taken into account to prevent degradation of the treatment.

GM1 CS-ADR-DSN.H.405 Applicability

(a) The obstacle limitation surfaces define the limits to which objects may project into the airspace. Each surface is related to one or more phases of a flight, and provides protection to aircraft during that phase.
(b) The OLS also help to prevent the aerodromes from becoming unusable by the growth of obstacles around the aerodromes.
(c) The effective utilisation of an aerodrome may be considerably influenced by natural features and man-made constructions outside its boundary. These may result in limitations on the distance available for take-off and landing and on the range of meteorological conditions in which take-off and landing can be undertaken. For these reasons, certain areas of the local airspace should be regarded as integral parts of the aerodrome environment.
(d) Objects which penetrate the obstacle limitation surfaces may in certain circumstances cause an increase in the obstacle clearance altitude/height for an instrument approach procedure or any associated visual circling procedure or have other operational impact on flight procedure design. Criteria for flight procedure design are contained in the Procedures for Air Navigation Services — Aircraft Operations (ICAO, PANS-OPS, Doc 8168).
(e) In ideal circumstances all the surfaces should be free from obstacles but when a surface is infringed, any safety measures required should have regard to:
  (1) the nature of the obstacle and its location relative to the surface origin, to the extended centre line of the runway or normal approach and departure paths, and to existing obstructions;
  (2) the amount by which the surface is infringed;
  (3) the gradient presented by the obstacle to the surface origin;
  (4) the type of air traffic at the aerodrome; and
  (5) the instrument approach procedures published for the aerodrome.
(f) Safety measures could be as follows:
  (1) promulgation in the AIP of appropriate information;
  (2) marking and/or lighting of the obstacle;
  (3) variation of the runway distances declared as available;
  (4) limitation of the use of the runway to visual approaches only;
  (5) restrictions on the type of traffic.
(g) In addition to the requirements described in the certification specifications of Chapter H, it may be necessary to call for other restrictions to development and construction on and in the vicinity of the aerodrome in order to protect the performance of visual and electronic aids to navigation and to ensure that such development does not adversely affect instrument approach procedures and the associated obstacle clearance limits.

GM1 CS-ADR-DSN.H.410 Outer horizontal surface

(a) The outer horizontal surface should extend from the periphery of the conical surface as shown in Figure GM-H-1. An outer horizontal surface is a specified portion of a horizontal plane around an aerodrome beyond the limits of the conical surface. It represents the level above which consideration needs to be given to the control of new obstacles in order to facilitate practicable and efficient instrument approach procedures, and together with the conical and inner horizontal surfaces to ensure safe visual manoeuvring in the vicinity of an aerodrome.
(b) The outer horizontal surface is of particular importance for safe operations in areas of high ground or where there are concentrations of obstacles.
(c) In the experience of some States, operational problems can arise from the erection of tall structures in the vicinity of aerodromes beyond the areas currently recognised in these aerodrome regulations and ICAO Annex 14 as areas in which restriction of new construction may be necessary. Such problems may be addressed through the provision of an outer horizontal surface, which is a specified portion of a horizontal plane around an aerodrome beyond the limits of the conical surface. It represents the level above which consideration needs to be given to the control of new obstacles in order to facilitate practicable and efficient instrument approach procedures, and together with the conical and inner horizontal surfaces to ensure safe visual manoeuvring in the vicinity of an aerodrome.
(d) As a broad specification for the outer horizontal surface, tall structures can be considered to be of

possible significance if they are both higher than 30 m above local ground level, and higher than 150 m above aerodrome elevation within a radius of 15 000 m of the centre of the airport where the runway code number is 3 or 4. The area of concern may need to be extended to coincide with the PANS OPS obstacle areas for the individual approach procedures at the airport under consideration.

(e) Guidance on Outer Horizontal Surface is included in ICAO Doc 9137, Airport Services Manual, Part 6, Control of Obstacles.

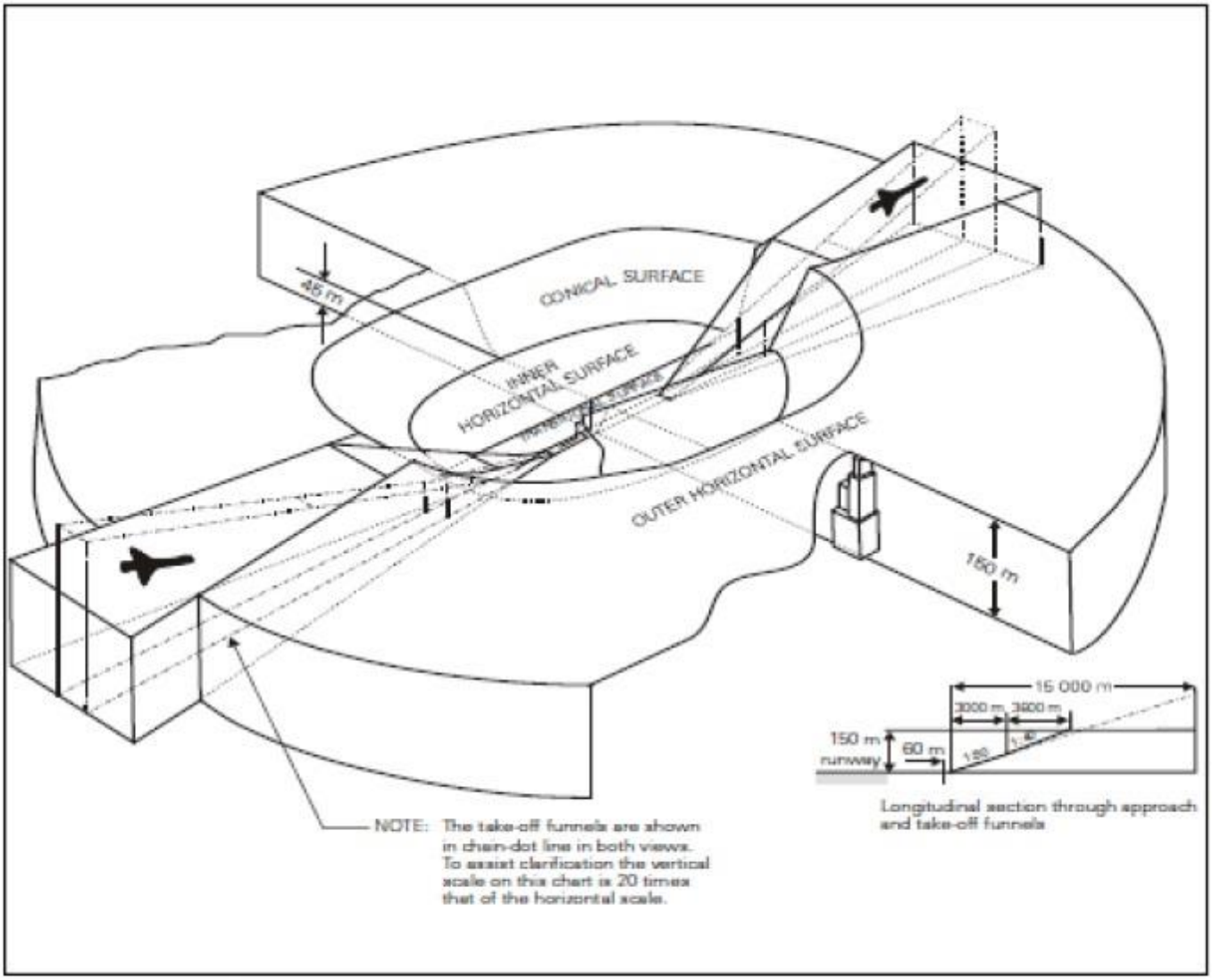


Figure GM-H-1. Disposition of Outer Horizontal Surface

GM1 CS-ADR-DSN.H.420 Inner horizontal surface

(a) The shape of the inner horizontal surface need not necessarily be circular. Guidance on determining the extent of the inner horizontal surface is contained in the ICAO Doc 9137, Airport Services Manual, Part 6, Control of Obstacles.

(b) The limits of the inner horizontal surface for longer runways (1 800 m or more in length) are defined as circles of radius 4 000 m centred on the strip ends of the runway. These circles are joined by common tangents parallel to the runway centre line to form a racetrack pattern. The boundary of this pattern is the boundary of the inner horizontal surface.

(c) For runways less than 1 800 m in length, the inner horizontal surface may be defined as a circle centred on the midpoint of the runway.

(d) To protect two or more runways, a more complex pattern could become necessary. In this situation, all the circles are joined tangentially by straight lines: illustrated at the Figure GM-H-2.

(e) For relatively level runways the selection of elevation datum location is not critical, but when the

thresholds differ by more than 6 m, the elevation datum should regard to the factors as the elevation of the most frequent used altimeter setting datum points, minimum circling altitudes in use or required and the nature of operations at the aerodrome. For more complex inner horizontal surfaces, with runways on different levels, as shown in Figure GM-H-2, a common elevation is not essential, but where surfaces overlap, the lower surface should be regarded as dominant.

(f) Further guidance is given in ICAO Doc 9137, Airport Services Manual, Part 6, Control of Obstacles.

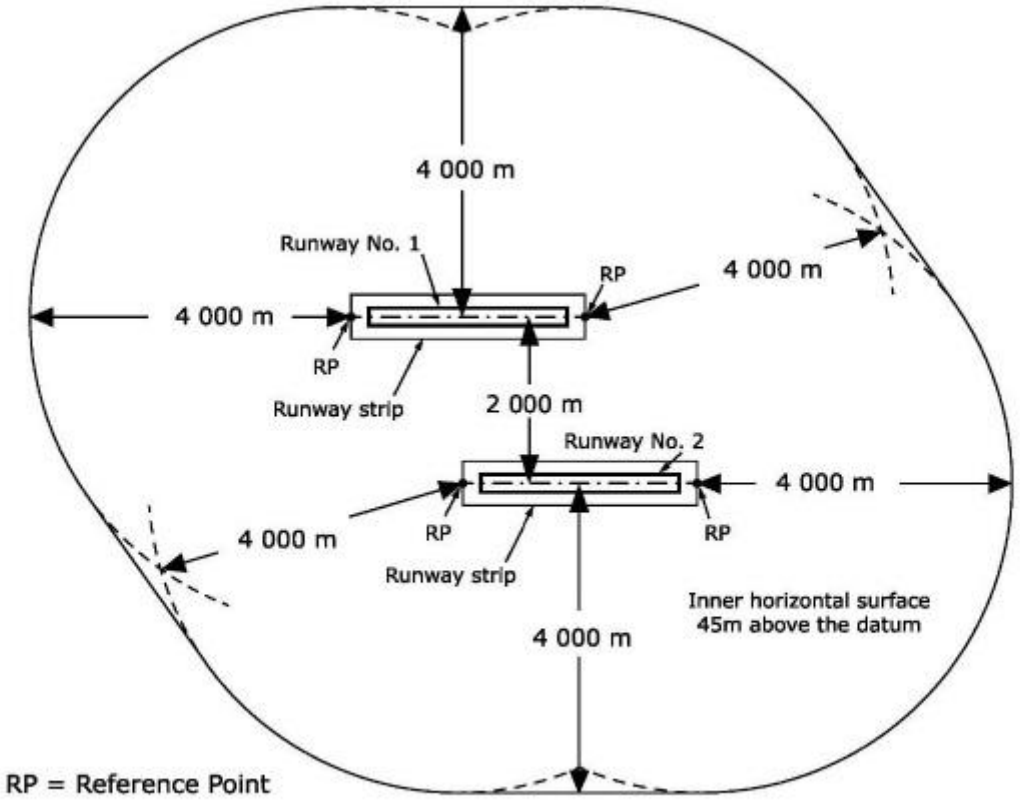


Figure GM-H-2. Composite inner horizontal surface for two parallel runways (where the runway code is 4)

GM1 CS-ADR-DSN.H.430 Transitional surface

When the elevation of a point on the lower edge is along the strip and equal to the elevation of the nearest point on the centre line of the runway or its extension as a result the transitional surface along the strip should be curved if the runway profile is curved, or a plane if the runway profile is a straight line. The intersection of the transitional surface with the inner horizontal surface should also be a curved or a straight line depending on the runway profile.

GM1 CS-ADR-DSN.H.440 Slewed take-off climb surface

The edge of a Take-off climb surface may be slewed in the direction of a turn away from the extended runway centre line up to a maximum of 15° splay. The portion of take-off climb surface encompassing the new departure track should be the same shape and dimensions as the original take-off climb surface measured relative to the new departure track. The opposite edge of the take-off climb surface should remain unchanged unless there is another turning departure towards that side as well, in which case, the edge may be slewed in that direction too.

GM1 CS-ADR-DSN.H.455 Inner transitional surface

(a) It is intended that the inner transitional surface be the controlling obstacle limitation surface for navigation aids, aircraft, and other vehicles that should be near the runway, and which is not to be penetrated except for frangible objects. The transitional surface is intended to remain as the controlling obstacle limitation surface for buildings, etc.

(b) The inner transitional surface along the strip should be curved if the runway profile is curved or a plane if the runway profile is a straight line. The intersection of the inner transitional surface with the inner horizontal surface should also be a curved or straight line depending on the runway profile.

GM1 CS-ADR-DSN.J.465 General

The requirements for obstacle limitation surfaces are specified on the basis of the intended use of a runway, i.e. take-off or landing, and type of approach, and are intended to be applied when such use of the runway is made. In cases where operations are conducted to or from both directions of a runway, the function of certain surfaces may be nullified because of more stringent requirements of another lower surface.

GM1 CS-ADR-DSN.J.470 Non-instrument runways

(a) Circumstances in which the shielding principle may reasonably be applied are described in the ICAO Doc 9137, Airport Services Manual, Part 6, Control of Obstacles.
(b) Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered that they may endanger aeroplanes.

GM1 CS-ADR-DSN.J.475 Non-precision approach runways

(a) If it is of particular importance for safe operation on circuits, arrival routes towards the aerodrome or on departure or missed approach climb-paths, an outer horizontal surface for non-precision approach runways should be established.
(b) Circumstances in which the shielding principle may reasonably be applied are described in ICAO Doc 9137, Airport Services Manual, Part 6, Control of Obstacles.
(c) Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered they may endanger aeroplanes.

GM1 CS-ADR-DSN.J.480 Precision approach runways

(a) The following obstacle limitation surfaces should be established for a precision approach runway Category I:
    (1) inner approach surface;
    (2) inner transitional surfaces; and
    (3) balked landing surface.
(b) See CS CS-ADR-DSN.T.915 for information regarding siting of equipment and installations on operational areas.
(c) Guidance on obstacle limitation surfaces for precision approach runways is given in ICAO Doc 9137, Airport Services Manual, Part 6, Control of Obstacles.
(d) Circumstances in which the shielding principle may reasonably be applied are described in ICAO Doc 9137, Airport Services Manual, Part 6, Control of Obstacles.
(e) Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered that they may endanger aeroplanes.
(f) For information on code letter F aeroplanes equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre. Additional guidance is given in ICAO Circular, 301, New Larger Aeroplanes — Infringement of the Obstacle Free Zone.

GM1 CS-ADR-DSN.J.485 Runways meant for take-off

(a) If no object reaches the 2 % (1:50) take-off climb surface, an obstacle-free surface of 1.6 % (1:62.5) should be established.
(b) When local conditions differ widely from sea level standard atmospheric conditions, it may be advisable for the slope specified in Table J-2 to be reduced. The degree of this reduction depends on the divergence between local conditions and sea level standard atmospheric conditions, and on the performance characteristics and operational requirements of the aeroplanes for which the runway is intended.
(c) Circumstances in which the shielding principle may reasonably be applied are described in ICAO Doc 9137, Airport Services Manual, Part 6, Control of Obstacles.
(d) Because of transverse slopes on a strip or clearway, in certain cases portions of the inner edge of the take-off climb surface may be below the corresponding elevation of the strip or clearway. It is not intended that the strip or clearway be graded to conform with the inner edge of the take-off climb surface, nor is it intended that terrain or objects which are above the take-off climb surface beyond the end of the strip or clearway, but below the level of the strip or clearway, be removed unless it is considered that they may endanger aeroplanes. Similar considerations apply at the junction of a clearway and strip where differences in transverse slopes exist.
(e) The operational characteristics of aeroplanes for which the runway is intended should be examined to see if it is desirable to reduce the slope specified in Table J-2 when critical operating conditions are to be catered to. If the specified slope is reduced, corresponding adjustment in the length of the take-off climb surface should be made so as to provide protection to a height of 300 m.

GM1 CS-ADR-DSN.J.486 Other objects

In certain circumstances, objects that do not project above any of the obstacle limitation surfaces may constitute a hazard to aeroplanes as, for example, where there are one or more isolated objects in the vicinity of an aerodrome.

GM1 CS-ADR-DSN.J.487 Objects outside the obstacle limitation surfaces

(a) Beyond the limits of the obstacle limitation surfaces the safety assessment should be conducted for the proposed constructions that extend above the established limits in order to protect safe operation of aircraft.
(b) The safety assessment may have regard to the nature of operations concerned and may distinguish between day and night operations.

GM1 CS-ADR-DSN.K.490 Wind direction indicator

(a) Wind direction indicators are important visual aids for all runway ends. Large wind direction indicators are particularly important at aerodromes where landing information is not available through radio communications. On the other hand, landing direction indicators are seldom used due to the necessity and, consequently, responsibility, of changing their direction as wind direction shifts. Visual ground signals for runway and taxiway serviceability are contained in ICAO Annex 2. Additional guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids, Chapter 3.

(b) A fabric wind cone is generally the type preferred by pilots because it provides a general indication of wind speed. Cones that extend fully at wind speeds of about 15 kt are most useful since this is the maximum crosswind landing component for small aircraft.

(c) It may be possible to improve the perception by the pilot of the location of the wind direction indicator by several means notably by circular marking around this indicator. The location of at least one wind direction indicator should be marked by a circular band 15 m in diameter and 1.2 m wide. The band should be centred about the wind direction indicator support, and should be in a colour chosen to give adequate conspicuity, preferably white.

(d) The usefulness of any visual aid is determined largely by its size, conspicuity, and location. Given conditions of good atmospheric visibility, the maximum distance at which the information available from an illuminated wind sleeve can be usefully interpreted is 1 km. Thus, in order that a pilot may make use of this information whilst on approach, the wind sleeve should be sited no farther from the runway threshold than 600 m. Obstacle criteria excluded, the ideal location is 300 m along the runway from the threshold and laterally displaced at 80 m from the runway centre line.

(e) This means, in effect, that only those aerodromes where the thresholds are less than 1 200 m apart can meet the minimum requirement with a single unit. Most code 3 and 4 aerodromes should require two or more units suitably sited in order to provide the best possible coverage.

(f) The final choice of unit numbers and location should depend on a number of factors which should vary from aerodrome to aerodrome. However, when deciding on the most appropriate location, account should be taken to ensure that the wind direction indicator is:
   (1) outside the Cleared and Graded Area of the runway and taxiway strips;
   (2) clear of the OFZ and ILS critical/sensitive areas where appropriate;
   (3) preferably not more than 200 m lateral displacement from the runway edge;
   (4) preferably between 300 m and 600 m from the runway threshold measured along the runway;
   (5) in an area with low background levels of illumination;
   (6) visible from the approach and take-off positions of all runways; and
   (7) free from the effects of air disturbance caused by nearby objects.

GM1 CS-ADR-DSN.K.500 Signalling lamp

When selecting the green light, use should be made of the restricted boundary of green as specified in GM1 CS-ADR-DSN.U.930(a).

GM1 CS-ADR-DSN.L.520 General – Colour and conspicuity

(a) Where there is insufficient contrast between the marking and the pavement surface, the marking should include an appropriate border.
  (1) This border should be white or black;
  (2) It is preferable that the risk of uneven friction characteristics on markings be reduced in so far as practicable by the use of a suitable kind of paint; and
  (3) Markings should consist of solid areas or a series of longitudinal stripes providing an effect equivalent to the solid areas.
  (4) Guidance on reflective materials is given in the ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.
(b) At aerodromes where operations take place at night, pavement markings should be made with reflective materials designed to enhance the visibility of the markings.

GM1 CS-ADR-DSN.L.530 Runway centre line marking

For the centre line marking the 30 m length of and gap between stripes may be adjusted to take into consideration the runway thresholds locations.

GM1 CS-ADR-DSN.L.540 Aiming point marking

For runways with widths of 30 m, the width of the rectangular stripes of the aiming point marking and the lateral spacing between the inner sides of the stripes may be adjusted in proportion to the available runway width to avoid overlapping of the aiming point marking with the runway side stripe marking.

GM1 CS-ADR-DSN.L.545 Touchdown zone marking

(a) In order to give information regarding the overall extension of a distance coding touchdown marking, as specified in CS CS-ADR-DSN.L.545, the last pair of markings after the threshold should consist of two single stripes, and the other pairs should correspond to the patterns shown in Figure L-4.
(b) Such sequential layout gives intuitive information about the extension of the touchdown zone and, as a consequence, of the LDA or of the distance between thresholds.

GM1 CS-ADR-DSN.L.550 Runway side stripe marking

When turn pads are not available at the end of a runway for back-track manoeuvres and threshold is displaced, in order to better identify full-strength bearing surface, it may be useful to display specific dashed markings as showed by Figure GM-L-1 and with dimensions described in Table GM-L-1.

GM1 CS-ADR-DSN.L.555 Taxiway centre line marking

The term ‘continuous guidance’ is not intended to require that taxiway centre line markings are provided onto aircraft stands. Instead, it is intended that the centre line marking be provided on taxiways leading to aircraft stands or other apron areas from which visual cues or other means exist, such as lead-in arrows and stand number indicators, to enable aircrew to manoeuvre the aircraft onto a stand or other parking area.

GM1 CS-ADR-DSN.L.560 Interruption of runway markings

(a) At an intersection of a runway and taxiway, the runway side stripe marking should be either continued across the intersection or interrupted. The interruption means one of the following:
  (1) the runway side stripe marking stops at the point where the taxiway fillet starts at either side of the taxiway (see Figure GM-L-2(A)); or
  (2) the runway side stripe marking stops at the point where the extended line of the taxiway edge crosses the runway (see Figure GM-L-2(B)); or

(3) the runway side stripe marking stops at a short distance on either side of the taxiway centre line marking in order to allow visible and continuous taxiway centre line marking guidance (see Figure GM-L-2(C)); or
(4) the taxiway centre line marking overlays and therefore interrupts a continuous runway side stripe marking (see Figure GM-L-2(D)).

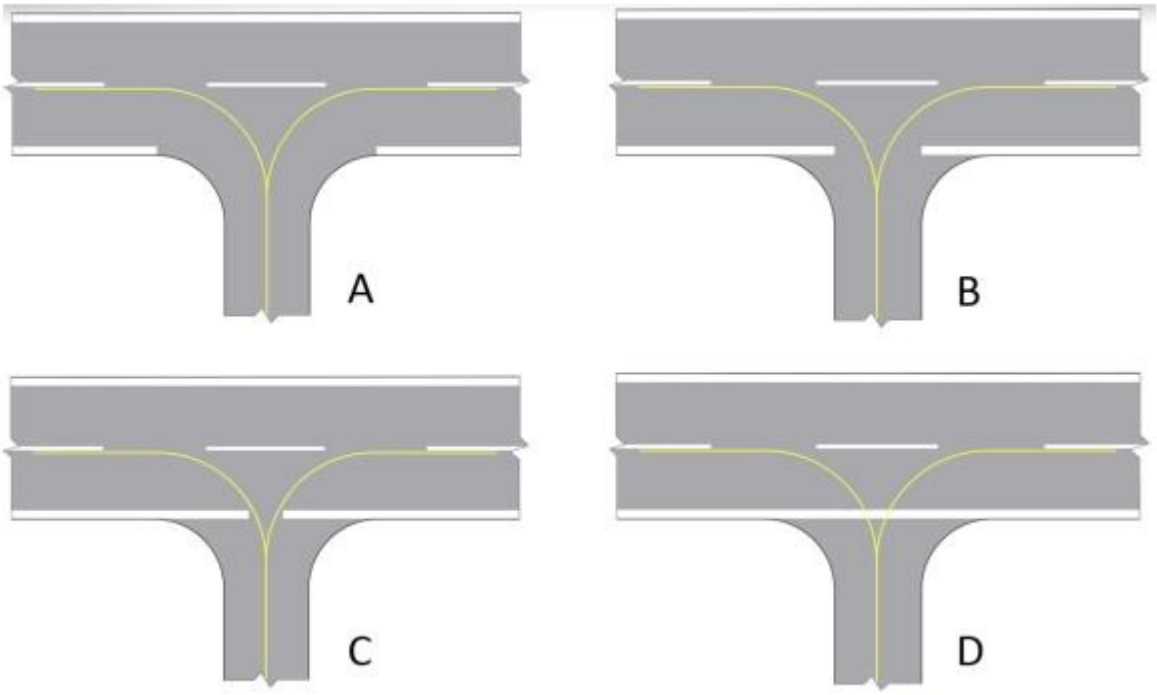


Figure GM-L-2. Illustration of runway side stripe marking interruption

(b) The overall perception of the runway side stripe marking depends on conspicuity needs and local conditions, such as the number, location and disposition of runway/taxiway intersections, nature of the surrounding terrain, operational needs at aerodrome, weather, etc.

GM1 CS-ADR-DSN.L.565 Runway turn pad marking

Where a runway turn pad is not provided, a marking for continuous guidance to enable an aeroplane to complete a 180-degree turn and align with the runway centre line may be provided. Such marking should be yellow, at least 15 cm in width and continuous in length.

GM1 CS-ADR-DSN.L.570 Enhanced taxiway centre line marking

The provision of enhanced taxiway centre line marking may form part of runway incursion prevention measures.

GM1 CS-ADR-DSN.L.575 Runway-holding position marking

When the Runway-holding position marking is supplemented with the term 'CAT II' or 'CAT III' on the areas or taxiways exceeding 60 m in accordance with CS CS-ADR-DSN.L.575(a)(6) and should be placed along with the Mandatory instruction marking in accordance with CS CS-ADR-DSN.L.605 both markings should be equally and symmetrically placed one next to another.

GM1 CS-ADR-DSN.L.590 Aircraft stand marking

(a) The distances to be maintained between the stop line and the lead-in line may vary according to different aircraft types, taking into account the pilot's field of view.
(b) Apron markings are installed to support the safe operation of aircraft on stands and apron areas. Where appropriate procedures are employed, markings may not be required, giving flexibility of

operations. Examples would include situations where aircraft marshallers are used or where aircraft are required to self-park on an open apron where different combinations of aircraft preclude dedicated markings. Specific markings/stands are normally more applicable for larger aircraft.

GM1 CS-ADR-DSN.L.595 Apron safety lines

(a) Ground equipment and vehicles should be kept outside predetermined limits when aircraft are manoeuvring or when the equipment is left unattended.
(b) Safety lines are required on an apron to mark the limits of parking areas for ground equipment, apron service roads and passengers' paths, etc. These lines are narrower and of a different colour to differentiate them from the guidelines used for aircraft.
  (1) Wing tip clearance lines. These lines should delineate the safety zone clear of the path of the critical aeroplane wing tip. The line should be drawn at appropriate distance outside the normal path of the wing tip of the critical aeroplane;
  (2) Equipment limit lines. These lines are used to indicate the limits of areas which are intended for parking vehicles and aircraft servicing equipment when they are not in use.
(c) Several methods may be used to identify which side of a safety line is safe for storage of such vehicles and equipment:
  (1) Spurs or an additional line (a discontinuous line of the same colour or a continuous line of a different conspicuous colour) may be provided on one side of the safety line. The side on which such spurs or an additional line is located is considered safe for parking vehicles and equipment;
  (2) The words 'Equipment Limit' may be painted on the side used by ground equipment and readable from that side;
  (3) Passenger path lines. These lines are used to indicate to passengers and escorting personnel the route that needs to be followed, when walking on the apron, in order to be clear of hazards. A pair of lines with zebra hatching between them may be used.

GM1 CS-ADR-DSN.L.597 Apron service road marking

(a) The term service road encompasses also other types of roads, such as the perimeter service roads, which are used to provide access to security or maintenance services etc. of the aerodrome. However, such types of service roads do not fall under the term 'apron service road'.
(b) When an apron service road crosses a taxiway, a separate road-holding position sign, in accordance with CS CS-ADR-DSN.N.800, or road-holding position marking, in accordance with CS CS-ADR-DSN.L.600, should indicate that vehicles are required to stop.
(c) Markings located on an apron are prescribed in CS CS-ADR-DSN.L.555, CS MAR>ADR-DSN.L.590 and CS CS-ADR-DSN.L.595.

GM1 CS-ADR-DSN.L.600 Road-holding position marking

(a) Where a road that accesses a runway or a taxiway is unpaved, it may not be possible to install markings. In such cases, a road-holding position signs and/or lights should be installed, combined with appropriate instructions on how the driver of a vehicle should proceed.
(b) Where it is possible to install markings, they should conform to national regulations for traffic sings and markings.

GM1 CS-ADR-DSN.L.605 Mandatory instruction marking

(a) Except where operationally required, a mandatory instruction marking should not be located on a runway.
(b) 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 illustrated in Figure GM-L-3. The shadowing only affects the vertical dimension.

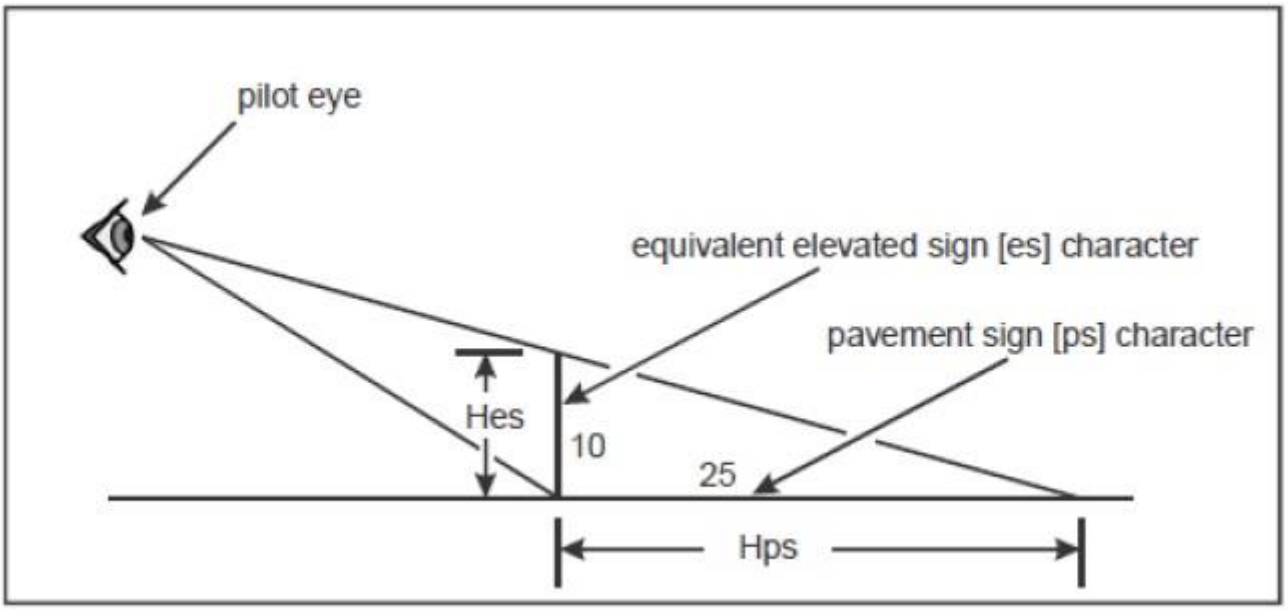


Figure GM-L-3. Illustration of pavement marking spacing calculation

(c) The following example illustrates how the pavement marking spacing is to be calculated:
(1) in the case of 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);
(2) Table N-3(b) indicates numeral to numeral code 1 and from Table N-3(c) this code has a dimension of 96 mm, for a character height of 400 mm;
(3) the pavement marking spacing for '10' is then (1 600/400) x 96 = 384 mm.

GM1 CS-ADR-DSN.L.610 Information marking

(a) Applicability: Where operationally required information sign should be supplemented by a marking on the pavement surface.
(b) Location:
(1) An information (location/direction) marking should be displayed prior to and following complex taxiway intersections, and where operational experience has indicated the addition of a taxiway location marking could assist flight crew ground navigation, and on the pavement surface at regular intervals along taxiways of great length.
(2) The information marking should be displayed across the surface of the taxiway or apron where necessary, and positioned so as to be legible from the cockpit of an approaching aircraft.

GM1 CS-ADR-DSN.M.615 General

(a) Aeronautical ground lights near navigable waters should be taken into consideration to ensure that the lights do not cause confusion to mariners.
(b) In dusk or poor visibility conditions by day, lighting can be more effective than marking. For lights to be effective in such conditions or in poor visibility by night, they should be of adequate intensity. To obtain the required intensity, it should usually be necessary to make the light directional, in which case the arcs over which the light shows should be adequate and so orientated as to meet the operational requirements. The runway lighting system should be considered as a whole, to ensure that the relative light intensities are suitably matched to the same end.
(c) While the lights of an approach lighting system may be of higher intensity than the runway lighting, it is good practice to avoid abrupt changes in intensity as these could give a pilot a false impression that the visibility is changing during approach.
(d) The conspicuity of a light depends on the impression received of contrast between the light and its background. If a light is to be useful to a pilot by day when on approach, it should have an intensity of at least 2 000 or 3 000 cd, and in the case of approach lights an intensity of the order of 20 000 cd is desirable. In conditions of very bright daylight fog it may not be possible to provide lights of sufficient intensity to be effective.
(e) On the other hand, in clear weather on a dark night, an intensity of the order of 100 cd for approach lights and 50 cd for the runway edge lights may be found suitable. Even then, owing to the closer range at which they are viewed, pilots have sometimes complained that the runway edge lights seemed unduly bright.
(f) In fog the amount of light scattered is high. At night this scattered light increases the brightness of the fog over the approach area and runway to the extent that little increase in the visual range of the lights can be obtained by increasing their intensity beyond 2 000 or 3 000 cd. In an endeavour to increase the range at which lights would first be sighted at night, their intensity should not be raised to an extent that a pilot might find excessively dazzling at diminished range.
(g) From the foregoing should be evident the importance of adjusting the intensity of the lights of an aerodrome lighting system according to the prevailing conditions, so as to obtain the best results without excessive dazzle that would disconcert the pilot. The appropriate intensity setting on any particular occasion should depend both on the conditions of background brightness and the visibility.
(h) Assessment on dazzle in the aerodrome vicinity:
  (1) Human vision is a complex mechanism using both eye and brain. Even though this mechanism is quite handled for eye, there is still a lack of knowledge on the interpretation of it by the brain. Thus, vision varies from one human being to another.
  (2) The field of view is defined by the area perceived by eyes. The perception of details is based on the luminance ratio between elements of the scene, taking into account spatial distribution. Luminance and contrast are key elements of vision mechanism.
  (3) Four sectors can be identified in the field of view (FOV):
    i) sensation field, corresponding to the absolute boundaries of FOV; it opens up to approximately 90° on each side of the eye direction;
    ii) visibility field, which is narrower and enables the perception of an object; it opens up to 60°;
    iii) conspicuity field, which enables the recognition, it opens up to 30°;
    iv) working conspicuity field, which is further tightly centred on the eye direction (1° to 2°); it enables the identification and is the working area of the vision.

  It is reminded that the retina is composed in its centre by cone cells (that see colours and details) and at the periphery by rod cells (that perceive movements and change of state).
(i) A safety assessment is conducted in order to identify situations where the risk of dazzling becomes unacceptable. Thus, it is noted that dazzle represents such a risk in the following situations:
  (1) during approach, especially after the aircraft has descended below the decision height: the pilot should not lose any visual cue;
  (2) at touchdown the pilot should not be surprised by a flash;
  (3) during rolling (landing or take-off), the pilot should be able to perceive his environment and detect any deviation from the centre line: the pilot should not lose any visual cue.

(4) Thus:
i) prejudicial dazzle due to veiling luminance should not occur during approach (slightly before the decision height) and rolling; and
ii) surprise effect should not occur at touchdown.

(j) Regarding air traffic controllers, it has been considered that dazzle induced by veiling effect should not reduce the visual perception of aircraft operations on, and close to the runway.

(k) The elements here above can be applied to solar panels. The following assumptions can be made:
(1) solar panels are inclined so as to efficiently capture the sunlight, conducting to a range of cross section surfaces;
(2) the maximum acceptable luminance value has been fixed to 20 000 cd/m2; and
(3) the surfaces varied from 100 m2 to several hectares.

(l) It is assumed that the aircraft maintains precisely its trajectory whereas in reality the approach is conducted into a conical envelop around the expected trajectory.

(m) For the purpose of NVS/NVG (aided) aircraft operations, the intensity of the lights of an aerodrome lighting system should be adjusted according to the prevailing conditions, so as to obtain the best results without excessive dazzle that would disconcert the pilot. The appropriate intensity setting on any particular occasion should depend on the type of lighting, NVS/NVG used, conditions of background brightness and the visibility.

GM1 CS-ADR-DSN.M.625 Approach lighting systems

(a) Types and characteristics
(1) The approach lighting patterns that have been generally adopted are shown in Figures M-1 and M-2. A diagram of the inner 300 m of the precision approach Category II and III lighting system is shown in Figures M-3A and M-3B.
(2) The approach lighting configuration is to be provided irrespective of the location of the threshold, i.e. whether the threshold is at the extremity of the runway or displaced from the runway extremity. In both cases, the approach lighting system should extend up to the threshold. However, in the case of a displaced threshold, inset lights are used from the runway extremity up to the threshold to obtain the specified configuration. These inset lights are designed to satisfy the structural requirements specified in CS MAR-ADR.DSN.M.615(d)(1).The characteristics of these inset lights should be in accordance with the specifications in CS CS-ADR-DSN.U.940, Figures U-5 or U-6, as appropriate and the chromaticity should be in accordance with the specifications in CS CS-ADR-DSN.U.930 and Figure U-1A or U-1B, as appropriate.
(3) Examples of flight path envelopes used in designing the lighting are shown in Figure GM-M-2.

(b) Horizontal installation tolerances:
(1) The dimensional tolerances are shown in Figure M-1 and M-2.
(2) The centre line of an approach lighting system should be as coincident as possible with the extended centre line of the runway with a maximum tolerance of ±15’.
(3) The longitudinal spacing of the centre line lights should be such that one light (or group of lights) is located in the centre of each crossbar, and the intervening centre line lights are spaced as evenly as practicable, between two crossbars or a crossbar and a threshold.
(4) The crossbars and barrettes should be at right angles to the centre line of the approach lighting system with a tolerance of ±30’ if the pattern in Figure M-2(A) is adopted or ± 2° if Figure M-2(B) is adopted.
(5) When a crossbar has to be displaced from its standard position, any adjacent crossbar should where possible, be displaced by appropriate amounts in order to reduce the differences in the crossbar spacing.
(6) When a crossbar in the system shown in Figure M-2(A) is displaced from its standard position, its overall length should be adjusted so that it remains one-twentieth of the actual distance of the crossbar from the point of origin. It is not necessary, however, to adjust the standard 2.7 m spacing between the crossbar lights but the crossbars should be kept symmetrical about the centre line of the approach lighting.

(c) Vertical installation tolerances:
(1) The ideal arrangement is to mount all the approach lights in the horizontal plane passing through the threshold as shown in Figure GM-M-1, and this should be the general aim as far as local conditions permit. However, buildings, trees, etc. should not obscure the lights from the

view of a pilot who is assumed to be 1° below the electronic glide path in the vicinity of the outer marker.

(2) Within a stopway or clearway, and within 150 m of the end of a runway, the lights should be mounted as near to the ground as local conditions permit in order to minimise risk of damage to aeroplanes in the event of an overrun or undershoot. Beyond the stopway and clearway, it is not so necessary for the lights to be mounted close to the ground, and, therefore, undulations in the ground contours can be compensated for by mounting the lights on poles of appropriate height.

(3) It is desirable that the lights be mounted so that as far as possible, no object within a distance of 60 m on each side of the centre line protrudes through the plane of the approach lighting system. Where a tall object exists within 60 m of the centre line and within 1 350 m from the threshold for a precision approach lighting system, or 900 m for a simple approach lighting system, it may be advisable to install the lights so that the plane of the outer half of the pattern clears the top of the object.

(4) In order to avoid giving a misleading impression of the plane of the ground, the lights should not be mounted below a gradient of 1 in 66 downwards from the threshold to a point 300 m out, and below a gradient of 1 in 40 beyond the 300 m point. For a precision approach Category II and III lighting system, more stringent criteria may be necessary, e.g. negative slopes not permitted within 450 m of the threshold.

(i) Centre line. The gradients of the centre line in any section (including a stopway or clearway) should be as small as practicable, and the changes in gradients should be as few and small as can be arranged, and should not exceed 1 in 60. Experience has shown that as one proceeds outwards from the runway, rising gradients in any section of up to 1 in 66, and falling gradients of down to 1 in 40, are acceptable.

(ii) Crossbars. The crossbar lights should be so arranged as to lie on a straight line passing through the associated centre line lights, and wherever possible, this line should be horizontal. It is permissible, however, to mount the lights on a transverse gradient not more than 1 in 80 if this enables crossbar lights within a stopway or clearway to be mounted nearer to the ground on sites where there is a cross-fall.

(5) When the barrette is composed of lights approximating to point sources, a spacing of 1.5 m between adjacent lights in the barrette has been found satisfactory.

(6) At locations where identification of the simple approach lighting system is difficult at night due to surrounding lights, sequence flashing lights installed in the outer portion of the system may resolve this problem.

(d) Clearance of obstacles:

(1) An area, hereinafter referred to as the light plane, has been established for obstacle clearance purposes, and all lights of the system are in this plane. This plane is rectangular in shape and symmetrically located about the approach lighting system's centre line. It starts at the threshold and extends 60 m beyond the approach end of the system, and is 120 m wide.

(2) No objects are permitted to exist within the boundaries of the light plane which are higher than the light plane except as designated herein. All roads and highways are considered as obstacles extending 4.8 m above the crown of the road, except aerodrome service roads where all vehicular traffic is under control of the aerodrome operator and coordinated with the aerodrome air traffic control. Railroads, regardless of the amount of traffic, are considered as obstacles extending 5.4 m above the top of the rails.

(3) It is recognised that some components of electronic landing aids systems, such as reflectors, antennas, monitors, etc. should be installed above the light plane. Every effort should be made to relocate such components outside the boundaries of the light plane. In the case of reflectors and monitors, this can be done in many instances.

(4) Where an ILS localiser is installed within the light plane boundaries, it is recognised that the localiser, or screen if used, should extend above the light plane. In such cases, the height of these structures should be held to a minimum and they should be located as far from the threshold as possible. In general, the rule regarding permissible heights is 15 cm for each 30 m the structure is located from the threshold. As an example, if the localiser is located 300 m from the threshold, the screen should be permitted to extend above the plane of the approach lighting system by 10 × 15 = 150 cm maximum but preferably should be kept as low as possible, consistent with proper operation of the ILS.

(5) In locating an MLS azimuth antenna the guidance contained in ICAO Annex 10, Volume I, Attachment G, should be followed. This material which also provides guidance on collocating an

MLS azimuth antenna with an ILS localiser antenna, suggests that the MLS azimuth antenna may be sited within the light plane boundaries where it is not possible or practical to locate it beyond the outer end of the approach lighting for the opposite direction of approach. If the MLS azimuth antenna is located on the extended centre line of the runway, it should be as far as possible from the closest light position to the MLS azimuth antenna in the direction of the runway end. Furthermore, the MLS azimuth antenna phase centre should be at least 0.3 m above the light centre of the light position closest to the MLS azimuth antenna in the direction of the runway end. (This could be relaxed to 0.15 m if the site is otherwise free of significant multipath problems.)

(6) Compliance with this requirement which is intended to ensure that the MLS signal quality is not affected by the approach lighting system, could result in the partial obstruction of the lighting system by the MLS azimuth antenna. To ensure that the resulting obstruction does not degrade visual guidance beyond an acceptable level, the MLS azimuth antenna should not be located closer to the runway end than 300 m and the preferred location is 25 m beyond the 300 m crossbar (this would place the antenna 5 m behind the light position 330 m from the runway end). Where an MLS azimuth antenna is so located, a central part of the 300 m crossbar of the approach lighting system would alone be partially obstructed. Nevertheless, it is important to ensure that the unobstructed lights of the crossbar remain serviceable all the time.

(7) Objects existing within the boundaries of the light plane, requiring the light plane to be raised in order to meet the criteria contained herein, should be removed, lowered, or relocated where this can be accomplished more economically than raising the light plane.

(8) In some instances objects may exist which cannot be removed, lowered, or relocated economically. These objects may be located so close to the threshold that they cannot be cleared by the 2 % slope. Where such conditions exist and no alternative is possible, the 2 % slope may be exceeded or a 'stair step' resorted to in order to keep the approach lights above the objects. Such 'step' or increased gradients should be resorted to only when it is impracticable to follow standard slope criteria, and they should be held to the absolute minimum. Under this criterion no negative slope is permitted in the outermost portion of the system.

(e) Consideration of the effects of reduced lengths:

(1) The need for an adequate approach lighting system to support precision approaches where the pilot is required to acquire visual references prior to landing, cannot be stressed too strongly. The safety and regularity of such operations is dependent on this visual acquisition. The height above runway threshold at which the pilot decides there are sufficient visual cues to continue the precision approach and land, should vary, depending on the type of approach being conducted and other factors such as meteorological conditions, ground and airborne equipment, etc. The required length of approach lighting system which should support all the variations of such approaches is 900 m, and this should always be provided whenever possible.

(2) However, there are some runway locations where it is impossible to provide the 900 m length of approach lighting system to support precision approaches.

(3) In such cases, every effort should be made to provide as much approach lighting system as possible. Restrictions on operations could be imposed on runways equipped with reduced lengths of approach lighting. There are many factors which determine at what height the pilot should have decided to continue the approach to land or execute a missed approach. It should be understood that the pilot does not make an instantaneous judgement upon reaching a specified height. The actual decision to continue the approach and landing sequence is an accumulative process which is only concluded at the specified height. Unless lights are available prior to reaching the decision point, the visual assessment process is impaired and the likelihood of missed approaches should increase substantially. There are many operational considerations which should be taken into account in deciding if any restrictions are necessary to any precision approach and these are detailed in ICAO Annex 6.

(f) For non-precision approach runways it is advisable to give consideration to the installation of a precision approach Category I lighting system or to the addition of a runway lead-in lighting system.

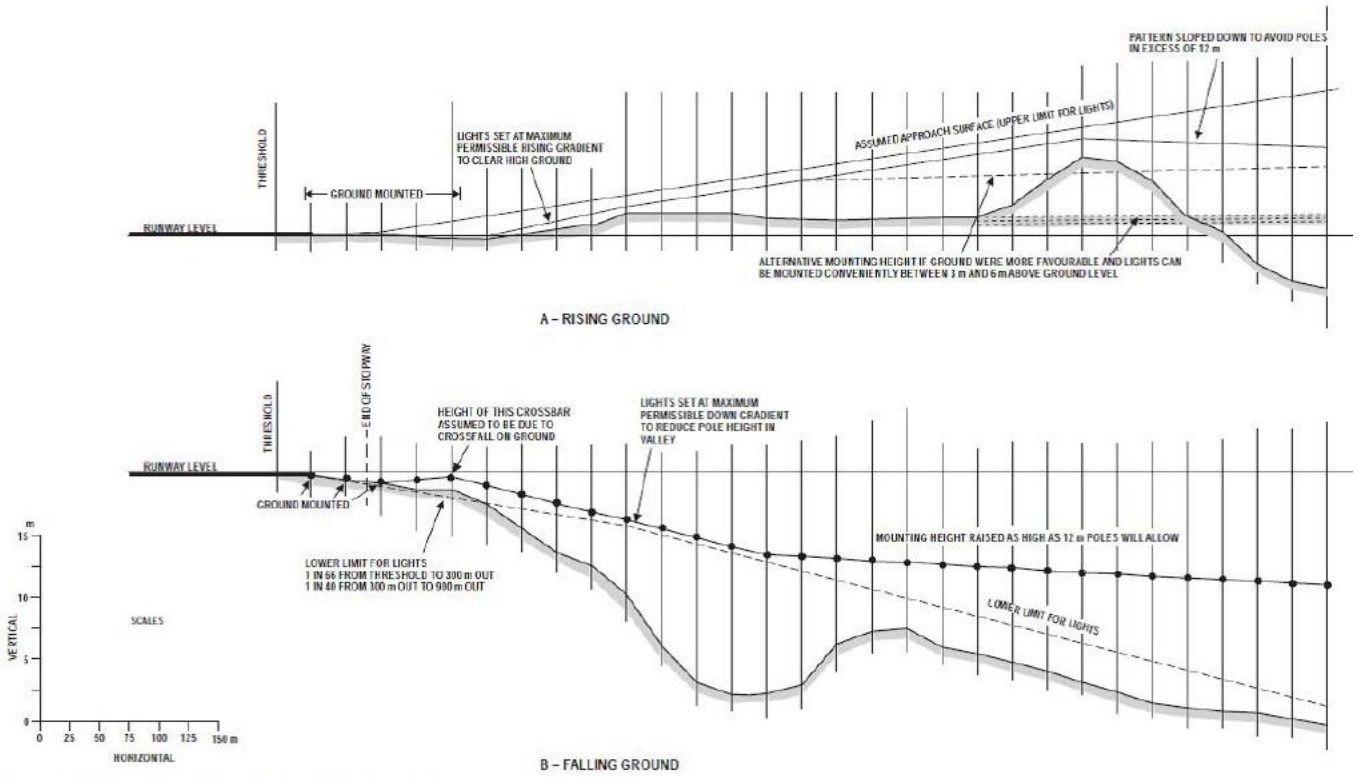


Figure GM-M-1. Vertical installation tolerances

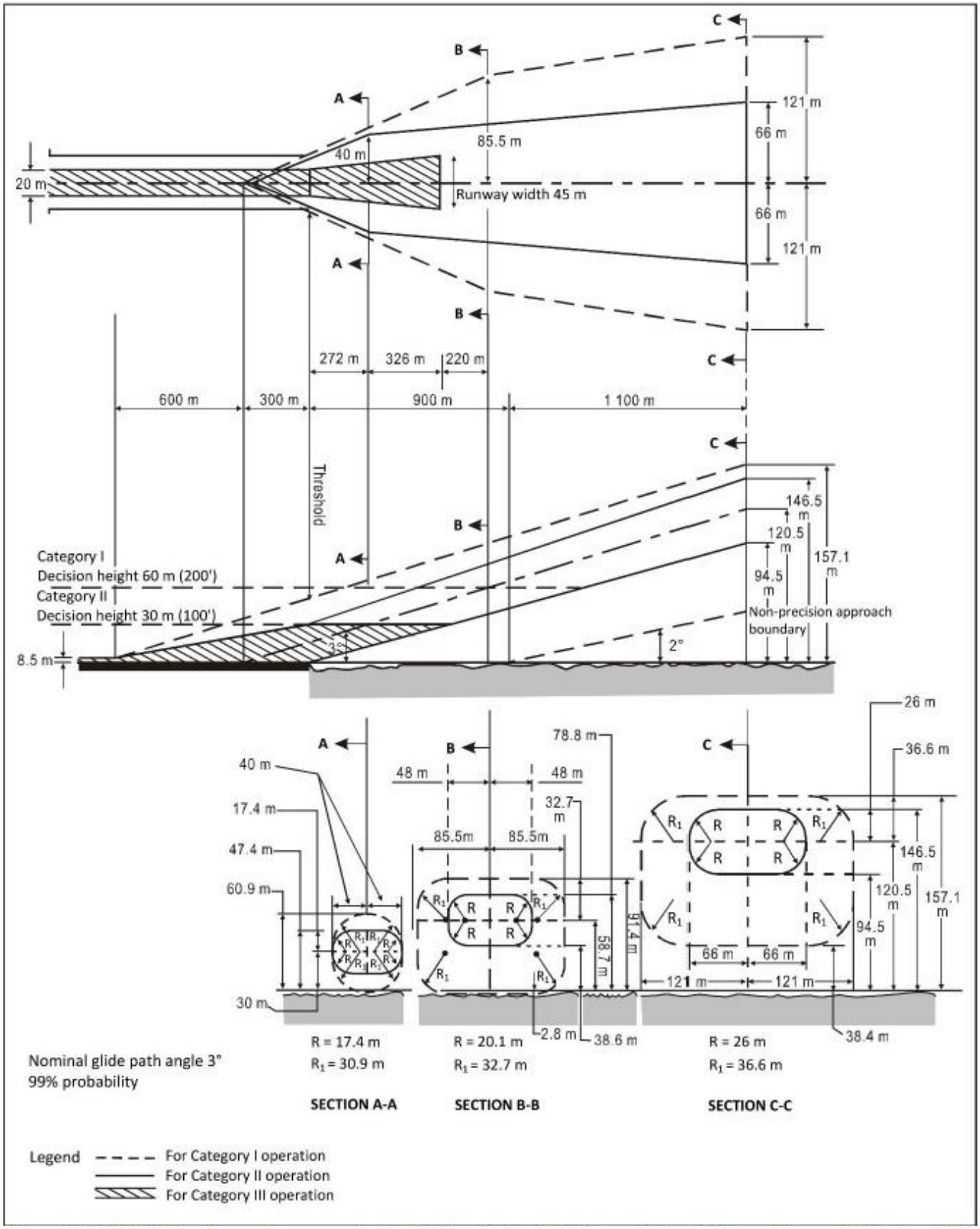


Figure GM-M-2. Flight path envelope examples for lighting design for Category I, II and III operations — Centre line lights

GM1 CS-ADR-DSN.M.630 Precision approach Category I lighting system

(a) The installation of an approach lighting system of less than 900 m in length may result in operational limitations on the use of the runway.

(b) Spacings for the crossbar lights between 1 m and 4 m are in use. Gaps on each side of the centre line may improve directional guidance when approaches are made with a lateral error, and facilitate the movement of rescue and firefighting vehicles.
(c) The flashing light system provides a long-distance information about the location and orientation of an active runway to the approaching pilots. Particularly in the surrounding of cities with urban lighting of streets, places and buildings, the flashing light system allows a clear identification of the approach by the flight crew. To prevent glare at night and have clear visibility, the high-intensity flashing light should be provided with an appropriate intensity control.

GM1 CS-ADR-DSN.M.635 Precision approach Category II and III lighting system

The length of 900 m is based on providing guidance for operations under Category I, II and III conditions. Reduced lengths may support Category II and III operations but may impose limitations on Category I operations. Additional guidance is given in ICAO Annex 14, Attachment A, Section 11.

GM1 CS-ADR-DSN.M.640 Visual approach slope indicator systems

(a) Factors that should be considered when making a decision on which runway on an aerodrome should receive first priority for the installation of a visual approach slope indicator system are:
  (1) frequency of use;
  (2) seriousness of the hazard;
  (3) presence of other visual and non-visual aids;
  (4) type of aeroplanes using the runway; and
  (5) frequency and type of adverse weather conditions under which the runway should be used.
(b) With respect to the seriousness of the hazard, the order given in the CS CS-ADR-DSN.M.640 may be used as a general guide. These may be summarised as:
  (1) inadequate visual guidance because of:
    (i) approaches over water or featureless terrain, or absence of sufficient extraneous light in the approach area by night;
    (ii) deceptive surrounding terrain.
  (2) serious hazard in approach;
  (3) serious hazard if aeroplanes undershoot or overrun; and
  (4) unusual turbulence.
(c) The presence of other visual or non-visual aids is a very important factor. Runways equipped with ILS or MLS would generally receive the lowest priority for a visual approach slope indicator system installation. It should be remembered, though, that visual approach slope indicator systems are visual approach aids in their own right and can supplement electronic aids. When serious hazards exist and/or a substantial number of aeroplanes not equipped for ILS or MLS use a runway, priority might be given to installing a visual approach slope indicator on this runway.
(d) Priority may be given to runways used by turbojet aeroplanes.
(e) Where a runway threshold is temporarily displaced from the normal position and one or more of the conditions specified in paragraph (a) above exist, a PAPI should be provided except that where the code number is 1 or 2 either an APAPI may be provided.

GM1 CS-ADR-DSN.M.655 Obstacle protection surface for PAPI and APAPI

(a) The displacement of the system upwind of the threshold reduces the operational landing distance.
(b) Additional guidance on the calculation for siting PAPI/ APAPI on a runway with ILS/MLS is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.

GM1 CS-ADR-DSN.M.685 Runway end lights

When the threshold is at the runway extremity, fittings serving as threshold lights may be used as runway end lights.

GM1 CS-ADR-DSN.M.695 Runway touchdown zone lights

To allow for operations at lower visibility minima, it may be advisable to use a 30 m longitudinal spacing between barrettes.

GM1 CS-ADR-DSN.M.700 Rapid exit taxiway indicator lights (RETILs)

(a) In low visibility conditions, rapid exit taxiway indicator lights provide useful situational awareness cues while allowing the pilot to concentrate on keeping the aircraft on the runway centre line.
(b) Rapid exit taxiway indicator lights should be considered on a runway intended for use in runway visual range conditions less than a value of 350 m where the traffic density is heavy.
(c) Rapid exit taxiway indicator lights should not be displayed in the event of any lamp failure or other failure that prevents the display of the light pattern depicted in Figure GM-M-3.
(d) Following a landing, runway occupancy time has a significant effect on the achievable runway capacity. Rapid exit taxiway indicator lights allow pilots to maintain a good roll-out speed until it is necessary to decelerate to an appropriate speed for the turn into a rapid exit turn-off. A roll-out speed of 60 kt until the first RETIL (three-light barrette) is reached is seen as the optimum.

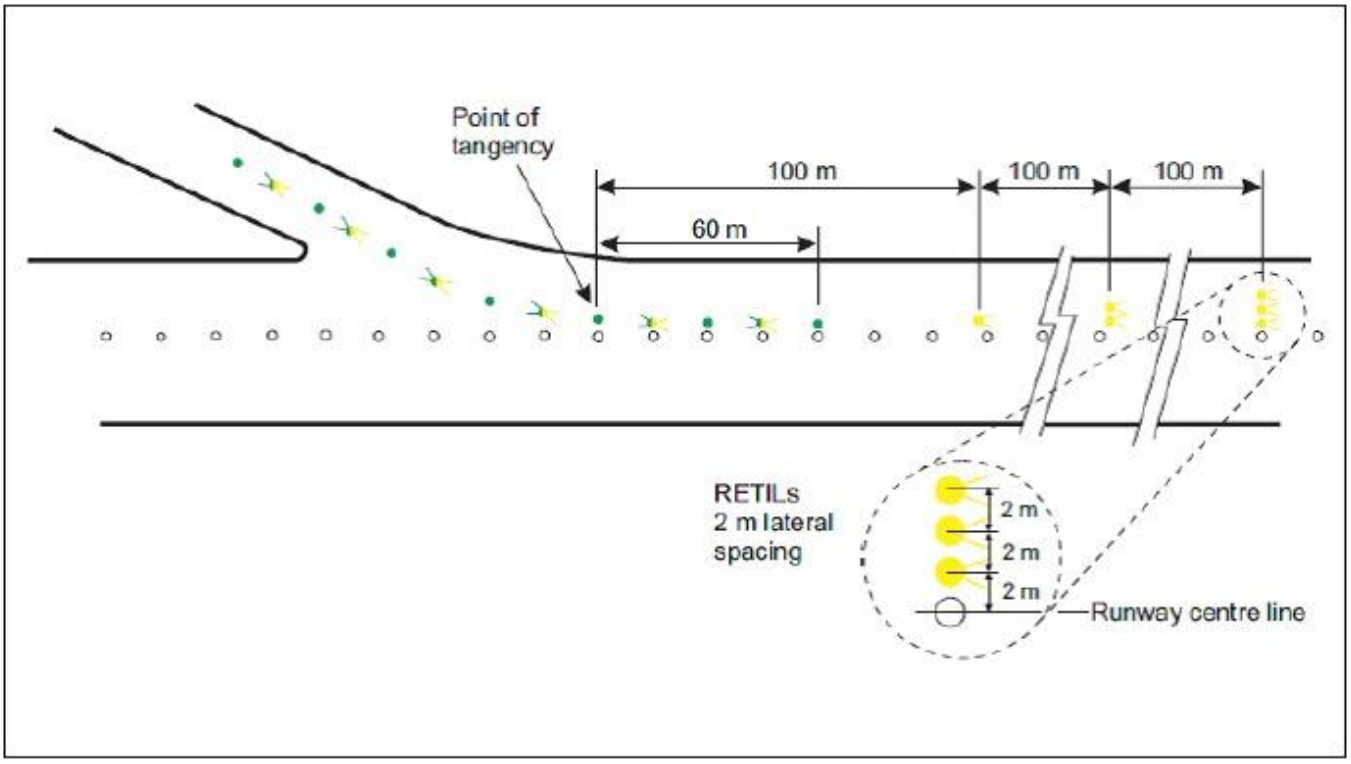


Figure GM-M-3. Rapid exit taxiway indicator lights (RETILs)

GM1 CS-ADR-DSN.M.710 Taxiway centre line lights

(a) In the case where taxiway centre line lights are provided and where there may be a need to delineate the edges of a taxiway, e.g. on a rapid exit taxiway, narrow taxiway, or in snow conditions, this may be done with taxiway edge lights or markers. Care is necessary to limit the light distribution of green lights on or near a runway so as to avoid possible confusion with threshold lights.
(b) Care should be taken to limit the light distribution of green lights on or near a runway so as to avoid possible confusion with threshold lights.
(c) The provisions of CS CS-ADR-DSN.M.710(c)(3) can form part of effective runway incursion prevention measures.

GM1 CS-ADR-DSN.M.730 Stop bars

(a) A stop bar is intended to be controlled either manually or automatically by air traffic services.
(b) Runway incursions may take place in all visibility or weather conditions. The provision of stop bars at runway-holding positions and their use at night and in visibility conditions greater than 550 m runway visual range can form part of effective runway incursion prevention measures.

(c) A pair of elevated lights should be added to each end of the stop bar where the in-pavement stop bar lights might be obscured from a pilot's view, for example by snow or rain, or where a pilot may be required to stop the aircraft in a position so close to the lights that they are blocked from view by the structure of the aircraft.
(d) Where necessary, to enhance conspicuity of an existing stop bar, extra lights are installed uniformly.
(e) Where the additional lights specified in (c) above are provided, these lights should be located not less than 3 m from the taxiway edge.
(f) Where the additional lights specified in (c) above are provided, these lights should have the same characteristics as the lights in the stop bar but should be visible to approaching aircraft up to the stop bar position.
(g) High-intensity stop bars should only be used in case of an absolute necessity and following a specific study.
(h) Care is required in the design of the electrical system to ensure that all of the lights of a stop bar will not fail at the same time. Guidance on this issue is given in ICAO Doc 9157, Aerodrome Design Manual, Part 5, Electrical Systems.

GM1 CS-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.
(b) Where taxiways are substantially wider than those specified in CS 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) Higher light intensities may be required to maintain ground movement at a certain speed in low visibilities.
(d) 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.
(e) 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.
(f) Additional guidance on runway guard lights is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.

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

(a) Runway incursions may take place in all visibility or weather conditions. The use of no-entry bars can form part of effective runway incursion prevention measures.
(b) Where necessary to enhance conspicuity, extra lights should be installed uniformly.
(c) 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) 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 CS-ADR-DSN.U.940, Figures U-21, U-22 or U-23, as appropriate.
(e) High-intensity no-entry bars are typically used only in case of an absolute necessity and following a safety assessment.

(f) 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 CS-ADR-DSN.U.940, Figures U-21 or U-23, as appropriate.

(g) 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.

GM1 CS-ADR-DSN.N.775 General

(a) Signs may need to be orientated to improve readability.
(b) Guidance on signs is contained in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids, Chapter 11.
(c) Guidance on frangibility is contained in ICAO Doc 9157, Aerodrome Design Manual, Part 6, Frangibility.
(d) Guidance on measuring the average luminance of a sign is contained in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.

GM1 CS-ADR-DSN.N.785 Information signs

(a) When an installation of information sign on the left-hand side is not possible, e.g. due to infrastructural or operational restrictions, an installation on the right-hand side of the taxiway in accordance with the specifications given in Table N-1 may also be acceptable when a safety assessment indicates that it would not adversely affect the safety of operations of aeroplanes.
(b) At a 'T' intersection, information signs may be located in the direction of the taxiway centre line to the opposite side of the crossing taxiway when a safety assessment indicates that guidance could be assured under all intended operating conditions and that it would not adversely affect the safety of operations of aeroplanes.

GM1 CS-ADR-DSN.P.820 Edge markers for snow-covered runways

Characteristics: Runway lights could be used to indicate the limits.

GM1 CS-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.
(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.
(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.
(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.

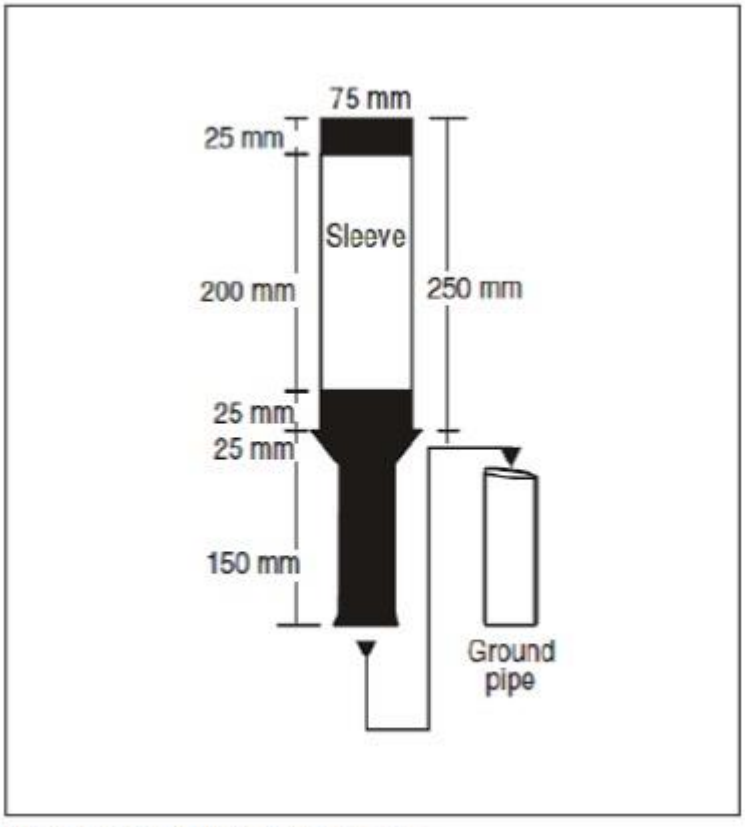


Figure GM-P-1. Taxiway edge marker

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

(a) The marking and/or lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of the obstacles. It does not necessarily reduce operating limitations which may be imposed by an obstacle.
(b) Other objects inside the obstacle limitation surfaces should be marked and/or lighted if a safety assessment indicates that the object could constitute a hazard to aircraft (this includes objects adjacent to visual routes e.g. waterway or highway).
(c) Overhead wires, cables, etc., crossing a river, waterway, valley or highway should be marked and their supporting towers marked and lighted if a safety assessment indicates that the wires or cables could constitute a hazard to aircraft.
(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.

GM1 CS-ADR-DSN.Q.841 Objects to be marked and/or lighted outside the lateral boundaries of the obstacle limitation surfaces

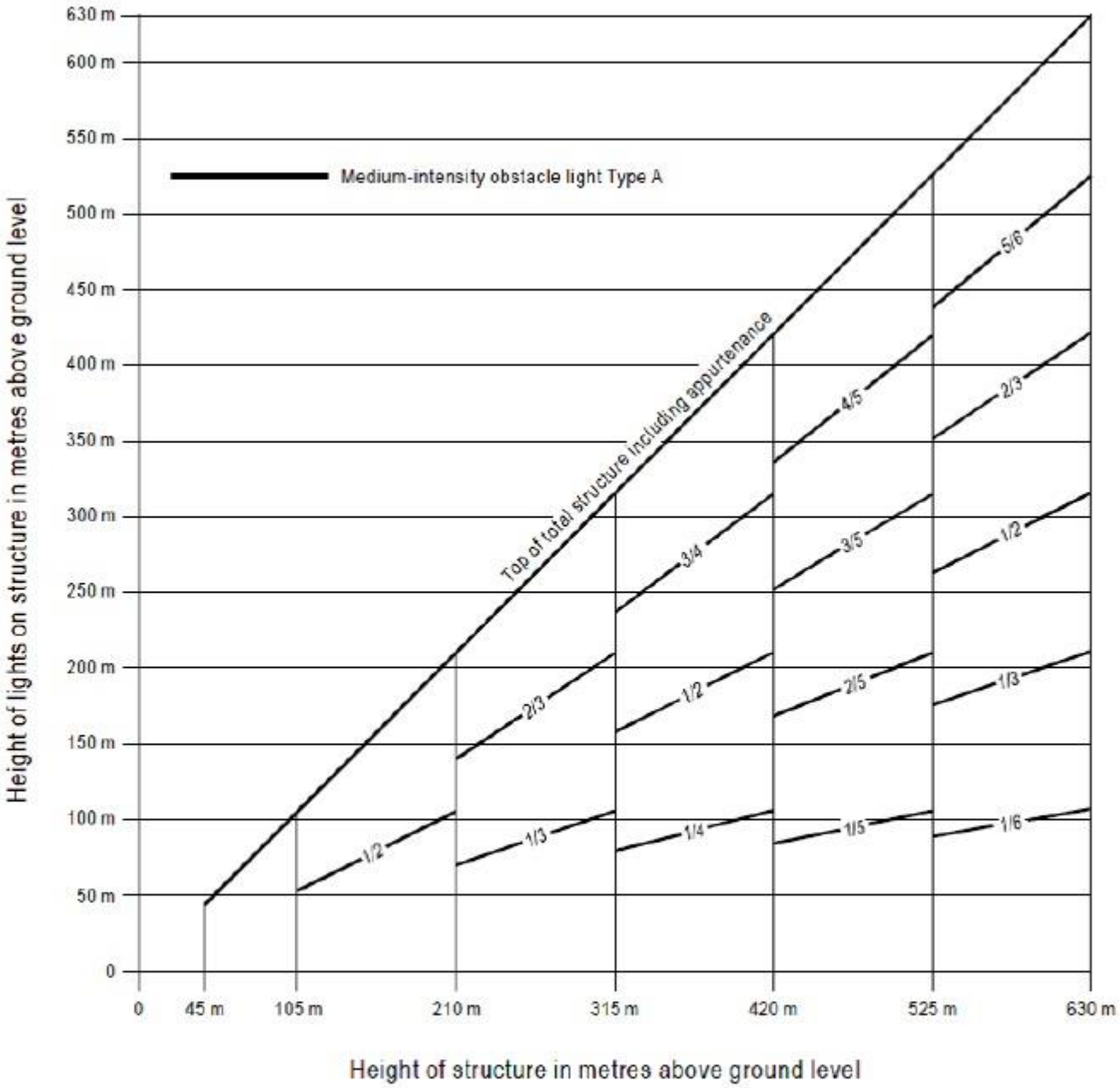
(a) Other objects outside the obstacle limitation surfaces should be marked and/or lighted if a safety assessment indicates that the object could constitute a hazard to aircraft (this includes objects adjacent to visual routes e.g. waterway, highway).
(b) Overhead wires, cables, etc., crossing a river, waterway, valley or highway should be marked and their supporting towers marked and lighted if a safety assessment indicates that the wires or cables could constitute a hazard to aircraft.

GM1 CS-ADR-DSN.Q.845 Marking of fixed objects

(a) Orange and white or alternatively red and white are preferably used, except where such colours merge with the background.
(b) Table Q-4 shows a formula for determining band widths, and for having an odd number of bands, thus permitting both the top and bottom bands to be of the darker colour.
(c) Against some backgrounds it may be found necessary to use a different colour from orange or red to obtain sufficient contrast.
(d) Alternative spacing may be suitable; priority is to highlight the location and definition of the object.

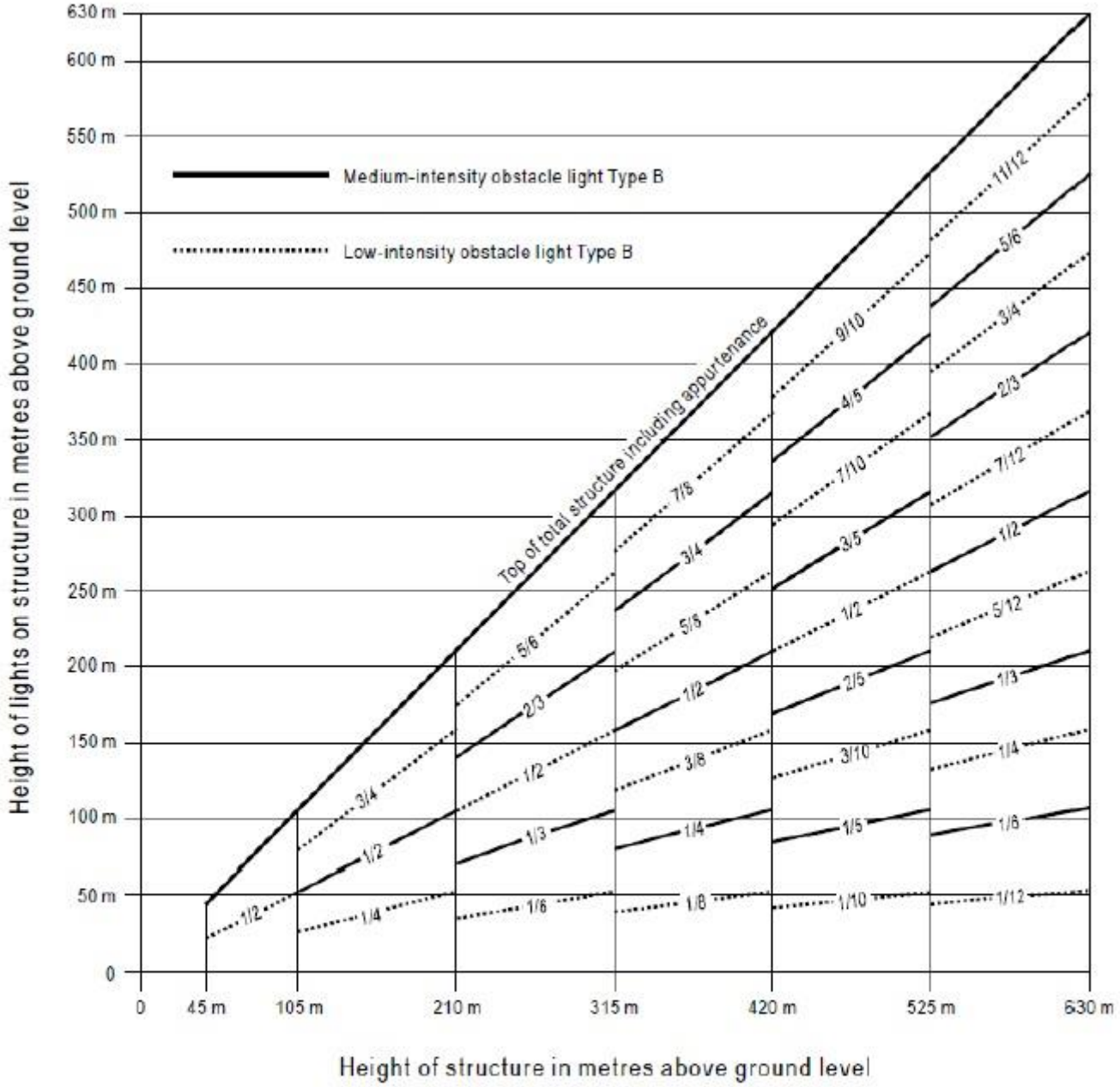
GM1 CS-ADR-DSN.Q.846 Lighting of fixed objects

(a) Guidance on how a combination of low-, medium-, and/or high-intensity lights on obstacles should be displayed is given in Figures GM-Q-1 to GM-Q-8.
(b) High-intensity obstacle lights are intended for day use as well as night use. Care should be taken to ensure that these lights do not create disconcerting dazzle or environmental concerns. Guidance on the design, location, and operation of high-intensity obstacle lights is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.
(c) Where, the use of high-intensity obstacle lights, Type A, or medium-intensity obstacle lights, Type A, at night may dazzle pilots in the vicinity of an aerodrome (within approximately 10 000 m radius) or cause significant environmental concerns, a dual obstacle lighting system should be provided. This system should be composed of high-intensity obstacle lights, Type A, or medium intensity obstacle lights, Type A, as appropriate, for daytime and twilight use and medium-intensity obstacle light, Type B or C, for night-time use.



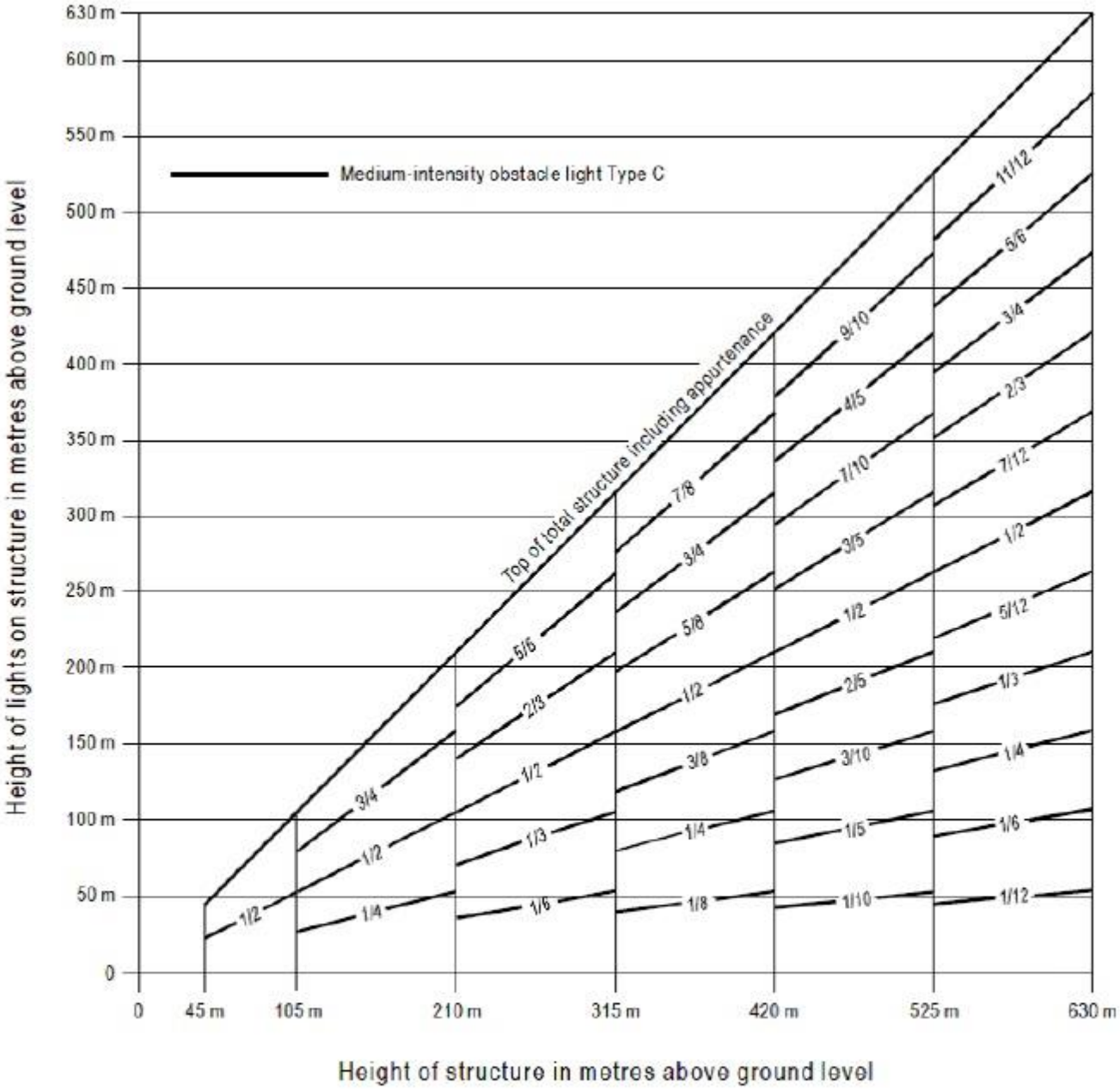
Note.— High-intensity obstacle lighting is recommended on structures with a height of more than 150 m above ground level. If medium-intensity lighting is used, marking will also be required.

Figure GM-Q-1.Medium-intensity flashing-white obstacle lighting system, Type A



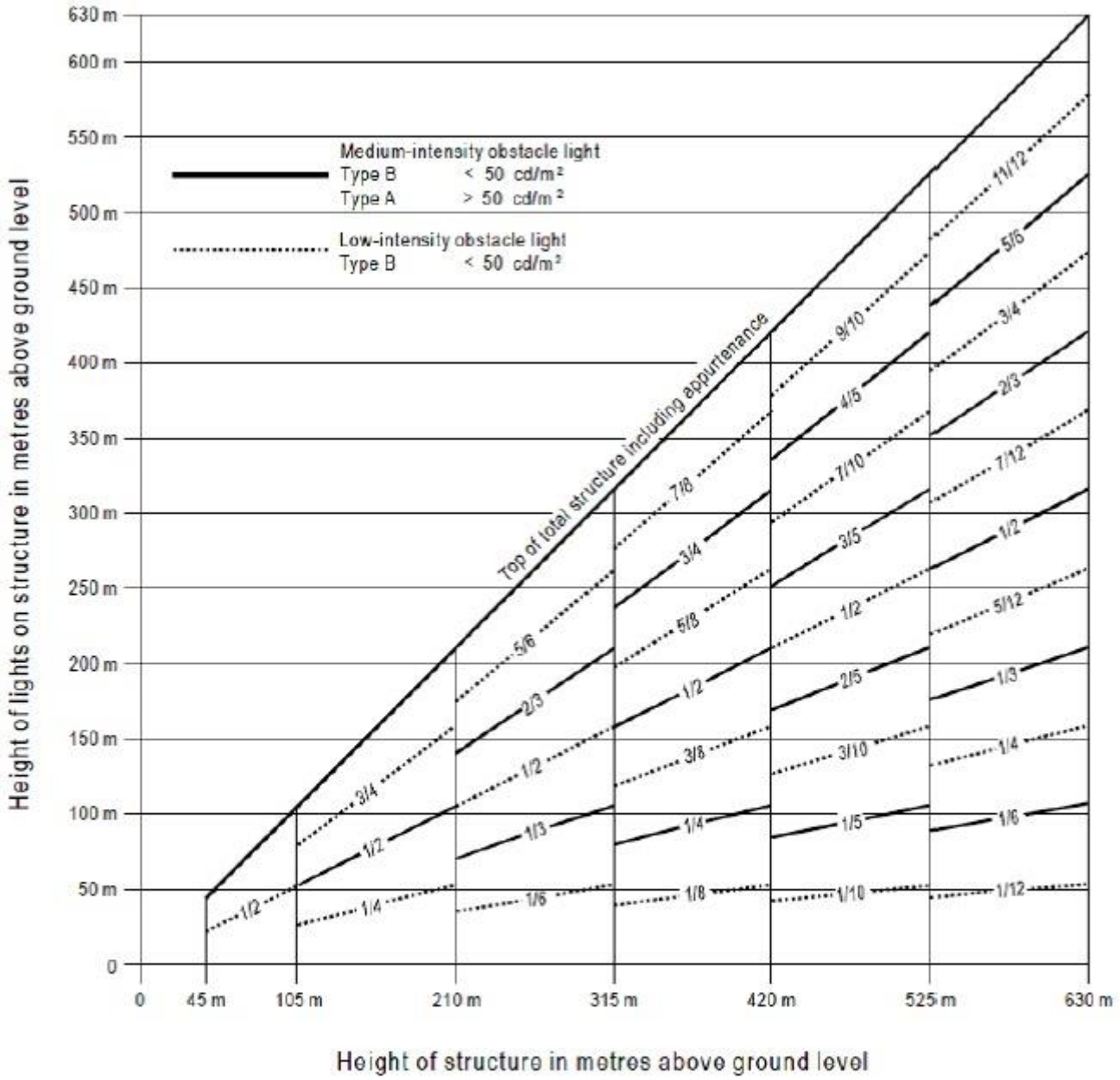
Note.— For night-time use only.

Figure GM-Q-2. Medium-intensity flashing-red obstacle lighting system, Type B



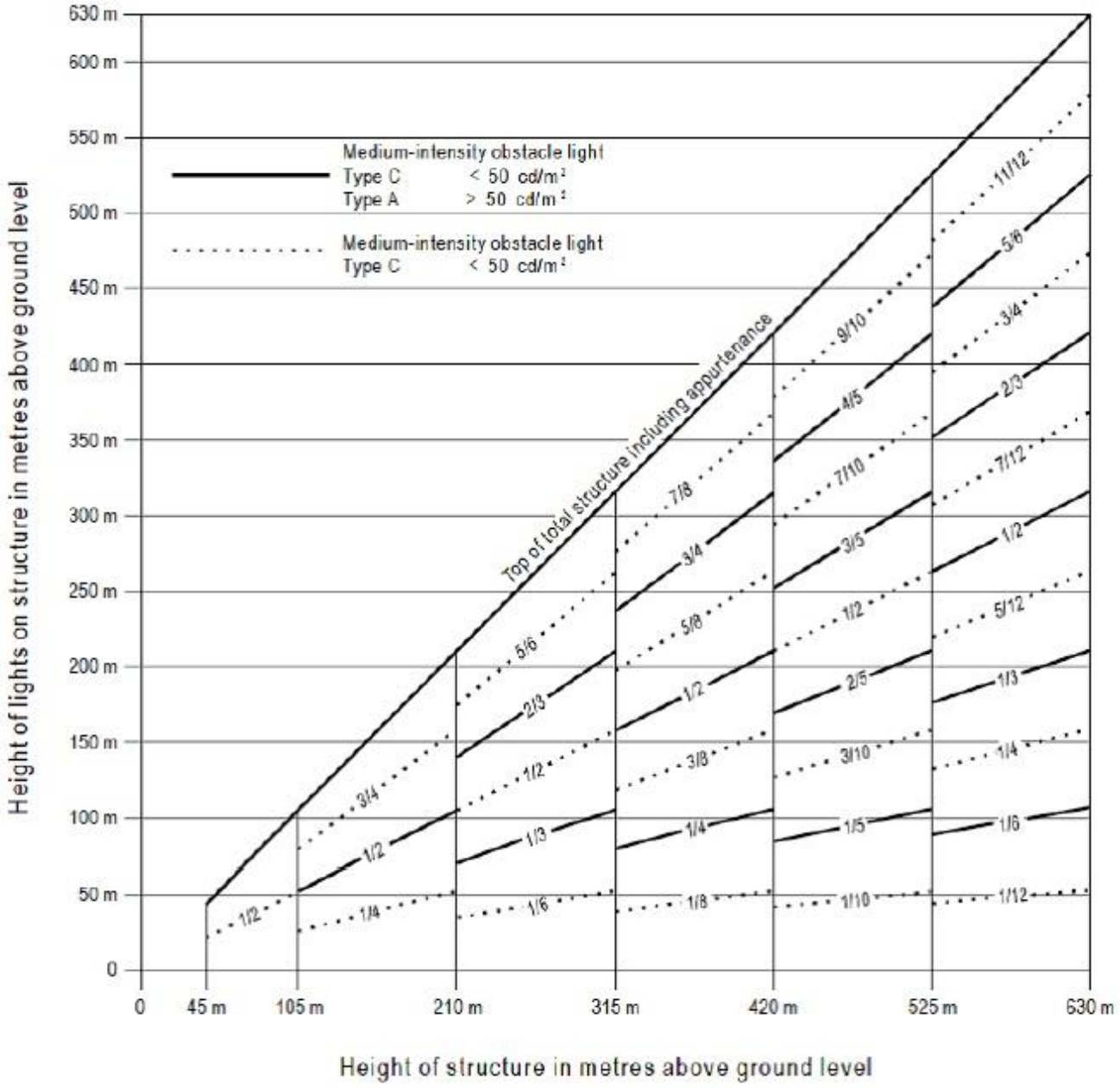
Note.— For night-time use only.

Figure GM-Q-3. Medium-intensity fixed-red obstacle lighting system, Type C



Note.— High-intensity obstacle lighting is recommended on structures with a height of more than 150 m above ground level. If medium-intensity lighting is used, marking will also be required.

Figure GM-Q-4. Medium-intensity dual obstacle lighting system, Type A/Type B



Note.— High-intensity obstacle lighting is recommended on structures with a height of more than 150 m above ground level. If medium-intensity lighting is used, marking will also be required.

Figure GM-Q-5. Medium-intensity dual obstacle lighting system, Type A/Type C

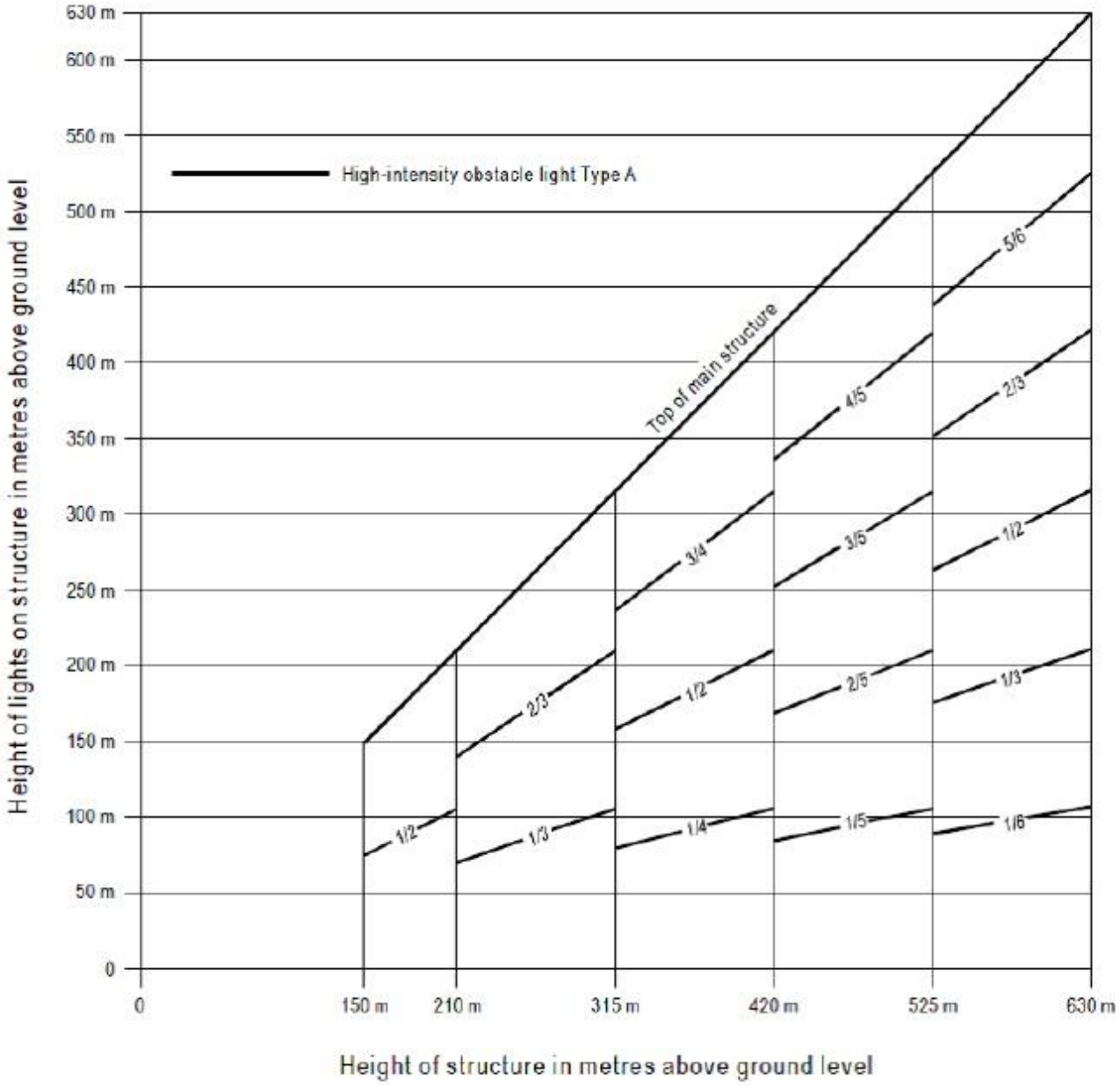


Figure GM-Q-6. High-intensity flashing-white obstacle lighting system, Type A

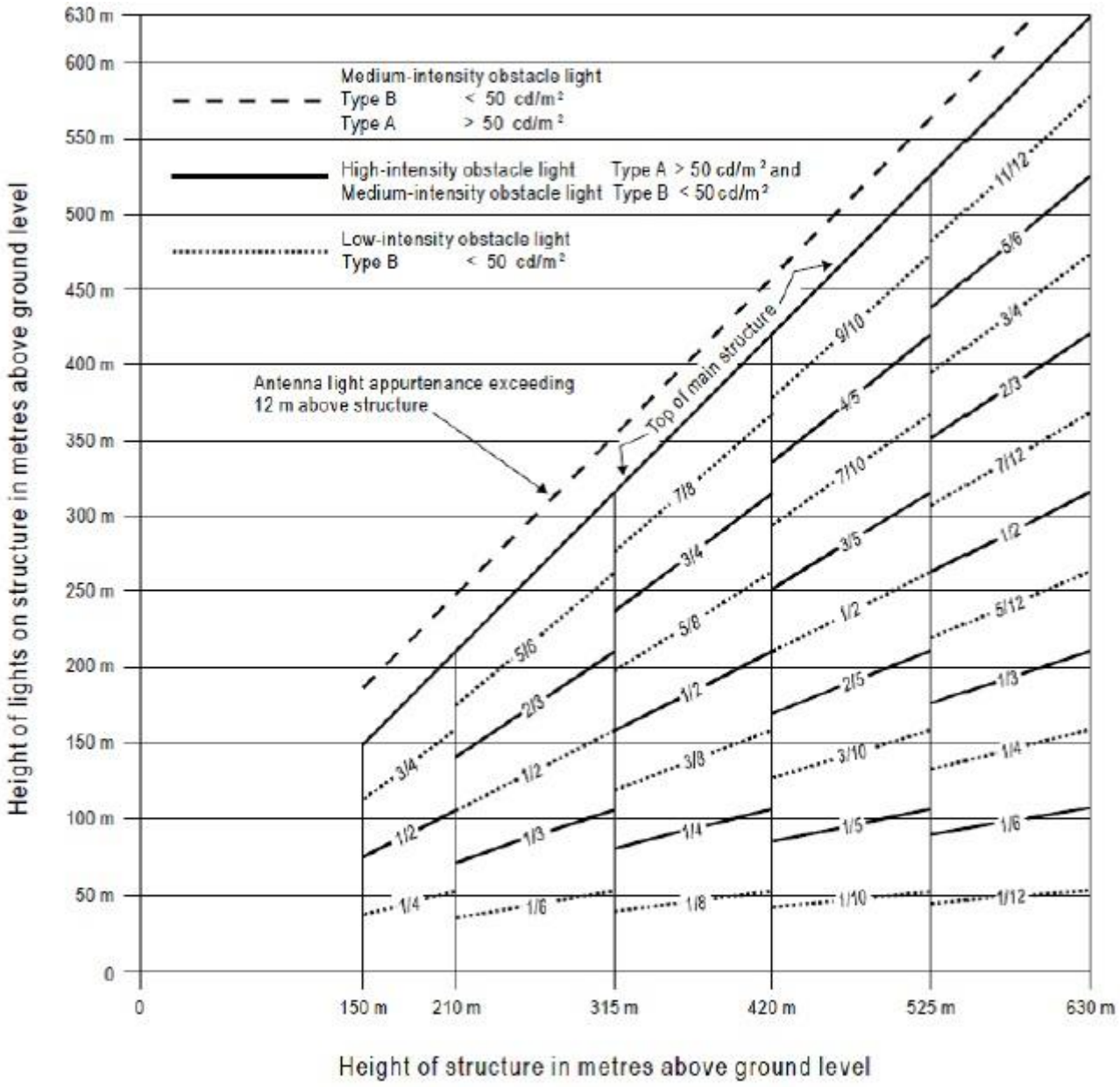


Figure GM-Q-7. High-/medium-intensity dual obstacle lighting system, Type A/Type B

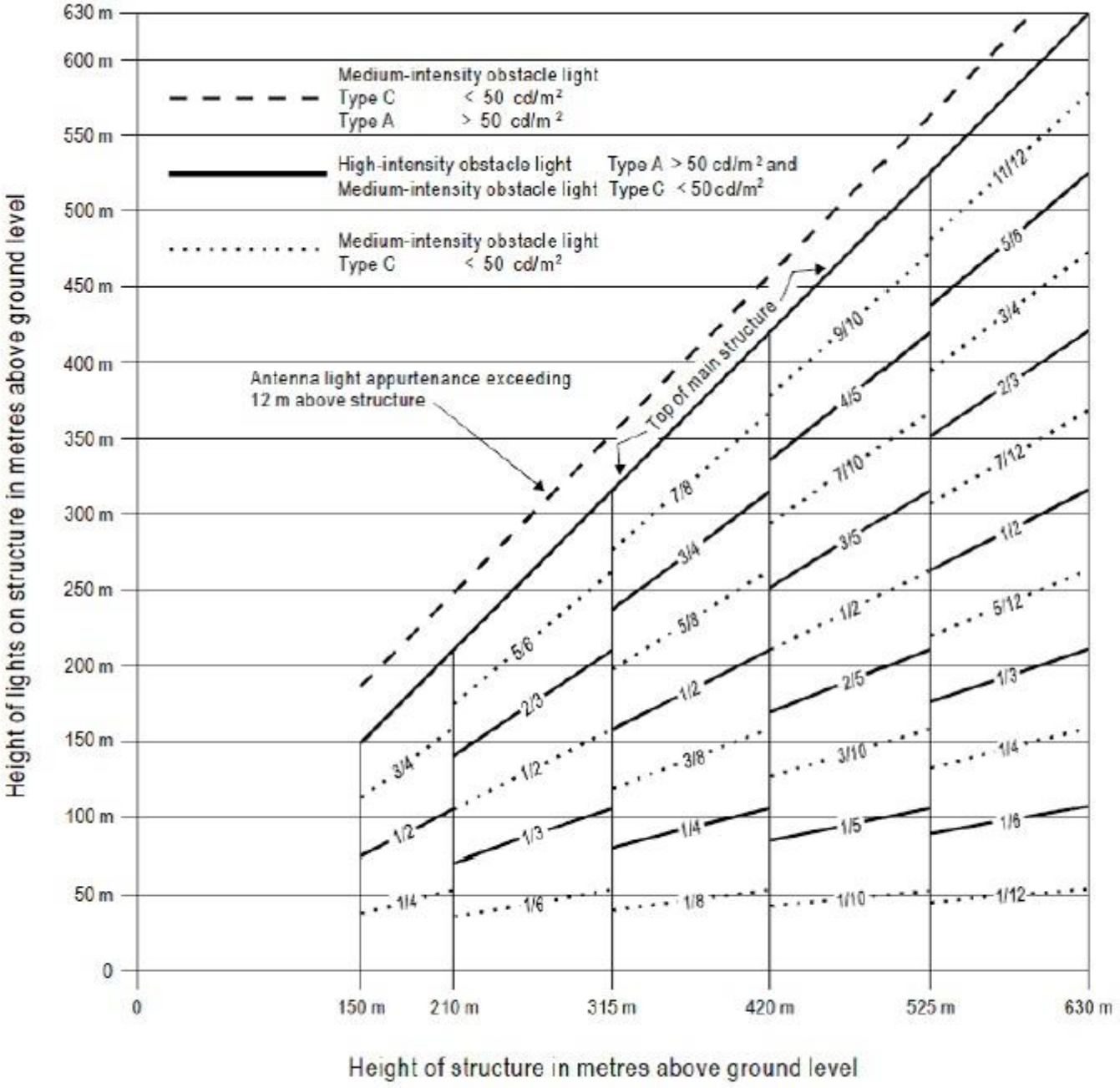


Figure GM-Q-8. High-/medium-intensity dual obstacle lighting system, Type A/Type C

In the cases as stated in CS CS-ADR-DSN.Q.848(c) and (d), normally the spacing would not exceed 52 m.

GM1 CS-ADR-DSN.Q.847 Lighting of fixed objects with a height less than 45 m above ground level

A group of buildings is regarded as an extensive object.

GM1 CS-ADR-DSN.Q.848 Lighting of fixed objects with a height 45 m to a height less than 150 m above ground level

Low-intensity obstacle lights, Type A or B, may be used for obstacles higher than 45 m if it is determined to be sufficient.

GM1 CS-ADR-DSN.Q.849 Lighting of fixed objects with a height 150 m or more above ground level

Where, the use of high-intensity obstacle lights, Type A, at night may dazzle pilots in the vicinity of an aerodrome (within approximately 10 000 m radius) or cause significant environmental concerns, medium-intensity obstacle lights, Type C, should be used alone, whereas medium-intensity obstacle lights, Type B, should be used either alone or in combination with low-intensity obstacle lights, Type B.

GM1 CS-ADR-DSN.Q.851 Marking and lighting of wind turbines

(a) Additional markings and lighting may be provided to the wind turbines if indicated by a safety assessment.
(b) Case by case studies for wind turbines of more than 315 m of overall height may conclude that additional markings and lighting are required.

GM1 CS-ADR-DSN.Q.852 Marking and lighting of overhead wires, cables, supporting towers, etc.

(a) Where high-intensity obstacle lights, Type B, are used, and it is not possible to locate them as described in CS CS-ADR-DSN.Q.852(d)(2), in some cases, this may require locating the lights off the tower.
(b) High-intensity obstacle lights are intended for day use as well as night use. Care should be taken to ensure that these lights do not create disconcerting dazzle or environmental concerns. Guidance on the design, location, and operation of high-intensity obstacle lights is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.
(c) Where the use of high-intensity obstacle lights, Type B, at night may dazzle pilots in the vicinity of an aerodrome (within approximately 10 000 m radius) or cause significant environmental concerns, a dual obstacle lighting system should be provided. This system should be composed of high-intensity obstacle lights, Type B, for daytime and twilight use and medium-intensity obstacle lights, Type B, for night-time use. Where medium-intensity lights are used they should be installed at the same level as the high-intensity obstacle light Type B.

GM1 CS-ADR-DSN.R.860 Non-load-bearing surfaces

(a) A taxi side stripe marking could also be placed along the edge of the load-bearing pavement to emphasise the location of the taxiway edge, with the outer edge of the marking approximately on the edge of the load-bearing pavement.
(b) At intersections of taxiways and on other areas where, due to turning, the possibility for confusion between the side stripe markings and centre line markings may exist, or where the pilot may not be sure on which side of the edge marking the non-load bearing pavement is, the additional provision of transverse stripes on the non-load bearing surface has been found to be of assistance.
(c) As shown in Figure GM-R-1, the transverse stripes should be placed perpendicular to the side stripe marking.
(d) On curves, a stripe should be placed at each point of tangency of the curve and at intermediate points along the curve so that the interval between stripes does not exceed 15 m. If deemed desirable to place transverse stripes on small straight sections, the spacing should not exceed 30 m.
(e) The width of the marks should be 0.9 m, and they should extend to within 1.5 m of the outside edge of the stabilised paving or be 7.5 m long whichever is shorter. The colour of the transverse stripes should be the same as that of the edge stripes, i.e. yellow.

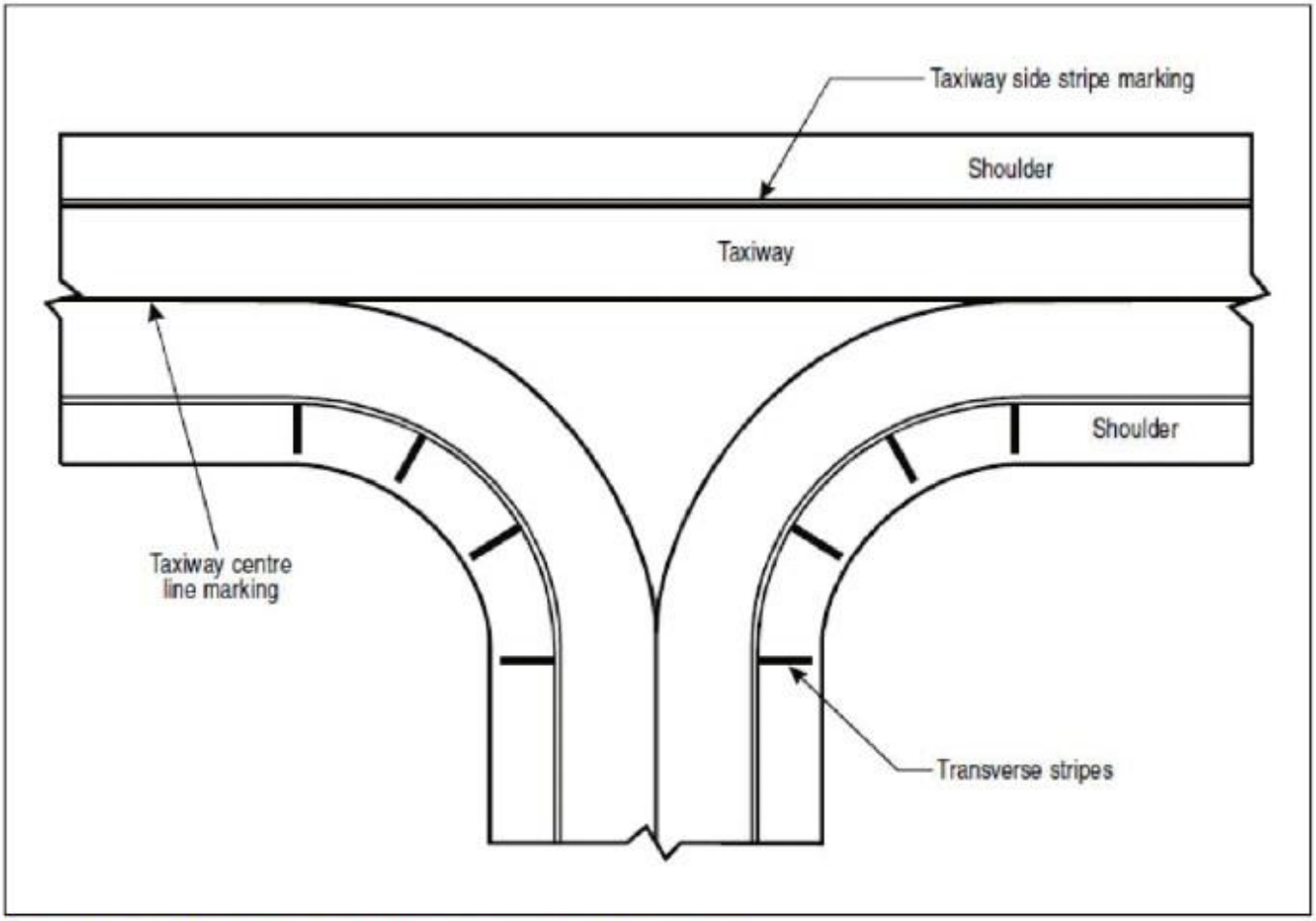


Figure GM-R-1. Marking of non-load bearing paved taxiway surface

More guidance on providing additional transverse stripes at an intersection or a small area on the apron is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.

GM1 CS-ADR-DSN.R.865 Pre-threshold area

For pre-threshold areas shorter than 60 m, markings may be modified or reduced in size so as to present the correct picture to aircrew.

GM1 CS-ADR-DSN.R.870 Unserviceable areas

(a) Unserviceability markers and lights are used for such purposes as warning pilots of a hole in a taxiway, or apron pavement, or outlining a portion of pavement, such as on an apron, that is under repair. They are not suitable for use when a portion of a runway becomes unserviceable, nor on a taxiway when a major portion of the width becomes unserviceable. In such instances, the runway or taxiway is normally closed.
(b) The spacing required for marking and lights should take into account visibility conditions, geometric configurations of the area, potential height differences of terrain so that the limits of unserviceable area is readily visible to pilot.
(c) Where a temporarily unserviceable area exists, it may be marked with fixed-red lights. These lights mark the most potentially dangerous extremities of the area.
(d) A minimum of four such lights may be used, except where the area is triangular in shape, in which case a minimum of three lights may be used.
(e) The number of lights may be increased when the area is large or of unusual configuration. At least one light should be installed for each 7.5 m of peripheral distance of the area.
(f) If the lights are directional, they should be orientated so that as far as possible, their beams are aligned in the direction from which aircraft or vehicles should approach.
(g) Where aircraft or vehicles should normally approach from several directions, consideration should be given to adding extra lights or using omnidirectional lights to show the area from these directions.
(h) Unserviceable area lights should be frangible. Their height should be sufficiently low to preserve clearance for propellers and for engine pods of jet aircraft.

GM1 CS-ADR-DSN.S.875 Electrical power supply systems for air navigation facilities

(a) The safety of operations at aerodromes depends on the quality of the supplied power. The total electrical power supply system may include connections to one or more external sources of electric power supply, one or more local generating facilities, and to a distribution network including transformers and switchgear. Many other aerodrome facilities supplied from the same system need to be taken into account while planning the electrical power system at aerodromes.
(b) The design and installation of the electrical systems need to take into consideration factors that can lead to malfunction, such as electromagnetic disturbances, line losses, power quality, etc. Additional guidance is given in ICAO Doc 9157, Aerodrome Design Manual, Part 5, Electrical Systems.
(c) Switch-over time is the time required for the actual intensity of a light measured in a given direction to fall from 50 % and recover to 50 % during a power supply changeover, when the light is being operated at intensities of 25 % or above.
(d) As a good practice, a measurement of the photometric parameters may be used for the evaluation of the switch-over time.
    (1) If the switch-over time is greater than 1 second, the following corrective actions may be used to decrease the switch-over time:
        (i) use of enhanced constant current regulators (CCR); or
        (ii) use of uninterruptible power supply (UPS).
    (2) If the photometric based switch-over time is below or equal 1 second, it is recommended to analyse the electrical system in order to find out an equivalent electrical switch-over time.
(e) For periodic measurement of the switch-over time a measurement of the equivalent electrical switch-over time at the feeding point of an aeronautical ground lights (AGL) system may be established.

GM1 CS-ADR-DSN.S.880 Electrical power supply

(a) At an aerodrome where the primary runway is a non-instrument runway, a secondary power supply capable of meeting the requirements of CS CS-ADR-DSN.S.875(d) should be provided, except that a secondary power supply for visual aids need not be provided when an emergency lighting system is provided and capable of being deployed in 15 minutes.
(b) Specifications for secondary power supply for radio navigation aids and ground elements of communications systems are given in ICAO Annex 10, Volume I, Aeronautical Telecommunications, Chapter 2.
(c) Requirements for a secondary power supply should be met by either of the following:
    (1) independent public power which is a source of power supplying the aerodrome service from a substation other than the normal substation through a transmission line following a route different from the normal power supply route and such that the possibility of a simultaneous failure of the normal and independent public power supplies is extremely remote; or
    (2) standby power unit(s) which are engine generators, batteries, etc. from which electric power can be obtained.
(d) Guidance on electrical systems is included in ICAO Doc 9157, Aerodrome Design Manual, Part 5, Electrical Systems.
(e) The requirement for minimum lighting may be met by other than electrical means.

GM1 CS-ADR-DSN.T.900 Emergency access and service roads

(a) Service roads at air side are installed to support all apron processes. Furthermore, service roads can be used as aerodrome perimeter service roads, providing access to navigation aids, as temporary roads for construction vehicles, etc.
(b) Some general considerations in the planning of roads are described as follows:
  (1) Every effort should be made to plan service roads at air side so that they do not cross runways and taxiways.
  (2) The planning of the aerodrome road layout should take into account the need to provide emergency access roads for use by rescue and firefighting vehicles to various areas on the aerodrome, and, in particular, to the approach areas. Service roads to navigation aids should be planned in such a manner as to present minimal interference to the function of the aids. If it is necessary for a service road to cross an approach area, the road should be located so that vehicles travelling on it are not obstacles to aircraft operations.
  (3) The service roads at air side system should be designed to account for local security measures. Access points to the system should, thus, need to be restricted. Should ground vehicle movements affect surface movement of aircraft on runways and taxiways, it should be required that the ground vehicle movements be coordinated by the appropriate aerodrome control. Control is normally exercised by means of two-way radio communication although visual signals, such as signal lamps, are adequate when traffic at the aerodrome is light. Signs or signals may also be employed to aid control at intersections.
  (4) At intersections with runways consideration should be given to providing runway guard lights or road-holding position lights as part of the aerodrome's runway incursion prevention programme. Runway guard lights should conform to the specifications provided in CS CS-ADR-DSN.M.745.
  (5) Roads should be designed and constructed to prevent FOD transfer to the runway and taxiways.
  (6) Roads within 90 m of a runway centre line generally should be surfaced to prevent surface erosion, and the transfer of debris to the runway and taxiways.
  (7) To facilitate the control and maintenance of the fencing, a perimeter service road should be constructed inside the aerodrome fencing.
  (8) Perimeter service road is also used by security patrols.
  (9) Where a fence is provided, the need for convenient access to outside areas should be taken into account. These access points should be of a suitable size to accommodate the passage of the largest RFFS vehicle in the aerodrome's fleet.
  (10) When greater security is thought necessary, a cleared area should be provided on both sides of the fence or barrier to facilitate the work of patrols, and to make trespassing more difficult.
  (11) Special measures should be required to prevent the access of an unauthorised person to runways or taxiways which overpass public roads.
(c) Emergency access roads should be considered on an aerodrome so as to facilitate achieving minimum response times for RFF vehicles.
(d) Emergency access roads should be provided on an aerodrome where terrain conditions permit their construction, so as to facilitate achieving minimum response times. Particular attention should be given to the provision of ready access to approach areas up to 1 000 m from the threshold, or at least within the aerodrome boundary.
(e) Emergency access roads are not intended for use for the functions of aerodrome service roads. Therefore, it is possible to provide different access control which should be clearly visible for all service ground traffic. Road-holding position markings, lights, or runway guard lights are not necessary if the access to an emergency access road is ensured for RFF only.
(f) Aerodrome service roads may serve as emergency access roads when they are suitably located and constructed.
(g) Emergency access roads should be capable of supporting the heaviest vehicles which should use them, and be usable in all weather conditions. Roads within 90 m of a runway centre line should be surfaced to prevent surface erosion and the transfer of debris to the runway. Sufficient vertical clearance should be provided from overhead obstructions for the largest vehicles.
(h) When the surface of the road is indistinguishable from the surrounding area, or in areas where snow may obscure the location of the roads, edge markers should be placed at intervals of about

10 m.

GM1 CS-ADR-DSN.T.910 Equipment frangibility requirements

(a) Equipment and supports required to be frangible should be designed and constructed so that they should break, distort, or yield in the event that they are accidentally impacted by an aircraft. The design materials selected should preclude any tendency for the components, including the electrical conductors, etc., to 'wrap around' the colliding aircraft or any part of it.
(b) Frangible structures should be designed to withstand the static and operational wind or jet blast loads with a suitable factor of safety but should break, distort, or yield readily when subjected to the sudden collision forces of a 3 000 kg aircraft airborne and travelling at 140 km/h (75 kt), or moving on the ground at 50 km/h (27 kt).
(c) Guidance on design for frangibility is contained in ICAO Doc 9157, Aerodrome Design Manual, Part 6, Frangibility.

GM1 CS-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 CS-ADR-DSN.M.615, CS CS-ADR-DSN.M.640, CS CS-ADR-DSN.N.775, and the certification specifications of 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 the certification specifications of Chapter J.
(e) The term 'aircraft safety purposes' refers to the installation of arresting systems.

GM1 CS-ADR-DSN.T.920 Fencing

(a) The fence or barrier should be located so as to separate the movement area and other facilities or zones on the aerodrome vital to the safe operation of aircraft from areas open to public access.
(b) Consideration should be given to the provision of a perimeter road inside the aerodrome fencing for the use of both maintenance personnel and security patrols.
(c) Special measures may be required to prevent the access of an unauthorised person to runways or taxiways which overpass public roads.
(d) Fencing can vary in design, height, and type depending on local needs. Generally, it is recommended that the fencing be galvanized steel, chain link fabric installed to a height of 2,5 m, and topped with a three-strand barbed wire overhang. The latter should have a minimum 15 cm separation between strands and extend outward at 45-degree angle from the horizontal. Fence posts should be installed at no greater than 3 m intervals and be located within 5 cm of any wall or structure forming part of the perimeter. Gates should be constructed with material of comparable strength and durability, and open to an angle of at least 90 degrees. Hinges should be such as to preclude unauthorised removal.
(e) Top and bottom selvages of the fence having a twisted and barbed finish. The bottom of the fence installed to within 5 cm of hard surfacing or stabilised soil. However, in areas where unstable soil conditions are prevalent, the fabric installed to extend at least 5 cm below the surface or imbedded in concrete curbing. All fencing should be grounded. Care should be taken that metallic fencing is not installed when it should interface with the operation of navigation aids. The fence itself should allow clear visibility and easy maintenance.
(f) The number of gates should be limited to the minimum required for the safe and efficient operation of the facility. Access points should need to be made in the fence to allow the passage of authorised vehicles and persons. While the number of access points should be kept to a minimum, adequate access points should be planned for routine operations, maintenance and emergency operations.

GM1 CS-ADR-DSN.T.921 Autonomous runway incursion warning system (ARIWS)

(a) The implementation of autonomous systems are generally quite complex in design and operation and, as such, deserves careful consideration by all involved parties such as aerodrome operators, air traffic services (ATS) and aircraft operators. This guidance provides a more clear description of the system(s) and offer some suggested actions required in order to properly implement this system(s) at an aerodrome.
(b) An ARIWS may be installed in conjunction with enhanced taxiway centre line markings, stop bars or runway guard lights.
(c) The system(s) should be operational under all weather conditions, including low visibility.
(d) An ARIWS may share common sensory components of a surface movement guidance and control system (SMGCS) or advanced surface movement guidance and control system (A-SMGCS), however, it operates independently of either system.
(e) General description:
  (1) The operation of an ARIWS is based upon a surveillance system which monitors the actual situation on a runway and automatically returns this information to warning lights at the runway (take-off) thresholds and entrances. When an aircraft departs from a runway (rolling) or arrives at a runway (short final), red warning lights at the entrances will illuminate, indicating that it is unsafe to enter or cross the runway. When an aircraft is aligned on the runway for take-off and another aircraft or vehicle enters or crosses the runway, red warning lights will illuminate at the threshold area, indicating that it is unsafe to start the take-off roll.
  (2) In general, an ARIWS consists of an independent surveillance system (primary radar, multilateration, specialised cameras, dedicated radar, etc.) and a warning system in the form of extra airfield lighting systems connected through a processor that generates alerts independent from the air traffic control (ATC) directly to the flight crews and vehicle operators.
  (3) An ARIWS does not require circuit interleaving, secondary power supply or operational connection to other visual aid systems.
  (4) In practice, not every entrance or threshold needs to be equipped with warning lights. Each aerodrome will have to assess its needs individually, depending on the characteristics of the aerodrome. There are several systems developed offering the same or similar functionality.
(f) Flight crew actions:
  (1) It is of critical importance that flight crews understand the warning being transmitted by the ARIWS system. Warnings are provided in near real-time directly to the flight crew because there is no time for 'relay' types of communications. In other words, a conflict warning generated to ATS which must then interpret the warning, evaluate the situation and communicate to the aircraft in question, would result in several seconds being taken up where each second is critical in the ability to stop the aircraft safely and prevent a potential collision. Pilots are presented with a globally consistent signal which means 'STOP IMMEDIATELY' and should be taught to react accordingly. Likewise, pilots receiving an ATS clearance to take-off or cross a runway, and seeing the red light array, should STOP and advise ATS that they aborted/stopped because of the red lights. Again, the criticality of the timeline involved is so tight that there is no room for misinterpretation of the signal. It is of utmost importance that the visual signal be consistent around the world.
  (2) It also has to be stressed that the extinguishing of the red lights does not, in itself, indicate a clearance to proceed. That clearance is still required from ATC. The absence of red warning lights only means that potential conflicts have not been detected.
  (3) In the event that a system becomes unserviceable, one of two things will occur. If the system fails in the extinguished condition, then no procedural changes need to be accomplished. The only thing that will happen is the loss of the automatic, independent warning system. Both ATS operations and flight crew procedures (in response to ATS clearances) will remain unchanged.
  (4) Procedures should be developed to address the circumstance where the system fails in the illuminated condition. It will be up to the ATS and/or aerodrome operator to establish those procedures depending on their own circumstances. It must be remembered that flight crews are instructed to 'STOP' at all red lights. If the affected portion of the system, or the entire system, is shut off the situation is reverted to the extinguished scenario described in the previous paragraph.
(g) Aerodromes:
  (1) An ARIWS does not have to be provided at all aerodromes. An aerodrome considering the installation of such a system may wish to assess its needs individually, depending on traffic

levels, aerodrome geometry, ground taxi patterns, etc. Local user groups such as the local runway safety team (LRST) may be of assistance in this process. Also, not every runway or taxiway needs to be equipped with the lighting array(s), and not every installation requires a comprehensive ground surveillance system to feed information to the conflict detection computer.

(2) Although there may be local specific requirements, some basic system requirements are applicable to all ARIWS:

(h) the control system and energy power supply of the system should be independent from any other system in use at the aerodrome, especially the other parts of the lighting system;

(i) the system should operate independently from ATS communications;

(ii) the system should provide a globally accepted visual signal that is consistent and instantly understood by crews; and

(iii) local procedures should be developed in the case of malfunction or failure of a portion of or the entire system.

(i) Air traffic services:

(1) The ARIWS is designed to be complementary to normal ATS functions, providing warnings to flight crews and vehicle operators when some conflict has been unintentionally created or missed during normal aerodrome operations. The ARIWS will provide a direct warning when, for example, ground control or tower (local) control has provided a clearance to hold short of a runway but the flight crew or vehicle operator has 'missed' the hold short portion of their clearance and the tower has issued a take-off or landing clearance to that same runway, and the 'non-read back' by the flight crew or vehicle operator was missed by ATC.

(2) In the case where a clearance has been issued and a crew reports a non-compliance due to 'red lights', or aborts because of 'red lights', then it is imperative that the controller assess the situation and provide additional instructions, as necessary. It may well be that the system has generated a false warning or that the potential incursion no longer exists; however, it may also be a valid warning. In any case, additional instructions and/or a new clearance need to be provided. In the case where the system has failed, then procedures will need to be put into place, as described in paragraphs (f)(3) and (f)(4) above. In no case should the illumination of the ARIWS be dismissed without confirmation that, in fact, there is no conflict. It is worth noting that there have been numerous incidents avoided at aerodromes with such systems installed. It is also worth noting that there have been false warnings as well, usually as a result of the calibration of the warning software, but in any case, the potential conflict existence or non-existence should be confirmed.

(3) While many installations may have a visual or audio warning available to ATS personnel, it is in no way intended that ATS personnel be required to actively monitor the system. Such warnings may assist ATS personnel in quickly assessing the conflict in the event of a warning and help them to provide appropriate further instructions, but the ARIWS should not play an active part in the normal functioning of any ATS facility.

(4) Each aerodrome where the system is installed should develop procedures depending upon its unique situation. Again, it has to be stressed that under no circumstances should pilots or operators be instructed to 'cross the red lights'. As indicated above, the use of local runway safety teams may greatly assist in the development of this process.

(j) Promulgation of information:

(1) Specifications on providing information in the aeronautical information publication (AIP) are given in ICAO Annex 15, Aeronautical Information Services. Information on the characteristics and status of an ARIWS at an aerodrome is promulgated in the AIP Section AD 2.9, and its status updated as necessary through notice to airmen (NOTAM) or automatic terminal information service (ATIS).

(2) Aircraft operators are to ensure that flight crews' documentation include procedures regarding ARIWS and appropriate guidance in compliance with ICAO Annex 6, Operation of Aircraft, Part I.

(3) Aerodromes may provide additional sources of guidance on operations and procedures for their personnel, aircraft operators, ATS and third-party personnel that may have to deal with an ARIWS.

GM1 CS-ADR-DSN.U.925 General

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.

GM1 CS-ADR-DSN.U.930 Colours for aeronautical ground lights

(a) The chromaticity for ground lights with filament-type light sources, where dimming is not required, or where observers with defective colour vision should 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	$y = 0.390 - 0.171x$

(b) Guidance on chromaticity changes resulting from the effect of temperature on filtering elements is given in ICAO Doc 9157, Aerodrome Design Manual, Part 4, Visual Aids.

(c) Where the colour signal is to be seen from long range, the current practice is to use colours within the boundaries specified in paragraph (a) above.

(d) For the chromaticity of ground lights with solid-state light sources, where observers with defective colour vision should 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	$y = 0.400$

(e) For the chromaticity of ground lights having a solid state light source, in order to avoid a large variation of shades of green, and if colours within the boundaries below are selected, colours within the boundaries specified in paragraph (d) above should not be used:

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

(f) Colour measurement for filament-type and solid state-type light sources:

(1) for the outermost isocandela curve, a measurement of colour coordinates should be made and recorded for review and judgement of acceptability; and

(2) certain light units may have an 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); then an assessment of the actual application should be conducted and, if necessary, a check of colour shift at angular ranges beyond the outermost curve carried out.

GM1 CS-HPT-DSN.A.020 Definitions

Further information on operations of performance classes 1, 2 and 3 helicopters are given in Commission Regulation (EU) No 965/2012 on air operations and in ICAO Annex 6, Operations of Aircraft, Part III, Helicopters.

GM1 CS-HPT-DSN.A.030 Criteria for military helipads

Applicable NATO requirements for helipads:
(a) STANAG 7174: Helipad clearance plane requirements
(b) STANAG 3619: Helipad & heliport marking and lighting
(c) STANAG 3158: Day marking of airfield runways and taxiways
(d) When deviating from above requirements, a National caviate shall be omitted to NATO.

GM1 CS-HPT-DSN.B.100 Final approach and take-off areas (FATOs)

(a) General:

(1) A FATO may not be necessary to be provided at and aerodrome, where the runway is used for the purposes of final approach and take-off of helicopters.

(2) Where a FATO is located near a runway or taxiway, and when simultaneous helicopter and aeroplane operations are planned, the separation distance between the edge of a runway or taxiway and the edge of a FATO should not be less than the appropriate dimension in Table GM1-B-1.

(3) Operational limitations should be considered under certain wind conditions.

If aeroplane mass and/or helicopter mass are	Distance between FATO edge and runway edge or taxiway edge
up to but not including 3 175 kg	60 m
3 175 kg up to but not including 5 760 kg	120 m
5 760 kg up to but not including 100 000 kg	180 m
100 000 kg and over	250 m
Note: The values specified in this table are primarily intended to mitigate risks of wake turbulence encounters. In addition to this table, when positioning a FATO intended to be used simultaneously with a nearby runway or taxiway, attention should be given to other CS ADR-DSN requirements such as the minimum runway strip width. Local environment should be taken into account when setting the separation between the FATO and nearby infrastructure elements to ensure the safety of simultaneous operations.	

Table GM1-B-1. FATO minimum separation distance

(b) A FATO should not be located:

(i) near taxiway intersections or holding points where jet engine efflux is likely to cause high turbulence; or

(ii) near areas where aeroplane vortex wake generation is likely to occur.

GM1 CS-HPT-DSN.B.110 Helicopter clearways

General: A helicopter clearway would need to be considered when the heliport is intended to be used by helicopters operating in performance class 1.

GM1 CS-HPT-DSN.B.120 Touchdown and lift-off areas (TLOFs)

Additional TLOFs may be located within runway-type FATOs.

GM1 CS-HPT-DSN.B.130 Safety areas

When only a single approach and take-off climb surface is provided, the need for specific protected side slopes should be determined by a safety assessment.

GM1 CS-HPT-DSN.C.200 Helicopter ground taxiways and helicopter ground taxi-routes

When a taxiway is intended for use by aeroplanes and helicopters, the provisions for taxiways for aeroplanes and helicopter ground taxiways will be taken into consideration and the more stringent requirements should apply.

GM1 CS-HPT-DSN.C.210 Helicopter air taxiways and helicopter air taxi-routes

The part of the helicopter air taxi-route that extends symmetrically on each side of the centre line from 0.5 times the largest overall width of the helicopters it is intended to serve to the outermost limit of the helicopter air taxi-route is its protection area.

GM1 CS-HPT-DSN.D.300 Helicopter stands

(a) It is not considered good practice to locate helicopter stands under a flight path.
(b) Where non-simultaneous operations are envisaged, the protection areas of helicopter stands and their associated taxi-routes may overlap (see Figure GM1-D-1).
(c) Characteristics: For a helicopter stand intended to be used by wheeled helicopters for turning on the ground, the dimension of the helicopter stand and the protection area, including the dimension of the central zone, would need to be significantly increased.

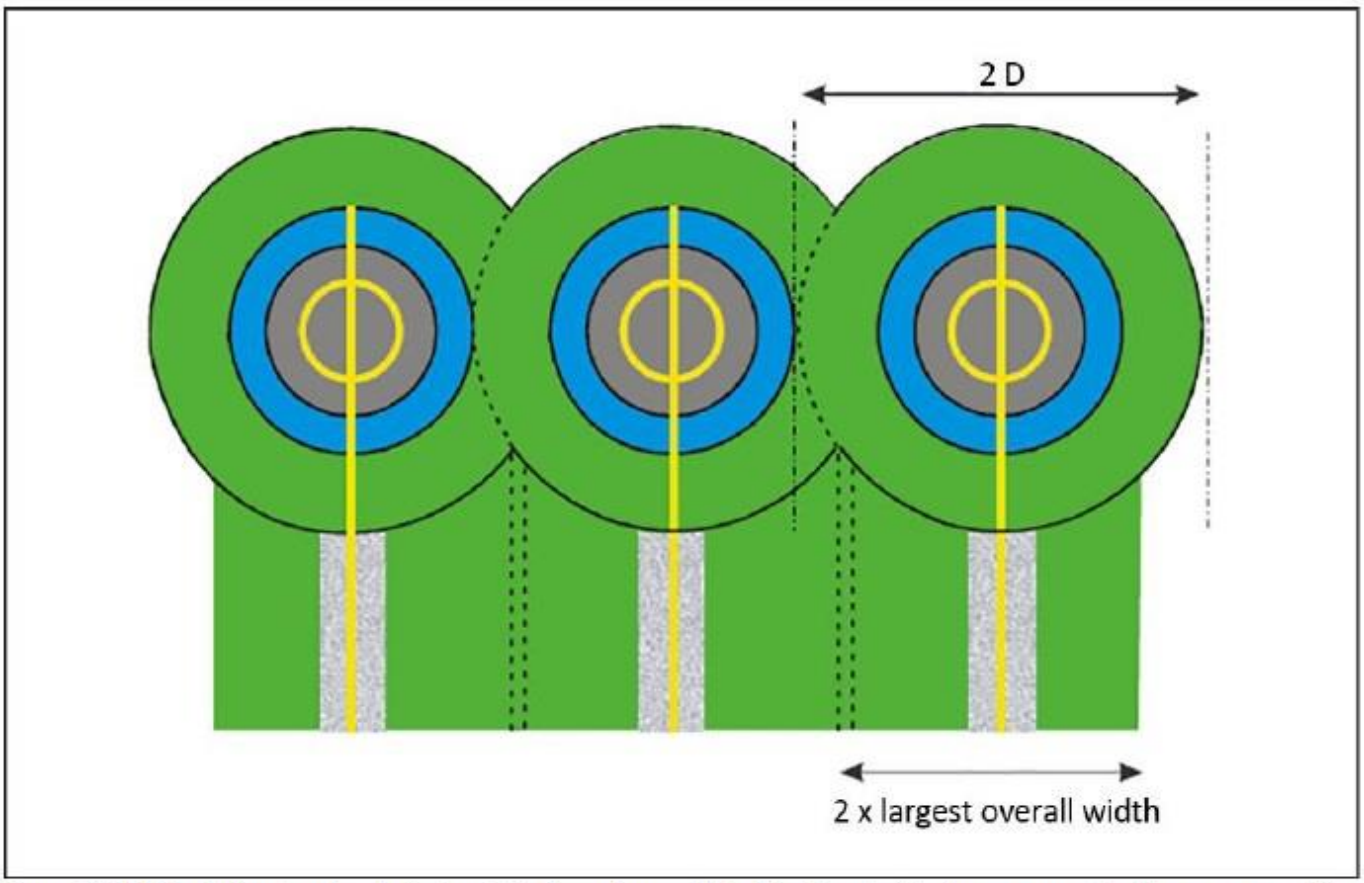


Figure GM1-D-1. Helicopter stands designed for hover turns with air taxi-routes/taxiways – non-simultaneous operations

GM1 CS-HPT-DSN.E.410 Approach surface

(a) Consultations with helicopter operators could assist the aerodrome operator in determining the appropriate slope category to apply according to the heliport environment and the most critical helicopter type for which the heliport is intended.

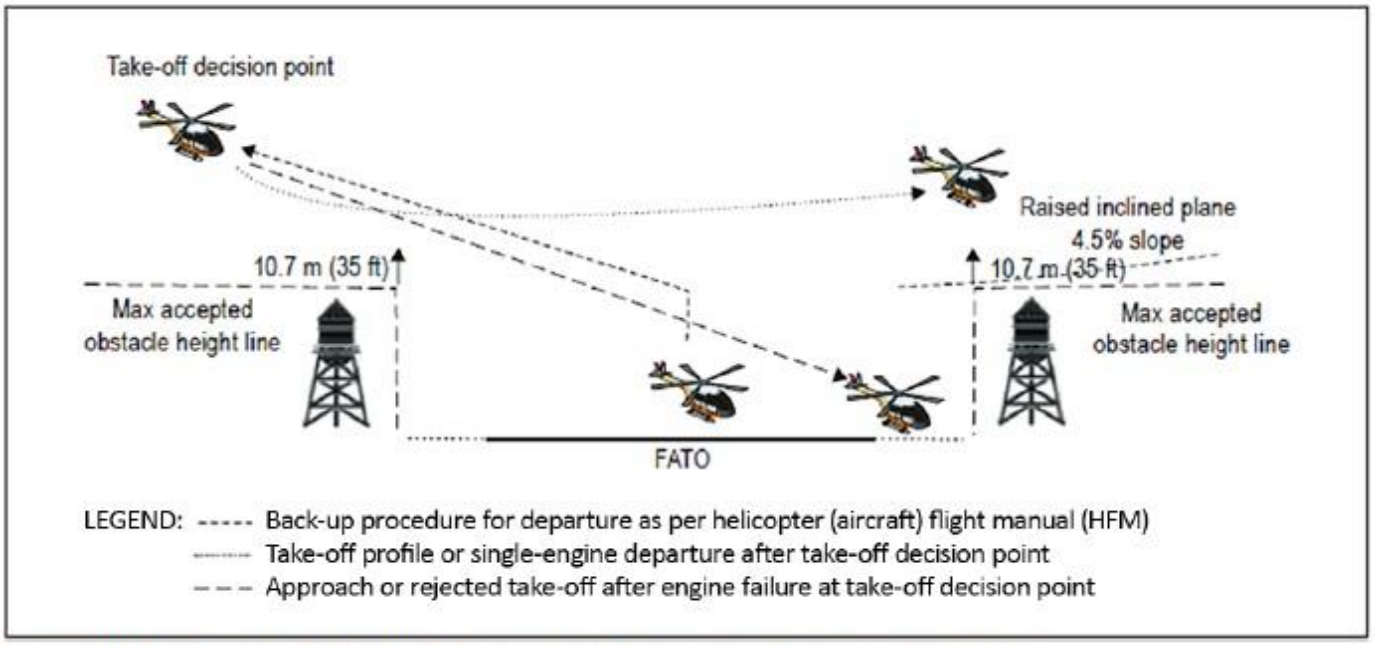


Figure GM1-E-1. Example of raised inclined plane during operations in performance class 1

(b) The example shown in Figure GM1-E-1 does not represent any specific profile, technique or helicopter type and is intended to show a generic example. An approach profile and a back-up procedure for departure profile are depicted. Specific manufacturers operations in performance class 1 may be represented differently in the specific helicopter (aircraft) flight manual (HFM).
(c) The approach/landing profile may not be the reverse of the take-off profile.
(d) Additional safety assessment for obstacles might be required in the area that a back-up procedure is intended. Helicopter performance and the HFM limitations would determine the extent of the assessment required.
(e) For heliports intended to be used by helicopters operated in performance class 2 and 3, it is good practice for the approach paths to be selected so as to permit safe forced landing or one-engine-inoperative landings such that, as a minimum requirement, injury to persons on the ground or water or damage to property are minimised. The most critical helicopter type for which the heliport is intended and the ambient conditions may be factors in determining the suitability of such areas.
(f) The approach and take-off surfaces should be offset from each other ideally by an angle of not less than 135 degrees.

GM1 CS-HPT-DSN.E.420 Take-off climb surface

(a) Helicopter take-off performance is reduced in a curve, so a straight portion along the take-off climb surface prior to the start of the curve allows for acceleration.
(b) For heliports intended to be used by helicopters operated in performance class 2 and 3, it is an operational requirement for departure paths to be selected so as to permit safe forced landings or one-engine-inoperative landings such that injury to persons on the ground or damage to property are minimised. The most critical helicopter type for which the heliport is intended and the ambient conditions may be factors in determining the suitability of such areas.
(c) The approach and take-off surfaces should be offset from each other ideally by an angle of not less than 135 degrees.

GM1 CS-HPT-DSN.F.500 General

When a runway is marked in accordance with the provisions of CS-ADR-DSN, and is utilised as a FATO, no additional runway markings or lighting are required for helicopter use.

GM1 CS-HPT-DSN.F.510 Wind direction indicators

(a) General: If the wind direction indicators serving the aerodrome do not clearly indicate the correct wind information at the heliport, additional wind direction indicators should be installed in order to provide wind information to the pilot during approach and take-off.
(b) Location:
  (1) A wind direction indicator should be located so as to indicate the wind conditions over the FATO and TLOF and in such a way as to be free from the effects of airflow disturbances caused by nearby objects or rotor downwash. It should be visible from a helicopter in flight, in a hover or on the movement area.
  (2) Where a TLOF and/or FATO are subject to a disturbed airflow, additional wind direction indicators located close to the area should be provided to indicate the surface wind on the area.
(c) Characteristics:
  (1) A wind direction indicator should give a clear indication of the direction of the wind and a general indication of the wind speed.
  (2) A wind direction indicator for the heliport should be a truncated cone made of lightweight fabric and should have the following minimum dimensions:
    (i) Length 2.4 m,
    (ii) Diameter (larger end) 0.6 m, and
    (iii) Diameter (smaller end) 0.3 m.
  (3) The colour of the wind direction indicator should be so selected as to make it clearly visible and understandable from a height of at least 200 m (650 ft) above the heliport, having regard to the background:
    (i) where practicable, a single colour, preferably white or orange, should be used;
    (ii) where a combination of two colours is required to give adequate conspicuity against changing backgrounds, they should preferably be orange and white, red and white, or black and white, and should be arranged in five alternate bands, the first and last band being the darker colour.
(d) A wind direction indicator at a heliport intended for use at night should be illuminated.

GM1 CS-HPT-DSN.F.520 Heliport identification marking

On a FATO which does not contain a TLOF and which is marked with an aiming point marking (see CS CS-HPT-DSN.F.550) the heliport identification marking should be established in the centre of the aiming point marking as shown in Figure F-1.

GM1 CS-HPT-DSN.F.530 Final approach and take-off area perimeter marking or markers

(a) Where a TLOF is coincident with a FATO, the TLOF marking can be used.
(b) FATO perimeter markers should be of a single colour, either orange or red, or the two contrasting colours of orange and white or, alternatively, red and white should be used except where such colours would merge with the background. A FATO perimeter marker should have dimensional characteristics as shown in Figure GM1-F-1.

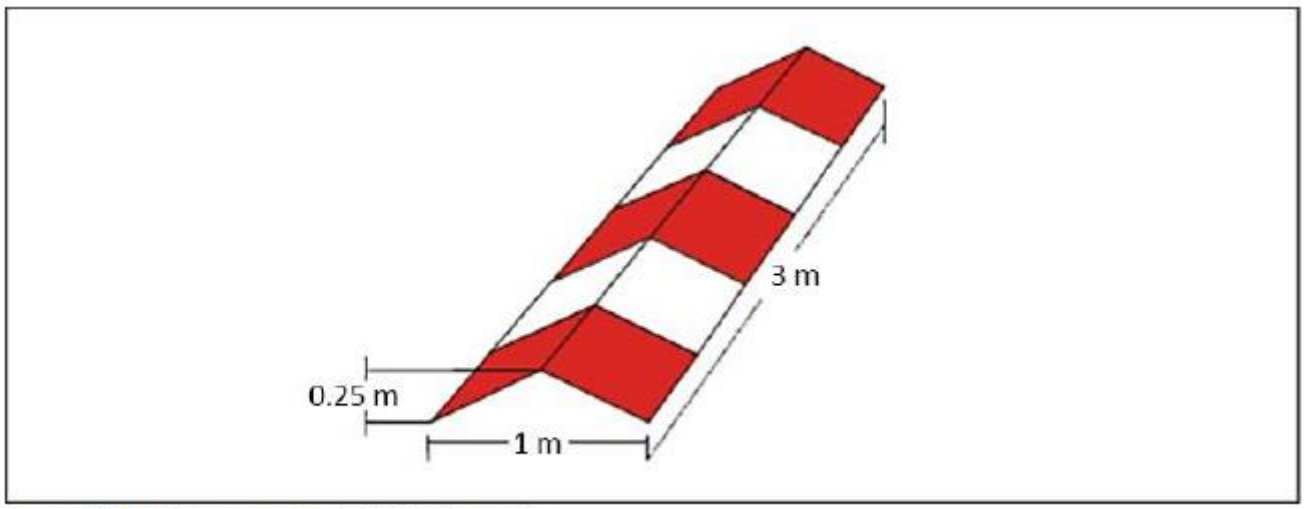


Figure GM1-F-1. Runway-type FATO edge marker

GM1 CS-HPT-DSN.F.540 Final approach and take-off area designation marking

For a runway-type FATO, the numbers and the letter of the marking should have a white colour and should be in the form and proportion shown in Figure GM1-F-2.

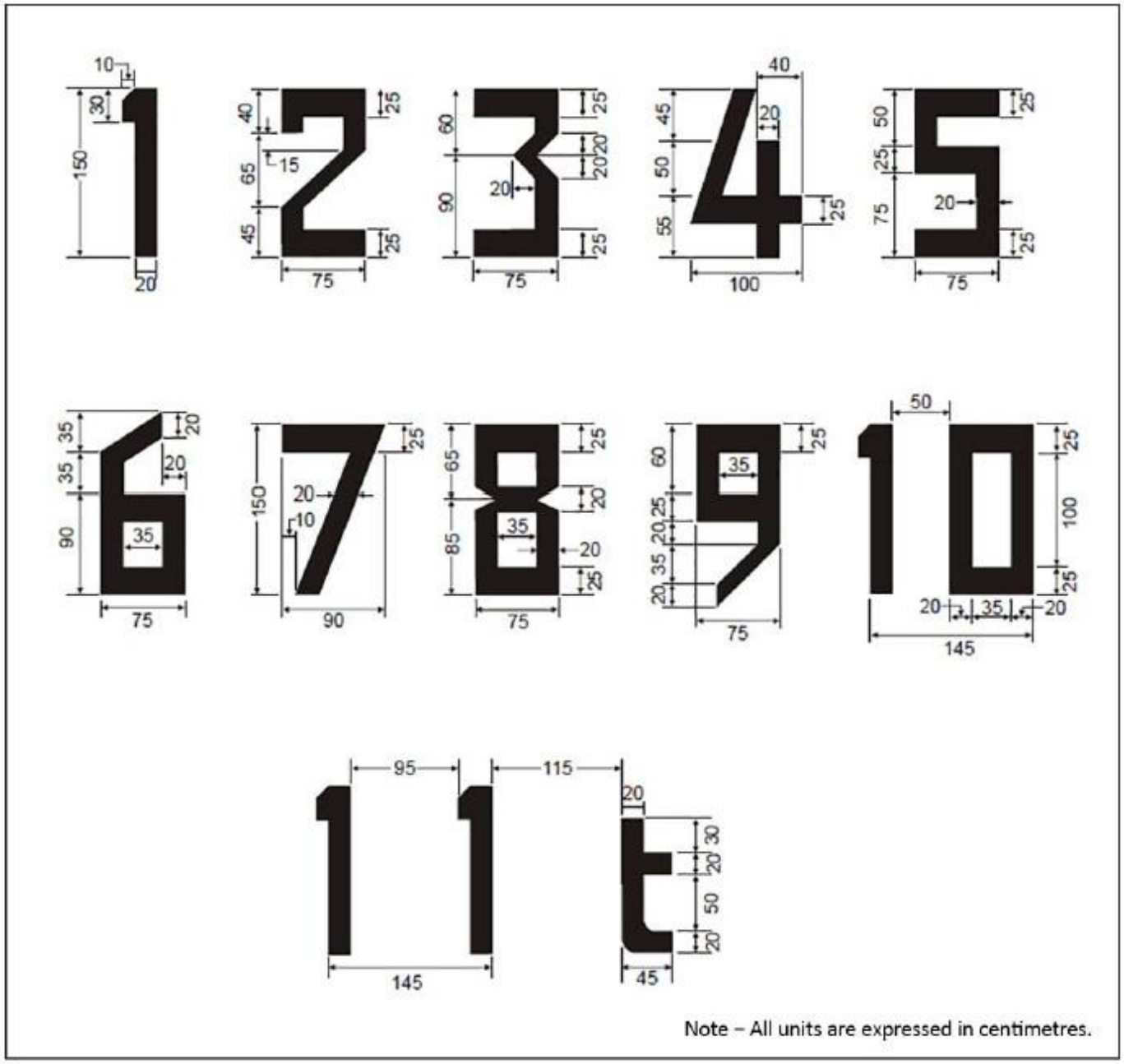


Figure GM1-F-2. Form and proportions of numbers and letter

GM1 CS-HPT-DSN.F.550 Aiming point marking

For all FATOs except runway-type FATOs, the aiming point marking should be located at the centre of the FATO, as shown in Figure F-1.

GM1 CS-HPT-DSN.F.560 Touchdown and lift-off area perimeter marking

A TLOF perimeter marking should be provided on each TLOF collocated with a helicopter stand.

GM1 CS-HPT-DSN.F.580 Heliport name marking

(a) Location: The heliport name marking should be displayed on the heliport so as to be visible, as far as practicable, at all angles above the horizontal.
(b) Characteristics:
  (1) A heliport name marking intended for use at night or during conditions of poor visibility should be illuminated, either internally or externally.
  (2) The colour of the marking should contrast with the background and preferably be white.

(3) Runway-type FATOs: The characters of the marking should be not less than 3 m in height.
(4) All FATOs except runway-type FATOs: The characters of the marking should be not less than 1.5 m in height.

GM1 CS-HPT-DSN.F.590 Helicopter ground taxiway markings and markers

(a) Ground taxi-routes are not required to be marked.
(b) Where necessary, signage should be provided on an aerodrome to indicate that a ground taxiway is suitable only for the use of helicopters.
(c) A helicopter ground taxiway edge marker should not present a hazard for aircraft operations.

GM1 CS-HPT-DSN.F.600 Helicopter air taxiway markings and markers

(a) Helicopter air taxi-routes are not required to be marked.
(b) Where a helicopter air taxiway could be confused with a helicopter ground taxiway, signage should be provided to indicate the mode of taxi operations that are permitted.
(c) Helicopter air taxiway edge markers should not be located at a distance from the centre line of the helicopter air taxiway of less than 0.5 times the largest overall width of the helicopter for which it is designed.
(d) Helicopter air taxiway edge markers should not penetrate a plane originating at a height of 25 cm above the plane of the helicopter air taxiway, at a distance from the centre line of the helicopter air taxiway of 0.5 times the largest overall width of the helicopter for which it is designed, and sloping upwards and outwards at a gradient of 5 per cent.

GM1 CS-HPT-DSN.F.610 Helicopter stand markings

Helicopter stand identification markings should be provided where there is a need to identify individual stands.

GM1 CS-HPT-DSN.F.630 Approach lighting system

Additional guidance on light intensity controls is given in GM1 CS-ADR-DSN.M.615.

GM1 CS-HPT-DSN.F.640 Flight path alignment guidance lighting system

The flight path alignment guidance lighting can be combined with a flight path alignment guidance marking (or markings).

GM1 CS-HPT-DSN.F.650 Visual alignment guidance system

A visual alignment guidance system should be provided where one or more of the following conditions exist:
(a) obstacle clearance, noise abatement or traffic control procedures require a particular direction to be flown;
(b) the environment of the heliport provides few visual surface cues; and
(c) it is physically impracticable to install an approach lighting system.

GM1 CS-HPT-DSN.F.660 Visual approach slope indicator

(a) A visual approach slope indicator should be provided for a heliport where one or more of the following conditions exist:
(1) obstacle clearance, noise abatement or traffic control procedures require a particular slope to be flown;
(2) the environment of the heliport provides few visual surface cues; and
(3) the characteristics of the helicopter require a stabilised approach.
(b) When more than one visual approach slope indicator is installed at an aerodrome (e.g. PAPI, APAPI), a visual approach slope indicator should be designed and calibrated in order to give a clear and unambiguous indication to helicopter pilots approaching to land.
(c) A heliport visual approach slope indicator should be located adjacent to the nominal aiming point

and aligned in azimuth with the preferred approach direction.
(d) Care is required in the design of the unit to minimise spurious signals between the signal sectors, and at the azimuth coverage limits.
(e) Larger azimuth coverage can be obtained by installing the HAPI system on a turntable.

GM1 CS-HPT-DSN.F.690 Touchdown and lift-off area lighting system

TLOF ASPSL and/or LPs to identify the touchdown marking and/or floodlighting should be provided for use at night when enhanced surface texture cues are required.

GM1 CS-HPT-DSN.F.710 Visual aids for denoting obstacles

(a) General: If it is not possible to display obstacle lights on obstacles at a heliport intended for use at night, the obstacles should be floodlit.
(b) Location: Obstacle floodlights should be arranged so as to illuminate the entire obstacle and, as far as practicable, in a manner so as not to dazzle helicopter pilots.
(c) Characteristics: Obstacle floodlighting should produce a luminance of at least 10 cd/m2.

FINAL CLAUSES

This Acceptable Means of Compliance and Guidance Material to the Military Aviation Regulation, NLD-MAR-ADR is known as NLD-MAR-ADR AMC & GM.

This Acceptable Means of Compliance and Guidance Material to the Military Aviation Regulation, NLD-MAR-ADR shall enter into force on January 10th, 2024 and will be published on the MAA-NLD internet/intranet.

The Hague, 10 January 2024

The Director Military Aviation Authority – the Netherlands,

J.P. Apon
Air Commodore