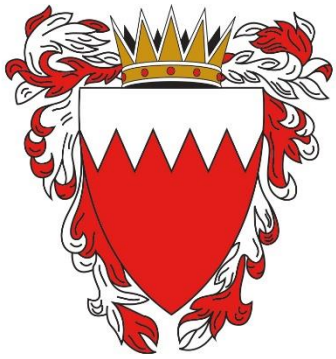

KINGDOM OF BAHRAIN

Ministry of Transportation
and Telecommunications

CIVIL AVIATION REGULATIONS 001

AERODROME STANDARDS & CERTIFICATION REGULATIONS

3rd February'2022

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Ministry of Transportation
and Telecommunications

Civil Aviation Regulations

Aerodrome Standards & Certification Regulations CAR001

The Civil Aviation Affairs of the Kingdom of Bahrain is responsible for updating Regulations issued in accordance with our obligations as a contracting State to the Chicago Convention (1944). Amendment 13B & 14 to Annex 14 Volume 1 has been reflected in this amendment to CAR001 Aerodrome Standards and Certification Regulations. I hereby issue this amended Regulation, being CAR001 Aerodrome Standards and Certification Regulations, effective third day of February,2022.

A/Undersecretary for Civil Aviation Affairs

PREFACE

As air traffic continues to increase in Bahrain, and international obligations evolve to assure safe aviation operations, it falls to Bahrain Civil Aviation Affairs (BCAA) to continue to develop its own standards, Regulations and procedures in accordance with its international obligations and the Kingdom's Law.

These Regulations set out the means by which the Kingdom complies with the mandatory requirement to certify Aerodromes that are used for international air traffic. These Regulations accord with Articles 28 and 37 and with Annex 14 to the convention on international civil aviation.

Furthermore, on the 1st March 2010 the BCAA ceased to have operational responsibility for BIA which was transferred to the Bahrain Airport Company. This necessitated a review and revision of the existing (2005) Regulations.

This document specifies the criteria applied by the Certification Authority (BCAA) on any organization desiring to operate an aerodrome in the Kingdom of Bahrain serving international civil aviation and for which an aerodrome certificate is required. The document also provides a reference to the holders of a certificate so that they may ensure compliance with the Authority's requirements as they relate to the developments and operational management of a certified aerodrome.

The Regulations represent the minimum standards necessary to meet the licensing requirement. They have been compiled without any differences from Annex 14 Volume 1, and where necessary, incorporate references from Annex 14 to other ICAO documents into the Regulations as standards.

If the Authority determines that an applicant is properly and adequately organized, resourced, equipped and able to conduct a safe operation in accordance with the requirements of these rules, Regulations, and standards prescribed hereunder, the Authority shall issue or renew an aerodrome certificate to the applicant as the aerodrome operator.

Amendments to these Regulations are the responsibility of the Bahrain Civil Aviation Affairs. Suggestions for improvement should be forwarded to the Authority.

RECORD OF AMENDMENTS AND CORRIGENDA

Amendment Number	Amendment Date	Incorporated by	Date Incorporated
Original issue	Dec 2010	Original issue	Dec 2010
1	Mar 2016	Amendments 10, 11 and 12	Mar 2016
2	Apr 2018	Amendment 13	Apr 2018
3	Feb 2022	Amendment 13B & 14 of Annex14 Vol. 1	Feb 2022

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INTRODUCTION

AERODROME CERTIFICATION

(1) Civil Aviation Affairs of the Kingdom of Bahrain (the Authority) may make Regulations with respect to aviation and, without restricting the generality of the foregoing, may make Regulations with respect to activities at aerodromes and the location, inspection, certification, registration and operation of aerodromes.

(2) The Authority is empowered to issue, review, transfer, refuse, suspend, withdraw, cancel and amend aerodrome certificates, and to establish minimum safety standards for the operation of aerodromes that serve any international civil air traffic.

(3) Any registered organization or individual desiring to operate an aerodrome that is described in paragraph (2) and that is required by the Authority, by rule, to be certified may file with the Authority an application for an aerodrome certificate. Such application shall include the aerodrome manual for the aerodrome. If the Authority determines that an applicant is properly and adequately equipped and able to conduct a safe operation in accordance with the requirements of these rules, and the Regulations, and standards prescribed hereunder, the Authority shall issue an aerodrome certificate to the applicant. Each aerodrome certificate shall prescribe such terms, conditions, and limitations as are reasonably necessary to assure safety.

(4) The Authority or its representative may

a) enter any

civil aerodrome used for domestic or international traffic for the purposes of making inspections relating to the enforcement of this part;

b) enter any place in the aerodrome for the purposes of an investigation of matters concerning aviation safety;

c) seize anything found in any place referred to in paragraph (a) or (b) that the Authority or its representative believes on reasonable grounds will afford evidence with respect to an offence under paragraph (5) or the causes or contributing factors pertaining to an investigation referred to in sub-paragraph (b).

(5) It shall be an offense to provide false information in support of an application for an aerodrome certificate or to otherwise act, or fail to act, so as to endanger the safety of aerodrome operations. The operator of an aerodrome may be proceeded against if found to have committed an offense in relation to the aerodrome or associated facility for which he is responsible under the terms of the aerodrome certificate. In such eventuality the operator of the aerodrome is liable to the penalty prescribed in Law.

Chapter 1 GENERAL

Reference: ICAO Annex 14, Ch 1; ICAO Doc 9774, Ch 3.

1.1 Application

1.1.1 These Regulations apply to civil aerodromes within the Kingdom of Bahrain that serve any international operations by aircraft.

1.2 Interpretation

1.2.1 The terms described in this sub-section shall have the following meaning whenever they appear in these Regulations, (each definition shows the source of its meaning from ICAO Annexes 4, 5, 6, 14, 15, ICAO Documents 4444, 9674 and 9774, the BIPM brochure on SI units or ISO9000).

accuracy	A degree of conformance between the estimated or measured value and the true value. (ICAO Annex 14)
aerodrome	A defined area on land (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft. (ICAO Annex 14)
aerodrome beacon	Aeronautical beacon used to indicate the location of an aerodrome from the air. (ICAO Annex 14)
aerodrome certificate	A certificate issued by the Authority under chapter 2 of these Regulations for operation of an aerodrome following the acceptance of the aerodrome manual for the aerodrome. (ICAO Doc 9774)
aerodrome elevation	The elevation of the highest point of the landing area. (ICAO Annex 14)
aerodrome facilities and equipment	Facilities and equipment inside the boundaries of an aerodrome that are constructed or installed and maintained for the arrival, departure and surface movement of aircraft. (ICAO Doc 9774)
aerodrome identification sign	A sign placed on an aerodrome to aid in identifying the aerodrome from the air. (ICAO Annex 14)
aerodrome manual	A manual included in an application for an Aerodrome Certificate pursuant to these Regulations and incorporating any amendments to the manual accepted by the Authority. (ICAO Doc 9774)
Aerodrome mapping data (AMD)	Data collected for the purpose of compiling aerodrome mapping information for aeronautical uses.
Aerodrome mapping database (AMDB)	A collection of aerodrome mapping data organized and arranged as a structured data set.
aerodrome operator	In relation to certificated aerodrome, the aerodrome certificate holder. (ICAO Doc 9774)

aerodrome reference point	The designated geographical location of an aerodrome. (ICAO Annex 14)
aerodrome traffic	All traffic on the manoeuvring area of an aerodrome and all aircraft flying in the vicinity of an aerodrome. *Note – An aircraft is in the vicinity of an aerodrome when it is in, entering or leaving an aerodrome traffic circuit.* (ICAO Doc 4444)
aerodrome traffic circuit	The specified path to be flown by aircraft operating in the vicinity of the airport. (ICAO Doc 4444)
aerodrome traffic density	a) Light: where the number of movements in the mean busy hour is not greater than 15 per runway or typically less than 20 total aerodrome movements. (ICAO Annex 14) b) Medium: where the number of movements in the mean busy hour is of the order of 16 to 25 per runway or typically between 20 to 35 total aerodrome movements. (ICAO Annex 14) c) Heavy: where the number of movements in the mean busy hour is of the order of 26 or more per runway or typically more than 35 total aerodrome movements. (ICAO Annex 14) *Note 1 – The number of movements in the mean busy hour is the arithmetic mean over the year of the number of movements in the daily busiest hour.* *Note 2 – Either a take-off or a landing constitutes a movement*
aerodrome traffic zone (ATZ)	An airspace of defined dimensions established around an aerodrome for the protection of aerodrome traffic. (ICAO Doc 4444)
aerodrome operating minima	The limits of usability of an aerodrome for: a) Take-off, expressed in terms of runway visual range an/or visibility and, if necessary, cloud conditions; b) Landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height as appropriate to the category of the operation; and c) Landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height and, if necessary, cloud conditions. (ICAO Annex 6)
aeronautical beacon	An aeronautical ground light visible at all azimuths, either continuously or intermittently, to designate a particular point on the surface of the earth. (ICAO Annex 14)
aeronautical ground light	Any light specially provided as an aid to air navigation, other than a light displayed on an aircraft. (ICAO Annex 14)

aeroplane	A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight. (ICAO Annex 6)
aeroplane reference field length	The minimum field length required for take-off at maximum certificated take-off mass, sea level, standard atmospheric conditions, still air and zero runway slope, as shown in the appropriate aeroplane flight manual prescribed by the certificating authority or equivalent data from the aeroplane manufacturer. Field length means balanced field length for aeroplanes, if applicable, or take-off distance in other cases. (ICAO Annex 14)
AIP	Aeronautical Information Publication. A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation. (ICAO Annex 15)
AIRAC	An acronym (Aeronautical Information Regulation and Control) signifying a system aimed at advance notification based on common effective dates, of circumstances that necessitate significant changes in operating practices. (ICAO Annex 15)
aircraft	Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface. (ICAO Annex 6)
aircraft accident	An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which: a) A person is fatally or seriously injured as a result of; i) being in the aircraft, or ii) direct contact with any part of the aircraft, or iii) direct exposure to jet blast or propeller wash b) The aircraft sustains damage or structural failure which i) adversely affects the structural strength, performance or flight characteristics of the aircraft, and ii) would normally require major repair or replacement of the affected component; or c) The aircraft is missing or completely inaccessible. *Note: ICAO Annex 13 should be consulted for a fuller definition which includes caveats relating to personal injury and to engine failure and consequential damage.*
aircraft classification number (ACN)	A number expressing the relative effect of an aircraft on a pavement for a specified standard sub grade category. (ICAO Annex 14)
aircraft incident	An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

aircraft stand	A designated area on an apron intended to be used for parking an aircraft. (ICAO Annex 14)
air traffic service (ATS)	A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service). (ICAO Doc 4444)
AIS	Aeronautical Information Service. A service established within the defined area of coverage responsible for the provision of aeronautical information/data necessary for the safety, regularity and efficiency of air navigation. (ICAO Annex 15)
annex	Annex to the Convention on International Civil Aviation (Chicago 1944). (ICAO)
approach surface	An obstacle limitation surface: an inclined plane or combination of planes preceding the threshold. (ICAO Annex 14)
apron	A defined area on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading of passengers, mail or cargo, fuelling, parking or maintenance. (ICAO Annex 14)
apron management service	A service provided to regulate the activities and the movement of aircraft and vehicles on an apron. (ICAO Annex 14)
arresting system	A system designed to decelerate an aeroplane overrunning the runway.
Authority	The responsible Authority for aerodrome certification, namely the Aviation Safety & Security Directorate in Bahrain Civil Aviation Affairs
Autonomous runway incursion warning system (ARIWS)	A system which provides autonomous detection of a potential incursion or of occupancy of an active runway and a direct warning to a flight crew or vehicle operator.
balked landing	A landing manoeuvre that is unexpectedly discontinued at any point below the obstacle clearance altitude/height. (ICAO Annex 14)
balked landing surface	An obstacle limitation surface: an inclined plane located at a specified distance after the threshold extending between the inner transitional surfaces. (ICAO Annex 14)
barrette	Three or more aeronautical ground lights closely spaced in a transverse line so that from a distance they appear as a short bar of light. (ICAO Annex 14)
Calendar	Discrete temporal reference system that provided the basis for defining temporal position to a resolution of one day (ISO10108*)
candela (cd)	The SI unit of luminous intensity. (BIPM)

certified aerodrome	An aerodrome whose operator has been granted an aerodrome certificate. (ICAO Doc 9774)
clearway	A defined rectangular area on the ground or water under the control of the appropriate authority, selected or prepared as a suitable area over which an aeroplane may make a portion of its initial climb to a specified height. (ICAO Annex 14)
commercial air transport operation	An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire. (ICAO Annex 6)
conical surface	An obstacle limitation surface sloping upwards and outwards from the periphery of the inner horizontal surface. (ICAO Annex 14)
Convention	Convention on International Civil Aviation (Chicago 1944). (ICAO)
cyclic redundancy check (CRC)	A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data. (ICAO Annex 14)
Data Accuracy	A degree of conformance between the estimated or measured value and true value
Data Integrity	A degree of assurance that an aeronautical data and its value has not been lost or altered since the origination or authorized amendment
data quality	A degree or level of confidence that the data provided meet the requirements of the data user in terms of accuracy, resolution and integrity. (ICAO Annex 14)
datum	Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities. (ICAO Annex 14)
declared distances	a) Take-off run available (TORA). The length of runway declared available and suitable for the ground run of an aeroplane taking off. b) Take-off distance available (TODA) The length of the take-off run available plus the length of the clearway, if provided. c) Accelerate-stop distance available (ASDA). The length of the take-off run available plus the length of the stopway, if provided. d) Landing distance available (LDA). The length of runway which is declared available and suitable for the ground run of an aeroplane landing. (ICAO Annex 14)
dependent parallel approaches	Simultaneous approaches to parallel or near-parallel instrument runways where radar separation minima between aircraft on adjacent extended runway centre lines are prescribed. (ICAO Annex 14)
displaced threshold	A threshold not located at the extremity of a runway. (ICAO Annex 14)
effective intensity	The effective intensity of a flashing light is equal to the intensity of a fixed light of the same colour which will produce the same visual range under identical conditions of observation. (ICAO Annex 14)

ellipsoid height (Geodetic height)	The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question. (ICAO Annex 14)
fixed light	A light having constant luminous intensity when observed from a fixed point. (ICAO Annex 14)
Foreign Object Debris (FOD)	An inanimate object within the movement area which has no operational or aeronautical function and which has the potential to be a hazard to aircraft operations.
frangible object	An object of low mass designed to break, distort or yield on impact so as to present the minimum hazard to aircraft. (ICAO Annex 14)
geodetic datum	A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame. (ICAO Annex 14)
geoid	The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents. (ICAO Annex 14)
geoid undulation	The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid. (ICAO Annex 14)
Gregorian calendar	Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar. (ICAO Annex 14)
hazard beacon	An aeronautical beacon used to designate a danger to air navigation. (ICAO Annex 14)
heliport	An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters. (ICAO Annex 14)
holding bay	A defined area where aircraft can be held, or bypassed, to facilitate efficient surface movement of aircraft. (ICAO Annex 14)
Hot spot	A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.
human factors principles	Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance. (ICAO Annex 14)
human performance	Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations. (ICAO Annex 14)
ICAO	International Civil Aviation Organization

identification beacon	An aeronautical beacon emitting a coded signal by means of which a particular point of reference can be identified. (ICAO Annex 14)
independent parallel approaches	Simultaneous approaches to parallel or near-parallel instrument runways where radar separation minima between aircraft on adjacent extended runway centre lines are not prescribed. (ICAO Annex 14)
independent parallel departures	Simultaneous departures from parallel or near-parallel instrument runways. (ICAO Annex 14)
inner approach surface	An obstacle limitation surface: a rectangular portion of the approach surface immediately preceding the threshold. (ICAO Annex 14)
inner horizontal surface	An obstacle limitation surface located in a horizontal plane above an aerodrome and its environs. (ICAO Annex 14)
inner transitional surface	An obstacle limitation surface similar to the transitional surface but closer to the runway. (ICAO Annex 14)

instrument runway	One of the following types of runways intended for the operation of aircraft using instrument approach procedures: a) Non-precision approach runway. A runway served by visual aids and a non-visual aid(s) intended for landing operations following an instrument approach operation type A and a visibility not less than 1 000 m.. b) Precision approach runway, category I. A runway served by visual aids and non-visual aid(s) intended for landing operations following an instrument approach operation type B with a decision height (DH) not lower than 60 m (200 ft) and either a visibility not less than 800 m or a runway visual range not less than 550 m. c) Precision approach runway, category II. A runway served by visual aids and non-visual aid(s) intended for landing operations following an instrument approach operation type Bwith a decision height lower than 60 m (200 ft) but not lower than 30 m (100 ft) and a runway visual range not less than 300 m. d) Precision approach runway, category III. A runway served by visual aids and non-visual aid(s) intended for landing operations following an instrument approach operation type B to and along the surface of the runway and: A- intended for operations with a decision height (DH) lower than 30 m (100 ft), or no decision height and a runway visual range not less than 175 m; B- intended for operations with a decision height lower (DH) than 15 m (50 ft), or no decision height and a runway visual range less than 175 m but not less than 50 m; C- intended for operations with no decision height (DH) and no runway visual range limitations.
integrity (aeronautical data)	A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment. (ICAO Annex 14)

Integrity classification (aeronautical data)	Classification based upon the potential risk resulting from the use of corrupted data. Aeronautical data is classified as: a) routine data: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; b) essential data: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and c) critical data: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.
intermediate holding position	A designated position intended for traffic control at which taxiing aircraft and vehicles shall stop and hold until further cleared to proceed, when so instructed by the aerodrome control tower. (ICAO Annex 14)
international airport	Any airport designated by the Contracting State in whose territory it is situated as an airport of entry and departure for international air traffic, where the formalities incident to customs, immigration, public health, animal and plant quarantine and similar procedures are carried out. (ICAO Annex 15)
landing area	That part of a movement area intended for the landing or take-off of aircraft. (ICAO Annex 14)
landing direction indicator	A device to indicate visually the direction currently designated for landing and for take-off. (ICAO Annex 14)
laser-beam critical flight zone (LCFZ)	Airspace in the proximity of an aerodrome but beyond the LFFZ where the irradiance is restricted to a level unlikely to cause glare effects. (ICAO Annex 14)
laser-beam free flight zone (LFFZ)	Airspace in the immediate proximity of the aerodrome where the irradiance is restricted to a level unlikely to cause any visual disruption. (ICAO Annex 14)
laser-beam sensitive flight zone (LSFZ)	Airspace outside, and not necessarily contiguous with, the LFFZ and LCFZ where the irradiance is restricted to a level unlikely to cause flash-blindness or after-image effects. (ICAO Annex 14)
lighting system reliability	The probability that the complete installation operates within the specified tolerances and that the system is operationally usable. (ICAO Annex 14)
local mean sea level	The mean sea level measured at Mina Salman – the location of the Bahrain National Level Datum
lumen (lm)	The SI derived unit of luminous flux: the luminous flux emitted in a solid angle of 1 steradian by a point source having a uniform intensity of 1 candela, (BIPM)

lux (lx)	The SI derived unit of illuminance: the illuminance produced by a luminous flux of 1 lumen uniformly distributed over a surface of 1 square metre, (BIPM)
manoeuvring area	That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons. (ICAO Annex 14)
marker	An object displayed above ground level in order to indicate an obstacle or delineate a boundary. (ICAO Annex 14)
marking	A symbol or group of symbols displayed on the surface of the movement area in order to convey aeronautical information. (ICAO Annex 14)
mean sea level (MSL)	The undisturbed mean sea level as determined by satellite altimetry. (See also “geoid” and “local mean sea level”)
movement area	That part of the aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s). (ICAO Annex 14)
near-parallel runways	Non-intersecting runways whose extended centre lines have an angle of convergence/divergence of 15 degrees or less. (ICAO Annex 14)
non-instrument runway	A runway intended for the operation of aircraft using visual approach procedures or an instrument approach procedure to a point beyond which the approach may continue in visual meteorological conditions. (ICAO Annex 14)
normal flight zone (NFZ)	Airspace not defined as LFFZ, LCFZ or LSFZ but which shall be protected from laser radiation capable of causing biological damage to the eye. (ICAO Annex 14)
obstacle	All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that: a) Are located on an area intended for the surface movement of aircraft: or b) Extended above a defined surface intended to protect aircraft in flight; or c) Stand outside those defined surfaces and that have been assessed as being a hazard to air navigation. (ICAO Annex 14)
obstacle free zone (OFZ)	The airspace above the inner approach surface, inner transitional surfaces, the balked landing surface and that portion of the strip bounded by these surface, which is not penetrated by any fixed obstacle other than a low-mass and frangibly mounted one required for air navigation purposes. (ICAO Annex 14)
obstacle limitation surfaces	A series of surfaces that define the volume of airspace at and around an aerodrome to be kept free of obstacles in order to permit the intended aeroplane operations to be conducted safely and to prevent the aerodrome from becoming unusable by the growth of obstacles around the aerodrome. (ICAO Doc 9774)

orthometric height	Height of a point related to the geoid, generally presented as an MSL elevation. (ICAO Annex 14)
Outer main gear wheel span (OMGWS)	The distance between the outside edges of the main gear wheels
pavement classification number (PCN)	A number expressing the bearing strength of a pavement for unrestricted operations. (ICAO Annex 14)
precision	The smallest difference that can be reliably distinguished by a measurement process. (ICAO Doc 9674)
precision approach runway	See instrument runway.
primary runway(s)	Runway(s) used in preference to others whenever conditions permit. (ICAO Annex 14)
protected flight zone	Airspace specifically designated to mitigate the hazardous effects of laser radiation. (ICAO Annex 14)
quality	Degree to which a set of inherent characteristics fulfils requirements. (ISO 9000).
quality assurance	Part of quality management focused on providing confidence that quality requirements will be fulfilled. (ISO 9000)
quality control	Part of quality management focused on fulfilling quality requirements. (ISO 9000)
quality management	Coordinated activities to direct and control an organization with regard to quality (ISO 9000)
quality management system	Set of interrelated or interacting elements to establish quality management policy and objectives and to achieve those objectives (derived from ISO 9000)
resolution	A number of units or digits to which a measured or calculated value is expressed and used (ICAO Doc 9674)
road	An established surface route on the movement area meant for the exclusive use of vehicles. (ICAO Annex 14)
road-holding position	A designated position at which vehicles may be required to hold. (ICAO Annex 14)

Runway	A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft. (ICAO Annex 14)
Runway condition Assessment matrix (RCAM)	A matrix allowing the assessment of the runway condition code, using associated procedures, from a set of observed runway surface condition(s) and pilot report of braking action
Runway condition Code (RWYCC)	A number describing the runway surface condition to be used in the runway condition report.
Runway condition Report (RCR)	A comprehensive standard report relating to runway surface condition(s)and its effect on the aeroplane landing and take-off performance
runway end safety area (RESA)	An area symmetrical about the extended runway centre line and adjacent to the end of the strip primarily intended to reduce the risk of damage to an aeroplane undershooting or overrunning the runway. (ICAO Annex 14)
runway guard lights	A light system intended to caution pilots or vehicle drivers that they are about to enter an active runway. (ICAO Annex 14)
runway-holding position	A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/ MLS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorized by the aerodrome control tower. (ICAO Annex 14)
runway strip	A defined area including the runway and stopway, if provided, intended: a) To reduce the risk of damage to aircraft running off a runway; and b) To protect aircraft flying over it during take-off or landing operations. (ICAO Annex 14)

Runway surface condition	A description of the condition(s) of the runway surface used in the runway condition report which establishes the basis for the determination of the runway condition code for aeroplane performances purposes a)Dry runway. A runway is considered dry when if its surface is free of moisture and not contaminated within the area intended to be used b)Wet runway. The surface is covered by any visible dampness or water up to and including 3mm deep within the intended area of use. c)Slippery wet runway. A wet runway where the surface friction characteristics of a significant portion of the runway have been determined to be degraded d)Contaminated runway. A runway is contaminated when a significant portion of the runway surface (whether in isolated area or not) within the length and width being used is covered by one or more of the substances listed in the runway surface condition descriptors. d)Runway surface condition descriptor. Standing water- Water of depth greater than 3mm Note;- Winter condition descriptors are not detailed under definitions as they are not applicable in the Kingdom of Bahrain, being a wet and dry only region.
runway turn pad	A defined area on a land aerodrome adjacent to a runway for the purpose of completing a 180-degree turn on a runway. (ICAO Annex 14)
runway visual range (RVR)	The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line. (ICAO Annex 14)
safety management system (SMS)	A systematic approach to managing safety including the necessary organizational structure, accountabilities, policies and procedures. (ICAO Annex 14)
segregated parallel operations	Simultaneous operations on parallel or near-parallel instrument runways in which one runway is used exclusively for approaches and the other runway is used exclusively for departures. (ICAO Annex 14)
shall	The operative verb used in relation to standards. (ICAO Annex 14)
should	The operative verb used in relation to recommended practices. (ICAO Annex 14)
shoulder	An area adjacent to the edge of a pavement so prepared as to provide a transition between the pavement and the adjacent surface. (ICAO Annex 14)

sign	a) *Fixed message sign*: a sign presenting only one message. b) *Variable message sign*: a sign capable of presenting several pre-determined messages or no message, as applicable. (ICAO Annex 14)
signal area	An area on an aerodrome used for the display of ground signals. (ICAO Annex 14)
station declination	An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated. (ICAO Annex 14)
stopway	A defined rectangular area on the ground at the end of take-off run available prepared as a suitable area in which an aircraft can be stopped in the case of an abandoned take-off. (ICAO Annex 14)
switch-over time (light)	The time required for the actual intensity of a light measured in a given direction to fall from 50 per cent and recover to 50 per cent during a power supply changeover, when the light is being operated at intensities of 25 per cent or above. (ICAO Annex 14)
take-off climb surface	An obstacle limitation surface: an inclined plane or other specified surface beyond the end of a runway or clearway. (ICAO Annex 14)
take-off runway	A runway intended for take-off only. (ICAO Annex 14)
taxiway	A defined path on a land aerodrome established for the taxiing of aircraft and intended to provide a link between one part of the aerodrome and another, including: a) Aircraft stand taxilane. A portion of an apron designated as a taxiway and intended to provide access to aircraft stands only. b) Apron taxiway. A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron. c) Rapid exit taxiway. A taxiway connected to a runway at an acute angle and designed to allow landing aeroplanes to turn off at higher speeds than are achieved on other exit taxiways thereby minimizing runway occupancy times. (ICAO Annex 14)
taxiway intersection	A junction of two or more taxiways. (ICAO Annex 14)
taxiway strip	An area including a taxiway intended to protect an aircraft operating on a taxiway and to reduce the risk of damage to an aircraft accidentally running off the taxiway. (ICAO Annex 14)
threshold	The beginning of that portion of the runway usable for landing. (ICAO Annex 14)
touchdown zone (TDZ)	The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway. (ICAO Annex 14)

transitional surface	An obstacle limitation surface: a complex surface along the side of the strip and part of the side of the approach surface, that slopes upwards and outwards to the inner horizontal surface, (ICAO Annex 14)
unserviceable area	A part of the movement area that is unfit and unavailable for use by aircraft. (ICAO Doc 9774)
usability factor	The percentage of time during which the use of a runway or system of runways is not restricted because of the cross-wind component. (ICAO Annex 14)
UTC	Coordinated Universal Time: time scale which forms the basis of a coordinated radio dissemination of standard frequencies and time signals. (ISO 8601)
wheel base	The distance from the aircraft nose gear to the geometric centre of the main gear. (ICAO Annex 14)
WGS–84	World Geodetic System – 1984: an earth-fixed global reference frame, including an earth model, defined by a set of primary and secondary parameters. (ICAO Doc 9674)
work area	A part of an aerodrome in which maintenance or construction works are in progress. (ICAO Doc 9774)

1.2.2 At the start of each chapter in these Regulations references are quoted in italics. These references do not form part of the Regulations, but are included to show the international source of the Regulations. In all cases the content of the Regulations shall take precedence over any and all guidance material.

1.2.3 The language used throughout these Regulations firstly uses the spelling as used in the ICAO Annexes; and secondly US English.

1.3 Standards and Recommended Practices

1.3.1 Any reference in these Regulations to standards is a reference to ICAO standards and recommended practices with particular reference to the latest version of Annex 14, Volume 1 to the Convention on International Civil Aviation (Chicago 1944). Additional references to the Aerodrome Design Manual (Doc 9157) are for guidance only unless otherwise specified. The specifications in this regulation shall apply, where appropriate, to heliports.

1.4 Reference Systems

1.4.1 *Horizontal reference system*: WGS–84 shall be used as the horizontal (geodetic) reference system. Reported aeronautical geographical data (indicating latitude and longitude) shall be expressed in terms of the WGS-84 geodetic reference datum.

1.4.2 *Vertical reference system*: Mean seal level (MSL) datum, which gives the relationship of gravity-related height (elevation) to a surface known as the geoid, shall be used as the vertical reference system.

1.4.3 *Temporal reference system*: The Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system. When a different

temporal reference system is used, this shall be indicated in GEN 2.1.2 of the Aeronautical Information Publication (AIP).

1.4.4 *Colour.* Wherever a colour is referred to in this Regulation, the specifications for that colour given in the latest version of Appendix 1 of Annex 14, Volume 1 to the Convention on International Civil Aviation (Chicago 1944).

1.5 Airport design

1.5.1 Architectural and infrastructure-related requirements for the optimum implementation of international civil aviation security measures shall be integrated into the design and construction of new facilities and alterations to existing facilities at an aerodrome.

1.6 Reference code

1.6.1 An aerodrome reference code — code number and letter — which is selected for aerodrome planning purposes shall be determined in accordance with the characteristics of the aeroplane for which an aerodrome facility is intended.

1.6.2 The aerodrome reference code numbers and letters shall have the meanings assigned to them in the latest version of Appendix 1 of Annex 14, Volume 1 to the Convention on International Civil Aviation (Chicago 1944) Table 1-1 **Aerodrome reference code**.

1.6.3 The code number for element 1 shall be determined from Table 1-1, column 1, selecting the code number corresponding to the highest value of the aeroplane reference field lengths of the aeroplanes for which the runway is intended.

Note.— The determination of the aeroplane reference field length is solely for the selection of a code number and is not intended to influence the actual runway length provided.

1.6.4 The code letter for element 2 shall be determined from Table 1-1, ~~column 3,~~ by selecting the code letter which corresponds to the greatest wingspan, or the greatest outer main gear wheel span, whichever gives the more demanding code letter of the aeroplanes for which the facility is intended.

Table 1-1 Aerodrome reference code

Code element 1	
Code number	Aeroplane reference field length
1	Less than 800 m
2	800m up to but not including 1200m
3	1200m up to but not including 1800m
4	1800m and over
Code element 2	
Code letter	Wingspan
A	Up to but not including 15m
B	15m up to but not including 24m
C	24m up to but not including 36m
D	36m up to but not including 52m
E	52m up to but not including 65m
F	65 m up to but not including 80m

1.7 Specific procedures for aerodrome operations

1.7.1 When the aerodrome accommodates an aeroplane that exceeds the certificated characteristics of the aerodrome, the compatibility between the operation of the aeroplane and aerodrome infrastructure and operations shall be assessed and appropriate measures developed and implemented in order to maintain an acceptable level of safety during operations.

1.7.2 Information concerning alternative measures, operational procedures and operating restrictions implemented at an aerodrome arising from 1.7.1 shall be promulgated

Chapter 2 AERODROME CERTIFICATION

Reference: ICAO Annex 14, Ch 1; ICAO Doc 9774, Ch 2

2.1 Requirement for an aerodrome certificate

2.1.1 The operator of an aerodrome forming an integral part of international airport shall be in possession of an aerodrome certificate.

2.2 Application for an aerodrome certificate

2.2.1 An applicant for an aerodrome certificate shall submit to the Authority an application in the form prescribed in Appendix A. The application shall include the aerodrome manual for the aerodrome.

2.2.2 The application shall include a No Objection/Approval from

a) Environment Protection Authority –including any environmental impact studies conducted
b) Urban Planning Authority
c) Civil Defence Force
d) Ministry of the Interior
e) Bahrain Defence Force
f) The concerned Municipality
g) any other concerned government authority.

2.3 Grant of an aerodrome certificate

2.3.1 Subject to the provisions in Regulations 2.3.2 the Authority may approve the application and accept the aerodrome manual submitted under Regulation 2.2.1 and grant an aerodrome certificate to the applicant in the form prescribed in Appendix B.

2.3.2 Before granting an aerodrome certificate, the Authority shall be satisfied that:

a) an acceptable safety management system is in place at the aerodrome;

b) the aerodrome facilities, services and equipment are in accordance with these Regulations;

c) the aerodrome's operating procedures make satisfactory provision for the safety of aircraft;

d) an aerodrome manual has been prepared for the applicant's aerodrome and submitted with the application contains all the relevant information; and

e) the applicant has the necessary competence, experience and resources to operate and maintain the aerodrome properly, and

f) All relevant approvals required by 2.2.2 are in place.

2.3.3 The Authority may refuse to grant an aerodrome certificate to an applicant. In such cases, the Authority shall notify the applicant, in writing, of its reason no later than 7 working days after making its decision.

2.4 Endorsement of conditions

2.4.1 After a successful completion of the processing of the application and inspection of the aerodrome, the Authority, while granting the aerodrome certificate will endorse the conditions of the type of use of the aerodrome and other details as required.

2.5 Validity of the aerodrome certificate

2.5.1 An aerodrome certificate shall be valid for 5 Years or until it is suspended or cancelled, whichever is earlier.

2.6 Transfer of an aerodrome certificate

2.6.1 The Authority may give its consent to, and issue an instrument of transfer of an aerodrome certificate to a transferee where:

a) the current holder of the aerodrome certificate notifies the Authority in writing at least 90 days before ceasing to operate the aerodrome that the current holder will cease to operate the aerodrome as of the date specified in the notice;

b) the current holder of the aerodrome certificate notifies the Authority in writing, the name of the transferee;

c) the transferee applies in writing to the Authority within 60 days before the current holder of the aerodrome certificate cease to operate the aerodrome, for the aerodrome certificate to be transferred to the transferee; and

d) the requirements of 2.2.1 and 2.3.2 are met.

2.6.2 If the Authority does not consent to the transfer of an aerodrome certificate, it shall notify the transferee, in writing, of its reasons within 7 working days after making that decision.

2.7 Amendment of the aerodrome certificate

2.7.1 The Authority may, provided that the requirements of Regulations 2.2.1 and 2.3.2, and 3.5.1 are met, amend an aerodrome certificate where:

a) there is a change in the use or operation of the aerodrome;

b) there is a change in the boundaries of the aerodrome; or

c) the holder of the aerodrome certificate requests the amendment.

2.7.2 If there is a change in ownership or management of the aerodrome, the new owner or manager shall apply for a transfer of the aerodrome certificate in accordance with 2.6.1.

2.7.3 If the aerodrome operator requests an amendment to the aerodrome certificate or the endorsed conditions such request shall be accompanied by:

a) a detailed account of the proposed amendment including the reasons for the amendment;

b) an assessment of the safety risks associated with any change in use or operation of the aerodrome including, where appropriate, the findings of any aeronautical study undertaken on behalf of the aerodrome operator; and

c) particulars of any consequential changes to the AIP, aerodrome manual and aerodrome emergency plan.

2.7.4 The Authority may amend an aerodrome certificate so as to restrict or prohibit specific operations at the aerodrome if the aerodrome operator breaches the conditions of the type of use endorsed by the aerodrome certificate. The Authority shall provide written notice of intention to amend an aerodrome certificate stating the reasons for the proposed amendment.

2.8 Suspension or Withdrawal of an Aerodrome Certificate

2.8.1 The Authority may suspend or withdraw an aerodrome certificate if the aerodrome operator fails to meet the obligations set out in Chapter 4 of these Regulations.

2.8.2 In the event of a serious failure of the aerodrome operator's safety management system the Authority may require specific operations to be suspended with immediate effect.

Chapter 3 AERODROME MANUAL

Reference: ICAO Annex 14, Ch 1; ICAO Doc 9774, App 1.

3.1 Preparation of an Aerodrome Manual

3.1.1 The operator of a certified aerodrome shall have a manual, to be known as the aerodrome manual, for the aerodrome.

3.1.2 The aerodrome manual shall:

a) be type written or printed and signed on behalf of the aerodrome operator by a duly authorised manager or executive;

b) be in a format that is easy to revise and insert replacement pages;

c) have a system for recording the currency of page and amendments thereto;

d) include a page for logging revisions; and

e) be organized in a manner that will facilitate the preparation review and approval process.

3.2 Location of the Aerodrome Manual

3.2.1 The aerodrome operator shall provide the Authority with a complete and current copy of the aerodrome manual.

3.2.2 The aerodrome operator shall keep at least one complete and current copy of the aerodrome manual at the aerodrome and one copy at the operator's principal place of business if that is other than the aerodrome.

3.2.3 The aerodrome operator shall make the aerodrome manual available to all relevant organizations operating at the airport, and take all reasonable steps to ensure that all relevant aerodrome personnel, regardless of their employer, are familiar with sections of the aerodrome manual relevant to their activity at the airport.

3.2.4 The aerodrome operator shall make the aerodrome manual available for inspection by the Authority.

3.3 Information to be included in the Aerodrome Manual

3.3.1 The operator of a certified aerodrome shall include the following particulars in an aerodrome manual; all pertinent information on the aerodrome site (including dimensions), facilities, services, equipment, operating procedures, organization and management including a safety management system, to the extent these are applicable to the aerodrome, under the following parts:

Part 1: General information as set out in part 1 of Appendix C of these Regulations.

Part 2: Particulars of the aerodrome site as set out in Part 2 of Appendix C of these Regulations.

Part 3: Particulars of the aerodrome required to be reported to the Aeronautical Information Service as set out in Part 3 of Appendix C of these Regulations.

Part 4: The aerodrome operating procedures and safety measures set out in Part 4 of Appendix C of these Regulations.

Part 5: Details of the aerodrome administration and the safety management system established for the aerodrome as set out in Part 5 of Appendix C of these Regulations.

3.3.2 If the Authority exempts the aerodrome operator from complying with any requirement set out in Regulation 2.3.2, the aerodrome manual shall show the reference number given to that exemption by the Authority and the date the exemption came into effect, and any condition(s)/procedures subject to which the exemption was granted.

3.3.3 If a particular is not included in the aerodrome manual because it is not applicable to the aerodrome, the aerodrome operator shall state in the manual:

a) that the particular is not applicable; and

b) the reason for non-applicability

3.4 Revision or variation of information

3.4.1 The operator of a certified aerodrome shall amend the aerodrome manual, whenever necessary, in order to maintain the accuracy of the manual. The procedure for amendment (including amendment triggers) shall be included in the manual.

3.4.2 To maintain the accuracy of the aerodrome manual and/or the safety of operations, the Authority may issue written directions to alter or amend the manual in accordance with the direction.

3.5 Notification of changes

3.5.1 An aerodrome operator shall notify the Authority as soon as is practicable, of any alterations that the operator wishes to make to the aerodrome manual.

3.6 Acceptance of the Aerodrome Manual

3.6.1 The Authority shall accept the aerodrome manual and any amendments, thereto, provided these meet the requirements of the preceding Regulations in this section.

Chapter 4 OBLIGATIONS OF THE AERODROME OPERATOR

Reference: ICAO Annex 14, Chs 2, 10; ICAO Annex 15 Ch 3; ICAO Doc 9774, Ch 3.

4.1 Compliance with standards

4.1.1 The aerodrome operator shall comply with the standards specified in Regulation 1.3 and with any conditions endorsed by the certificate issued pursuant to Regulations 2.4.1.

4.2 Competence of operational and maintenance personnel

4.2.1 The aerodrome operator shall employ adequate numbers of qualified and skilled personnel for performing all critical activities in the aerodrome operation and maintenance processes.

4.2.2 Where the Authority has prescribed competency certification requirement for personnel referred to in Regulation 4.2.1, the aerodrome operator shall employ only those persons possessing such certificates.

4.2.3 The aerodrome operator shall implement a program to maintain and develop the competence of the personnel referred to in Regulation 4.2.1.

4.3 Aerodrome operation and maintenance

4.3.1 Subject to any directions that the Authority may issue, the aerodrome operator shall operate and maintain the aerodrome in accordance with the procedures set out in the aerodrome manual.

4.3.2 To ensure the safety of aircraft, the Authority may give written directions to an aerodrome operator to alter the procedures set out in the aerodrome manual.

4.3.3 The aerodrome operator shall ensure proper and efficient maintenance of the aerodrome facilities for which the operator has responsibility.

4.3.4 The aerodrome operator shall co-ordinate with the ATS provider in order to be satisfied that appropriate air traffic services are available to ensure the safety of aircraft in the airspace associated with the aerodrome. The coordination shall cover other areas related to safety such as aeronautical information service, aerodrome control service, designated meteorological authorities, and security.

4.4 Aerodrome operator's safety management system

4.4.1 The aerodrome operator shall implement a safety management system acceptable to the Authority. The safety management system shall clearly define lines of safety accountability, including a direct accountability for safety on the part of senior management. As a minimum the system shall:

a) identify safety hazards;

b) ensure the implementation of remedial action necessary to maintain agreed safety performance;

c) provide for continuous monitoring and regular assessment of the safety performance; and

d) aim at a continuous improvement of the overall performance of the safety management system.

4.4.2 The aerodrome operator shall oblige all the users of the aerodrome including fixed base operators, ground handling agencies, and other organizations that perform activities independently at the aerodrome in relation to flight or aircraft handling, to comply with the requirements laid down by the aerodrome operator with regard to safety and order at the aerodrome, and shall monitor such compliance.

4.4.3 The aerodrome operator shall oblige all the users of the aerodrome including fixed base operators and organizations referred to in Regulation 4.4.2 to cooperate in the program to promote safety and order at, and the safe use of, the aerodrome by immediately informing it of the accidents, incidents, defects and faults which have a bearing on safety.

4.5 Aerodrome operator's internal safety audits and safety reporting

4.5.1 The aerodrome operator shall arrange for an audit of the safety management system including an inspection of the aerodrome facilities and equipment. The audit shall cover the aerodrome operator's own functions. The aerodrome operator shall also arrange an external audit and inspection program for evaluation of other users including fixed-base operators and organizations working at the aerodrome referred to in Regulation 4.4.2.

4.5.2 The audits referred to in Regulation 4.5.1 shall be carried out at intervals not exceeding 12 months, or more frequently as required by the Authority.

4.5.3 The aerodrome operator shall ensure that the audit reports including the report on the aerodrome facilities, services and equipment are prepared by suitably qualified safety experts.

4.5.4 The aerodrome operator shall retain a copy of the report(s) referred to in Regulation 4.5.3 for the duration of the validity of the aerodrome certificate and for two years after the end of the period for which the certificate is valid, and shall supply a copy of the report(s) to the Authority upon request for its review/reference.

4.5.5 The reports referred to in Regulation 4.5.3 shall be prepared and signed by the persons who carried out the audit and inspection.

4.6 Access to aerodrome

4.6.1 Persons authorized by the Authority may inspect and carry out tests on the aerodrome facilities, services and equipment, inspect aerodrome operator's documents and records, and verify the aerodrome operator's safety management system before the aerodrome certificate is granted or renewed and subsequently, at any other time, for the purpose of ensuring safety and order at the aerodrome.

4.6.2 An aerodrome operator shall, at the request of persons referred to in Regulation 4.6.1, allow access to any part of the aerodrome or, any aerodrome facility, including equipment, records, documents and operator's personnel for the purpose referred to in Regulation 4. 6. 1.

4.6.3 The aerodrome operator shall cooperate in conducting the activities referred to in sub-section 4.6. 1.

4.7 Notifying and reporting

4.7.1 An aerodrome operator shall adhere to the requirements to notify and report to the Authority, Aeronautical Information Service (AIS), air traffic control and pilots within the specified time limits required by Regulations 4.7.2 to 4.7.5 inclusive.

4.7.2 *Notification of inaccuracies in Aeronautical Information Service (AIS) Publications*: an aerodrome operator shall review the issues of Aeronautical Information Publication (AIP), AIP Supplements, AIP Amendments, Notices to Airmen (NOTAMS), pre-flight Information Bulletins and Aeronautical Information Circulars issued by the AIS on initial receipt thereof, and at regular intervals thereafter in accordance with the AIRAC publication cycle. Immediately after such reviews, an aerodrome operator shall notify AIS of any inaccurate information contained therein that pertains to the aerodrome.

4.7.3 *Notification of changes in aerodrome facilities, equipment, and level of service planned in advance*: an aerodrome operator shall notify the Authority and AIS in writing at least 60 days before any change to the aerodrome facility or equipment or the level of service at the aerodrome that has been planned in advance and that is likely to effect the accuracy of the information contained in any AIS publication referred to in Regulation 4.7.2.

4.7.4 *Issues requiring immediate notification*: subject to the requirements of Regulation 4.7.5, an aerodrome operator shall give to the Authority and AIS, and cause to be received at air traffic control and the flight operations unit, immediate notice giving details of any of the following circumstances of which the operator has knowledge:

a) obstacles, obstructions and hazards:
   i) any projections by an object through an obstacle limitation surface relating to the aerodrome; and
   ii) the existence of any obstruction or hazardous condition affecting aviation safety at or near the aerodrome;

b) level of service: reduction in the level of service at the aerodrome set out in the AIS publications referred to in Regulation 4.7.2.

c) movement area: closure of any part of the movement area of the aerodrome; and

d) any other condition that could affect aviation safety at the aerodrome and against which precautions are warranted.

4.7.5 *Immediate notification to pilots*: when it is not feasible for an aerodrome operator to cause notice of a circumstance referred to in 4.7.4 to be received at the air traffic control or a flight operations unit in accordance with that Regulation, the aerodrome operator shall give immediate notice directly to the pilot who may be affected by that circumstance.

4.8 Special Inspections

4.8.1 An aerodrome operator shall inspect an aerodrome, as the circumstances require, to ensure aviation safety:

a) as soon as practicable, after an aircraft accident or incident within the meaning of these terms defined in ICAO Annex 13 and the Kingdom's notification procedure for notifying incidents and accidents.

b) during any period of construction or repair of the aerodrome facilities or equipment that is critical to the safety of aircraft operations; and

c) at any other time when there are conditions at the aerodrome that could affect aviation safety.

4.9 Removal of obstructions and hazardous items from Aerodrome surface

4.9.1 An aerodrome operator shall remove from the surface of the aerodrome any vehicle, other obstruction or item that is likely to be hazardous.

4.10 Warning Notices

4.10.1 Where low flying aircraft, at or near an aerodrome, or taxiing aircraft are likely to be hazardous to people or vehicular traffic, the aerodrome operator shall:

a) post notices warning of the hazard on any public way that is adjacent to the manoeuvring area; or

b) if such a public way is not controlled by the aerodrome operator, inform the authority responsible for posting the notices on the public way that there is a hazard.

4.11 Aerodrome Data

4.11.1 The aerodrome operator shall compile and submit to AIS and the Authority the aerodrome data as required by these Regulations. The determination and reporting of aerodrome related aeronautical data shall be in accordance with Appendix C and with the requirements contained in ICAO Annex 14 Vol.1 chapter 2, para.2.1 and Appendix 5; and Annex 15 chapters 3, 4 and 11.

4.11.2 *Aerodrome reference point*: an aerodrome reference point shall be established for an aerodrome. The aerodrome reference point shall be located near the initial or planned geometric centre of the aerodrome and shall normally remain where first established. The position of the aerodrome reference point shall be measured and reported to the AIS and the Authority in degrees, minutes and seconds in accordance with the requirements of WGS-84.

4.11.3 *Aerodrome and runway elevations*: the aerodrome elevation and geoid undulation at the aerodrome elevation position, and points on the runway where applicable, shall be measured to the accuracy of:

a) for the aerodrome elevation: one-half metre;

b) for non-precision approach runways, 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 shall be measured to the accuracy of one-half metre.

c) for precision approach runways, the elevation and geoid undulation of the threshold, the elevation of the runway end and the highest elevation of the touchdown zone shall be measured to the accuracy of one-quarter metre.

4.11.4 *Aerodrome reference temperature*: an aerodrome reference temperature shall be determined for an aerodrome in degrees Celsius. 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). This temperature should be averaged over a period of years.

4.11.5 *Aerodrome dimensions and related information*: the data for each facility provided on an aerodrome shall be measured or described, as appropriate, in accordance with Appendix C and with the requirements detailed in ICAO Annex 14 Vol.1, chapter 2, para.2.5.

4.11.6 *Strength of pavements*: the bearing strength of a pavement shall be determined in accordance with the requirements contained in ICAO Annex 14 Vol.1, chapter 2, para.2.6.

4.11.7 *Pre-flight altimeter check location*: one or more pre-flight altimeter check locations shall be established for an aerodrome. A pre-flight check location shall be located on an apron. The elevation of a pre-flight altimeter check location shall be given as the average elevation, rounded to the nearest foot, of the area on which it is located. The elevation of any portion of a pre-flight altimeter check location shall be within 3 m of the average elevation for that location.

4.11.8 *Declared distances*: the following distances shall be calculated to the nearest metre for a runway:

a) take-off run available (TORA);

b) take-off distance available (TODA);

c) accelerate-stop distance available (ASDA); and

d) landing distance available (LDA).

4.11.9 *Condition of the movement area and related facilities*: information on the condition of the movement area and the operational status of related facilities shall be provided to the AIS, and similar information of operational significance to the air traffic services units, to enable those units to provide the necessary information to arriving and departing aircraft. The information shall be kept up to date and changes in conditions reported without delay. The nature, format and conditions of the information to be provided are specified in ICAO Annex 15 and PANS-ATM (Doc 4444).and PANS-AIM(Doc 10066)

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

a) construction or maintenance work;
b) rough or broken surfaces on a runway, a taxiway or an apron;
c) water on a runway, a taxiway or an apron;
d) other contaminants on a runway, a taxiway or an apron
e) other temporary hazards including parked aircraft;
f) failure or irregular operation of part or all of the aerodrome visual aids; and
g) failure of the normal or secondary power supply
h) reduction in category of rescue Fire service
i) any other information of operational significance

4.11.10

Inspections of the movement area: in order to facilitate compliance with Regulation 4.11.9 the following inspections shall be carried each day:

a) for the movement area at least once where the code number is 1 or 2 and at least twice where the code number is 3 or 4; and

b) for the runway(s), inspection in addition to a) whenever the runway surface conditions may have changed significantly due to meteorological conditions.

4.11.10.1 Personnel assessing and reporting runway surface conditions required in 4.11.9 and 4.11.9.1 *shall* be trained and competent to perform their duties. Training of personnel shall be in accordance with guidance provided in Annex 14, Attachment A, Section 6. and PANS -Aerodrome (Doc 9981)

4.11.11 *Runway surface condition(s) for use in the runway condition report;* The runway surface condition shall be assessed and reported through a runway condition code (RWYCC) and a description using the following terms:

(1) DRY

(2) STANDING WATER

(3) WET

Note: The conditions, either singly or in combination with other observations, are criteria for which the effect on aeroplane performance is sufficiently deterministic to allow assignment of a specific runway condition code.

Winter condition descriptors are not detailed under definitions as they are not applicable in the Kingdom of Bahrain, being a wet and dry only region.

4.11.11.1 Whenever an operational runway is contaminated, an assessment of the contaminant depth and coverage over each third of the runway shall be made and reported.

Note: Procedure on depth and coverage reporting as per PANS – Aerodromes (Doc 9981)

4.11.11.2 Information that a runway or portion thereof slippery wet shall be made available

Note 1: The surface friction characteristics of a runway or a portion thereof can be degraded due to rubber deposits, surface polishing, poor drainage or other factors. The determination that a runway or portion thereof is slippery wet stems from various methods used solely or in combination. These methods may be functional friction measurements, using a continuous friction measuring device, that fall below a minimum standard as defined by the State, observations by aerodrome maintenance personnel, repeated reports by pilots and aircraft operators based on flight crew experience, or through analysis of aeroplane stopping performance that indicates a substandard surface. Supplementary tools to undertake this assessment are described in the PANS-Aerodromes (Doc 9981).

Note 2: see4.11.9 and 4.11.6 concerning the provision of information to, and coordination between appropriate authority

4.11.11.3 Notification shall be given to aerodrome users when the friction level of a paved runway or portion thereof is less than that specified by the State. (Appendix E)

Guidance on determining and expressing the minimum friction level is provided in

Assessment, Measurement and Reporting of Runway Surface Conditions (Cir 329).
Procedures on conducting a runway surface friction characteristics evaluation program are provided in the PANS-Aerodromes (Doc 9981). Information to be promulgated in a NOTAM

4.11.12 Runway Condition Report (RCR):

a) The aerodrome operator shall disseminate a RCR through the aeronautical information services and air traffic services, when the runway is wholly or partly contaminated by standing water. When the runway is wet, not associated with the presence of standing water the assessed information shall be disseminated using the RCR through the air traffic services only.

b) Reporting, in compliance with the runway condition report, shall commence when a significant change in runway surface condition occurs due to water

c) Reporting of the runway surface condition shall continue to reflect significant changes until the runway is no longer contaminated. When this occurs, the aerodrome shall issue a runway condition report that states the runway is wet or dry as appropriate

4.11.12.1 Runway Condition Code (RWYCC):

a) The RWYCC shall be reported for each third of the runway assessed.

b) The assessment process shall include:

1. Assessing and reporting the condition of the movement area;
2. Providing the assessed information in the correct format; and
3. Reporting significant changes without delay.

c) The information to be reported shall be compliant with the RCR which consists:

1. Aeroplane performance calculation sections; and
2. Situational awareness section.

d) The information shall be included in an information string in the following order using only AIS compatible characters in a Runway Condition Report. The Runway Condition Report consist of the:

1. Aeroplane performance calculation sections:

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 published width.

2. situational awareness section:

i) reduced runway length; ii) taxiway conditions; iii) apron conditions; iv) plain language remarks.

4.11.13 *Disabled aircraft removal*: the telephone/telex number(s) and e-mail address of the office of the aerodrome coordinator of operations for the removal of an aircraft disabled on or adjacent to the movement area shall be made available, on request, to aircraft operators. Information concerning the capability to remove an aircraft disabled on or adjacent to the movement area shall be made available in the aerodrome manual.

4.11.14 *Rescue and fire fighting*: information concerning the level of protection provided at an aerodrome for aircraft rescue and fire fighting purposes shall be made available. The level of protection normally available at an aerodrome shall be expressed in terms of the category of the rescue and fire fighting services as required by

Regulations 10.5 and 10.7, as described in ICAO Annex 14 Vol 1 chapter 9 para. 9.2. The level of protection declared shall be in accordance with the types and amounts of extinguishing agents normally available at the aerodrome. Changes in the level of protection normally available at an aerodrome for rescue and fire fighting shall be notified to the appropriate air traffic services units and AIS to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been corrected, the above units shall be advised accordingly. A change should be expressed in terms of the new category of the rescue and fire fighting service available at the aerodrome.

4.11.15 *Visual approach slope indicator systems*: information concerning a visual approach slope indicator system installation shall be made available in accordance with the requirements contained in ICAO Annex 14 Vol.1, chapter 2 para.2.12.

4.11.16 Coordination between AIS and the aerodrome operator shall be as detailed in ICAO Annex 14 Vol. 1 chapter 2 para. 2.13 so as to provide the data and information required by these Regulations with the required accuracy and a minimum of delay.

Chapter 5 PHYSICAL CHARACTERISTICS

Reference: ICAO Annex 10 Volume 1, Annex 14, Ch 3, Att. A; ICAO Doc 9157 Parts 1, 2, 3.

5.1 General

5.1.1 The Kingdom of Bahrain does not notify any differences from Annex 14 under article 38 of the Convention in respect of the standards for physical characteristics of aerodromes, and has adopted certain recommended practices as standards.

5.2 Runways

5.2.1 General

Note: Many factors affect the determination, siting and number of runways. One important factor is the usability factor, as determined by the wind distribution. Another important factor is the alignment of the runway to facilitate the provision of approaches conforming to the approach surface requirements of Chapter 6 of these Regulations.

5.2.1.1 When a new instrument runway is being located, particular attention shall be given to areas over which aeroplanes will be required to fly when following instrument approach and missed approach procedures, so as to ensure that obstacles in these areas or other factors will not restrict the operation of the aeroplanes for which the runway is intended.

5.2.1.2 The number and orientation of runways at an aerodrome shall, in so far as is practicable, be such that the usability factor of the aerodrome is not less than 95 per cent for the aeroplanes that the aerodrome is intended to serve.

5.2.2 Runway length

5.2.2.1 A threshold shall be located at the extremity of a runway unless operational considerations justify the choice of another location. When it is necessary to displace a threshold, either permanently or temporarily, from its normal location, account shall be taken of the various factors which may have a bearing on the location of the threshold in accordance with ICAO Annex 14 Vol 1, Attachment A. Where this displacement is due to an unserviceable runway condition, a cleared and graded area of at least 60 m in length shall be available between the unserviceable area and the displaced threshold. Additional distance shall also be provided to meet the requirements of the runway end safety area as appropriate.

5.2.2.2 The actual runway length to be provided for a primary runway shall be adequate to meet the operational requirements of the aeroplanes for which the runway is intended and shall, in so far as is practicable, not be less than the longest length determined by applying the corrections for local conditions to the operations and performance characteristics of the relevant aeroplanes. Standard runway lengths and corrections for local conditions shall be determined in accordance with ICAO Annex 14 Vol 1, para 3.1.7.

5.2.2.3 The length of a secondary runway shall be determined similarly to primary runways except that it need only be adequate for those aeroplanes which require to use that secondary runway in addition to the other runway or runways in order to obtain a usability factor of at least 95 per cent. Standard runway lengths and corrections for local conditions shall be determined in accordance with ICAO Annex 14 Vol 1, para 3.1.8.

5.2.2.4 Where a runway is associated with a stopway or clearway, an actual runway length less than that resulting from application of paragraphs 5.2.2.3 or 5.2.2.3, 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.

Note — Guidance on use of stopways and clearways is given in ICAO Annex 14 Vol. I, Attachment A, Section 2.

5.2.3 Runway width

5.2.3.1—The width of a runway shall be not less than the dimension specified in the following tabulation

Table 5-1 – Runway width

Outer Main Gear Wheel Span (OMGWS)				
Code number	Up to but not including 4.5m	4.5m up to but not including 6m	6m up to but not including 9m	9m up to but not including 15m
1 ≈	18 m	18 m	23 m	--
2 ≈	23 m	23 m	30 m	--
3	30 m	30 m	30 m	45 m
4	---	--	45 m	45 m
≈ The width of a precision approach runway should be not less than 30mtr where the code number is 1 or 2				

Note 1 — The combinations of code numbers and OMGWS for which widths are specified have been developed for typical aeroplane characteristics.

Note 2 — Factors affecting runway width are given in the ICAO Aerodrome Design Manual, Part 1.

Note 3 — See 7.2.2 concerning the provision of runway shoulders, in particular for Code F aeroplanes.

5.2.4 Separation of parallel runways

5.2.4.1—Where parallel non-instrument runways are intended for simultaneous use,the minimum distance between their centre lines shall be:

— 210 m where the higher code number is 3 or 4;
— 150 m where the higher code number is 2; and
— 120 m where the higher code number is 1.

Note — Procedures for wake turbulence categorization 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

5.2.4.2 Where parallel instrument runways are intended for simultaneous use subject to conditions specified in the PANS-ATM (Doc 4444) and the PANS-OPS (Doc 8168), Volume I, the minimum distance between their centre lines shall be:

— 1 035 m for independent parallel approaches;
— 915 m for dependent parallel approaches;
— 760 m for independent parallel departures;
— 760 m for segregated parallel operations;

except that:

a) for segregated parallel operations the specified minimum distance

1) may be decreased by 30 m for each 150 m that the arrival runway is staggered toward the arriving aircraft, to a minimum of 300 m; and
2) should be increased by 30 m for each 150 m that the arrival runway is staggered away from the arriving aircraft;

b) 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.

Note — Procedures and facilities requirements for simultaneous operations on parallel or near-parallel instrument runways are contained in the PANS-ATM (Doc 4444), Chapter 6 and the PANS-OPS (Doc 8168), Volume I, Part III, Section 2 and Volume II, Part I, Section 3; Part II, Section 1; and Part III, Section 3, and relevant guidance is contained in the ICAO Manual of Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (Doc 9643).

5.2.5 Slopes on runways

5.2.5.1 *Longitudinal slopes*: the slope computed by dividing the difference between the maximum and minimum elevation along the runway centerline by the runway length shall not exceed

a) 1 per cent where the code number is 3 or 4; and
b) 2 per cent where the code number is 1 or 2.

5.2.5.2 Along no portion of a runway shall the longitudinal slope exceed

a) 1.25 per cent where the code number is 4, except that for the first and last quarter of the length of the runway the longitudinal slope shall not exceed 0.8 per cent;

b) 1.5 per cent where the code number is 3, except that for the first and last quarter of the length of a precision approach runway category II or III the longitudinal slope shall not exceed 0.8 percent; and

c) 2 per cent where the code number is 1 or 2.

5.2.5.3 *Longitudinal slope changes*: where slope changes cannot be avoided, a slope change between two consecutive slopes shall not exceed

a) 1.5 per cent where the code number is 3 or 4; and
b) 2 per cent where the code number is 1 or 2.

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

a) 0.1 per cent per 30m (minimum radius of curvature of 30,000m) where the code number is 4;

b) 0.2 per cent per 30m (minimum radius of curvature of 15,000m) where the code number is 3; and

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

5.2.5.5 Undulations or appreciable changes in slopes located close together along a runway shall be avoided. The distance between the points of intersection of two successive curves shall not be less than:

a) the sum of the absolute numerical values of the corresponding slope changes multiplied by the appropriate value as follows:

i) 30,000m where the code number is 4;

ii) 15,000m where the code number is 3; and

iii) 5,000m where the code number is 1 or 2; or

b) 45m;

whichever is greater.

5.2.5.6 Traverse slope: To promote the most rapid drainage of water, the runway surface shall if practicable, be cambered except where a single crossfall from high to low in the direction of the wind most frequently associated with rain would ensure rapid drainage. The transverse slope shall ideally be:

a) 1.5 per cent where the code letter is C, D, E or F; and

a) 2 per cent where the code letter is A or B;

but in any event shall not exceed 1.5 per cent or 2 per cent, as applicable, nor be less than 1per cent except at runway or taxiway intersections where flatter slopes may be necessary.

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

Note. — On wet runways with crosswind conditions the problem of aquaplaning from poor drainage is apt to be accentuated. Additional guidance is included in the Aerodrome Design Manual (Doc 9157), Parts 1 and 3.

5.2.5.7 The transverse slope shall be substantially the same throughout the length of a runway except at an intersection with another runway or taxiway where an even transition shall be provided, in so far as is practicable taking account of the need for adequate drainage.

5.2.6 Strength of runways

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

5.2.7 Surface of runways

5.2.7.1 The surface of a runway shall be constructed without irregularities that would impair the runway surface friction characteristics or otherwise adversely affect the take–off or landing of an aeroplane.

5.2.7.2 A paved runway shall be so designed and constructed or resurfaced as to provide surface friction characteristics at or above the minimum friction level as may be set by the CAA. The design objective for the friction levels of a new runway shall be in accordance with Appendix E, Table E-1.

5.2.7.3 Measurements of the surface friction characteristics of a new or resurfaced paved runway shall be made with continuous friction measuring device using self-wetting features. The device used shall be approved by the Authority and operated in accordance with Appendix E.

5.2.7.4 The maintenance planning friction level below which corrective action should be initiated in accordance with Regulation 10.2.3 shall be determined from column (5) of Table E-1.

5.2.7.5 The minimum friction level below which information that a runway may be slippery when wet should be made available in accordance with Regulation 4.11.12 shall be determined from column (6) of Table E-1.

5.2.7.6 The average surface texture depth of a new surface shall be not less than 1.0mm.

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

5.2.8 Runway shoulders

5.2.8.1 Runway shoulders shall be provided for a runway where the code letter is D, E or F

5.2.8.2 *Width of runway shoulders*: For aeroplanes with OMGWS from 9 m up to but not including 15 m, the runway shoulders shall extend symmetrically on each side of the runway so that the overall width of the runway and its shoulders is not less than:

a) 60 m where the code letter is D or E;

b) 60 m where the code letter is F with two- or three- engined aeroplanes; and

c) 75 m where the code letter is F with four (or more)-engined aeroplanes

5.2.8.3 *Slopes on runway shoulders*: the surface of the shoulder that abuts shall be flush with the surface of the runway and its transverse slope shall not exceed 2.5 per cent.

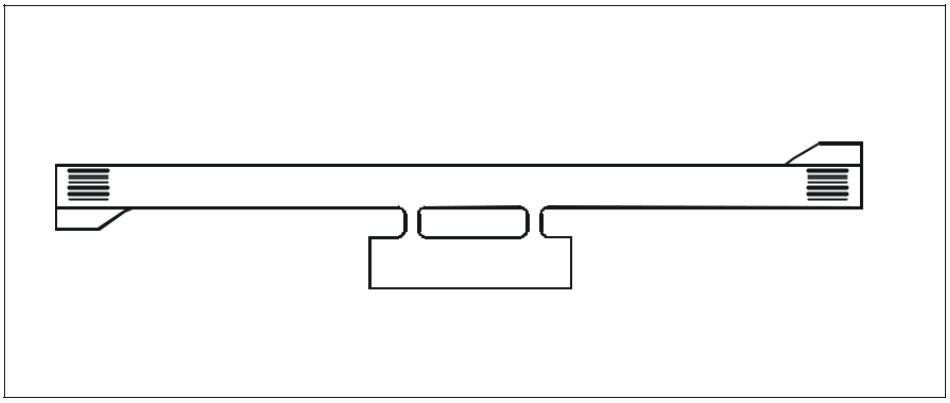
5.2.8.4 *Strength of runway shoulders*: a runway shoulder shall be prepared or constructed so as to be capable, in the event of an aeroplane running off the runway, of supporting the aeroplane without inducing structural damage to the aeroplane and of supporting ground vehicles which may operate on the shoulder.

5.2.8.5 *Surface of a runway shoulder: A* runway shoulder shall be prepared or constructed so as to resist erosion and the ingestion of the surface material by

aeroplane engines. Runway shoulders for code letter F aeroplanes shall be paved to a minimum overall width of runway and shoulder of not less than 60 m.

5.3 Runway turn pads

5.3.1 Where the end of the runway is not served by a taxiway or a taxiway turnaround and where the code letter is D, E or F, a runway turn pad shall be provided to facilitate a 180-degree turn of aeroplanes in accordance with ICAO Annex 14 Vol 1, para 3.3.



Typical turn pad layout

5.3.2 The intersection angle of the runway turn pad with the runway shall not exceed 30 degrees.

5.3.3 The nose wheel steering angle to be used in the design of the runway turn pad shall not exceed 45 degrees.

5.3.4 The design of a runway turn pad shall be such that, when the cockpit of the aeroplane for which the turn pad is intended remains over the turn pad marking, the clearance distance between any wheel of the aeroplane landing gear and the edge of the turning pad shall be not less than that given by the following tabulation:

Table 5-2 – Runway turn pad clearance

	Outer Main Gear Wheel Span (OMGWS)			
	Up to but not Including 4.5 m	4.5m up to but not including 6m	6m up to but not including 9m	9m up to but not including 15 m
Clearance	1.50 m	2.25 m	3m* 4 m * *	4 m

**If the turn pad is intended to be used by aeroplanes with a wheel base less than 18 m.*

***If the turn pad is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.*

5.3.5 The longitudinal and transverse slopes on a runway turn pad shall be sufficient to prevent the accumulation of water on the surface and facilitate the rapid drainage of surface water. The slopes shall, in so far as is practicable, be the same as those on the adjacent runway pavement surface.

5.3.6 The strength of a runway turn pad shall be at least equal to that of the adjoining runway which it serves. The aerodrome operator shall give due consideration to the fact that the turn pad will be subjected to slow moving traffic making hard turns and consequent higher stresses on the pavement.

5.3.7 The surface of a runway turn pad shall not have surface irregularities that may cause damage to an aeroplane using the turn pad, and shall be so constructed or resurfaced as to provide surface friction characteristics at least equal to that of the adjoining runway.

5.3.8 The runway turn pad shall be provided with shoulders of such width as is necessary to prevent surface erosion by the jet blast of the most demanding aeroplane for which the turn pad is intended, and to reduce the risk of foreign object damage to the aeroplane engines. The strength of the runway turn pad shoulders shall be at least as capable as the runway shoulders.

5.4 Runway strips

5.4.1 A runway and any associated stopway shall be included in a runway strip.

5.4.2 *Length of a runway strip*: a strip shall extend before the threshold and beyond the end of the runway or stopway for a distance of at least:

a) 60 m where the code number is 2, 3 or 4;

b) 60 m where the code number is 1 and the runway is an instrument one;

c) 30 m where the code number is 1 and the runway is a non– instrument one.

5.4.3 *Width of runway strips*: a strip including a precision approach runway shall extend laterally to a distance of at least:
— 140 m where the code number is 3 or 4; and
— 70 m where the code number is 1 or 2;

5.4.4 A strip including a non–precision approach runway shall extend laterally to a distance of at least:
— 140 m where the code number is 3 or 4; and
— 70 m where the code number is 1 or 2;
on each side of the centre line of the runway and its extended centre line throughout the length of the strip.

5.4.5 A strip including a non–instrument runway shall extend on each side of the centre line of the runway and its extended centre line throughout the length of the strip, to a distance of at least:
— 75 m where the code number is 3 or 4;
— 40 m where the code number is 2; and
— 30 m where the code number is 1.

5.4.6 *Objects on runway strips*: an object situated on a runway strip which may endanger aeroplanes shall be regarded as an obstacle and shall where practicable, be removed.

5.4.7 No fixed object, other than visual aids required for air navigation purposes or those required for aircraft safety purposes and which must be sited on the runway strip, and satisfying the relevant frangibility requirement and satisfying the relevant frangibility requirement in DOC 9157-Part 6 , shall be permitted on a runway strip of a precision approach runway within the distance stated below

a) within 77.5 m of the runway centre line of a precision approach runway category I, II or III
where the code number is 4 and the code letter is F; or

b) within 60 m of the runway centre line of a precision approach runway category I, II or III
where the code number is 3 or 4; or

c) within 45 m of the runway centre line of a precision approach runway category I
where the code number is 1 or 2.

5.4.8 No mobile object shall be permitted on the part of the runway strip specified in 5.4.7 during the use of the runway for landing or take–off.

5.4.9 *Grading of runway strips*:
That portion of a strip of an instrument runway within a distance of at least:
— 75 m where the code number is 3 or 4; and
— 40 m where the code number is 1 or 2;
from the centre line of the runway and its extended centre line shall provide a graded area for aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway.

Note: Guidance on grading of a greater area of a strip including a precision approach runway where the code number is 3 or 4 is given in Annex 14. Attachment A, Section 9.

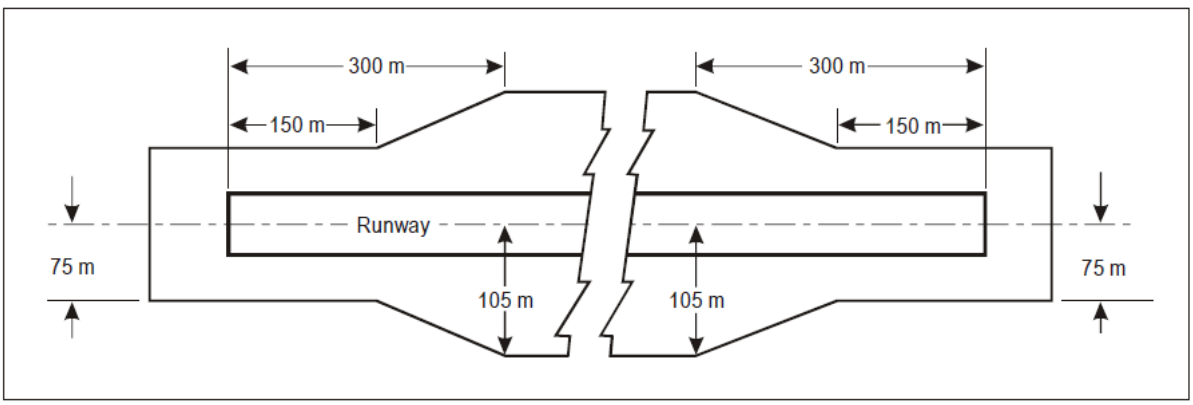


Figure 5-1 Graded portion of a runway strip

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

— 75 m where the code number is 3 or 4;
— 40 m where the code number is 2; and
— 30 m where the code number is 1;

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

5.4.11 The surface of that portion of a strip that abuts a runway, shoulder or stopway shall, in so far as is practicable, be flush with the surface of the runway, shoulder or stopway.

5.4.12 That portion of a strip to at least 30 m before a threshold shall be prepared against blast erosion in order to protect a landing aeroplane from the danger of an exposed edge. Where these areas have paved surfaces, they shall be able to withstand the occasional passage of the critical aeroplane for runway pavement design. The area adjacent to the end of a runway may be referred to as a blast pad.

5.4.13 *Slopes on runway strips*: a longitudinal slope along that portion of a strip to be graded shall not exceed

— 1.5 per cent where the code number is 4;
— 1.75 per cent where the code number is 3; and
— 2 per cent where the code number is 1 or 2.

5.4.14 Longitudinal slope changes on that portion of a strip to be graded shall be as gradual as practicable and abrupt changes or sudden reversals of slopes avoided.

5.4.15 To facilitate drainage, the transverse slopes on that portion of a strip to be graded shall be adequate to prevent the accumulation of water on the surface but shall not exceed:

— 2.5 per cent where the code number is 3 or 4; and

— 3 per cent where the code number is 1 or 2;

except that to facilitate drainage the slope for the first 3 m outward from the runway, shoulder or stopway edge shall be negative as measured in the direction away from the runway and may be as great as 5 per cent.

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

5.4.17 A strip shall be prepared or constructed so as to minimize hazards arising from differences in load bearing capacity to aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway in that portion of a strip within a distance of at least:

a) 75 m where the code number is 3 or 4;

b) 40 m where the code number is 2;

c) 40 m where the code number is 1 and the runway is an instrument runway; and

d) 30 m where the code number is 1 and the runway is a non-instrument runway.

5.5 Runway end safety areas

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

a) the code number is 3 or 4; and

b) the code number is 1 and 2 and the runway is an instrument runway.

5.5.2 A runway end safety area shall extend from the end of a runway strip to a distance of at least 90 m where:
- the code number is 3 or 4; and
- the code number is 1 or 2 and the runway is an instrument one.

If an arresting system is installed, the above length may be reduced, based on the design specification of the system, subject to acceptance by the CAA.

5.5.3 A runway end safety area should extend from the end of a runway strip to a distance of 240 m where the code number is 3 or 4 (or a reduced length when an arresting system is installed), and 120 m where the code number is 1 or 2 and the runway is an instrument one; or a reduced length when an arresting system is installed; and 30 m where the code number is 1 or 2 and the runway is a non-instrument one.

5.5.4 The width of a runway end safety area shall be at least twice that of the associated runway, and should, wherever practicable, be equal to that of the graded portion of the associated runway strip.

5.5.5 An object situated on a runway end safety area which may endanger aeroplanes shall be regarded as an obstacle and shall, where practicable, be removed.

5.5.6 A runway end safety area shall provide a cleared and graded area for aeroplanes which the runway is intended to serve in the event of an aeroplane undershooting or overrunning the runway

5.5.7 The slopes of a runway end safety area shall be such that no part of the runway end safety area penetrates the approach or take-off and climb surface.

5.5.8 The longitudinal slope of a runway end safety area shall not exceed a downward slope of 5 per cent. Longitudinal slope changes shall be as gradual as practicable and abrupt changes or sudden reversals of slopes avoided.

5.5.9 The transverse slope of a runway end safety area shall not exceed an upward or downward slope of 5 per cent. Transitions between differing slopes should be as gradual as practicable.

5.5.10 A runway end safety area shall 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 he movement of rescue and fire fighting vehicles as required in section 9.10 of this regulation.
Note — Guidance on strength of a runway end safety area is given in the ICAO Aerodrome Design Manual, Part 1.

5.6 Clearways

5.6.1 A clearway need not be provided. If provided, the origin of a clearway shall be at the end of the take-off run available, and shall extend laterally to a distance of at least 75 m on each side of the extended centre line of the runway.

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

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

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

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

5.6.4 Abrupt upward changes in slope shall be avoided when the slope on the ground in a clearway is relatively small or when the mean slope is upward.

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

5.7 Stopways

5.7.1 A stopway need not be provided. If provided, a stopway shall have the same width and meet the same criteria for slopes, strength and surface characteristics as the runway with which it is associated.

5.8 Radio altimeter operating area

5.8.1 A radio altimeter operating area shall be established in the pre-threshold area of a precision approach runway, and shall extend before the threshold for a distance of at least 300 m, and shall extend laterally, on each side of the extended centre line of the runway, to a distance of 60 m.

5.8.2 On a radio altimeter operating area, longitudinal slope changes should be avoided or kept to a minimum. Where slope changes cannot be avoided, the slope changes shall be as gradual as practicable and abrupt changes or sudden reversals of slopes avoided. The rate of change between two consecutive slopes shall not exceed 2 per cent per 30 m.

5.9 Taxiways

5.9.1 Unless otherwise indicated the requirements in this section shall apply to all types of taxiways.

5.9.2 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. Notwithstanding the foregoing, to reduce the risk of runway incursions, the number of taxiway entrances having direct access to a runway shall be kept to the minimum required for efficient runway use.

5.9.3 The design of a taxiway shall be such that, when the cockpit of the aeroplane for which the taxiway is intended remains over the taxiway centre line markings, the

clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway shall be not less than that given by the following tabulation:

Table 5-3 Clearance between outer main wheel of aeroplane and the edge of the taxiway

OMGWS				
	Up to but not Including 4.5m	4.5m up to but not Including 6m	6m up to but not Including 9m	9m up to but not Including 15m
Clearance	1.50m	2.25m	3m (*a,b) 4m (*c)	4m

*a -On straight portions.
*b -On curved portions if the taxiway is intended to be used by aeroplanes with a wheelbase of less than18m.
*c- On curved portions if the taxiway is intended to be used by aeroplanes with a wheelbase equal to or greater than 18m.
Note — Wheelbase means the distance from the nose gear to the geometric centre of the main gear.

5.9.4 A straight portion of a taxiway shall have a width of not less than that given by the following tabulation:

Table 5-4 – Taxiway width

OMGWS				
	Up to but not Including 4.5m	4.5m up to but not Including 6m	6m up to but not Including 9m	9m up to but not Including 15m
Taxiway width	7.5m	10.5m	15m	23m

5.9.5 The separation distance between the centre line of a taxiway and the centre line of runway, the centre line of a parallel taxiway or an object shall not be less than the appropriate dimension specified in Table 5-1, except that it may be permissible to operate with lowerseparation distances at an existing aerodrome if an aeronautical study indicates that such lower separation distances would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

Note 1 — Guidance on factors which may be considered in the aeronautical study is given in the ICAO Aerodrome Design Manual, Part2.

Note 2 — 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).

Note 3 — The separation distances of Table 5-1, 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 the ICAO Aerodrome Design Manual, Part 2.

Note 4 — The separation distance between the centre line of an aircraftstand taxilane and an object shown in Table 5-1, column 13, increased may need to be when jet exhaust wake velocity may cause hazardous conditions for ground servicing.

Table 5-5 – Taxiway minimum separation distances

Code letter	Distance between taxiway centre line and runway centre line (metres)								Taxiway centre line to taxiway centre line (metres)	Taxiway, other than aircraft stand taxilane, centre line to object (metres)	Aircraft stand taxilane centre line to aircraft stand taxilane centre line (metres)	Aircraft stand taxilane centre line to object (metres)
	Instrument runways Code number				Non-instrument runways Code number							
	1	2	3	4	1	2	3	4				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A	77.5	77.5	-	-	37.5	47.5	-	-	23	15.5	19.5	12
B	82	82	152	-	42	52	87	-	32	20	28.5	16.5
C	88	88	158	158	48	58	93	93	44	26	40.5	22.5
D	-	-	166	166	-	-	101	101	63	37	59.5	33.5
E	-	-	172.5	172.5	-	-	107.5	107.5	76	43.5	72.5	40
F	-	-	180	180	-	-	115	115	91	51	87.5	47.5

Note 1 – The separation distances shown in columns (2) to (9) represent ordinary combinations of runways and taxiways. The basis for development of these distances is given in the ICAO Aerodrome Design Manual, Part2.

Note 2 – The distances in columns (2) to (9) do not guarantee sufficient clearance behind a holding aeroplane to permit the passing of another aeroplane on a parallel taxiway. See ICAO Aerodrome Design Manual, Part 2.

5.9.6 *Longitudinal slopes*: the longitudinal slope of a taxiway shall not exceed
- 1.5 per cent where the code letter is C, D, E or F; and
- 3 per cent where the code letter is A or B.

5.9.7 Where a change in longitudinal slope cannot be avoided, the transition from one slope to another slope shall be accomplished by a curved surface with a rate of change not exceeding:
- 1 per cent per 30 m (minimum radius of curvature of 3 000 m) where the code letter is C, D, E or F; and
- 1 per cent per 25 m (minimum radius of curvature of 2 500 m) where the code letter is A or B

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

- 3 m above the taxiway, it will be possible to see the whole surface of the taxiway for a distance of at least 300 m from thatpoint, where the code letter is C, D, E or F;
- 2 m above the taxiway, it will be possible to see the whole surface of the taxiway for a distance of at least 200 m from thatpoint, where the code letter is B; and
- 1.5 m above the taxiway, it will be possible to see the whole surface of the taxiway for a distance of at least 150 m from thatpoint, where the code letter is A.

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

- 1.5 per cent where the code letter is C, D, E or F; and
- 2 per cent where the code letter is A or B.

Note — See paragraph 5.12.5 of this regulation regarding transverse slopes on an aircraft stand taxilane.

5.9.10 *Strength of a taxiway*: the strength of a taxiway shall be at least equal to that of the runway it serves. Consideration shall be given to the fact that a taxiway will 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.

5.9.11 *Taxiway surface*: the surface of a taxiway shall not have irregularities that cause damage to aeroplane structures. The surface of a paved taxiway shall be so constructed or resurfaced as to provide suitable surface friction . Suitable surface friction characteristics are those surface properties required on taxiways that assure safe operation of aeroplanes.

5.9.12 *Shoulders*: straight portions of a taxiway where the code letter is C, D, E or F shall, where practicable, be provided with shoulders which extend symmetrically on each side of the taxiway so that the over–all width of the taxiway and its shoulders on straight portions is not less than
— 44 m where the code letter is F;
— 38 m where the code letter is E;
— *34m where the code letter is D; and*
— *25 m where the code letter is C.*

5.9.13 On taxiway curves and on junctions or intersections where increased pavement is provided, the shoulder width shall be not less than that on the adjacent straight portions of the taxiway.

5.9.14 When a taxiway is intended to be used by turbine–engined aeroplanes, the surface of the taxiway shoulder shall be so prepared as to resist erosion and the ingestion of the surface material by aeroplane engines.

5.9.15 Changes in direction of taxiways should be as few and small as possible. The radii of the curves should be compatible with the manoeuvring capability and normal taxiing speeds of the aeroplanes for which the taxiway is intended. The design of the curve should be such that, when the cockpit of the aeroplane remains over the taxiway centre line markings, the clearance distance between the outer main wheels of the aeroplane and the edge of the taxiway should not be less than those specified in section 5.9.3

5.9.16 *Junctions and intersections:* To facilitate the movement of aeroplanes, fillets should be provided at junctions and intersections of taxiways with runways, aprons and other taxiways. The design of the fillets should ensure that the minimum wheel clearances specified in 5.9.3 are maintained when aeroplanes are manoeuvring through the junctions or intersections.

Note— Consideration will have to be given to the aeroplane datum length when designing fillets. Guidance on the design of fillets and the definition of the term aeroplane datum length are given in the Aerodrome Design Manual (Doc 9157), Part

5.9.17 Rapid exit taxiways: *A* rapid exit taxiway shall be designed with a radius of turn-off curve of at least:
— *550 m where the code number is 3 or 4; and*
— *275 m where the code number is 1 or 2;*

to enable exit speeds under wet conditions of:

— *93 km/h where the code number is 3 or 4; and*
— *65 km/h where the code number is 1 or 2.*

Note.— Design specification details, the locations of rapid exit taxiways along a runway are based on several criteria described in the Aerodrome Design Manual *(Doc 9157), Part 2, in addition to different speed criteria.*

5.9.18 The radius of the fillet on the inside of the curve at a rapid exit taxiway shall be sufficient to provide a widened taxiway throat in order to facilitate early recognition of the entrance and turn-off onto the taxiway.

5.9.19 A rapid exit taxiway shall include a straight distance after the turn-off curve sufficient for an exiting aircraft to come to a full stop clear of any intersecting taxiway

5.9.20 The intersection angle of a rapid exit taxiway with the runway shall not be greater than 45° nor less than 25° and preferably should be 30

5.10 Taxiway strips

5.10.1 A taxiway, other than an aircraft stand taxilane, shall be included in a strip. A taxiway strip shall extend symmetrically on each side of the centre line of the taxiway throughout the length of the taxiway to at least the distance from the centre line stated in Table 5-1 column11

5.10.2 The taxiway strip shall provide an area clear of objects which may endanger taxiing aeroplanes. Consideration shall be given to the location of drains and the design of drains and drain covers on a taxiway strip to prevent damage to an aeroplane accidentally running off the taxiway.

5.10.3 The centre portion of a taxiway strip shall provide a graded area to a distance from the centre line of the taxiway of at least the distance given by the following tabulation:

— 10.25 m where the OMGWS is up to but not including 4.5 m;

— 11 m where the OMGWS is 4.5 m up to but not including 6 m;

— 12.50 m where the OMGWS is 6 m up to but not including 9 m;

— 18.50 m where the OMGWS is 9 m up to but not including 15 m, where the code letter is D;

— 19 m where the OMGWS is 9 m up to but not including 15 m, where the code letter is E;

— 22 m where the OMGWS is 9 m up to but not including 15 m, where the code letter is F.

5.10.4 The surface of the strip shall be flush at the edge of the taxiway or shoulder, if provided, and the graded portion shall not have an upward transverse slope, relative to the adjacent taxiway surface, exceeding;

— 2.5 per cent for strips where the code letter is C, D, E or F; and
— 3 per cent for strips of taxiways where the code letter is A or B;

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

5.10.5 The transverse slopes on the portion of a taxiway strip beyond that to be graded shall not exceed 5% upward or downward.

5.11 Holding bays and positions

5.11.1 Holding bay (s) shall be provided when the traffic density is medium or high.

5.11.2 A runway holding-position shall be established:

a) on the taxiway, at the intersection of a taxiway and a runway;

b) at an intersection of a runway with another runway when the former runway is part of a standard taxi-route; and

c) on a taxiway if the location or alignment of the taxiway is such that a taxiing aircraft or vehicle can infringe an obstacle limitation surface or interfere with the operation or radio navigation aids.

5.11.3 An intermediate holding position shall be established on a taxiway at any point other than a runway holding position where it is desirable to define a specific holding limit.

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

5.11.5 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 shall be in accordance with Table 5-2 and, in the case of a precision approach runway, such that a holding aircraft or vehicle will not interfere with the operation of radio navigation aids.

5.11.6 At elevations greater than 700 m (2 300 ft) the distance of 90 m specified in Table 5-2 for a precision approach runway code number 4 shall be increased as follows:

a. up to an elevation of 2 000 m (6 600 ft); 1 m for every 100 m (330 ft) in excess of 700m (2300ft)

b. elevation in excess of 2 000 m (6 600 ft) and up to 4 000 m (13 320 ft); 13 m plus 1.5 m for every 100 m (330 ft) in excess of 2 000 m (6 600 ft); and

c. elevation in excess of 4 000 m (13 320 ft) and up to 5 000 m (16 650 ft); 43 m plus 2m for every 100m(330ft) in excess of 4000m(13320ft)

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

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

c.

b. This distance may need to be increased to avoid interference with radio navigation aids, particularly the glide path and localizer facilities. Information on critical and sensitive areas of ILS and MLS is contained in ICAO Annex 10, Volume I, Attachments C and G, respectively (See also section 5.11..6 of this regulation).

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

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

c. Where the code letter is F, This distance shall be 107.5m Note;

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

Table 5- 6 Minimum distance from the runway center line to a holding bay, runway holding position or road holding position

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

5.11.8 The location of a runway-holding position established in accordance with 5.11.3 shall be such that a holding aircraft or vehicle will not infringe the obstacle free zone,

approach surface, take-off climb surface or ILS/MLS critical/ sensitive area or interfere with the operation of radio navigation aid.

5.12 Aprons

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

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

5.12.3 On aprons, service roads and areas for the manoeuvring and storage area for ground equipment shall be provided.

5.12.4 The strength of each part of an apron shall be capable of withstanding the traffic of the aircraft it is intended to serve. Due consideration should be given to portions of the apron that will be subject to slow moving or stationary aircraft and the resulting higher stresses than a runway.

5.12.5 Slopes on an apron and aircraft stand taxilane should be kept as level as drainage requirements permit, but should be sufficient to prevent the accumulation of water on the surface.

5.12.5.1 On an aircraft stand the maximum slope shall not exceed 1 per cent.

5.12.6 An aircraft stand shall provide at least the minimum clearance distances as stated in Table 5-~~6~~ 3 between an aircraft using the stand and any adjacent building, aircraft, and other objects.

Table 5-7 Clearances on Aircraft Stands

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

5.12.7 Where the code letter is D, E or F and when special circumstances so warrant, these clearances may be reduced, at the discretion of the Authority, at a nose-in aircraft stand:

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

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

5.13 Isolated aircraft parking position

5.13.1 An isolated aircraft parking position shall be designated suitable for the parking of an aircraft which is known or believed to be the subject of unlawful interference, or which for other reasons needs isolation from normal aerodrome activities.

5.13.2 The isolated aircraft parking position shall be located at the maximum distance practicable and in any case shall never be less than 100 m from other parking positions, buildings, or public use areas etc. Care shall be taken to ensure that the position is not located over underground utilities such as gas and aviation fuel and, to the extent feasible, electrical or communication cables.

5.14 Siting and Construction of Equipment and Installations on Operational Areas

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

a) on a runway strip, a runway end safety area, a taxiway strip or within the distance specified in Table 5.~~6~~ 1 for the distance from the taxiway centerline of an object (not a taxilane); or

b) on a clearway if it would endanger an aircraft in the air without the approval of the Authority

5.14.2 Any equipment required and approved by the Authority for air navigation or for aircraft safety purposes shall be frangible and mounted as low as possible where it must be located:

a) on that portion of a runway strip within:

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

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

b) on a runway end safety area, a taxiway strip or within the distances specified in Table 5-~~6~~1 for the 'distance from the taxiway centre line of an object (not a taxilane); or

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

5.14.3 In the case of a precision approach runway category I, II or III no equipment or installation shall be located:

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

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

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

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

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

unless it is required to be there for air navigation purposes, and has been approved by the Authority.

5.14.4 Any equipment or installation required for air navigation or for aircraft safety purpose which is located within the areas subject to Regulation 5.14.3 shall be frangible and mounted as low as possible.

5.14.5 Any equipment or installation required for air navigation or for aircraft safety purpose which is an obstacle of operational significance protruding through any obstacle limitation shall be frangible and mounted as low as possible and approved by the Authority.

Chapter 6 MARKINGS

References: ICAO Annex 14, Ch 5; ICAO Doc 9157 Parts 2 and 4.

6.1 Markings General

6.1.1 At an intersection of two (or more) runways the marking of the more important runway, except for the runway side stripe marking, shall be displayed and the markings of the other runway(s) shall be interrupted. The runway side stripe marking of the more important runway may be either continued across the intersection or interrupted. The order of importance of runways for the display of runway markings shall be as follows:

a) 1st - precision approach runway;

b) 2nd - non–precision approach runway; and

c) 3rd - non–instrument runway.

6.1.2 At an intersection of a runway and taxiway or turn pad the markings of the runway shall be displayed and the markings of the taxiway or turn pad interrupted, except that runway side stripe markings may be interrupted.

6.1.3 Runway markings shall be white.

6.1.4 Taxiway markings, runway turn pad markings and aircraft stand markings shall be yellow.

6.1.5 Apron safety lines shall be of a conspicuous colour which shall contrast with that used for aircraft stand markings

6.1.6 Pavement markings shall be made with reflective material to enhance their visibility at night.

6.1.7 An unpaved taxiway should be provided, so far as practicable, with the markings prescribed for paved taxiways.

6.2 Runway Markings

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

6.2.2 A runway designation marking shall meet the specification of ICAO Annex 14 Vol 1 para 5.2.2 and Figures 5-2 and 5-3.

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

6.2.4 A runway centre line marking shall meet the specification of ICAO Annex 14 Vol 1 para 5.2.3 and figure 5-2.

6.2.5 A threshold marking shall be provided at the threshold of a runway. A threshold marking shall include a transverse stripe, not less than 1.8 m wide, where the threshold is displaced from the extremity of the runway or where the extremity of the runway is not square with the runway centre line.

6.2.6 A runway threshold marking shall meet the specification of ICAO Annex 14 Vol 1 para 5.2.4 and Figures 5-2 and 5-4.

6.2.7 Where a runway threshold is permanently displaced arrows conforming to ICAO Annex 14 Vol 1 Figure 5-4 (B) shall be provided on the portion of the runway before the displaced threshold.

6.2.8 When a runway is temporarily displaced from the normal position, it shall be marked in accordance with ICAO Annex 14 Vol 1 Figure 5-4 (A) or (B) and all markings prior to the displaced threshold shall be obscured except the runway centre line marking, which shall be converted to arrows.

6.2.9 Where that portion of the runway before the threshold is unfit for the movement of aircraft, closed markings of either yellow chevrons or white crosses shall be used.

6.2.10 An aiming point marking shall be provided at each approach end of a paved runway where the code number is 3 or 4.

6.2.11 An aiming point marking shall be provided at each approach end of a paved instrument runway where the code number is 1 or 2.

6.2.12 An aiming point marking shall conform to ICAO Annex 14 Vol 1 Para 5.2.5, Table 5-1 and Figure 5-5.

6.2.13 A touchdown zone marking shall be provided at each approach end of a paved runway where the code number is 3 or 4, and at each end of a paved precision approach runway where the code number is 2.

6.2.14 A touchdown zone marking shall conform to ICAO Annex 14 Vol 1 Para 5.2.6 and Figure 5-5.

6.2.15 A runway side stripe marking shall be provided between the thresholds of a paved runway, and where a runway turn pad is provided the runway side stripe marking shall be continued between the runway and the runway turn pad.

6.2.16 A runway side stripe marking shall have an overall width of at least 0.9 m on runways 30 m or more in width and at least 0.45 m on narrower runways.

6.3 Taxiway Markings

6.3.1 A taxiway centre line marking shall be provided on a paved taxiway and apron in such a way as to provide continuous guidance from the runway centre line to the aircraft stands.

6.3.2 Taxiway centre line marking shall be provided on a paved runway when the runway is part of a taxi route, and where the taxiway centre line is not coincident with the runway centre line.

6.3.3 Where it is necessary to denote the proximity of a runway-holding position, enhanced taxiway centre line marking shall be provided.

6.3.4 Where provided, enhanced taxiway centre line marking shall be installed at each taxiway/runway intersection.

6.3.5 On a straight section of a taxiway the taxiway centre line marking shall be located along the taxiway centre line. On a taxiway curve the marking shall continue from the straight portion of the taxiway at a constant distance from the outside edge of the curve.

6.3.6 At an intersection of a taxiway with a runway where the taxiway serves as an exit from the runway, the taxiway centre line marking shall be curved into the runway centre line marking. The taxiway centre line marking shall be extended parallel to the runway centre line marking for a distance of at least 60 m beyond the point of tangency where the code number is 3 or 4, and for a distance of at least 30 m where the code number is 1 or 2.

6.3.7 Where taxiway centre line marking is provided on a runway in accordance with 6.3.2 the marking shall be located on the centre line of the designated taxiway.

6.3.8 Where provided:
(1) An enhanced taxiway centre line marking shall extend from the runway-holding position Pattern A (as defined in ICAO Annex 14 Figure 5-6, Taxiway markings) to a distance of up to 47m in the direction of travel away from the runway.
(2) If the enhanced taxiway centre line marking intersects another runway-holding position marking, such as for a precision approach category II or III runway, that is located within 47m of the first runway-holding position marking, the enhanced taxiway centre line marking shall be interrupted 0.9m prior to and after the intersected runway-holding position marking. The enhanced taxiway centre line marking shall continue beyond the intersected runway-holding position marking for at least 3 dashed line segments or 47m from start to finish, whichever is greater.
(3) If the enhanced taxiway centre line marking continues through a taxiway/taxiway intersection that is located within 47m of the runway-holding position marking, the enhanced taxiway centre line marking shall be interrupted 1.5m prior to and after the point where the intersected taxiway centre line crosses the enhanced taxiway centre line. The enhanced taxiway centre line marking shall continue beyond the taxiway/taxiway intersection for at least 3 dashed line segments or 47m from start to finish, whichever is greater.
(4) Where two taxiway centre lines converge at or before the runway-holding position marking, the inner dashed line shall not be less than 3m in length.
(5) Where there are two opposing runway-holding position markings and the distance between the markings is less than 94m, the enhanced taxiway centre line markings shall extend over this entire distance. The enhanced taxiway centre line markings shall not extend beyond either runway-holding position marking.

6.3.9 A taxiway centre line marking shall conform to ICAO Annex 14 Vol 1 Para 5.2.8.

6.3.10 A taxiway side stripe marking shall be provided a the outer edge of the load bearing pavement of a taxiway, runway turn pad and apron where non load bearing surfaces cannot readily be distinguished from load bearing surfaces. A taxiway side stripe marking shall consist of a pair of solid yellow lines each 150mm wide and spaced 150mm apart. Where taxiway side strip markings are provided on an intersection, whether taxiway to taxiway, or taxiway to runway, the taxiway side stripe marking shall be augmented by yellow transverse stripes with dimensions 0.9 m and 150mm in conformance with ICAO Doc 9157 Part 4 para 2.2.3 and Figure 2-1.

6.3.11 Where a runway turn pad is provided, a runway turn pad marking shall be provided for continuous guidance to enable an aeroplane to complete a 180 degree turn and align with the runway centerline. A runway turn pad marking shall conform to ICAO Annex 14 Vol 1 para 5.2.9.2 and ICAO Doc 9157 Part 2 Figure 1-3.

6.3.12 A runway holding position marking shall be displayed at a runway holding position. Markings shall be yellow and conform to Pattern A1 (or A2) or Pattern B1 (or B2) as defined in ICAO Annex 14 Vol 1, para 5.2.10 and Figures 5-6 and 5-8.

6.3.13 At an intersection of a taxiway and a non-instrument, non-precision approach or take-off runway the marking shall be pattern A. Where a single runway holding position is provided at an intersection of a taxiway and a precision approach runway the marking shall be patter A. Where two or three runway holding positions are provided at such an intersection, the runway holding position marking closer (closest) to the runway shall be pattern A, and the markings farther from the runway shall be pattern B.

6.3.14 Where a pattern B runway holding position marking exceeds 60 m in length, the term "CAT II" or "CAT III" as appropriate shall be marked on the surface at the ends of the runway holding position marking and at equal intervals not exceeding 45 m between successive marks. The letters shall be not less than 1.8m high and shall be placed not more than 0.9 m beyond the holding position marking.

6.3.15 A runway holding position marking displayed at a runway/runway intersection shall be perpendicular to the centre line of the runway forming part of the standard taxiway route, and shall be pattern A2.

6.3.16 An intermediate holding position marking shall be displayed along an intermediate holding position. Where an intermediate holding position marking is displayed at an intersection of two paved taxiways it shall be located across the taxiway at sufficient distance from the near edge of the intersecting taxiway to ensure safe clearance between taxiing aircraft. It shall be coincident with a stop bar or intermediate holding position lights where provided.

6.3.17 An intermediate holding position marking shall consist of a single yellow broken line in compliance with ICAO Annex 14 Vol 1 Figure 5-6.

6.3.18 When a VOR checkpoint is established it shall be identified by a VOR aerodrome checkpoint marking in accordance with ICAO Annex 14, Vol 1, para 5.2.12.

6.4 Apron Markings

6.4.1 Aircraft stand markings shall be provided for designated parking positions on a paved apron. Aircraft stand markings on a paved apron shall be located so as to provide the clearances specified in Regulation 5.12.6.

6.4.2 Aircraft stand markings should include all necessary markings as required by the parking configuration, including stand identification, lead-in line, direction arrow, turn bar, turn line, alignment bar, stop line, and lead-out line. The aerodrome operator shall ensure that aircraft stand markings are compatible with other parking aids including automated aids and aircraft marshalling procedures.

6.4.3 Lead-in, turning, and lead-out lines shall be yellow, continuous in length and have a minimum width of 150mm, alternatives may be agreed with the Authority.

6.4.4 Apron safety lines should be provided on a paved apron as required by the parking configurations and ground facilities. Apron safety lines shall be located so as to define the areas intended for use by ground vehicles and other aircraft servicing

equipment, etc, to provide safe separation from aircraft. Apron safety lines shall be 100mm wide white lines: single white lines for service road, equipment parking, air jetty and aircraft stand limit lines; double white lines for marking the limit of the apron bordering the manoeuvring area. Other colours except yellow may be used within white bordered boxes to indicate restricted or prohibited areas. Where other colours are used their visibility shall be assessed under all foreseeable lighting conditions.

6.4.5 Where passengers are require to walk on the apron passenger path lines shall be used to guide passengers clear of hazards. The area between the path lines shall be distinctively marked to indicate its purpose.

6.5 Road–Holding Position Marking

6.5.1 A road–holding position marking shall be provided across the road at all road entrances to a runway; the marking shall be in accordance with the standards as approved by the Public Works Authority and the General Directorate of Traffic.

6.6 Instruction and Information Marking

6.6.1 A mandatory instruction marking shall be provided on the surface of the pavement where it is impracticable to install a mandatory instruction sign in accordance with Regulation 7.11. Mandatory instruction markings shall be as specified in ICAO Annex 14 Vol 1, para 5.2.16.

6.6.2 Where operationally required, such as on taxiways exceeding 60 m in width, or to assist in the prevention of a runway incursion, a mandatory instruction sign shall be supplemented by a mandatory instruction marking.

6.6.3 The mandatory instruction marking on taxiways, where the code letter is A, B, C, or D, shall be located across the taxiway equally placed about the taxiway centerline and on the holding side of the runway-holding position marking as shown in ICAO Annex 14 Vol 1 Figure 5-9 (a). The distance between the nearest edge of the marking and the runway holding position marking or the taxiway centre line marking shall be not less than 1 m.

6.6.4 The mandatory instruction marking on taxiways, where the code letter is E or F, shall be located on both sides of the taxiway centre line marking and on the holding side of the runway-holding position marking as shown in ICAO Annex 14 Vol 1 Figure 5-9 (b). The distance between the nearest edge of the marking and the runway holding position marking or the taxiway centre line marking shall be not less than 1 m.

6.6.5 An information marking shall be provided on the surface of the pavement where it is impracticable to install an information sign in accordance with Regulation 7.12. Information markings shall be as specified in ICAO Annex 14 Vol 1 para 5.2.17.

6.6.6 Where operationally required, an information sign should be supplemented by an information marking.

6.7 Marking of Restricted Use Areas

6.7.1 A closed marking shall be displayed on a runway or taxiway, or portion thereof, which is permanently closed to the use of all aircraft. The closed marking shall conform to the specifications in ICAO Annex 14, Vol 1 para 7.1.

6.7.2 A closed marking shall be displayed on a temporarily closed runway or taxiway or portion thereof, except that such marking may be omitted when the closing is of short duration and adequate warning by air traffic services is provided.

6.7.3 On a runway a closed marking shall be placed at each end of the runway, or portion thereof, declared closed, and additional markings shall be so placed that the maximum interval between markings does not exceed 300 m. On a taxiway a closed marking shall be placed at least at each end of the taxiway or portion thereof closed.

6.7.4 When a runway or taxiway or portion thereof is permanently closed, all normal runway and taxiway markings shall be obliterated and lighting removed.

6.7.5 Shoulders for taxiways, runway turn pads, holding bays and aprons and other non load–bearing surfaces which cannot readily be distinguished from load–bearing surfaces and which, if used by aircraft, might result in damage to the aircraft shall have the boundary between such areas and the load–bearing surface marked by a taxiway side stripe marking.

6.7.6 When the surface before a threshold is paved and exceeds 60 m in length and is not suitable for normal use by aircraft, the entire length before the threshold shall be marked with a yellow chevron marking. The chevron marking shall be of the form illustrated in ICAO Annex 14 Vol 1 Figure 7-2.

6.7.7 Unserviceability markers consisting of conspicuous upstanding devices shall be displayed wherever 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.

6.7.8 Unserviceability markers 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 shall not be used 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 shall be closed.

6.8 Markers

6.8.1 Markers shall comply with the specifications in ICAO Annex 14 Vol 1 para 5.5.

6.8.2 Markers shall be frangible; those located near a runway or taxiway shall be sufficiently low to preserve clearance for propellers and for the engine pods of jet aircraft.

6.8.3 Stopway edge markers shall be provided when the extent of a stopway is not clearly indicated by its appearance compared with that of the surrounding ground.

6.8.4 Taxiway edge markers shall be provided on a taxiway where the code number is 1 or 2 and taxiway centre line or edge lights or taxiway centre line markers are not provided. Taxiway edge markers should conform to the specification in ICAO ANNEX 14 Vol 1, para 5.5.5.

6.8.5 Taxiway centre line markers should be provided on a taxiway where the code number is 1 or 2 and taxiway centre line or edge lights or taxiway edge markers are not provided.

6.8.6 Taxiway centre line markers should be provided on a taxiway where the code number is 3 or 4 and taxiway centre lights are not provided if there is a need to improve the guidance provided by the taxiway centre line marking.

6.8.7 Taxiway centre line markers shall be installed at least at the same location as would taxiway centre line lights had they been used and shall conform to the specification in ICAO ANNEX 14 Vol 1, para 5.5.6.

6.8.8 Where the extent of an unpaved taxiway is not clearly indicated by its appearance compared with that of the surrounding ground, markers shall be provided. Where taxiway lights are provided, the markers shall be incorporated in the light fixtures. Where there are no lights, markers of conical shape shall be placed so as to delimit the taxiway clearly.

Chapter 7 LIGHTING AND SIGNS

References: ICAO Annex 14, Ch 5; ICAO Doc 9157 Parts 2 and 4.

7.1 Lighting General

7.1.1 *Lights which may endanger the safety of aircraft*: any non–aeronautical ground light near an aerodrome which might endanger the safety of aircraft shall be extinguished, screened or otherwise modified so as to eliminate the source of danger.

7.1.2 *Laser emissions which may endanger the safety of aircraft:* to protect the safety of aircraft against the hazardous effects of laser emitters, the following protected zones should be established around aerodromes in accordance with ICAO Annex 14 Vol 1, para 5.3.1.2:

- a laser-beam free flight zone (LFFZ);
- a laser-beam critical flight zone (LCFZ); and
- a laser-beam sensitive flight zone.

7.1.3 *Lights which may cause confusion:* any non-aeronautical ground light which, by reason of its intensity, configuration or colour, might prevent, or cause confusion in, the clear interpretation of aeronautical ground lights shall be extinguished, screened or otherwise modified so as to eliminate such a possibility. In particular, attention shall be directed to a non–aeronautical ground light visible from the air within the approach area.

7.1.4 *Aeronautical ground lights which may cause confusion to mariners*: in the case of aeronautical ground lights near navigable waters, due consideration shall be given to ensuring that the lights do not cause confusion to mariners.

7.1.5 *Elevated approach lights:* elevated approach lights and their supporting structures shall be frangible if they are sited within 300 m from the threshold or up to a distance where they no longer constitute a major hazard to an aircraft in flight or an aircraft over-running the runway end, whichever is the lesser. The top 12 m of the support structure of elevated approach lights sited beyond 300 m from the threshold shall be frangible if the height of the support structure exceeds 12 m.

7.1.6 When an approach light fixture or supporting structure is not, in itself, sufficiently conspicuous, it shall be suitably marked.

7.1.7 *Elevated runway, stopway and taxiway lights*: elevated runway, stopway and taxiway lights shall be frangible and shall be marked so as to be conspicuous by day. Their height shall be sufficiently low to preserve clearance for propellers and for the engine pods of jet aircraft; obstacle lights shall not be fitted.

7.1.8 *Surface lights*: light fixtures inset in the surface of runways, stopways, taxiways and aprons shall be so designed and fitted as to withstand being run over by the wheels of an aircraft without damage either to the aircraft or to the lights themselves.

7.1.9 Unless otherwise indicated, the aerodrome lighting provided in accordance with these Regulations shall conform to the relevant specifications within ICAO Annex 14 Vol 1 Para 5.3.

7.1.10 Note: 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 shall be of adequate intensity. To obtain the required intensity, it is necessary to make the light directional, in which case the arcs over which the light shows shall be adequate and so orientated as to meet the operational requirements. The runway lighting system shall be considered as a whole, to ensure that the relative light intensities are suitably matched to the same end.

7.1.11 The intensity of runway lighting shall be adequate for the minimum conditions of visibility and ambient light in which use of the runway is intended, and compatible with that of the nearest section of the approach lighting system when provided.

7.1.12 Note: 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.

7.1.13 Where a high–intensity lighting system is provided, a suitable intensity control shall be incorporated to allow for adjustment of the light intensity to meet the prevailing conditions. Separate intensity controls or other suitable methods shall be provided to ensure that the following systems when installed, can be operated at compatible intensities:

a) approach lighting system;

b) runway edge lights;

c) runway threshold and wing bar lights;

d) runway end lights;

e) runway centre line lights;

f) runway touchdown zone lights; and

g) taxiway centre line lights.

7.2 Aeronautical Beacons

7.2.1 Where operationally necessary an aerodrome beacon or an identification beacon shall be provided at an aerodrome intended for operation at night. The operational requirement shall be determined having regard to the requirements of the air traffic using the aerodrome, the conspicuity of the aerodrome features in relation to its surroundings and the installation of other visual and non-visual aids useful in locating the aerodrome.

7.2.2 *Aerodrome beacon*: an aerodrome beacon shall be provided at an aerodrome intended for use at night if one or more of the following conditions are met:

a) aircraft navigate predominantly by visual means;

b) reduced visibilities are frequent; or,

c) it is difficult to locate the aerodrome from the air due to surrounding lights or terrain.

7.2.3 Where provided, the aerodrome beacon shall be located on or adjacent to the aerodrome in an area of low ambient background lighting and shall conform to the requirements of ICAO Annex 14 Vol 1, para 5.3.3.6 and 5.3.3.7.

7.2.4 *Identification beacon*: an identification beacon shall be provided at an aerodrome which is intended for use at night and cannot easily be identified from the air by other means.

7.2.5 Where provided, the identification beacon shall be located on the aerodrome in an area of low ambient background lighting and shall conform to the requirements of ICAO Annex 14 Vol 1, para 5.3.3.11 to 5.3.3.14.

7.3 Approach Lighting System

7.3.1 *Non–instrument runway*: a simple Approach Lighting System shall be provided where practicable to serve a non-instrument runway where the code number is 3 or 4 and intended for use at night, except when the runway is used only in conditions of good visibility, and sufficient guidance is provided by other visual aids.

7.3.2 *Non precision approach runway*: a simple approach lighting system shall be provided to serve a non-precision approach runway, except when the runway is used only in conditions of good visibility or sufficient guidance is provided by other visual aids. Consideration shall be given to the installation of a precision approach category I lighting system.

7.3.3 *Precision approach runway*: a precision approach category I lighting system shall be provided to serve a precision approach runway category I.

7.3.4 A precision approach runway category II and III lighting systems shall be provided to serve a precision approach runway category II or III.

7.3.5 *Runway lead–in lighting*: lead–in lighting system shall be provided where it is desired to provide visual guidance along a specific approach path, for reasons such as avoiding hazardous terrain or for purposes of noise abatement.

7.4 Precision Approach Path Indicator Systems

7.4.1 A precision approach path indicator system shall be provided to serve the approach to a runway where one or more of the following conditions exist:

a) the runway is used by turbojet or other aircraft with similar approach guidance requirements;

b) the pilot of any type of aircraft may have difficulty in judging the approach due to:

i) inadequate visual guidance such as is experienced during an approach over water or featureless terrain by day or in the absence of sufficient extraneous lights in the approach area by night, or

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

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

d) physical conditions at either end of the runway present a serious hazard in the event of an aircraft under shooting or overrunning the runway; and

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

7.5 Runway Lights

7.5.1 *Runway threshold identification lights*: threshold identification lights shall be provided:

a) at the threshold of a non–precision approach runway where it is not practical to provide other visual approach aids or where additional threshold conspicuity is necessary due to extraneous lighting or lack of daytime contrast ; and

b) where a runway threshold is permanently displaced from the runway extremity or temporarily displaced from the normal position and additional threshold conspicuity is necessary.

7.5.2 Where provided, runway threshold identification lights shall conform to the requirements of ICAO Annex 14 Vol 1, para 5.3.8.

7.5.3 *Runway edge lights*: edge lights shall be provided for a runway intended for use at night or for a precision approach runway intended for use by day or night.

7.5.4 Runway edge lights shall be provided on a runway intended for take off with an operating minima below a runway visual range (RVR) of 800m by day.

7.5.5 *Runway threshold lights*: threshold lights shall be provided for a runway equipped with runway edge lights except on a non–instrument or non–precision approach runway where the threshold is displaced and wing bar lights are provided. The lights shall conform to the requirements of ICAO Annex 14 Vol 1 para 5.3.10 and Figure 5-22.

7.5.6 *Wing bar lights*: threshold wing bar lights shall be provided

a) on a precision approach runway when additional conspicuity is considered necessary; and

b) on a non-instrument or non-precision runway where the threshold is displaced and runway threshold lights are required, but are not provided.

7.5.7 Where provided, wing bar lights shall conform to the requirements of ICAO Annex 14 Vol 1 para 5.3.10 and Figure 5-22.

7.5.8 *Runway end lights*: end lights shall be provided for a runway equipped with runway edge lights.

7.5.9 *Runway centre line lights*: centre line lights shall be provided on a precision approach runway category II or III.

7.5.10 Runway centre line lights shall be provided on a precision approach runway category I, particularly when the runway is used by aircraft with high landing speeds or where the width between the runway edge lights is greater than 50 m.

7.5.11 *Touchdown zone lights*: touchdown zone lights shall be provided in the touchdown zone of a precision approach runway category II or III.

7.5.12 *Simple touchdown zone lights:* Except where TDZ lights are provided in accordance with paragraph 7.5.11, at an aerodrome where the approach angle is greater than 3.5 degrees and/or the Landing Distance Available combined with other factors increases the risk of an overrun, Simple Touchdown Zone Lights shall be provided. Simple Touchdown Zone Lights shall be a pair of lights located on each side of the

runway centreline 0.3 metres beyond the upwind edge of the final Touchdown Zone Marking. The lateral spacing between the inner lights of the two pairs of lights shall be equal to the lateral spacing selected for the Touchdown Zone Marking. The spacing between the lights of the same pair shall not be more than 1.5 m or half the width of the touchdown zone marking, whichever is greater. Where provided on a runway without TDZ markings, Simple Touchdown Zone lights shall be installed in such a position that provides the equivalent TDZ information. Simple Touchdown Zone Lights shall be fixed unidirectional lights showing variable white, aligned so as to be visible to the pilot of a landing aeroplane in the direction of approach to the runway. Simple Touchdown Zone Lights shall be in accordance with the specifications in ICAO Annex 14 Appendix 2, Figure A2-5.

7.5.13 *Stopway lights*: stopway lights shall be provided for a stopway intended for use at night.

7.5.14 *Runway turnpad lights***:** turnpad lights shall be provided for continuous guidance where a turnpad is intended for use in visual conditions less than 350m.

7.6 Taxiway Lights

7.6.1 *Taxiway centre line lights*: centre line lights shall be provided on an exit taxiway, taxiway and apron intended for use in runway visual range conditions less than a value of 350m in such a manner as to provide continuous guidance between the runway centre line and the point on the apron where aircraft commence manoeuvring for parking. Except as provided for in this paragraph, taxiway centre line lights on a taxiway other than an exit taxiway and on a runway forming part of a standard taxi-route shall be fixed lights showing green with beam dimensions such that the light is visible only from aeroplanes on or in the vicinity of the taxiway. Taxiway centre line lights on an exit taxiway shall be fixed lights. Alternate taxiway centre line lights shall show green and yellow from their beginning near the runway centre line to the perimeter of the ILS/MLS critical/sensitive area or the lower edge of the inner transitional surface, whichever is farthest from the runway; and thereafter all lights shall show green. The first light in the exit centre line shall always show green and the light nearest to the perimeter shall always show yellow. Where it is necessary to denote the proximity to a runway, taxiway centre line lights shall be fixed lights showing alternating green and yellow from the perimeter of the ILS/MLS critical/sensitive area or the lower edge of the inner transitional surface, whichever is farthest from the runway, to the runway and continue alternating green and yellow until:

a) their end point near the runway centre line; or

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

7.6.2 *Taxiway edge lights*: edge lights shall be provided on a runway turn pad, holding bay, apron, etc. intended for use at night and on a taxiway not provided with taxiway centre line lights and intended for use at night, except that taxiway edge lights need not be provided where, considering the nature of the operations, adequate guidance can be achieved by surface illumination or other means.

7.6.3 Taxiway edge lights shall be provided on a runway forming part of a standard taxi–route and intended for taxiing at night where the runway is not provided with taxiway centre lights.

7.6.4 Taxiway edge lights shall be fixed lights showing blue. The lights shall show up to at least 75° above the horizontal and at all angles in azimuth necessary to provide guidance to a pilot taxiing in either direction. At an intersection, exit or curve the lights shall be shielded as far as practicable so that they cannot be seen in angles of azimuth in which they may be confused with other lights.

7.6.5 The intensity of taxiway edge lights shall be at least 2 cd from 0° to 6° vertical, and 0.2 cd at any vertical angles between 6° and 75°.

7.6.4 *Stopbars*: a stop bar shall be provided across the taxiway at every runway-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions less than a value of 550m except where:

a) operational procedures are in place to limit the number of aircraft on the manoeuvring area to one at any time when visual range conditions of less than 550m arise, or

b) appropriate aids and procedures are available to assist in preventing inadvertent incursions of traffic onto the runway.

7.6.5 Stop bars shall be controlled either manually or automatically by air traffic services**.**

7.6.6 Where there is more than one stop bar associated with a taxiway/runway intersection, only one shall be illuminated at any given time. A pair of elevated lights shall 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.

7.6.7 Stop bars installed at a runway-holding position shall be unidirectional and shall show red in the direction of approach to the runway. Where the additional lights are provided, these lights shall have the same characteristics as the lights in the stop bar, but shall be visible to approaching aircraft up to the stop bar position. 10The intensity in red light and beam spreads of stop bar lights shall be in accordance with the specifications in ICAO Annex 14 Appendix 2, Figures A2-12 through A2-16, as appropriate.

7.6.7 Where stop bars are specified as components of an advanced surface movement guidance and control system and where, from an operational point of view, higher intensities are required to maintain ground movements at a certain speed in very low visibilities or in bright daytime conditions, the intensity in red light and beam spreads of stop bar lights should be in accordance with the specifications of ICAO Annex 14 Appendix 2, Figure A2-17, A2-18 or A2-19. Where a wide beam fixture is required, the intensity in red light and beam spreads of stop bar lights should be in accordance with the specifications of ICAO Annex 14 Appendix 2, Figure A2-17 or A2-19.

7.6.8 13The lighting circuit shall be designed so that:

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

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

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

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

7.6.9 *Intermediate holding position lights*: intermediate holding position lights shall be provided at a taxiway intermediate holding position intended for use in RVR conditions less than 350m.

7.6.10 *Runway guard lights*: runway guard lights, of configuration A, as illustrated in ICAO Annex 14 Vol 1, Figure 5-28, shall be provided at each taxiway/runway intersection associated with a runway intended for use in:

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

b) runway visual range (RVR) conditions of values between 550m and 1200m.

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

7.6.12 Configuration B runway guard lights shall not be collocated with a stop bar.

7.6.13 No-entry bar

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

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

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

7.6.13.4 A pair of elevated lights shall 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.

7.6.13.5 The intensity in red light and beam spreads of no-entry bar lights shall be in accordance with the specifications in ICAO Annex 14 Appendix 2, Figures A2-12 through A2-16, as appropriate.

7.6.13.6 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 shall be in accordance with the specifications of ICAO Annex 14 Appendix 2, Figure A2-17, A2-18 or A2-19. Where a wide beam fixture is required, the intensity in red light and beam spreads of no-entry bar lights should be in accordance with the specifications of ICAO Annex Appendix 2, Figure A2-17 or A2-19.

7.6.13.7 The lighting circuit shall be designed so that:

a) no-entry bars are switchable selectively or in groups;
b) when a no-entry bar is illuminated, any taxiway centre line lights installed beyond the no-entry bar, when viewed towards the runway, shall be extinguished for a distance of at least 90 m; and
c) when a no-entry bar is illuminated, any stop bar installed between the no-entry bar and the runway shall be extinguished.

7.7 Apron Lighting

7.7.1 *Apron floodlighting*: floodlighting shall be provided on an apron, and on a designated isolated aircraft parking position, intended to be used at night.

7.7.2 Apron floodlights shall be located so as to provide adequate illumination on all apron service areas, with a minimum of glare to pilots of aircraft in flight and on the ground, aerodrome and apron controllers, and personnel on the apron. The arrangement and aiming of floodlights shall be such that an aircraft stand receives light from two or more directions to minimize shadows.

7.7.3 The spectral distribution of apron floodlights shall be such that the colours used for aircraft marking connected with routine servicing, and for surface and obstacle marking can be correctly identified.

7.7.4 The average illuminance on an apron should be at least:

a) *Aircraft stand*:
   i) horizontal illuminance: 20 lux with a uniformity ratio (average to minimum) of not more than 4:1; and
   ii) vertical illuminance: 20 lux at a height of 2 m above the apron in relevant directions.

b) *Other apron areas*: horizontal illuminance: 50 per cent of the average illuminance on the aircraft stands with a uniformity ratio (average to minimum) of not more than 4 to 1.

7.7.5 *Visual docking guidance system*: a visual docking guidance system shall be provided when it is intended to indicate, by a visual aid, the precise positioning of an aircraft on an aircraft stand and other alternative means, such as marshallers, are not practicable.

7.7.6 The need for a visual docking guidance system shall be evaluated in accordance the guidance provided in ICAO Annex 14 Vol 1 para 5.3.24. Where provided, such a system shall comply with the requirements of that paragraph.

7.7.7 *Aircraft stand manoeuvring guidance lights*: manoeuvring guidance lights shall be provided to facilitate the positioning of an aircraft on an aircraft stand intended for use in poor visibility conditions unless adequate guidance is provided by other means. Aircraft stand manoeuvring guidance lights shall be collocated with the aircraft stand markings, and shall comply with ICAO Annex 14 Vol 1 para 5.3.25.

7.8 Road–Holding Position Light

7.8.1 A road–holding position light shall be provided at each road-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions less than a value of 550m.

7.9 Signs General

7.9.1 Signs may be either fixed message signs or variable message signs. All signs shall be frangible and, if located near a runway or taxiway shall be sufficiently low to preserve clearance for propellers and the engine pods of jet aircraft**.**

7.9.2 Signs shall be provided to convey, a mandatory instruction, information on a specific location or destination on a movement area or to provide other information to meet the requirements of a Surface Movement Guidance and Control System provided in accordance with Regulation 8.2.

7.9.3 Signs should be marked so as to be conspicuous by day if they are located within the clearance distances specified for an obstacle from a taxiway or taxilane in Table 5-5 of ICAO Annex 14, Vol 1. Obstacle lights shall not be installed on signs on the movement area.

7.9.4 Unless otherwise indicated, the aerodrome signs provided in accordance with these Regulations shall conform to the relevant specifications within ICAO Annex 14 Vol 1 Para 5.4**.**

7.10 Mandatory Instruction Signs

7.10.1 A mandatory instruction sign shall be provided to identify a location beyond which an aircraft taxiing or vehicle shall not proceed unless authorised by the aerodrome control tower. Where this is impracticable mandatory instruction markings shall be provided in accordance with Regulation 6.6.1.

7.10.2 Mandatory instruction signs shall include runway designation signs, category I, II or III holding position signs, runway holding position signs, road holding position signs and NO ENTRY signs.

7.10.3 A pattern "A" runway-holding position marking provided in accordance with Regulation 6.3.8 shall be supplemented at a taxiway/runway intersection or a runway/runway intersection with a runway designation sign.

7.10.4 A pattern "B" runway-holding position marking provided in accordance with Regulation 6.3.7 shall be supplemented with a Category I, Category II, Category III or Category II/III holding position sign.

7.10.5 A mandatory instruction sign shall consist of an inscription in white on a red background.

7.10.6 Where, owing to environmental or other factors, the conspicuity of the inscription on a mandatory instruction sign needs to be enhanced, the outside edge of the white inscription shall be supplemented by a black outline measuring 10 mm in width for runway code numbers 1 and 2, and 20 mm in width for runway code numbers 3 and 4.

7.11 Information Signs

7.11.1 An information sign shall be provided where there is an operational need to identify by a sign, a specific location or routing information. Where this is impracticable information markings shall be provided in accordance with Regulation 6.6.3.

7.11.2 Information signs shall include direction signs, location signs, destination signs, runway exit signs, runway vacated signs and intersection take-off signs.

7.11.3 *Runway exit sign*: a runway exit sign shall be provided where there is an operational need to identify a runway exit.

7.11.4 *Runway vacated sign*: a runway vacated sign shall be provided where the exit taxiway from a precision approach runway is not provided with taxiway centre line lights and there is a need to indicate to a pilot leaving the runway the perimeter of the ILS critical/sensitive area or the lower edge of the inner transitional slope whichever is farther from the runway centre line.

7.11.5 *Location and direction signs*: a combined location and direction sign shall be provided when it is intended to indicate routing information prior to a taxiway intersection.

7.11.6 A direction sign shall be provided when there is an operational need to identify the designation and direction of taxiways at an intersection.

7.11.7 A location sign shall be provided in conjunction with a runway designation sign except at a runway/runway intersection.

7.11.8 A location sign shall be provided in conjunction with a direction sign except that it may be omitted where an aeronautical study indicates that it is not needed.

7.11.9 A location sign shall, where necessary, be provided to identify taxiways exiting an apron or to identify taxiways beyond an intersection.

7.11.10 Where a taxiway ends at an intersection such as a “T” and it is necessary to identify this, a direction sign and/or other appropriate visual aid shall be used. The sign and/or other visual aid shall be located on the opposite side of the intersection facing the taxiway.

7.11.11 At a taxiway intersection, information signs shall be located prior to the intersection and in line with the taxiway intersection marking. Where there is no taxiway intersection marking, the signs shall be installed at least 60 m from the centre line of the intersecting taxiway where the code number is 3 or 4 and at least 40 m where the code number is 1 or 2. A taxiway location sign installed beyond a taxiway intersection may be located on either side of the taxiway.

7.11.12 A runway exit sign shall be located on the same side of the runway (left or right) as the exit. A runway exit sign shall be located prior to the runway exit point in line with a position at least 60 m prior to the point of tangency where the code number is 3 or 4, and at least 30 m where the code number is 1 or 2.

7.11.13 A runway vacated sign shall be located at least on one side of the taxiway and shall be positioned in accordance with ICAO Annex 14 Vol, para 5.4.3.18.

7.11.14 Information signs should, wherever practicable, be located on the left-hand side of the taxiway except as specified in Regulation 7.11.10, 7.11.11, 711.12 and 711.13.

7.11.15 A taxiway location sign installed in conjunction with a runway designation sign or runway vacated sign shall be positioned outboard of that sign.

7.11.16 A destination sign shall not normally be collocated with a location or direction sign.

7.12.17 An information sign other than a location sign shall not be collocated with a mandatory instruction sign.

7.12 VOR Aerodrome Checkpoint Sign

7.12.1 When a VOR aerodrome checkpoint is established it shall be identified by a sign which shall conform to ICAO Annex 14 Vol 1, para 5.4.4.2 to 5.4.4.4. The sign shall be provided in addition to the marking required by Regulation 6.3.12.

7.13 Aerodrome Identification Sign

7.13.1 An aerodrome identification sign shall be provided at an aerodrome where there is insufficient alternative means of visual identification.

7.14 Aircraft Stand Identification Signs

7.14.1 An aircraft stand identification marking shall be supplemented with an aircraft stand identification sign where feasible.

7.15 Road-Holding Position Sign

7.15.1 A road-holding position sign shall be provided at all road entrances to a runway. The road-holding position sign shall be located 1.5 m from the edge of the road at the holding position. The road holding position sign shall be in accordance with the standards as approved by the Public Works Authority and the General Directorate of Traffic, except that the Aerodrome Operator shall determine the siting, height and illumination of the sign under the aerodrome's SMS. Wording on the sign shall be in Arabic and English.

Chapter 8 EQUIPMENT AND INSTALLATIONS

Reference: ICAO Annex 14, Ch 8.

8.1 Indicators and Signalling Devices

8.1.1 An aerodrome shall be equipped with at least one wind direction indicator. Wind direction indicators shall be of the form specified in ICAO Annex 14, Chapter 5, para 5.1.1.

8.1.2 A wind direction indicator shall be located so as to be visible from aircraft in flight or on the movement area and in such a way as to be free from the effects of air disturbances caused by nearby objects. Sufficient number of wind direction indicators shall be installed in suitable locations such that a wind direction indicator is visible from every runway threshold.

8.1.3 A wind direction indicator provided in relation to a runway notified as being available for use by night shall be illuminated.

8.1.4 Where provided, a landing direction indicator shall be located in a conspicuous place on the aerodrome, and where required for use by night shall be illuminated or outlined by white lights.

8.1.5 A signalling lamp to the specification of ICAO Annex 14 Vol 1 para 5.1.3 shall be provided at a controlled aerodrome in the aerodrome control tower.

8.2 Surface Movement and Guidance System

8.2.1 A surface movement guidance and control system shall be provided at an aerodrome.

8.2.2 The design of a surface movement guidance and control system shall 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.

8.2.3 The visual aid components of a surface movement guidance and control system, i.e. markings, lights and signs shall be designed to conform to the relevant specifications in chapters 6 and 7 of these Regulations respectively.

8.2.4 The surface movement guidance control system shall be designed to assist in the prevention of inadvertent incursions of aircraft and vehicles onto an active runway.

8.2.5 The system shall be designed to assist in the prevention of collisions between aircraft, and between aircraft and vehicles or objects, on any part of the movement area.

8.2.6 Where a surface movement guidance and control system is provided by selective switching of stop bars and taxiway centre line lights in accordance with Regulation 7.6, the following requirements shall be met:

a) taxiway routes which are indicated by illuminated taxiway centre line lights shall be capable of being terminated by an illuminated stop bar;

b) the control circuits shall be 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.

8.2.7 Surface movement radar for the manoeuvring area shall be provided at an aerodrome intended for use in runway visual range conditions less than a value of 350 m and at other aerodromes when traffic density and operating conditions are such that traffic flow cannot safely be maintained by alternative procedures and facilities.

8.2.8 All vehicles entering the manouvering area shall be fitted with a transponder approved by the CAA. If, for any reason, a vehicle not suitably equipped with an approved transponder is required to enter the manouvering area, it shall be escorted by a vehicle equipped with an approved transponder.

8.3 Power Supply

8.3.1 Adequate primary power supply shall be available at aerodromes for the safe functioning of air navigation facilities.

8.3.2 The following aerodrome facilities shall be provided with a secondary power supply capable of supplying power when there is a failure of the primary power supply:

a) the signalling lamp and the minimum lighting necessary to enable air traffic services personnel to carry out their duties;

b) all obstacle lights which are essential to ensure the safe operation of aircraft;

c) approach, runway and taxiway lighting;

d) meteorological equipment;

e) essential security lighting, if provided in accordance with 8.5;

f) essential equipment and facilities for the aerodrome responding emergency agencies;

g) floodlighting on designated isolated aircraft parking positions, where provided; and

h) illumination of apron areas over which passengers may walk.

8.3.3 Electric power supply connections to those facilities for which secondary power is required shall be so arranged that the facilities are automatically connected to the secondary power supply on failure of the normal source of power.

8.3.4 The time interval between failure of the normal source of power and the complete restoration of the service shall be as short as practicable, except that for visual aids associated with non-precision, precision approach or take-off runways the requirements of Table 8-1 for maximum switch-over times shall apply.

8.3.5 Requirements for a secondary power supply should be met by either of the following:

a) 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

b) standby power unit(s), which are engine generators, batteries, etc., from which electric power can be obtained.

8.3.6 At an aerodrome where the primary runway is a non-instrument runway, a secondary power supply capable of meeting the requirements of Table 8-1 shall be provided, except that a secondary power supply for visual aids need not be provided when an emergency lighting system in accordance with the specification of ICAO Annex 14 Vol 1, para 5.3.2 is provided and is capable of being deployed in 15 minutes.

8.3.7 At an aerodrome where the primary runway is a non-precision approach runway, a secondary power supply shall be provided except that a secondary power supply for visual aids shall be provided for the non-precision approach runway in use.

Runway	Lighting aids requiring power	Max switch over time
Non instrument	PAPI	Secondary power supply recommended, with switch over time as short as possible
	Runway edge	
	Runway threshold	
	Runway end	
	Obstacle	
Non-precision approach	Approach light system	15 secs
	PAPI	15 secs
	Runway edge	15 secs
	Runway threshold	15 secs
	Runway end	15 secs
	Obstacle	15 secs
Precision approach category I	Approach light system	15 secs
	PAPI	15 secs
	PAPI (where approach is over hazardous or precipitous terrain)	1 sec
	Runway edge	15 secs
	Runway edge (where approach is over hazardous or precipitous terrain)	1 sec
	Runway threshold where runway centerline provided	15 secs
	Runway threshold where no runway centerline provided	15 secs
	Runway end	15 secs
	Essential taxiway	15 secs
	Obstacle	15 secs
Precision approach category II/III	Inner 300m of the approach light system	1 sec
	Other parts of the approach light system	15 secs
	Obstacle (that are essential to safety of flight operation)	15 secs
	Runway edge	15 secs
	Runway threshold	1 sec
	Runway end	1 sec
	Runway centre line	1 sec
	Runway touchdown zone	1 sec
	All stop bars	1 sec
	Essential taxiway	15 secs
Take-off runways (meant for take-off in RVR conditions less than 800m)	Runway edge	15 secs
	Runway end	1 sec
	Stopway	1 sec
	Runway centre line	1 sec
	All stop bars	1 sec
	Essential taxiway	15 secs
	Obstacle (that are essential to safety of flight operation)	15 secs

Table 8-1 Secondary power supply requirements

8.3.8 For a precision approach runway, a secondary power supply capable of meeting the requirements of Table 8-1 for the appropriate category of precision approach runway shall be provided. Electric power supply connections to those facilities for which secondary power is required shall be so arranged that the facilities are automatically connected to the secondary power supply on failure of the normal source of power.

8.3.9 For a runway meant for take-off in runway visual range conditions less than a value of 800m, a secondary power supply capable of meeting the relevant requirements of Table 8-1 shall be provided.

8.4 Electrical Systems

8.4.1 The design and provision of electrical power systems for aerodrome visual and radio navigation aids, including the power supply, lighting and control of the lighting systems included in table 9-1 shall be such that an equipment failure will not leave the pilot with inadequate visual guidance or misleading information.

8.4.2 Where the secondary power supply of an aerodrome is provided by the use of duplicate feeders, such supplies shall be physically and electrically separate so as to ensure the required level of availability and independence.

8.4.3 Where a runway forming part of a standard taxi-route is provided with runway lighting and taxiway lighting, the lighting systems shall be interlocked to preclude the possibility of simultaneous operation of both forms of lighting.

8.5 Monitoring

8.5.1 A system of monitoring visual aids shall be employed to ensure lighting system reliability. Where lighting systems are used for aircraft control purposes, such systems shall be monitored automatically so as to provide an immediate indication of any fault which may affect the control functions. This information shall be automatically relayed to the air traffic service unit.

8.5.2 For a runway meant for use in runway visual range conditions less than a value of 550m, the lighting systems detailed in Table 8-1 shall be monitored so as to provide an immediate indication when the service ability level of any element falls below the relevant minimum serviceability level specified in ICAO Annex 14 Vol 1 para 10.4.7. This information shall be immediately relayed to the maintenance crew.

8.5.3 For a runway meant for use in runway visual range conditions less than a value of 350m, the lighting systems detailed in Table 8-1 shall be monitored automatically to provide an immediate indication when the serviceability level of any element falls below the relevant minimum level specified in ICAO Annex 14 Vol 1 para 10.4.7 or other level specified by the Authority. This information shall be automatically relayed to the aerodrome controller and displayed in a prominent position.

8.6 Fencing

8.6.1 A fence or other suitable barrier shall be provided on an aerodrome to prevent the entrance to the movement area of both animals large enough to be a hazard to aircraft, and to deter the inadvertent or premeditated access of an unauthorized person onto the non-public area of the aerodrome. This shall include the barring of sewers, ducts, tunnels, etc., where necessary to prevent access. Suitable barriers shall be provided to prevent the access of unauthorized personnel to runways or taxiways which overpass public roads.

8.6.2 Suitable means of protection shall be provided to deter the inadvertent or premeditated access of unauthorized persons into ground installations and facilities essential for the safety of civil aviation located off the aerodrome. These means of protection shall be subject to approval by the Authority.

8.6.3 The fence or barrier shall 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. A cleared area of at least 3 m shall be provided on both sides of the fence or barrier to facilitate the work of patrols, and to make trespassing more

difficult by the removal of climbing aids such as trees, signs, lighting equipment and parked vehicles.

8.7 Security Lighting

8.7.1 Fencing and other barriers provided in accordance with Regulation 8.5 shall be illuminated at a minimum essential level to ensure the security of the boundary between public and non-public areas. At access points, and elsewhere as appropriate, lights shall be located so as to illuminate the ground area on both sides of the fence or barrier. Such lights shall not interfere with or detract from the effectiveness of aeronautical lights

8.8 Airport Design

8.8.1 Architectural and infrastructure-related requirements for the optimum implementation of international civil aviation security measures shall be integrated into the design and construction of new facilities and alterations to existing facilities at an aerodrome.

Chapter 9 EMERGENCY SERVICES

Reference: ICAO Annex 14, Ch 9; Doc 9137 Parts 1, 5, 7.

9.1 Aerodrome Emergency Planning

Note: Aerodrome emergency planning is the process of preparing an aerodrome to cope with an emergency at the aerodrome or in its vicinity. The objective or aerodrome emergency planning is to minimize the effects of an emergency, particularly in respect of saving lives, protecting the environment and maintaining air traffic.

9.1.1 An aerodrome emergency plan shall be established at an aerodrome, commensurate with the aircraft operations and other activities conducted at the aerodrome. The aerodrome emergency plan shall provide for the coordination of the actions to be taken in an emergency occurring at an aerodrome or in its vicinity.

9.1.2 The aerodrome emergency plan shall set forth the procedures for coordinating the response of various aerodrome and government agencies (or services) and of those agencies in the surrounding community that could be of assistance in responding to the emergency including:

a) air traffic services provider;

b) rescue and fire fighting services;

c) aerodrome administration;

d) medical and ambulance services;

e) aircraft operators;

f) security services

g) police.

h) fire departments;

i) hospitals;

j) defense forces

k) coast guard.

l) Government departments

m) Rescue Co-ordination Centre

9.1.3 The emergency plan shall observe Human Factors principles to ensure optimum response by all agencies participating in emergency operations.

9.1.4 The aerodrome emergency plan shall include plans for responding to emergencies including:

a) aircraft emergencies including aircraft accidents on or in the vicinity of the aerodrome;

b) sabotage including bomb threats;

c) unlawfully seized aircraft;

d) medical and public health emergencies;

e) dangerous goods occurrences;

f) building fires and failures of essential systems in terminal buildings;

g) extreme weather conditions and natural disasters.

9.1.5 The aerodrome emergency plan document shall include at least the following:

a) types of emergencies planned for;

b) agencies involved in the plan (both on and off the aerodrome) along with their telephone numbers and notification procedures;

c) responsibility and role of each agency, the emergency operations centre and the command post, for each type of emergency;

d) a clearly specified commander and chain of command and authority for each emergency specified and covering all phases of the emergency;

e) information on names and telephone numbers of offices or people to be contacted in the case of a particular emergency;

f) a list of pertinent on-aerodrome services available with telephone numbers and contact procedures;

g) copies of Memoranda of Understanding (MOUs) or agreements with other agencies for mutual aid and the provision of emergency services; and

h) Grid map(s) of the aerodrome and its immediate vicinity to appropriate scales.

9.1.6 A grid map of the aerodrome and its immediate vicinity shall be provided to the emergency response vehicle(s) normally providing first emergency response.

9.2 Medical Services and Equipment

Note: The objective is to ensure that sufficient emergency medical services are provided in accordance with the type and configuration of aircraft using the aerodrome and the volume of traffic. The nature and scale of the facilities and equipment required should be determined by a formal assessment taking into account the largest aircraft using the aerodrome and the external medical services and facilities available in emergency. Guidance on the provision of medical services and equipment may be found in Part 7 of the ICAO Airport Services Manual (Document 9137).

9.2.1 The aerodrome operator shall assess the level of medical supplies and emergency equipment to be held on the aerodrome for emergency purposes and shall seek the advice and cooperation of the Ministry of Health and responding ambulance services in establishing this level.

9.2.2 The aerodrome operator shall ensure that sufficient and appropriate ambulances operated by appropriately trained and qualified personnel and carrying sufficient medical supplies are available at all times when the aerodrome is available for use by aircraft. Such provision shall have regard for the ambulance facilities available in the area of the airport and their ability to meet within a reasonable time a sudden demand for assistance on the scale envisaged.

9.3 Emergency Operations Centre and Command Post

9.3.1 A fixed emergency operations centre and a mobile command post shall be available for use during an emergency. The emergency operations centre shall be a part of the aerodrome facilities and shall be responsible for the overall coordination and general direction of the response to an emergency.

9.3.2 The command post shall be a facility capable of being moved rapidly to the site of an emergency, when required, and shall undertake the local coordination of those agencies responding to the emergency.

9.3.3 The aerodrome operator shall assign a person to assume control of the emergency operations centre and, when appropriate, another person the command post.

9.3.4 Adequate communication systems linking the command post and the emergency operations centre with each other and with the participating agencies shall be provided in accordance with the plan and consistent with the particular requirements of the aerodrome and the external emergency services.

9.4 Aerodrome Emergency Exercise

9.4.1 The aerodrome emergency plan shall contain procedures for periodic testing of the adequacy of the plan and for reviewing the results in order to improve its effectiveness. Tests shall involve the participation of relevant agencies and associated resources.

9.4.2 The aerodrome emergency plan shall be tested by conducting:

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

b) a series of modular tests commencing in the first year and concluding in a full-scale aerodrome emergency exercise at intervals not exceeding three years; and reviewed thereafter, or after an actual emergency, so as to correct any deficiency found during such exercises or actual emergency.

Note: The purpose of a full-scale exercise is to ensure the adequacy of the plan to cope with different types of emergencies under a full range of operating conditions including operations at night and twilight and under reduced visibility. The purpose of a partial exercise is to ensure the adequacy of the response to individual participating agencies and components of the plan, such as the communications system. The purpose of modular tests is to enable concentrated effort on specific components of established emergency plans.

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

9.5 Rescue and Fire Fighting

Note: The principal objective of a rescue and firefighting service is to save lives in the event of an aircraft accident or incident occurring at, or in the immediate vicinity of, an 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.

The most important factors bearing on effective rescue in a survivable aircraft accident are: the training received, the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and fire fighting purposes can be put into use.

Requirements to combat building and fuel farm fires, or to deal with foaming of runways, are not taken into account within minimum equipment and media specifications in these Regulations. However, if the aerodrome operator chooses to deploy RFFS resources to any such incident, the operator shall ensure that this is without prejudice to the response time and minimum discharge rate objectives specified in these Regulations.

9.5.1 Rescue and firefighting equipment and services shall be provided at a certified aerodrome to at least the minimum standards detailed in these Regulations.

9.5.2 Public or private organizations, suitably located and equipped, may be designated to provide the rescue and firefighting service. The fire station housing these organizations shall be located on the aerodrome.

9.5.3 Where an aerodrome is located close to water, swampy areas, or difficult terrain, and where a significant portion of the approach or departure operations takes place over these areas, specialist rescue and firefighting services and equipment appropriate to the hazard shall be available. For aerodromes located close to water or swampy areas, as per the foregoing, sufficient rescue boats and lifesaving flotation equipment shall be kept available with a suitable means of deployment commensurate with the largest aeroplane normally using the aerodrome. The requirements for specialist services and equipment shall be assessed in accordance with ICAO Annex 14 Vol 1 para 18.4.

9.6 Level of Protection to be Provided

9.6.1 The level of protection provided at an aerodrome for rescue and firefighting shall be appropriate to the aerodrome category determined using the principles in 9.6.2.

9.6.2 The aerodrome category shall be determined from Table 9-1 and shall be based on the longest aeroplanes using the aerodromes and their fuselage width. In order to categorize the aeroplanes using the aerodrome, first evaluate their overall length and second, 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 9-1, column 3 for that category, then the category for that aeroplane shall actually be one category higher.

Aerodrome category	**Aeroplane overall length**	**Maximum Fuselage width**
(1)	(2)	(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 9-1 Aerodrome category for rescue and fire fighting

9.6.3 During anticipated periods of reduced activity, the level of protection available shall 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.

9.6.4 In the event of unforeseen temporary depletion in the level of RFF protection, whether by a reduction in media, vehicles or manpower available, the aerodrome operator shall inform the air traffic service provider and aircraft operators and take all necessary steps to restrict landings and take-offs by aircraft using the airport until the level required by Regulation 9.6.2 for those aircraft is restored.

9.7 Rescue and Fire Fighting Vehicles

9.7.1 The aerodrome operator shall undertake a study to determine the number, type, and specification of rescue and fire fighting vehicles appropriate to a certified aerodrome to enable it to meet at least the minimum response time and subsequent requirements as detailed in Regulation 9.10.

Characteristics	Vehicles up to 4500 L RFF category 1 and 2	Vehicles up to 4500 L RFF category 3 to 9	Vehicles over 4500 L
Monitor	Optional	Required	Required
Monitor design feature	High discharge capacity	High discharge capacity	High and low discharge capacity
Monitor range	Appropriate to longest aeroplane	Appropriate to longest aeroplane	Appropriate to longest aeroplane
Foam production whilst mobile (up to 8kph)	Required	Required	Required
Hand lines	Required	Required	Required
Under vehicle nozzles	Optional	Optional	Required
Bumper turret	Optional	Optional	Required
Acceleration to 80kph (minimum) at normal operating temperature	25sec	25sec	40sec
Top speed (minimum)	105kph	105kph	100kph
All-wheel drive capability	Required	Required	Required
Auto, or semi auto transmission	Required	Required	Required
Single rear wheel configuration	Preferred	Required	Required
Minimum angle of approach and departure	30°	30°	30°
Minimum angle of static tilt	30°	30°	28°

Table 9-2 Minimum characteristics for RFF vehicles

9.7.2 Rescue and fire fighting vehicles shall meet at least the minimum characteristics detailed in table 9.2. The number of operational fire fighting vehicles provided shall not be less than that specified in column (6) of Table 9-3.

9.8 Extinguishing Agents

9.8.1 Both principal and complementary agents shall be provided on vehicles at an aerodrome to at least the minimum quantities and discharge rates carried on the minimum number of vehicles as listed in table 9-3. The principal extinguishing agent shall be a foam meeting the minimum performance level B rating as given in the Airport Services Manual, Part 1, Chapter 8. The complementary agents shall comply with the appropriate specifications of the International Organization for Standardization (ISO).*

9.8.2 Extinguishing agents shall comply with the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level B. The amount of foam concentrate provided on a vehicle shall be sufficient to produce a least two loads of foam solution based on the quantities given in column (3) of Table 9-3.

Aerodrome category	Foam meeting performance level B			Complementary agents	Minimum number of rescue and fire fighting vehicles
	Water (l)	Foam Concentrate for 2 loads* (l)	Discharge rate foam solution/ minute (l)	Dry chemical powders (kg)	
(1)	(2)	(3)	(4)	(5)	(6)
1	230	28	230	45	1
2	670	81	550	90	1
3	1200	144	900	135	1
4	2400	288	1800	135	1
5	5400	648	3000	180	1
6	7900	948	4000	225	2
7	12100	1452	5300	225	2
8	18200	2184	7200	450	3
9	24300	2916	9000	450	3
10	32300	3876	11200	450	3

***Note: The quantity of foam concentrate is based upon that required to produce a 6% solution**

Table 9-3 Minimum extinguishing agents and vehicles

9.8.3 The complementary extinguishing agent shall be a dry chemical powder suitable for extinguishing hydrocarbon fires, and shall be compatible for use with foam. Alternative complementary agents having equivalent firefighting capability may be utilized with approval of the Authority. Dry chemical powders shall only be substituted with an agent that has equivalent or better firefighting capabilities, for all types of fires where complementary agent is expected to be used.

9.8.4 A reserve supply of foam concentrate and complementary agent, equivalent to 200 per cent of the quantities of these agents in accordance with Table 9-3 shall be maintained on the aerodrome for vehicle replenishment purposes. Category 1 and 2 aerodromes that have replaced up to 100 per cent of the water with complementary agent shall hold a reserve supply of complementary agent of 200 per cent.

9.8.5 Supplementary water supplies, for the expeditious replenishment of rescue and fire fighting vehicles at the scene of an aircraft accident shall be provided. Such water supplies shall be capable of replenishing fire foam vehicles at an aircraft accident scene such that the flow of foam onto the aircraft is continuous for the expected duration for which firefighting can be reasonably anticipated. Supplementary water supplies should be provided by the provision of auxiliary water tank vehicles and/or other suitable means.

9.9 Rescue Equipment

9.9.1 Rescue equipment commensurate with the level of aircraft operations which is manufactured and maintained to an appropriate standard shall be provided on the rescue and fire fighting vehicle(s), and shall be not less than that indicated in Table 9-4. Guidance on the rescue equipment provided at an aerodrome is given In the Aerodrome Services Manual (Doc 9137), Part 1.

Equipment	Airport RFF Category			
	1-2	3-5	6-7	8-10
Adjustable wrench	1	1	1	1
Rescue axe, large non-wedge type	–	1	1	2
Rescue axe, small non-wedge type	1	2	4	4
Bolt cutter, 61cm	1	1	1	1
Crowbar, 95 cm	1	1	1	2
Crowbar, 1.65 cm	1	1	1	2
Cold chisel, 2.5cm	1	1	2	2
Flashlight/hand lamps	2	3	4	8
Hammer, 1.8kg	–	1	1	1
Grab or salvaging hook	1	1	2	3
Metal cutting saw, or hacksaw, heavy duty, complete with spare blades	1	1	1	1
Fire resistant blanket	1	1	2	3
Extending ladder, of overall length appropriate to the aircraft types in use	1	1	2	3
Rope line, 45m length	1	1	2	2
Rope line, 30m length	1	1	2	2
Rope line, Pocket 6m	One per operational fire fighter			
Side cutting pliers, 17.8cm	1	1	1	1
Slip joint pliers, 25cm	1	1	1	1
Assorted screwdrivers, set	1	1	1	1
Tin snippers	1	1	1	1
Chocks, 15cm high	–	–	1	1
Chocks, 10cm high	1	1	–	–
Powered rescue saw complete with 2 blades	1 of either	1 of either	1 of either	1
Pneumatic rescue chisel complete, plus spare cylinder, chisel and retaining clip				1
Seat belt/harness cutting tool	1	2	3	4
Flame resistant gloves, pairs	2	3	4	8
Breathing apparatus, including cylinder	One set per fire fighter on duty			
Spare cylinder for breathing apparatus	One per fire fighter on duty			
Oxygen inhaler	–	1	1	1
Hydraulic or pneumatic forcing tool	–	1	1	1
Medical first aid kit	1	1	2	3
Tarpaulin	1	1	2	3
Ventilation/cooling fan	–	1	2	3
Stretcher	1	2	2	2
Protective clothing	One set per fire fighter on duty			

Table 9-4 Minimum list of rescue equipment to be carried on RFF vehicles

9.10 Response Time

9.10.1 The rescue and firefighting service shall be able to achieve and consistently demonstrate response times not exceeding two minutes to the ends of each runway, and not exceeding three minutes to any other part of the movement area in optimum visibility and surface conditions. Response time is interpreted as the time between the initial call to the rescue and firefighting service, and the time when the first responding vehicle(s) is (are) in position to apply foam at a rate of at least 50 per cent of the discharge rate specified in Table 9-3.

9.10.2 To meet the operational objective as nearly as possible in less than optimum conditions of visibility, especially during low visibility operations, suitable guidance, equipment and/or procedures for rescue and firefighting services shall be provided.

9.10.3 Any vehicles, other than the first responding vehicle(s), required to deliver the amounts of extinguishing agents specified in Table 9-3 shall ensure continuous agent application and shall arrive no more than four minutes from the initial call. Any vehicles, other than the first responding vehicles(s), required to deliver the amounts of extinguishing agents specified in Table 9-3 should ensure continuous agent application and should arrive no more than three minutes from the initial call.

9.10.4 A system of preventive maintenance of rescue and fire fighting vehicles and rescue equipment shall be employed to ensure effectiveness of the equipment and compliance with the specified response time throughout the life of the vehicle.

9.11 Emergency Access Roads

9.11.1 Emergency access roads shall 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 1000m from the threshold, or at least within the aerodrome boundary. Where a fence is provided, the need for convenient access to outside areas shall be taken into account. Aerodrome service roads may serve as emergency access roads when they are suitably located and constructed.

9.11.2 Emergency access roads shall be capable of supporting the heaviest vehicles which will use them and be usable in all weather conditions. Roads within 90m of a runway shall be surfaced to prevent surface erosion and the transfer of debris to the runway. Sufficient vertical and horizontal clearance shall be provided from overhead and roadside obstructions for the largest vehicles.

9.11.3 When the surface of the road is indistinguishable from the surrounding area, or additional guidance is necessary to indicate the edge or corner of the road, edge markers shall be placed at intervals of about 10m.

9.12 Fire Stations

9.12.1 All operational rescue and fire fighting vehicles shall be housed in a fire station. Satellite fire stations shall be provided whenever the response time cannot be achieved from a single fire station. The fire station shall be located so that the access for rescue and fire fighting vehicles into the runway area is direct and clear, requiring a minimum number of turns.

9.13 Communication and Alerting Systems

9.13.1 A discrete communication system should be provided linking a fire station with the control tower, any other fire station on the aerodrome and the rescue and fire fighting vehicles.

9.13.2 An alerting system for rescue and firefighting personnel, capable of being operated from that station, shall be provided at a fire station, any other fire station on the aerodrome and the aerodrome control tower.

9.14 Personnel

9.14.1 All rescue and firefighting personnel shall meet the medical and physical standards as described in Appendix D.

9.14.2 All rescue and firefighting personnel shall be properly trained to perform their duties in an efficient manner and shall 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 fuel fires. RFF personnel shall be under the direction of a designated chief of emergency crew. Sufficient numbers of personnel shall receive driving instruction in off-road and soft ground techniques to ensure that at any time every designated driver of an operational RFF vehicle is so trained. Sufficient numbers of personnel shall receive instruction in water borne rescue and boat handling techniques to ensure that at any time every designated crew member of an operational rescue boat is so trained.

9.14.3 The rescue and firefighting personnel training program shall include training in human performance, including team coordination.

9.14.4 During flight operations, sufficient trained and competent personnel shall be designated to be readily available to ride the rescue and fire fighting vehicles and to operate the equipment at maximum capacity. These personnel shall be deployed in a way that ensures that minimum response times as detailed in Regulation 9.10.1 riding at least the number of vehicles specified in column (6) of Table 9-3 can be achieved, and that continuous agent application at the rate specified in Table 9-3 can be fully maintained. When appropriate, personnel shall be competent in the use of hand lines, ladders and other rescue and firefighting equipment associated with aircraft rescue and firefighting operations.

9.14.5 The aerodrome operator shall submit to the Authority analyses and plans for the minimum number of trained personnel to be on duty for each airport RFF category to be provided. Such analyses and plans shall include sufficient personnel for:

a) Management of the RFF personnel and fire station;

b) Duty RFF watch command supervision;

c) Duty RFF vehicle crew command supervision for each operational major RFF vehicle and rescue boat, where a rescue boat is provided;

d) Duty operating crew of each operational RFF vehicle and rescue boat, where a rescue boat is provided;

e) Duty operating crew of supplementary water vehicles and facilities;

f) Duty control room or communications facility crew where the facility is operated by and/or serving the RFF services;

g) Duty operational crew to form appropriate breathing apparatus team(s), complete with breathing apparatus control officer(s) appropriate to the size and type of aircraft using the aerodrome.

h) Duty operational crew of ambulances where ambulances are provided by the aerodrome under the aerodrome emergency plan.

9.14.6 The types of aircraft using the aerodrome, and types and operation of the rescue and fire fighting vehicles shall be taken into account when determining the number of personnel required to be provided for rescue and firefighting. The aerodrome operator shall take account of the operating systems and methodology of all RFFS equipment and the number and type of vehicles in use when determining the minimum number of RFF personnel to be on duty for any given RFF category. In so doing supervisory RFF personnel shall not be included in the minimum number of operating personnel for any vehicle. The level of staffing shall be documented in the Aerodrome Manual.

9.14.7 All responding rescue and firefighting personnel shall be provided with suitable protective clothing and respiratory equipment to enable them to perform their duties in an effective manner. Protective clothing and respiratory equipment shall be inspected and maintained in accordance with the manufacturers' instructions.

9.15 Disabled Aircraft Removal

9.15.1 The aerodrome operator shall establish a plan, in consultation with aircraft owners and operators, for the removal of an aircraft disabled on, or adjacent to, the movement area, and a coordinator designated to implement the plan, when necessary. The disabled aircraft removal plan shall be based on the characteristics of the aircraft that may normally be expected to operate at the aerodrome, and include:

a) a list of equipment and personnel on, or in the vicinity of, the aerodrome which would be available for such purpose;

b) arrangements for the rapid receipt of aircraft recovery equipment kits available from other aerodromes;

c) a list of nominated agents acting on behalf of each aircraft operator at the aerodrome;

d) a statement of the aircraft operator arrangements for the use of pooled specialist equipment; and

e) a list of local contractors (with contacts and telephone numbers) with suitable removal equipment for hire.

f) plans for the offloading of baggage, cargo and fuel in situ.

g) procedures for the protection of evidence, custody and removal of the aircraft, its equipment and contents in support of accident and incident investigations.

9.15.2 All major users of the aerodrome shall be informed of the preparations and capabilities contained within the disabled aircraft removal plan. The designated coordinator shall be made known to all aircraft owners, operators and their nominated agents.

Chapter 10 AERODROME SERVICES

Reference: ICAO Annex 14, Ch 9 and 10; Doc 9137 Part 2; Doc 9157 Part 2; Doc 9683.

10.1 Maintenance Program

10.1.1 A maintenance program including preventive maintenance where appropriate shall be established at an aerodrome to maintain facilities in a condition which does not impair the safety, regularity or efficiency of air navigation. Details of such a program shall be outlined in the aerodrome manual. "Facilities" are intended to include, but are not limited to, such items as pavements, prepared surfaces, visual aids, fencing, drainage and electrical systems and buildings.

10.1.2 The design and application of the maintenance program shall observe Human Factors principles and comply with the aerodrome's safety management system.

10.2 Pavements Maintenance

10.2.1 The surfaces of all movement areas including pavements (runways, taxiways, and aprons and adjacent areas) shall be inspected and their conditions monitored regularly as part of an aerodrome preventive and corrective maintenance programme with the objective of avoiding and eliminating any foreign object debris (FOD) that might cause damage to aircraft or impair the operation of aircraft systems. The surface of a runway shall be maintained in a condition such as to preclude formation of harmful irregularities.

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

10.2.3 Runway surface friction characteristics for maintenance purpose shall be measured at least every four months (the frequency of these measurements shall be sufficient to determine the trend of the surface friction characteristics of the runway) with a continuous friction measuring device using self-wetting features and documented. The friction characteristics shall also be measured after runway overlay renewal or repair and following incidents or reports of reduced friction from aircraft operators.

10.2.4 Corrective maintenance action shall be programmed when either the average coefficient of friction for the entire runway, or a portion of the runway of 100m in length or more, is below the maintenance planning level specified in column 3 of table 5-5. E1 Immediate corrective maintenance action, and if appropriate notification action, shall be taken when the average coefficient of friction for the entire runway, or a portion of the runway of 100m in length or more, is below the minimum friction level specified in column 4 of table 5-5. E1

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

10.2.6 When a taxiway is used by turbine-engined aeroplanes the surface of the taxiway shoulders shall be maintained so as to be free of any loose stones or other objects that could be ingested by the aeroplane engines.

10.2.7 Dust, sand, oil, standing water, rubber deposits and other contaminants shall be removed from the surface of runways in use as rapidly and completely as possible to minimize accumulation. This may be as part of a preventative maintenance program including sweeping and/or in response to inspection reports.

10.2.8 Maintenance procedures shall not require the use of substances that may damage the surface of a runway, taxiway or other paved area in a manner that may affect safety.

10.3 Runway Pavement Overlays

10.3.1 Regulations 10.3.2 to 10.3.5 shall apply whenever a runway is to be returned temporarily to operational service before resurfacing is complete. This may necessitate a temporary ramp between the new and old runway surfaces.

10.3.2 The longitudinal slope of the temporary ramp shall be between 0.5 per cent and 1.0 per cent measured with reference to the existing runway surface or previous overlay course for overlays up to 5cm in thickness and shall not exceed 1.0 per cent for thicker overlays.

10.3.3 Overlaying shall proceed from one end of the runway toward the other end so that based on runway utilization most aircraft operations will experience a down ramp.

10.3.4 The entire width of the runway shall be overlaid during each work session, and the overlay should be constructed and maintained above the minimum friction level specified by the CAA.

10.3.5 Before a runway being overlaid is returned to a temporary operational status a runway centre line marking shall be provided in accordance with Regulation 6.2. Additionally, the location of any temporary threshold shall be identified by either a 3.6 m minimum width transverse stripe or suitable markers.

10.4 Visual Aids Maintenance

10.4.1 A system of preventive maintenance of visual aids shall be employed to ensure lighting and marking system reliability

10.4.2 The system of preventive maintenance shall be so designed and implemented as to meet the performance level objectives for visual aids set out in Regulations 10.5.3 to 10.5.12 A light shall be deemed unserviceable when its intensity falls to meet the criteria set out in para 10.5.1 of ICAO Annex 14 Vol 1.

10.4.3 The system of preventive maintenance employed for a precision approach runway category II or III shall have the objective that, during any period of category II or III operations, all approach and runway lights are serviceable, and that in any event at least:

a) 95 per cent of the lights are serviceable in each of the following particular significant elements:
   i) precision approach category II and III lighting system, the inner 450 m;
   ii) runway centre line lights;

iii) runway threshold lights; and

iv) runway edge lights;

b) 90 per cent of the lights are serviceable in the touchdown zone lights;

c) 85 per cent of the lights are serviceable in the approach lighting system beyond 450 m; and

d) 75 per cent of the lights are serviceable in the runway end lights.

10.4.4 In order to provide continuity of guidance, the allowable percentage of unserviceable lights in a system listed in 11.4.3, shall not be permitted in such a way as to alter the basic pattern of the lighting system. Additionally, an unserviceable light shall not be permitted adjacent to another unserviceable light, except in a barrette or a crossbar where two adjacent unserviceable lights may be permitted.

10.4.5 For the purpose of these Regulations and with respect to barrettes, crossbars and runway edge lights:

a) lights shall be considered to be adjacent if located consecutively, and

b) laterally: in the same barrette or crossbar; or

c) longitudinally: in the same row of edge lights or barrettes.

10.4.6 The system of preventive maintenance employed for a stop bar provided at a runway-holding position used in conjunction with a runway intended for operations in runway visual range conditions less than a value of 350 m shall have the following objective:

a) no more than two lights will remain unserviceable; and

b) two adjacent lights will not remain unserviceable unless the light spacing is significantly less than that specified.

10.4.7 The system of preventive maintenance employed for a taxiway intended for use in runway visual range conditions less than a value of 350 m shall have as its objective that no two adjacent taxiway centre line lights be unserviceable.

10.4.8 The system of preventive maintenance employed for a precision approach runway category I shall have as its objective that, during any period of category I operations, all approach and runway lights are serviceable, and that in any event at least 85 per cent of the lights are serviceable in each of the following:

a) precision approach category I lighting system;

b) runway threshold lights;

c) runway edge lights; and

d) runway end lights.

10.4.9 In order to provide continuity of guidance, an unserviceable light shall not be permitted adjacent to another unserviceable light.

10.4.10 The system of preventive maintenance employed for a runway intended for take-off in runway visual range conditions less than a value of 550 m shall have as its objective that all runway lights are serviceable, and that in any event at least:

a) 95 per cent of the lights are serviceable in the runway centre line lights and runway edge lights; and

b) 75 per cent of the lights are serviceable in the runway end lights.

10.4.11 The system of preventive maintenance employed for a runway intended for take-off in runway visual range conditions of 550 m or greater shall have as its objective that all runway lights are serviceable, and that in any event at least 85 per cent of the lights are serviceable in the runway edge lights; and runway end lights.

10.5 Wildlife Hazard Reduction

10.5.1 The wildlife strike hazard on, or in the vicinity of, an aerodrome shall be assessed through the recording of wildlife strikes to aircraft and the collection of information from aircraft operators, airport personnel, and other sources etc. on the presence of birds on or around the aerodrome constituting a potential hazard to aircraft operations and an ongoing evaluation of the wildlife hazard by competent personnel.

10.5.2 In the event of a wildlife strike, or a near miss, a wildlife strike occurrence report form shall be completed by the tower controller and submitted (as soon as possible, but in any case within 48 hours) to the Authority's Air Transport Directorate for further action. The reporting process shall comply with The ICAO Bird Strike Information System (IBIS) that is designed to collect and disseminate information on bird strikes to aircraft.

10.5.3 The aerodrome operator shall take appropriate action to reduce the risk to aircraft operations by adopting measures to minimize the likelihood of collisions between wildlife and aircraft. .

10.5.4 Garbage disposal dumps or any such other source which may attract wildlife to the aerodrome, or its vicinity, shall be eliminated or their establishment prevented, unless an aeronautical study incorporating a wildlife assessment indicates that they are unlikely to create conditions conducive to a wildlife hazard problem. Where the elimination of existing sites is not possible, the aerodrome operator shall ensure that any risk to aircraft posed by these sites is assessed and reduced to as low as reasonably practicable.

10.6 Apron Management Service

10.6.1 An appropriate apron management service shall, when warranted by the volume of traffic and operating conditions, be provided on an apron by the aerodrome operator in order to:

a) regulate movement with the objective of preventing collisions between aircraft, and between aircraft and obstacles;

b) regulate entry of aircraft into, and coordinate exit of aircraft from, the apron with the aerodrome control tower; and

c) ensure safe and expeditious movement of vehicles and appropriate regulation of other activities.

10.6.2 When the aerodrome control tower does not directly participate in the apron management service, procedures shall be established to facilitate the orderly transition of aircraft between the apron management unit and the aerodrome control tower.

10.6.3 An apron management service shall be provided with radiotelephony communications facilities.

10.6.4 Where low visibility procedures are in effect, persons and vehicles operating on an apron shall be restricted to the essential minimum.

10.6.5 An aircraft stand shall be visually monitored to ensure that the recommended clearance distances are provided to an aircraft using the stand.

10.7 Aerodrome Vehicle Operations

10.7.1 An emergency vehicle responding to an emergency shall be given priority over all other surface movement traffic on an apron.

10.7.2 Roads located on the movement area shall be restricted to the exclusive use of aerodrome personnel and other authorized persons, and access to the public buildings by an unauthorized person shall not require use of such roads.

10.7.3 A vehicle shall be operated:

a) on a manoeuvring area only as authorized by the aerodrome control tower and;

b) on an apron only as authorized by the appropriate designated authority.

10.7.4 A vehicle operating on an apron shall:

a) give way to an emergency vehicle; an aircraft taxiing, about to taxi, or being pushed or towed; and

b) give way to other vehicles in accordance with local regulations.

10.7.5 The driver of a vehicle on the movement area shall comply with all mandatory instructions conveyed by markings and signs unless otherwise authorized by:

a) the aerodrome control tower when on the manoeuvring area; or

b) the appropriate designated authority when on the apron.

10.7.6 The driver of a vehicle on the movement area shall comply with all mandatory instructions conveyed by lights.

10.7.7 The driver of a vehicle on the movement area shall hold a CAA driving license, be appropriately trained for the tasks to be performed and shall hold an airport driving permit.

10.7.8 The driver of a vehicle on the movement area shall comply with the instructions issued by:

a) the aerodrome control tower, when on the manoeuvring area; and

b) the appropriate designated authority, when on the apron.

10.7.9 The driver of a radio-equipped vehicle shall establish satisfactory two-way radio communications with the aerodrome control tower before entering the manoeuvring area and with the appropriate designated authority before entering the apron. The driver shall maintain a continuous listening watch on the assigned frequency when on the manoeuvring area.

10.8 Ground Servicing of Aircraft

10.8.1 Fire extinguishing equipment suitable for at least initial intervention in the event of a fuel fire and personnel trained in its use shall be readily available during the ground

servicing of an aircraft, and there shall be a means of quickly summoning the emergency response service in the event of a fire or major fuel spill.

10.8.2 When aircraft refuelling operations take place while passengers are embarking, on board or disembarking, ground equipment shall be positioned so as to allow:

a) the use of a sufficient number of exits for expeditious evacuation; and

b) a ready escape route from each of the exits to be used in an emergency.

10.9 Marking and/or lighting of objects

10.9.1 The presence of objects which must be lighted, as specified in ICAO Annex 14 6.1, shall be indicated by low-, medium- or high-intensity lights, or a combination of such lights.

10.9.2 Low-intensity obstacle lights, Types A, B, C and D, medium-intensity obstacle lights, types A, B and C, high-intensity obstacle lights Type A and B, shall be in accordance with the specifications in Table 6-3 and Appendix 1 of ICAO Annex 14.

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

10.9.4 All mobile objects to be marked shall be coloured or display flags.

10.9.5 When mobile objects are marked by colour, a colour scheme approved by the CAA shall be used.

10.9.6 Flags used to mark mobile objects shall be displayed around, on top of, or around the highest edge of the object. Flags shall not increase the hazard presented by the object they mark.

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

10.9.8 Low intensity obstacle lights, Type C, shall be displayed on vehicles and other mobile objects excluding aircraft. Low intensity obstacle lights, Type C, displayed on vehicles associated with emergency or security shall be flashing-blue and those displayed on other vehicles shall be flashing-yellow. Low intensity obstacle lights, type D, shall be displayed on follow-me vehicles.

10.9.10 Low intensity obstacle lights on objects with limited mobility such as aerobridges shall be fixed-red, and as a minimum be in accordance with the specifications for low-intensity obstacle lights, type A, in table 6-3. The intensity of the lights shall be sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general levels of illumination against which they would normally be viewed.

10.10 Fixed objects

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

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

10.10.3 An object shall be coloured to show alternating contrasting bands if:

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

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

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

10.10.4 An object shall be coloured in a single conspicuous colour if its projection on any vertical plane has both dimensions less than 1.5 m. Orange or red should be used, except where such colours merge with the background.

10.10.5 Marking by Flags.

Flags used to mark fixed objects shall be displayed around, on top of, or around the highest edge of the object. When flags are used to mark extensive objects or a group of closely spaced objects, they shall be displayed at least every 15 m. Flags shall not increase the hazard presented by the object they mark. Flags used to mark fixed objects shall not be less than 0.6 m on each side. Flags used to mark fixed objects should be orange in colour or a combination of two triangular sections, one orange and the other white, or one red and the other white, except that where such colours merge with the background, other conspicuous colours should be used.

10.10.6 Lighting

In case of an object to be lighted one or more low-, medium- or high-intensity obstacle lights shall be located as close as practicable to the top of the object. In the case of a chimney or other structure of like function, the top lights should be placed sufficiently below the top so as to minimize contamination by smoke etc.

10.10.7 In the case of a tower or antenna structure indicated by high-intensity obstacle lights by day with an appurtenance, such as a rod or an antenna, greater than 12 m where it is not practicable to locate a high intensity obstacle light on top of the

appurtenance, such a light shall be located at the highest practicable point and, if practicable, a medium-intensity obstacle light, type A, mounted on the top.

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

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

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

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

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

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

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

Appendix A: Application for Aerodrome Certificate

KINGDOM OF BAHRAIN
Ministry of Transportation and Telecommunications

مملكة البحرين
وزارة المواصلات والاتصالات

Application for the Grant of an Aerodrome Certificate

NAME:

ADDRESS:

DATE OF APPLICATION:

LIST OF SUPPORTING DOCUMENTS:
Include location data, intended operator(s) and intended purpose, aerodrome manual etc.

ACCOUNTABLE PERSON:

On behalf of the applicant named above, I hereby certify that the information contained in this application is true and complete.

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Name Date

Position

Contacts

Appendix B: Aerodrome Certificate

Part 1 - AERODROME CERTIFICATE

KINGDOM OF BAHRAIN
Ministry of Transportation and Telecommunications

مملكة البحرين
وزارة المواصلات والاتصالات

Certificate Number

Name of the Aerodrome

Aerodrome Reference Point

Aerodrome Operator

This Aerodrome Certificate is issued by the Bahrain Civil Aviation Affairs (the Authority) in pursuance of its obligation to enforce the Civil Aviation Laws and Regulations in accordance with accepted international standards at aerodromes that serve international air traffic within the Kingdom of Bahrain. The Authority hereby certifies that the above named aerodrome is in acceptable compliance with the Civil Aviation Regulation 001 (CAR 001 – Aerodrome Standards & Certification Regulations) except as noted in Part II of this Certificate “Deviation from Standards”.

Conditions and Special Procedures applicable to this Aerodrome Certificate are listed in Part III.

This Certificate may be amended, suspended or withdrawn at any time by the Authority in the event of failure of the aerodrome operator to with Regulations and/or applicable Conditions or Special Procedures.

The validity of this Certificate is based on the information contained in the approved Aerodrome manual and continued operation in compliance with Regulations. The certificate shall remain in force for 5 years from the date of issue unless amended, suspended or withdrawn.

Date of Issue:

Part II – Deviation from Standards

KINGDOM OF BAHRAIN
Ministry of Transportation and Telecommunications

مملكة البحرين
وزارة المواصلات والاتصالات

Name of the Aerodrome

Aerodrome Reference Point

The following deviations from standards have been accepted by the Authority, subject to the conditions stipulated in Part III of this Certificate:

Authorised Signature: Date:

KINGDOM OF BAHRAIN
Ministry of Transportation and Telecommunications

مملكة البحرين
وزارة المواصلات والاتصالات

PART III – Conditions and Special Procedures

The Authority certifies the above named aerodrome as an aerodrome to be used as a place of take-off and landing of aircraft engaged in international flights, subject to the following conditions.

General Conditions:

1. The aerodrome is licensed for international civil air traffic operations and shall at all times when it is available for the take-off or landing of aircraft be so available to all persons on equal terms and conditions except as directed by the Authority.

2. No aircraft shall take-off or land at the aerodrome unless such fire-fighting and rescue services and such medical services and equipment as are required in respect of such an aircraft in the Regulations are provided there. Such services and equipment shall at all times when the aerodrome is available for the take-off or landing of aircraft be kept fit and ready for immediate turnout.

3. Changes in the physical characteristics of the aerodrome including the erection of new buildings and alterations to existing buildings or to visual aids shall not be made without prior approval of the Authority.

4. The Certificate holder shall, by the quickest means available, notify the Authority of any material change in the surface of the landing area, or in the obstruction characteristics of the approach, take-off or circuit in relation to the aerodrome.

5. The aerodrome is approved for the take-off and landing of aircraft at night. Such systems of lighting appropriate to the Category of Runway in use as described in the Regulations shall be in operation at all times when aircraft are taking-off or landing at the aerodrome at night, provided that minor temporary unserviceability, not of a character likely to affect the safety of operations, shall not prelude the take-off or landing of aircraft.

6. The Certificate holder shall inform the Authority of the times during which the aerodrome is to be generally available for the take-off or landing of aircraft, and of any changes in those times, and whether the aerodrome is to be available by arrangement with the Certificate holder outside those times.

KINGDOM OF BAHRAIN
Ministry of Transportation and Telecommunications

مملكة البحرين
وزارة المواصلات والاتصالات

7. Without prejudice to condition 1, nothing in this Certificate shall be taken to confer on any person the right to use the aerodrome without the consent of the Certificate holder,

8. Expressions used in this certificate shall have the same respective meanings as in the Regulations.

Special Conditions and Procedures

(Conditions applying to operators relating to any accepted deviations in Part II – Deviations from standards)

Authorized Signatory _____ Date _____

Appendix C: Schedule of Particulars to be Included in an Aerodrome Manual

Part 1 GENERAL

C1.1 Purpose and scope of the manual;

C1.2 Legal requirements for an aerodrome certificate and the manual as prescribed in the Aerodrome Standards and Certification Regulations;

C1.3 Conditions for use of the aerodrome;

C1.4 The system provided for generating and updating aeronautical information and the arrangements for its promulgation;

C1.5 The system for recording aircraft movements; and

C1.6 Obligations of the Aerodrome Operator in accordance with Chapter 4 of these Regulations.

C1.7 Procedure for distributing the manual.

C1.8 Procedure for determination of the requirement to amend the manual, and the procedure for the amendment of the manual.

Part 2 PARTICULARS OF THE AERODROME SITE

C2.1 General information pertaining to the aerodrome including, as a minimum, the particulars specified in C2.2 to C2.4 inclusive;

C2.2 A plan or plans to a suitable scale (1:2500 or 1:5000) of the aerodrome showing the main aerodrome facilities for the operation of the aerodrome including, particularly, the location of each wind direction indicator and the aerodrome boundaries;

C2.3 A plan or plans showing the distance of the aerodrome from the nearest city, town or other populous areas, and the location of any aerodrome facilities and equipment outside the boundaries of the aerodrome; and

C2.4 Particulars of the title of the aerodrome site; or if the boundaries of the aerodrome are not defined in the documents of the title, particulars of title of, or interest in, the property on which the aerodrome is located and a plan showing the boundaries and position of the aerodrome.

Part 3 PARTICULARS OF THE AERODROME REQUIRED TO BE REPORTED TO AERONAUTICAL INFORMATION SERVICE (AIS)

C3 Note 1: Accuracy of the information in Part 3 is critical to aircraft safety. Information requiring engineering survey and operational assessment should be gathered or verified by suitably qualified technical persons.

C3 *Note 2: Information shall conform to Data Quality Standards detailed in ICAO Annexes 14 and 15.*

C3.1 GENERAL INFORMATION

C3.1.1 Name of the aerodrome;

C3.1.2 Location of the aerodrome;

C3.1.3 Geographical co-ordination of the Aerodrome Reference Point determined in terms of World Geodetic System 1984 (WGS-84) reference datum;

C3.1.4 Aerodrome elevation and geoid undulation;

C3.1.5 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;

C3.1.6 Aerodrome reference temperature;

C3.1.7 Details of the aerodrome beacon; and

C3.1.8 Name of the aerodrome operator and the postal address, telephone numbers and e-mail addresses at which the aerodrome operator may be contacted at all times.

C3.2 AERODROME DIMENSIONS AND RELATED INFORMATION

C3.2.1 Runway true bearing, magnetic variation, including the source and means of calculation and updating the variation, designation number, length, width, strength (PCN), including means of calculation of PCN, displaced threshold location, slope, surface type, type of runway including operational minima, and for a precision approach runway, the existence of an obstacle free zone;

C3.2.2 Length, width and surface type of strip, runway shoulders, runway end safety areas, stopways, including strength of shoulders and stopways;

C3.2.3 Locations and means of control of all road access points to all runways;

C3.2.4 Length, width, strength and surface type of taxiways;

C3.2.5 Apron surface type and strength, and aircraft stands;

C3.2.6 Clearway length, width and ground profile;

C3.2.7 Visual aids for approach procedures i.e. approach lighting type and precision approach path indicator system (PAPI); marking and lighting of runways, taxiways, aprons, and airside roads; other visual guidance and control aids on taxiways (including runway holding positions, intermediate holding positions and stop bars),

aprons, and airside roads, location and type of visual docking guidance system; availability of standby power for lighting and aerodrome services;

C3.2.8 Location and radio frequency of VOR aerodrome checkpoints;

C3.2.9 Location and designation of standard taxi-routes;

C3.2.10 The geographical co-ordinates of each threshold;

C3.2.11 The geographical co-ordinates of appropriate taxiway centre line points;

C3.2.12 The geographical co-ordinates of each aircraft stand;

C3.2.13 The geographical co-ordinates and the top elevation of significant obstacles in the approach and take-off areas, transitional surface area, in the circling area and in the vicinity of the aerodrome. (The information should be shown in the form of charts as required for the preparation of aeronautical information publications as specified in Annexes 4 and 15 to the Convention of International Civil Aviation);

C3.2.14 Pavement surface type and bearing strength using Aircraft Classification Number - Pavement Classification Number (ACN-PCN) method;

C3.2.15 One or more pre-flight altimeter check locations established on an apron and their elevation;

C3.2.16 Declared distances, and the means of calculation thereof, including the correction factors applied in accordance with Regulation 5.2:

a) take-off run available (TORA);

b) take-off distance available (TODA);

c) accelerate-stop distance available (ASDA);

d) landing distance available (LDA);

C3.2.17 Disabled aircraft removal plan, including:

a) the telephone, telex, facsimile numbers, and e-mail address of the aerodrome coordinator for the removal of a disabled aircraft;

b) information on the capability to remove a disabled aircraft - expressed in terms of the largest type of aircraft which the aerodrome is equipped to remove.

C3.2.18 Rescue and fire fighting:

a) level of protection, expressed in terms of the category of the rescue and fire fighting services which should be in accordance with the longest aeroplane normally using the aerodrome;

b) the type and amounts of extinguishing agents normally available at the aerodrome;

c) The type and operational details of RFF vehicles normally available at the aerodrome;

Part 4 PARTICULARS OF THE AERODROME OPERATING PROCEDURES AND SAFETY MEASURES

C4.1 INTRODUCTION

C4.1.1 Prior to applying for an aerodrome certificate or an amendment to a valid certificate the aerodrome operator shall undertake an assessment of the hazards associated with operating the aerodrome. A synopsis of the hazards identified and the proposed methods to control the risks arising from such hazards shall be presented in the aerodrome manual. The hazard assessment shall be reviewed on a regular basis and before any proposals for significant changes to aerodrome operations, facilities or physical characteristics are submitted to the Authority for consideration. Where appropriate the hazard assessment shall be supported by an aeronautical study.

C4.1.2 Particulars of operating procedures and safety measures shall be provided for each of the categories set out in C4.2 to C4.17 as a minimum. In writing the procedure for each category, clear and precise information should be included on:

a) when, or in what circumstances, is an operating procedure to be activated;

b) how is each operating procedure activated, and by whom;

c) a summary of any hazards associated with the procedure, and the methods to control the risks arising from such hazards;

d) actions to be taken;

e) the person responsible for the procedure and the actions

f) the person(s) to carry out the actions; and

g) equipment, and access to such equipment, necessary for carrying out the actions.

C4.1.3 If any of the procedures specified in C4.2 to C4.17 is not relevant or applicable, the reason should be given.

C4.2 AERODROME REPORTING

C4.2.1 Particulars of the procedures for reporting any changes to the aerodrome information set out in the AIP and procedures for requesting the issue of NOTAMS, including the following:

a) Arrangements for reporting any changes to the Authority and recording the reporting of changes, during and outside the normal hours of aerodrome operations;

b) Names and roles of persons responsible for notifying the changes and their telephone number during and outside the normal hours of aerodrome operations; and

c) The location and telephone numbers, as provided by the Authority, of the place at which changes are to be reported to the Authority.

C4.3 ACCESS TO AERODROME MOVEMENT AREA

C4.3.1 Particulars of the procedures developed and to be followed, in coordination with the agency responsible for preventing unlawful interference in civil aviation at the aerodrome, for preventing unauthorized entry of persons, vehicles equipment, animals or other things, into the movement area including the following:

a) The role of aerodrome operator, aircraft operator, aerodrome fixed-based operators, aerodrome security entity, the Authority and other government departments, as applicable; and

b) The names and roles of the personnel responsible for controlling access to the aerodrome and the telephone number for contacting those personnel during and after working hours.

C4.4 AERODROME EMERGENCY PLAN

C4.4.1 Particulars of the aerodrome emergency plan, including the following:

a) Plans for dealing with emergencies occurring at the aerodrome or in its vicinity, including malfunction of aircraft in flight, structural fires, sabotage including bomb threat (aircraft or structure), unlawful seizure of aircraft and incidents on the airport covering "during the emergency" and "after the emergency" considerations;

b) Details of tests for aerodrome facilities and equipment to be used in emergencies, including the frequency of these tests;

c) Details of exercises to tests emergency plans, including the frequency of those exercises;

d) Arrangements for reviewing the frequency of those exercises;

e) List of organizations, agencies and persons of authority both on - and -off-airport for site roles; their telephone numbers, facsimile numbers, e-mail and SITA addresses and radio frequencies of offices;

f) Establishment of an aerodrome emergency committee to organize training and other preparations for dealing with emergencies; and

g) Appointment of an on-scene commander of and overall emergency operation.

C4.5 RESCUE AND FIRE FIGHTING

C4.5.1 Particulars of the facilities, equipment, personnel and procedures for meeting the rescue and firefighting requirements, including the names and roles of the persons responsible for dealing with the rescue and firefighting services at the aerodrome.

a) Details of the manning and supervision of the RFF services;

b) Details of the title and location of documents detailing the training procedures and records for RFF personnel.

Note: This subject should also be covered in appropriate detail in the aerodrome emergency plan.

C4.6 AIR NAVIGATION SERVICES

C4.6.1 Particulars of the arrangements in place for the control of aerodrome traffic.

C4.6.2 Particulars, and means of compliance, of any responsibilities of the aerodrome operator that are carried out by staff of the air traffic services provider, including reporting and audit procedures.

C4.7 AERODROME MOVEMENT AREA AND OBSTACLE LIMITATION SURFACE INSPECTION BY THE AERODROME OPERATOR.

C4.7.1 Particulars of the procedures for the inspection of the aerodrome movement area and obstacle limitation surfaces, including the following:

a) Arrangement for carrying out inspections, including runway friction and water depth measurement on runways and taxiways, during and outside the normal hours of aerodrome operations;

b) Arrangement and means of communicating with the Air Traffic Control and the appropriate aerodrome operator's office during an inspection;

c) Arrangements for keeping inspection records, and the location of such records;

d) Details of inspection intervals and times;

e) Inspection checklist;

f) Arrangements for reporting the results of the inspection and for taking prompt follow-up actions to ensure correction of unsafe conditions; and

g) The names and roles of persons responsible for carrying out inspections and their telephone numbers during and after working hours.

C4.8 VISUAL AID AND AERODROME ELECTRICAL SYSTEM

C4.8.1 Particulars of the procedures for the inspection and maintenance of the aeronautical lights (including obstacle lighting), signs, markers and aerodrome electrical system including the following:

a) Arrangements for carrying out inspections during and outside the normal hours of aerodrome operations and the checklist for inspections;

b) Arrangements for recording the result of inspections and for taking follow-up action to correct deficiencies;

c) Arrangements for carrying out routine maintenance and emergency maintenance;

d) Arrangements for primary power supplies;

e) Arrangements for secondary power supplies, if any, and if applicable, particulars of any other method of dealing with partial or total system failure; and

f) The names and roles of the persons responsible for the inspection and maintenance of the lighting and the telephone numbers for contacting those persons during and after working hours.

C4.9 AIRSIDE AREA MAINTENANCE

C4.9.1 Particulars of the facilities and procedures for the maintenance of movement area, including:

a) Arrangements for maintaining the paved areas;

b) Arrangements for maintaining the unpaved runways and taxiways;

c) Arrangements for maintaining the runway and taxiway strip, and roads;

d) Arrangements for the maintenance of aerodrome drainage;

e) Arrangements for the maintenance of other areas of operational significance, including for wildlife control purposes.

C4.10 AERODROME WORKS SAFETY

C4.10.1 Particulars of the procedures for planning and carrying out works safely (including works which may have to be carried out at short notice) on or in the vicinity of the movement area that may extend above and obstacle limitation surface including the following:

a) Arrangements for communicating with Air Traffic Control during the progress of such works;

b) Names, telephone numbers and roles of the persons and organizations responsible for planning and carrying out the works and the arrangements for contacting those persons and organizations at all times;

c) Names of the aerodrome fixed-base and aircraft operators and ground handling agents who are to be notified of the work, their telephone numbers during and after working hours and, where appropriate, their e-mail addresses;

d) Distribution list for work plans, if required;

e) Arrangements for preventing interruption or damage to power supplies required for visual aids or other air navigation equipment during work in their vicinity;

f) Arrangements for demarcation of work areas, and operational areas, including arrangements for works access, and immobilization of aeronautical ground lighting in out of service parts of the movement area.

C4.11 APRON MANAGEMENT

C4.11.1 Particulars of the apron management procedures, including the following arrangements between air traffic control and the apron management unit;

a) Arrangements for planning, allocating, controlling and communicating aircraft parking positions;

b) Arrangements for initiating engine start and ensuring clearance of aircraft push-back;

c) Marshalling and follow me (vehicle) services.

C4.11.2 Procedures to ensure apron safety, including:

a) Protection from jet blasts, propeller wash, and movement of propellers;

b) Enforcement of safety precautions during aircraft refuelling operations;

c) Apron FOD control, cleaning and sweeping;

d) Arrangements for reporting incidents/accidents on and apron;

e) Arrangements for auditing the safety compliance of all personnel working on the apron.

C4.12 AIRSIDE VEHICLE CONTROL

C4.12.1 Particulars of the procedures for the control of surface vehicles operating on, or in the vicinity of, the movement area, including the following:

a) Details of the applicable traffic rules (including speed limits and the means of enforcement of the rules); and

b) The method of issuing vehicle permits for operating vehicles in the movement area.

c) The method of issuing driving permits for drivers of vehicles and mechanized equipment operating in the movement area.

C4.12.2 Details of the marking and lighting schemes applied to vehicles on the manoeuvring area, aprons, and airside roads.

C4.13 WILDLIFE HAZARD MANAGEMENT

C4.13.1 Particulars of the procedure to deal with danger to aircraft operations caused by the presence of birds or animals in the aerodrome flight pattern or movement area, including the following:

a) Arrangements for assessing any wildlife hazard;

b) Arrangements for implementing and maintaining wildlife control programs; and

c) Names and roles of the persons responsible for dealing with wildlife hazards, and their telephone numbers during and after working hours.

C4.14 DISABLED AIRCRAFT REMOVAL PLAN AND PROCEDURE

C4.14.1 Particulars of the procedure for removing an aircraft which is disabled on or adjacent to the movement area including the following:

a) Roles of the aerodrome operator and the holder of the aircraft certificate of registration;

b) Arrangements for notifying the holder of the certificate of registration;

c) Arrangements for liaising with air traffic control;

d) Arrangements for obtaining equipment and personnel to remove the disabled aircraft; and

e) the names, roles and telephone numbers of persons responsible for arrangement of the removal of disabled aircraft, their telephone number and, where appropriate, their e-mail addresses.

C4.15 HANDLING OF HAZARDOUS MATERIAL

C4.15.1 Particulars of the procedures for the safe handling, storage and disposal of hazardous material on the aerodrome, including the following:

a) The arrangements for special areas on the aerodrome to be set-up for the storage of inflammable liquids (including aviation fuels) and any other hazardous material; and

b) The method to be followed for the delivery, storage, dispensing and handling of hazardous materials.

Note: Hazardous materials include inflammable liquids and solids, corrosive liquids, compressed gases and magnetized or radioactive materials. The arrangement to deal with an accidental spillage or release of hazardous material should be included in the aerodrome emergency plan.

C4.16 LOW VISIBILITY OPERATIONS

C4.16.1 Particulars of procedures to be introduced for low visibility operations, including:

a) The measurement and reporting of runway visual range, as and when required;

b) The names and telephone numbers during and after working hours of the persons responsible for measuring the runway visual range;

c) Procedures to control access to the movement area.

C4.17 PROTECTION OF RADAR AND NAVIGATIONAL SITES

C4.17.1 Particulars of the procedures for the protection of radar and radio navigational aids located on the aerodrome to ensure that their performance will not be degraded, including the following:

a) The arrangement for the control of activities in the vicinity of radar and navigational aid installations including those which are outside the aerodrome boundary but which are the responsibility of the aerodrome operator;

b) The arrangements for ground maintenance in the vicinity of these installations; and

c) The arrangements for the supply and installations of signs warning of hazardous microwave radiation.

Part 5 AERODROME ADMINISTRATION & SAFETY MANAGEMENT SYSTEM

C5.1 AERODROME ADMINISTRATION

C5.1.1 Particulars of the aerodrome administration, including:

a) Aerodrome organization structure chart showing the names and positions of key personnel;

b) Responsibilities and accountabilities of key personnel;

c) The name, position and telephone numbers of the person who has overall responsibility for aerodrome safety;

d) The names, position and contact details of persons who may substitute for the Accountable Manager, the circumstances and order in which such substitution may occur and the arrangements for notifying relevant third parties of such substitution.

e) Airport committees.

C5.2 SAFETY MANAGEMENT SYSTEM (SMS)

C5.2.1 Particulars of the aerodrome's safety management system established for ensuring compliance with all safety requirements and achieving continuous improvement in safety performance, the essential features being:

a) Safety policy including the relationship between safety management and operational and maintenance processes;

b) Structure and organization of the SMS including staffing and assignment of individual and group responsibilities on safety issues;

c) SMS strategy and planning, such as setting safety performance measures, standards and targets, allocating priority for implementing safety initiatives, and providing a framework for controlling the risks to an acceptable level agreed with the Authority keeping always in view the requirements of ICAO Annex 14 Vol 1, the Civil Aviation Law and other national standards rules and regulations;

d) SMS implementation including facilities, methods and procedures for the effective communication of safety messages and enforcement of safety requirements;

e) The system for hazard identification and risk assessment including the arrangements for undertaking, reviewing and updating the aerodrome hazard assessment and for commissioning aeronautical studies in accordance with C4.1;

f) The system for the identification of, and action on, critical safety areas which require a higher level of safety management integrity (Safety Measures Program);

g) Measuring performance of the SMS by internal safety audit and review system detailing the systems and program for quality control on safety

h) Measures for safety promotion, accident prevention an system for risk control involving analysis and handling of accidents, incidents, complaints, defects, faults, discrepancies and failures, and continuing safety monitoring;

i) System for the documentation of all safety related airport facilities as well as airport operational and maintenance records including information on the design

and construction of aircraft pavements and aerodrome lighting. The system should enable easy retrieval of records including charts;

j) Staff training and competency including review and evaluation of the adequacy of training provided to staff on safety related duties and of the certification system for testing their competency;

k) Incorporation of safety related clauses in the contracts for work at the aerodrome and enforcement, thereof

l) Methods of reviewing performance and procedures with named individual responsibilities for reviewing safety policy, arising from the findings of reviews, audits, and risk assessments.

m) Means of application of quality assurance measures to the entire SMS.

C5.2.2 The safety policy shall be signed by the aerodrome operator, and reflect the commitment at the highest level of the aerodrome organization to the structured management of safety. The policy should be as brief as possible but shall include statements addressing:

a) Statement of high level commitment to safety;

b) Statement of the duties imposed on all personnel with regard to safety;

c) Statement of the duties imposed on all aerodrome organizations to cooperate with, promote and comply with the SMS approach to safety, and the aerodrome operator's safety policy;

d) Reference to the means of hazard identification and risk assessment contained in the SMS;

e) Statement of how significant risks are communicated to those who need to know;

f) Statement of how safety is incorporated into other policy and budgetary decisionmaking processes;

g) Statement of the SMS review processes.

C5.2.3 The structure of the organization should include:

a) Competence: how competence is defined within the organization, and how it is achieved including through recruitment, training and advisory support;

b) Control: the allocation of responsibilities, securing of commitment, instruction, supervision, discipline, and

c) Co-operation: how co-operation is achieved between individuals and groups, including the Authority, other government agencies and all organizations operating on the aerodrome, and the application of a no blame culture where appropriate.

d) Communication: how the SMS is communicated by spoken, written, and visual means.

C5.2.4 Standards and objectives set within the SMS should be shown to be:

a) Specific;

b) Measurable;

c) Achievable;

d) Realistic;

e) Time scheduled.

C5.2.5 The review and performance monitoring processes should include procedures for:

a) Active monitoring aiming to reduce risks by achieving objectives and standards, and ensuring that such objectives and standards are effective.

b) Reactive monitoring investigating incidents, accidents, damage, injuries and safety reports aiming to both identify the cause for performance to be substandard, and recommending within the SMS procedure how to best avoid any repetition;

c) Identifying the degree of compliance with safety performance standards and/or targets as identified by the SMS;

d) Identifying areas where standards are absent or inadequate;

e) Achievement of stated objectives within the given timescales;

f) Analysis of reports to identify immediate and underlying causes, trends, and common features.

Appendix D: Medical Examinations for Aerodrome RFFS Personnel

D1.0 Introduction

D1.1 RFFS personnel shall be subject to medical examination prior to recruitment, and at regular intervals thereafter, to ensure:

a) individuals attain an acceptable standard of fitness commensurate with the physical and psychological demands of foreseeable operational duties; and

b) that the performance of the RFFS is not compromised by physical or psychological limitations of personnel.

D1.2 Failure to meet the required standards of health and/or fitness may disqualify an applicant or lead from appointment to temporary or permanent suspension from operational duties of serving RFFS personnel.

D1.3 The aerodrome operator shall establish a health and fitness monitoring programme as an integral part of the aerodrome Safety Management System (SMS) to meet the requirements of D1.1. This programme shall be based upon assessment of health and fitness against medical standards which shall be published in the Safety Management Manual or a supplement thereto and shall be subject to approval by the Authority.

D1.4 The monitoring programme shall include arrangements for the development, review and revision of the medical standards shall form part of the SMS. Provision shall be made for scheduled medical examinations at a frequency approved by the Authority. Additional examinations of particular individuals shall be undertaken when changes in physical condition and/or behaviour or so require.

D1.5 The aerodrome operator shall ensure that the medical standards and the criteria for assessing the suitability of individuals for RFFS duties are based on the factors set out in D2. The criteria for appointment and suspension from duty shall be in accordance with the Laws of the Kingdom of Bahrain relating to the employment of persons and the management of occupational health and safety.

D1.6 Health and fitness examinations shall be undertaken by suitably qualified and experienced persons including, where necessary, licensed and approved medical practitioners. All persons undertaking health and fitness examinations and making recommendations concerning the employment of individuals shall be duly appointed by the aerodrome operator and fully conversant with the duties to be undertaken by applicants and serving personnel and the medical standards and associated test procedures.

D2.0 Factors affecting the suitability of individuals for RFFS duties

D2.1 Medical standards shall address the physical condition of an individual including chronic or acute pathology and any behavioural factors that might affect their ability to perform the required RFFS duties. The effects of long term prescribed medication shall also be considered.

D2.2 Physical condition

D2.2.1 The physical condition of the individual shall be formally assessed at each examination. The assessment shall include but not be limited to:

a) physique including muscle power , weight and body mass index;

b) exercise tolerance;

c) balance;

d) hearing; and

e) sight, including visual acuity and colour perception.

D2.3 Behavioural Factors

D2.3.1 The following behavioural factors shall be considered when assessing suitability or continuing fitness for RFFS operational duties:

a) emotional and mental stability;

b) mental capacity;

c) drug or alcohol abuse/dependency

D3.0 Pathology Leading to Possible Disqualification or Suspension from Active Duties

D3.1 The following conditions may be temporary and/or susceptible to remedial treatment and will need individual assessment by a specialist prior to appointment to operational duties, or to permit retention on RFF duties for serving personnel.

a) a history of epilepsy;

b) relapsing gastric or duodenal ulcer;

c) certain perforations of the ears, otitis media, or gross nasal sepsis or obstruction; certain labyrinthine disturbances; uncomplicated perforation of one eardrum may be acceptable provided there is no serious hearing loss or chronic discharge;

d) hernia or hydrocele;

e) serious varicose veins giving rise to symptoms;

f) certain serious, chronic skin diseases;

g) diseases of the lungs which may produce limitation of physical performance;

h) significant disease of the cardiovascular system;

i) diabetes or other causes of glycosuria;

j) organic nervous disorders including a history of vertigo or any condition which might impair the sense of balance;

k) significant obesity.

l) pregnancy (women may be assessed post-delivery).

Appendix E: Friction Characteristics of Runway Surfaces

Reference: ICAO Annex 14 Vol 1, Attachment A; ICAO Doc 9137, Part 2, Ch 2, 3 and 5.

E1 Approved Measuring Equipment

E1.1 The device approved by the Authority for measuring friction characteristics of runway surfaces is the Grip Tester Trailer. The aerodrome operator shall obtain prior approval from the Authority before any other friction measuring equipment is utilized.

E1.2 The measuring equipment shall be maintained in a fully functional condition and shall be calibrated in accordance with the manufacturer's instructions.

E2 Friction Classification Survey

E2.1 Friction classification surveys shall be undertaken as required by Regulations 5.2.7 and 10.2.

E2.2 Surveys shall be undertaken at nominal speeds of 65 kph and 95 kph. Runs shall be made in both directions along a runway and a mean value taken.

E2.3 Surveys shall be undertaken with tire pressure and water depth as specified in Table E-1. The test tire shall be of type C as specified in ICAO Document 9137 Part 2, Chapter 5.

(1)	(2)	(3)	(4)	(5)	(6)
Test speed km/h (tolerance)	Tire pressure kPa	Test water depth (tolerance)	Design objective for new runway surfaces	Maintenance planning level	Minimum friction level
65 (± 5)	140	1mm (± 5%)	>0.74	0.53	0.43
95 (± 5)	140	1mm (± 5%)	>0.64	0.36	0.24

Table E-1 Runway surface condition levels and test conditions

APPENDIX F.
FRAMEWORK FOR
SAFETY MANAGEMENT SYSTEMS (SMS)

Introduction

This appendix specifies the framework for the implementation and maintenance of a safety management system (SMS) by a certified aerodrome. An SMS is a management system for the management of safety by an organization. The framework includes four components and twelve elements representing the minimum requirements for SMS implementation. The implementation of the framework shall be commensurate with the size of the organization and the complexity of the services provided. This appendix also includes a brief description of each element of the framework.

1. Safety policy and objectives
1.1 – Management commitment and responsibility
1.2 – Safety accountabilities
1.3 – Appointment of key safety personnel
1.4 – Coordination of emergency response planning
1.5 – SMS documentation

2. Safety risk management

2.1 – Hazard identification
2.2 – Safety risk assessment and mitigation

3. Safety assurance

3.1 – Safety performance monitoring and measurement
3.2 – The management of change
3.3 – Continuous improvement of the SMS

4. Safety promotion

4.1 – Training and education
4.2 – Safety communication

1. Safety policy and objectives

1.1 Management commitment and responsibility

The certified aerodrome shall define the organization's safety policy which shall be in accordance with international and national requirements, and which shall be signed by the accountable executive of the organization. The safety policy shall reflect organizational commitments regarding safety; shall include a clear statement about the provision of the necessary resources for the implementation of the safety policy; and shall be communicated, with visible endorsement, throughout the organization. The safety policy shall include the safety reporting procedures; shall clearly indicate which types of operational behaviours are unacceptable; and shall include the conditions under which disciplinary action would not apply. The safety policy shall be periodically reviewed to ensure it remains relevant and appropriate to the organization.

1.2 Safety accountabilities

The certified aerodrome shall identify the accountable executive who, irrespective of other functions, shall have ultimate responsibility and accountability, on behalf of the

certified aerodrome, for the implementation and maintenance of the SMS. The certified aerodrome shall also identify the accountabilities of all members of management, irrespective of other functions, as well as of employees, with respect to the safety performance of the SMS. Safety responsibilities, accountabilities and authorities shall be documented and communicated throughout the organization, and shall include a definition of the levels of management with authority to make decisions regarding safety risk tolerability.

1.3 Appointment of key safety personnel

The certified aerodrome shall identify a safety manager to be the responsible individual and focal point for the implementation and maintenance of an effective SMS.

1.4 Coordination of emergency response planning

The certified aerodrome shall ensure that an emergency response plan that provides for the orderly and efficient transition from normal to emergency operations and the return to normal operations, is properly coordinated with the emergency response plans of those organizations it must interface with during the provision of its services.

1.5 SMS documentation

The certified aerodrome shall develop an SMS implementation plan, endorsed by senior management of the organization, that defines the organization's approach to the management of safety in a manner that meets the organization's safety objectives. The organization shall develop and maintain SMS documentation describing safety policy and objectives, the SMS requirements, the SMS processes and procedures, the accountabilities, responsibilities and authorities for processes and procedures, and the SMS outputs. Also as part of the SMS documentation, the certified aerodrome shall develop and maintain a safety management systems manual (SMSM), to communicate its approach to the management of safety throughout the organization.

2. Safety risk management

2.1 Hazard identification

The certified aerodrome shall develop and maintain a formal process that ensures that hazards in operations are identified. Hazard identification shall be based on a combination of reactive, proactive and predictive methods of safety data collection.

2.2 Safety risk assessment and mitigation

The certified aerodrome shall develop and maintain a formal process that ensures analysis, assessment and control of the safety risks in aerodrome operations.

3. Safety assurance

3.1 Safety performance monitoring and measurement

The certified aerodrome shall develop and maintain the means to verify the safety performance of the organization, and to validate the effectiveness of safety risks

controls. The safety performance of the organization shall be verified in reference to the safety performance indicators and safety performance targets of the SMS.

3.2 The management of change

The certified aerodrome shall develop and maintain a formal process to identify changes within the organization which may affect established processes and services; to describe the arrangements to ensure safety performance before implementing changes; and to eliminate or modify safety risk controls that are no longer needed or effective due to changes in the operational environment.

3.3 Continuous improvement of the SMS

The certified aerodrome shall develop and maintain a formal process to identify the causes of substandard performance of the SMS, determine the implications of substandard performance of the SMS in operations, and eliminate or mitigate such causes.

4. Safety promotion

4.1 Training and education

The certified aerodrome shall develop and maintain a safety training programme that ensures that personnel are trained and competent to perform the SMS duties. The scope of the safety training shall be appropriate to each individual's involvement in the SMS.

4.2 Safety communication

The certified aerodrome shall develop and maintain formal means for safety communication that ensures that all personnel are fully aware of the SMS, conveys safety critical information, and explains why particular safety actions are taken and why safety procedures are introduced or changed.