CHAPTER 2. AERODROME DATA

2.1 Aeronautical data

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

Note: - Specifications governing the quality system are given in ICAO **Annex 15, Chapter 3.**

2.1.2 CAA shall ensure that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classification and data integrity level shall apply:

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

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

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

2.1.3 Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the cyclic redundancy check (CRC). To achieve protection of the integrity level of critical and essential aeronautical data as classified in 2.1.2 above, a 32 or 24 bit CRC algorithm shall apply respectively.

2.1.4 To achieve protection of the integrity level of routine aeronautical data as classified in 2.1.2 a 16-bit CRC algorithm shall apply.

Note: - Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and tractability) is contained in the World Geodetic System – 1984 (WGS-84) Manual (Doc 9674).

2.1.5 Geographical coordinates indicating latitude and longitude shall be determined and reported to the aeronautical information services authority in terms of the World Geodetic System 1984 (WGS-84) geodetic reference datum, identifying those geographical coordinates which have been transformed into WGS-84 coordinates by mathematical means and whose accuracy of original field work does not meet the requirements in Table **2-1,2-2,2-3,2-4,2-5.**

AERONAUTICAL DATA QUALITY REQUIREMENTS

Table 2-1. Latitude and longitude

Latitude and longitude	Accuracy Data type	Classification Integrity
Aerodrome reference point	30 m surveyed/calculated	routine 1×10^{-3}
NAVAIDS located at the aerodrome	3 m surveyed	essential 1×10^{-5}
Obstacles in the circling area and at the aerodrome	3 m surveyed	essential 1×10^{-5}
Significant obstacles in the approach and take-off area	3 m surveyed	essential 1×10^{-5}
Runway threshold	1 m surveyed	critical 1×10^{-8}
Runway end (flight path alignment point)	1 m surveyed	critical 1×10^{-8}
Runway centre line points	1 m surveyed	critical 1×10^{-8}
Taxiway centre line points	0.5 m surveyed	essential 1×10^{-5}
Aircraft stand-points/INS check-points	0.5 m surveyed	routine 1×10^{-3}

Table 2-2. Elevation/Altitude/Height

Elevation/altitude/height	Accuracy Data type	Classification Integrity
Aerodrome elevation	0.5 m or 1 ft surveyed	essential 1×10^{-5}
WGS-84 geoid undulation at aerodrome elevation position	0.5 m or 1 ft surveyed	essential 1×10^{-5}
Runway threshold, non-precision approaches	0.5 m or 1 ft surveyed	essential 1×10^{-5}
WGS-84 geoid undulation at runway threshold, non-precision approaches	0.5 m or 1 ft surveyed	essential 1×10^{-5}
Runway threshold, precision approaches	0.25 m or 1 ft surveyed	critical 1×10^{-8}
WGS-84 geoid undulation at runway threshold, precision approaches	0.25 m or 1 ft surveyed	critical 1×10^{-8}
Obstacles in the approach and take-off areas	1 m or 1 ft surveyed	essential 1×10^{-5}
Obstacles in the circling areas and at the aerodrome	1 m or 1 ft surveyed	essential 1×10^{-5}
Distance measuring equipment/precision (DME/P)	3 m (10 ft) surveyed	essential 1×10^{-5}

Table 2-3. Declination and magnetic variation

Declination/variation	Accuracy Data type	Classification Integrity
Aerodrome magnetic variation	1 degree surveyed	essential 1×10^{-5}
ILS localizer antenna magnetic variation	1 degree surveyed	essential 1×10^{-5}
MLS azimuth antenna magnetic variation	1 degree surveyed	essential 1×10^{-5}

Table 2- 4. Bearing

Declination/variation	Accuracy Data type	Classification Integrity
ILS localizer alignment	1/100 degree surveyed	essential 1×10^{-5}
MLS zero azimuth alignment	1/100 degree surveyed	essential 1×10^{-5}
Runway bearing	1/100 degree surveyed	routine 1×10^{-3}

Table 2- 5. Length/Distance/Dimension

Length/distance/dimension	Accuracy Data type	Classification Integrity
Runway length	1 m or 1 ft surveyed	critical 1×10^{-8}
Stopway length	1 m or 1 ft surveyed	critical 1×10^{-8}
Landing distance available	1 m or 1 ft surveyed	critical 1×10^{-8}
ILS localizer antenna-runway end, distance	3 m (10 ft) calculated	routine 1×10^{-3}
ILS glide slope antenna-threshold, distance along centre line	3 m (10 ft) calculated	routine 1×10^{-3}
ILS markers-threshold distance	3 m (10 ft) calculated	essential 1×10^{-5}
ILS DME antenna-threshold, distance along centre line	3 m (10 ft) calculated	essential 1×10^{-5}
MLS azimuth antenna-runway end, distance	3 m (10 ft) calculated	routine 1×10^{-3}
MLS elevation antenna-threshold, distance along centre line	3 m (10 ft) calculated	routine 1×10^{-3}
MLS DME/P antenna-threshold, distance along centre line	3 m (10 ft) calculated	Essential 1×10^{-5}

2.1.6 The order of accuracy of the field work shall be such that the resulting operational navigation data for the phases of flight will be within the maximum deviations, with respect to an appropriate reference frame, as indicated in tables contained in **Table 2-1,2-2,2-3,2-4 and 2-5.**

2.1.7 In addition to the elevation (referenced to mean sea level) of the specific surveyed ground positions at aerodromes, geoid undulation (referenced to the WGS-84 ellipsoid) for those positions as indicated in **Table 2-1,2-2,2-3,2-4 and 2-5**, shall be determined and reported to the **aeronautical information services authority.**

Note 1: - An appropriate reference is that which enables WGS-84 to be realized on a given aerodrome and with respect to which all coordinate data are elated.
Note: - 2 Specifications governing the publication of WGS-84 coordinates are given in Anex4, Chapter 2 and Annex-15, Chapter 3.

2.2 Aerodrome reference point

2.2.1 An aerodrome reference point shall be established for an aerodrome.

2.2.2 The aerodrome reference point shall be located near the initial or planned geometric centre of the aerodrome and shall normally remain where first established.

2.2.3 The position of the aerodrome reference point shall be measured and reported to the aeronautical information services authority **in degrees, minutes and seconds**.

2.3 Aerodrome and runway elevations

2.3.1 The aerodrome elevation and geoid undulation at the aerodrome elevation position **shall be measured to the accuracy of one-half metre or foot** and reported to the aeronautical information services authority.

2.3.2 For an aerodrome used by international civil aviation for non-precision approaches, the elevation and geoid undulation of each threshold, the elevation of the runway end and any significant high and low intermediate points along the runway shall be **measured to the accuracy of one-half metre or foot** and reported to the aeronautical information services authority.

2.3.3 For precision approach runway, the elevation and geoid undulation of the threshold, the elevation of the runway end and the highest elevation of the touchdown zone shall be **measured to the accuracy of one-quarter metre or foot** and reported to the aeronautical information services authority.

Note: - Geoid undulation must be measured in accordance with the appropriate system of coordinates.

2.4 Aerodrome reference temperature

2.4.1 An aerodrome reference temperature shall be determined for an aerodrome **in degrees Celsius.**

2.4.2 The aerodrome reference temperature **shall 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 shall be averaged over a period of years.

2.5 Aerodrome dimensions and related information

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

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

b) Strip
Runway End Safety Area | Length, width to the nearest meter or foot surface type;
Stopway

c) Taxiway – designation, width, surface type;

d) Apron – surface type, aircraft stands;

e) The boundaries of the air traffic control service;

f) Clearway – length to the nearest metre or foot, ground profile;

g) Visual aids for approach procedures, marking and lighting of runways, taxiways and aprons, other visual guidance and control aids on taxiways and aprons, including taxi-holding positions and stop bars, and location and type of visual docking guidance systems;

h) Location and radio frequency of any VOR aerodrome check-point;

i) Location and designation of standard taxi-routes; and

i) Distances to the nearest metre or foot of localizer and glide path elements comprising an instrument landing system (ILS) or azimuth and elevation antenna of microwave landing system (MLS) in relation to the associated runway extremities.

2.5.2 The geographical coordinates of each threshold shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.5.3 The geographical coordinates of appropriate taxiway centre line points shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.5.4 The geographical coordinates of each aircraft stand shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.5.5 The geographical coordinates of significant obstacles in the approach and take-off areas, in the circling area and in the vicinity of an aerodrome shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and tenths of seconds. In addition, the top elevation rounded up to the nearest metre or foot, type, marking and lighting (if any) of the significant obstacles shall be reported to the aeronautical information services authority.

Note: - 1. See Annex-15, Appendix 8 , for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in area 2 and 3.

Note: - 2 Implementation of Annex-15 provision 10.6.1.2 concerning the availability, as of **18 November 2010**,of obstacle data according to area 2 and area 3 specifications would be facilitated by appropriate advanced planning for the collection and processing of such data.

2.6 Strength of pavements

2.6.1 The bearing strength of a pavement shall be determined.

2.6.2 The bearing strength of a pavement intended for aircraft of apron (ramp) mass greater than 5 700 kg shall be made available using the aircraft classification number C pavement classification number (ACN-PCN) method by reporting all of the following information:

a) The pavement classification number (PCN);

b) Pavement type for ACN-PCN determination;

c) Subgrade strength category;

d) Maximum allowable tire pressure category or maximum allowable tire pressure value; and

e) Evaluation method.

Note: - If necessary, PCNs may be published to an accuracy of one-tenth of a whole number.

2.6.3 The pavement classification number (PCN) reported shall indicate that an aircraft with an aircraft classification number (ACN) equal to or less than the reported PCN can operate on the pavement subject to any limitation on the tire pressure, or aircraft all-up mass for specified aircraft type(s).

Note: - Different PCNs may be reported if the strength of the pavement is subject to significant seasonal variation.

2.6.4 The ACN of an aircraft shall be determined in accordance with the standard procedures associated with the ACN-PCN method.

Note: - The standard procedures for determining the ACN of an aircraft are given in the ICAO Aerodrome Design Manual, Part3. For convenience several aircraft types currently in use have been evaluated on rigid and flexible pavements founded on the four subgrade categories in 2.6.6 b) below and the results tabulated in that manual.

2.6.5 For the purposes of determining the ACN, the behaviour of a pavement shall be classified as equivalent to a rigid or flexible construction.

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

a) Pavement type for ACN-PCN determination:

	Code
Rigid pavement	R
Flexible pavement	F

Note: - If the actual construction is composite or non-standard, include a note to that effect (see example 2 below).

b) Subgrade strength category:

	Code
High strength: characterized by K = 150 MN/m3 and representing all K values above 120 MN/m3 for rigid pavements, and by CBR = 15 and representing all CBR values above 13 for flexible pavements.	A

	Code
Medium strength: characterized by K = 80 MN/m3 and representing a range in K of 60 to 120 MN/m3 for rigid pavements, and by CBR = 10 and representing a range in CBR of 8 to 13 for flexible pavements.	B

	Code
Low strength: characterized by K = 40 MN/m3 and representing a range in K of 25 to 60 MN/m3 for rigid pavements, and by CBR = 6 and representing a range in CBR of 4 to 8 for flexible pavements.	C
Ultra low strength: characterized by K = 20 MN/m3 and representing all K values below 25 MN/m3 for rigid pavements, and by CBR = 3 and representing all CBR values below 4 for flexible pavements.	D

c) Maximum allowable tire pressure category:

	Code
High: no pressure limit	W
Medium: pressure limited to 1.50 MPa	X
Low: pressure limited to 1.00 MPa	Y
Very low: pressure limited to 0.50 MPa	Z

d) Evaluation method:

	Code
Technical evaluation: representing a specific study of the pavement characteristics and application of pavement behavior technology.	T
Using aircraft experience: representing a knowledge of the specific type and mass of aircraft satisfactorily being supported under regular use.	U

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

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

PCN 80 / R / B / W / T

Example 2: - If the bearing strength of a composite pavement, behaving like a flexible pavement and resting on a high strength sub grade, has been assessed by using aircraft Experience to be PCN 50 and the maximum tire pressure allowable is 1.00 MPa, then the reported information would be:

PCN 50 / F / A / Y / U

Note: - Composite construction

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

PCN 40/F/B/0.8mpa/T

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

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

2.6.7 **Recommendation:** -Criteria should be established to regulate the use of a pavement by an aircraft with an ACN higher than the PCN reported for that pavement in accordance with 2.6.2 and 2.6.3. (For simple **method for regulating overload** operations **see Para 2.7** and for more details see Aerodrome Design Manual, Part 3).

2.6.8 The bearing strength of a pavement intended for aircraft of apron (ramp) mass equal to or less than 5 700 kg shall be made available by reporting the following information:

a) Maximum allowable aircraft mass; and
b) Maximum allowable tire pressure.

Example: 4 000 kg/0.50 MPa.

2.7. Guidance on the method regulating overload operations

2.7.1 Overload operations

2.7.1.1 Overloading of pavements can result either from loads too large, or from a substantially increased application rate, or both. Loads larger than the defined (design or evaluation) load shorten the design life, whilst smaller loads extend it. With the exception of massive overloading, pavements in their structural behavior are not subject to a particular limiting load above, which they suddenly or catastrophically fail. Behavior is such that a pavement can sustain a definable load for an expected number of repetitions during its design life. As a result, occasional minor over-loading is acceptable, when expedient, with only limited loss in pavement life expectancy and relatively small acceleration of pavement deterioration. For those operations in which magnitude of overload and/or the frequency of use do not justify a detailed analysis, the following criteria are suggested:

a) for flexible pavements, occasional movements by aircraft with ACN not exceeding 10 per cent above the reported PCN shall not adversely affect the pavement;
b) for rigid or composite pavements, in which a rigid pavement layer provides a primary element of the structure, occasional movements by aircraft with ACN not exceeding 5 per cent above the reported PCN shall not adversely affect the pavement;
c) if the pavement structure is unknown, the 5 per cent limitation shall apply; and
d) the annual number of overload movements shall not exceed approximately 5 per cent of the total annual aircraft movements.

2.7.1.2 Such overload movements shall not normally be permitted on pavements exhibiting signs of distress or failure. Furthermore, overloading shall be avoided during any periods of thaw following frost penetration, or when the strength of the pavement or its subgrade could be weakened by water. Where overload operations are conducted, the appropriate authority shall review the relevant pavement condition regularly, and shall also review the criteria for overload operations periodically since excessive repetition of overloads can cause severe shortening of pavement life or require major rehabilitation of pavement.

2.7.2 ACNs for several aircraft types

For convenience, several aircraft types currently in use have been evaluated on rigid and flexible pavements founded on the four subgrade strength categories in Chapter 2, 2.6.6 b) and the results tabulated in the ICAO **Aerodrome Design Manual, Part 3**.

2.8. Pre- flight altimeter check location

2.8.1 One or more pre-flight check locations shall be established for an aerodrome.

2.8.2 **Recommendation**: - *A pre-flight check location should be located on an apron.*

Note 1: - Locating a pre-flight altimeter check location on an apron enables an altimeter check to be made prior to obtaining taxi clearance and eliminates the need for stopping for that purpose after leaving the apron.

Note 2: - Normally an entire apron can serve as a satisfactory altimeter check location.

2.8.3 The elevation of a pre-flight altimeter check location shall be given as the average elevation, rounded to the nearest meter or 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 (10 ft) of the average elevation for that location.

2.9 Declared distances

The following distances shall be calculated to the nearest metre or foot for a runway intended for use by international commercial air transport:

a) Take-Off Run Available (TORA);

b) Take-Off Distance Available (TODA);

c) Accelerate-Stop Distance Available (ASDA); and

d) Landing Distance Available (LDA).

2.10 Guidance on Calculation of declared distances

2.10.1 The to **declared distances to be calculated for each runway** direction comprise: the take-off run available (TORA), take-off distance available (TODA), accelerate-stop distance available (ASDA), and landing distance available (LDA).

2.10.2 Where a runway is not provided with a stopway or clearway and the threshold is located at the extremity of the runway, the four declared distances shall normally be equal to the length of the runway, as shown in **Figure 2-1(A).**

2.10.3 Where a runway is provided with a clearway (CWY), then the TODA will include the length of clearway, as shown in **Figure2-1 (B).**

2.10.4 Where a runway is provided with a stopway (SWY), then the ASDA will include the length of stopway, as shown in **Figure2-1 (C).**

2.10.5 Where a runway has a displaced threshold, then the LDA will be reduced by the distance the threshold is displaced, as shown in **Figure 2-1 (D).** A displaced threshold affects only the LDA for approaches made to that threshold; all declared distances for operations in the reciprocal direction are unaffected.

2.10.6 Figure **2-1 (B)** through **2-1 (D)** illustrate **a** runway provided with a clearway or a stopway or having a displaced threshold. Where more than one of these features exist, then more than one of the declared distances will be modified but the modification will follow the same principle illustrated. An example showing a situation where all these features exist is shown in **Figure 2-1 (E).**

2.10.7 A suggested format for providing information on declared distances is given in **Figure 2-1 (F) ,** If a runway direction cannot be used for take-off or landing, or both, because it is operationally forbidden, then this shall be declared and the words “not usable” or the abbreviation NU entered.

2.11 Condition of the movement area and related facilities

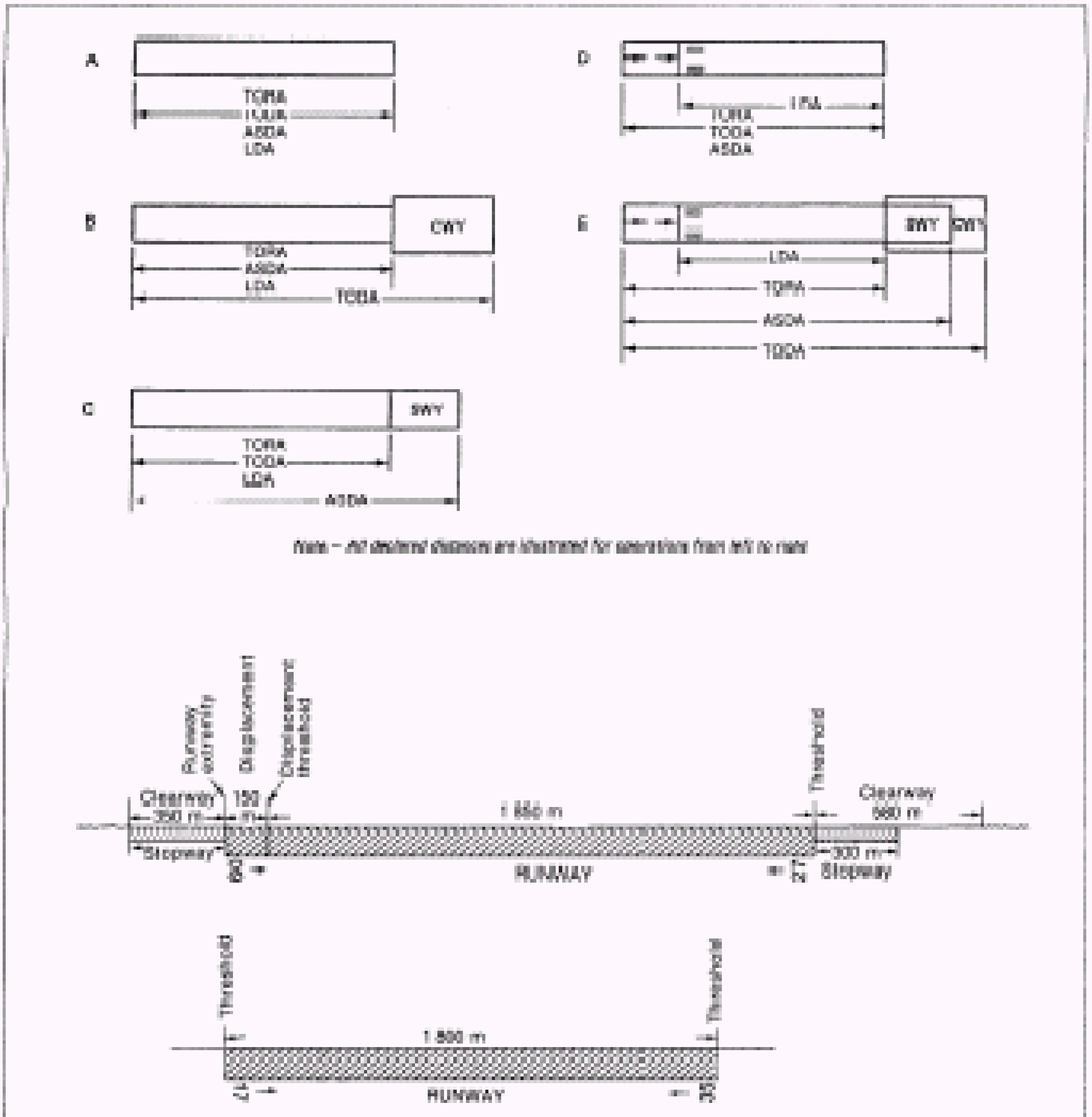
2.11.1 Information on the condition of the movement area and the operational status of related facilities shall be provided to the appropriate aeronautical information service units, and similar information of operational significance to the air traffic services units, to enable those units to provide the necessary information to arriving and departing aircraft. The information shall be kept up to date and changes in conditions reported without delay.

2.11.2 The condition of the movement area and the operational status of related facilities shall be monitored and reports on matters of operational significance or affecting aircraft performance given, particularly in respect of the following:

a) Construction or maintenance work;
b) Rough or broken surfaces on a runway, a taxiway or an apron;
c) Snow, slush or ice on a runway, a taxiway or an apron;
d) Water on a runway, a taxiway or an apron;
e) Snow banks or drifts adjacent to a runway, a taxiway or an apron;
f) Anti-icing or de-icing liquid chemicals on a runway or a taxiway;
g) Other temporary hazards, including parked aircraft;
h) Failure or irregular operation of part or all of the aerodrome visual aids; and
i) Failure of the normal or secondary power supply.

2.11.3 **Recommendation**: - To facilitate compliance with 2.11.1 and 2.11.2 inspections of the movement area should be carried out **each day at least once** where the code number is 1 or 2 and **at least twice** where the code number is **3 or 4.**

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



F

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

FIGURE 2-1

Water on a runway

2.11.4 Whenever water is present on a runway, a description of the runway surface conditions on the centre half of the width of the runway, including the possible assessment of water depth, where applicable, shall be made available using the following terms:

DAMP – the surface shows a change of colour due to moisture.
WET – the surface is soaked but there is no standing water.
WATER PATCHES – significant patches of standing water are visible.
FLOODED – extensive standing water is visible.

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

2.11.6 A runway or portion thereof shall be determined as being slippery when wet when the measurements specified in 2.11.7 show that the runway surface friction characteristics as measured by a continuous friction measuring device are below the minimum friction level specified by the CAA.

2.11.7 **Measurements of the friction** characteristics of a runway surface **shall be made periodically** with a continuous friction-measuring device using self-wetting features

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

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

2.12 Guidance on the Determination of friction characteristics of wet paved runways

2.12.1 The friction of a wet paved runway shall be measured to:

a) Verify the friction characteristics of new or resurfaced paved runways when wet **(See Chapter 3, 3.1.23**);

b) Assess periodically the slipperiness of paved runways when wet **(See Para 2.11.7);**

c) Determine the effect on friction when drainage characteristics are poor (**See Chapter 10, 10.2.6**); and

d) Determine the friction of paved runways that become slippery under unusual conditions (**See Para, 2.11.9).**

2.12.2 Runways shall be evaluated when first constructed or after resurfacing to determine the wet runway surface friction characteristics. Although it is recognized that friction reduces with use, this value will represent the friction of the relatively long central portion of the runway that is uncontaminated by rubber deposits from aircraft operations and is therefore of operational value. Evaluation tests shall be made on clean surfaces. If it is not possible to clean a surface before testing, then for purposes of preparing an initial report a test could be made on a portion of clean surface in the central part of the runway.

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

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

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

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

2.12.7 When the results of any of the measurements identified in **2.12.2 through 2.12.6** indicate that only a particular portion of a runway surface is slippery, then action to promulgate this information and, if appropriate, take corrective action is equally important.

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

2.12.9 The Aerodrome Standards requires CAA to specify two friction levels as follows:

a) a maintenance friction level below which corrective maintenance action shall be initiated; and

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

Furthermore, CAA shall establish criteria for the friction characteristics of new or resurfaced runway surfaces. **Table 2-6** provides guidance on establishing the design objective for new runway surfaces and maintenance planning and minimum friction levels for runway surfaces in use.

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

2.12.11 Other friction measuring devices can be used, provided they have been correlated with at least one test equipment mentioned above. The ICAO Airport Services Manual, Part 2 provides guidance on the methodology for determining the friction values corresponding to the design objective, maintenance planning level and minimum friction level for a friction tester not identified in the table 2-6.

Table 2-6

Test Equipment	Test tire		Test speed (km/h)	Test water Depth (mm)	Design Objective For new surface	Maintenance Planning level	Minimum Friction level
	Type	Pressure (Kpa)					
(1)	(2)		(3)	(4)	(5)	(6)	(7)
Mu-meter trailer	A A	70 70	65 95	1.0 1.0	0.72 0.66	0.52 0.38	O.42 O.26
Skiddometer Trailer	B B	210 210	65 95	1.0 1.0	0.82 0.74	0.60 0.47	0.50 0.34
Surface Friction Tester vehicle	B B	210 210	65 95	1.0 1.0	0.82 0.74	0.60 0.47	0.50 0.34
Runway friction Tester vehicle	B B	210 210	65 95	1.0 1.0	0.82 0.74	0.60 0.54	0.50 0.41
TATRA Friction tester vehicle	B B	210 210	65 95	1.0 1.0	0.76 0.67	0.57 0.52	0.48 0.42
GRIP TESTER Trailer	C C	140 140	65 95	1.0 1.0	0.74 0.64	0.53 0.36	0.43 0.24

2.13 Snow, slush or ice on a runway

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

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

2.13.1 **Recommendation.** - Whenever a runway is affected by snow, slush or ice, and it has not been possible to clear the precipitant fully, the condition of the runway should be assessed, and the friction coefficient measured. (**See Para 2.12**)

2.13.2 **Recommendation: -** The readings of the friction measuring device on snow-, slush-, or ice-covered surfaces should adequately correlate with the readings of one other such device.

Note: - the principal aim is to measure surface friction in a manner that is relevant to the friction experienced by an aircraft tire, thereby providing correction between the friction measuring device and aircraft braking performance.

2.13.3 **Recommendation: -** whenever dry snow, wet snow or slush is present on a runway, an assessment of the mean depth over each third of the runway should be made to an accuracy of approximately 2 cm for dry snow, 1 cm for wet snow and 0.3 cm for slush.

2.14 Guidance on determining and expressing the friction characteristics of snow- and ice-covered paved surfaces

2.14.1 There is an operational need for reliable and uniform information concerning the friction characteristics of ice- and snow-covered runways. Accurate and reliable indications of surface friction characteristics can be obtained by friction measuring devices; however, further experience is required to correlate the results obtained by such equipment with aircraft performance, owing to the many variables involved, such as: aircraft mass, speed, braking mechanism, tire and under-carriage characteristics.

2.14.2 The friction coefficient shall be measured if a run-way is covered wholly or partly by snow or ice and repeated as conditions change. Friction measurements and/or braking action assessments on surfaces other than runways shall be made when an unsatisfactory friction condition can be expected on such surfaces.

2.14.3 The measurement of the friction coefficient provides the best basis for determining surface friction conditions. The value of surface friction shall be the maximum value, which occurs when a wheel is slipping but still rolling. Various friction measuring devices may be used. As there is an operational need for uniformity in the method of assessing and reporting runway friction conditions, the measurements shall preferably be made with equipment, which provides continuous measuring of the maximum friction along the entire runway. Measuring techniques and information on limitations of the various friction measuring devices and precautions to be observed are given in the ICAO **Airport Services Manual, Part 2.**

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

2.14.5 The friction conditions of a runway shall be expressed as" braking action information" in terms of the measured friction coefficient or estimated braking action. Specific numerical values are necessarily related to the design and construction of each friction measuring device as well as to the surface being measured and the speed employed.

2.14.6 The table below with associated descriptive terms was developed from friction data collected only in compacted snow and ice and shall not therefore be taken to be absolute values applicable in all conditions. If the surface is affected by snow or ice and the braking action is reported as" good ", pilots shall not expect to find conditions as good as on a clean dry runway (where the available friction may well be greater than that needed in any case). The value" good" is a comparative value and is intended to mean that aeroplanes shall not experience directional control or braking difficulties, especially when landing.

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

2.14.7 It has been found necessary to provide surface friction information for each third of a runway. The thirds are called A, B and C. For the purpose of reporting information to aeronautical service units, section A is always the section associated with the lower runway designation number. When giving landing information to a pilot before landing, the sections are however referred to as first, second or third part of the runway. The first part always means the first third of the runway as seen in the direction of landing. Friction measurements are made along two lines parallel to the runway, i.e. along a line on each side of the centre line approximately 3 m or that distance from the centre line at which most operations take place. The objective of the tests is to determine the mean friction value for sections A, B and C. In cases where a continuous friction-measuring device is used, the mean values are obtained from the friction values recorded for each section. The distance between each test point shall be approximately 10 per cent of the usable length of the runway. If it is decided that a single test line on one side of the runway centre line gives adequate coverage of the runway, then it follows that each third of the runway shall have three tests carried out on it. Test results and calculated mean friction values are entered in a special form (see ICAO **Airport Services Manual, Part 2).**

Note: - Where applicable, figures for stopway friction value shall also be made available on request.

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

2.14.9 Airport Services Manual, Part 2 provides guidance on the uniform use of test equipment to achieve compatible test results and other information on removal of surface contamination and improvement of friction conditions.

2.15 Disabled aircraft removal

Note: - Guidance on removal of a disabled aircraft, including recovery equipment, is given in the **Airport Services Manual, Part 5**. See also Annex 13 concerning protection of evidence, custody and removal of aircraft.

2.15.1 **Recommendation: -** A plan for the removal of an aircraft disabled on, or adjacent to, the movement area should be established for an aerodrome, and a coordinator designated to implement the plan, when necessary

2.15.2 **Recommendation: -** The disabled aircraft removal plan should be based on the characteristics of the aircraft that may normally be expected to operate at the aerodrome, and include among other things:

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

b) Arrangements for the rapid receipt of aircraft recovery equipment kits available from other aerodromes.

2.15.3 **Recommendation: -** The telephone/telex number(s) of the office of the aerodrome coordinator of operations for the removal of an aircraft disabled on or adjacent to the movement area should be made available, on request, to aircraft operators.

2.15.4 **Recommendation: -** Information concerning the capability to remove an aircraft disabled on or adjacent to the movement area should be made available.

Note. - The capability to remove a disabled aircraft may be expressed in terms of the largest type of aircraft, which the aerodrome is equipped to remove.

2.16 Rescue and fire fighting

2.16.1 General

The principal objective of a rescue and fire fighting service is to save lives. For this reason, the provision of means of dealing with an aircraft accident or incident occurring at, or in the immediate vicinity of, an aerodrome assumes primary importance because it is within this area that there are the greatest opportunities of saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following an aircraft accident or incident, or at any time during rescue operations.

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.

2.16.2 Application

2.16.3 Rescue and fire fighting equipment and services shall be provided at an aerodrome.

Note: - Public or private organizations, suitably located and equipped, may be designated to provide the rescue and fire fighting service. It is intended that the fire station housing these organizations be normally located on the aerodrome, although an off-aerodrome location is not precluded provided the response time can be met.

2.16.4 Where a aerodrome is located close to water/swampy areas, or difficult terrain, and where a significant portion of approach or departure operations takes place over these areas, specialist rescue services and fir fighting equipment appropriate to the hazard and risk shall be available.

Note 1: - Special fire fighting equipment need not be provided for water areas; this does not prevent the provision of such equipment if it would be of practical use, such as when the areas concerned include reefs or islands.

Note 2: - The objective is to plan and deploy the necessary life-saving flotation equipment as expeditiously as possible in a number commensurate with the largest aeroplane normally using the aerodrome.

Note 3: - Additional guidance is available in Chapter 13 of the Airport Services Manual, Part I.

Level of protection to be provided

2.16.5 The level of protection provided at an aerodrome for rescue and fire fighting shall be appropriate to the aerodrome category determined using the principles in 2.16.7 and 2.16.8 except that, where the number of movements of the aeroplanes in the highest category normally using the aerodrome is less than 700 in the busiest consecutive three months, the level of protection provided shall be not less than one category below the determined category.

Note: - Either a take-off or a landing constitutes a movement.

2.16.6 From 1st January 2005, the level of protection provided at an aerodrome for rescue and fire fighting shall be equal to the aerodrome category determined using the principles in2.16.7 and 2.16.8.

2.16.7 The aerodrome category shall be determined from Table 9-1 and shall be based on the longest aeroplanes normally using the aerodrome and their fuselage width.

Note: - To categorize the aeroplanes using the aerodrome, first evaluate their overall length and second, their fuselage width.

2.16.8 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 2-7**, column 3 for that category, then the category for that aeroplane shall actually be one category higher.

Note: - Guidance on categorizing aerodromes for rescue and fire fighting purposes and on providing rescue and fire fighting equipment and services is given in Attachment A, Section 16 and in the Airport Services Manual, Part 1.

2.16.9 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.

Table 2-7 Aerodrome Categories For Rescue and Fire Fighting

Aerodrome Category	Aeroplane overall Length	Maximum Fuselage Width
(1)	(2)	(3)
1	0 m up to but not including 9m	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

Extinguishing agents

2.16.10 Both principal and complementary agents shall normally be provided at an aerodrome.

Note: - Descriptions of the agents may be found in the Airport Services Manual, part 1.

2.16.11 The principal extinguishing agent shall be:
a) a foam meeting the minimum performance level A; or
b) a foam meeting the minimum performance level B; or
c) a combination of these agents;

except that the principal extinguishing agent for aerodromes in categories 1 to 3 shall preferably meet the minimum performance level B.

Note: - Information on the required physical properties and fire extinguishing performance criteria needed for foam to achieve an acceptable performance level A or B rating is given in the Airport Services Manual, Part 1.

2.16.12 The complementary extinguishing agent shall be a dry chemical powder suitable for extinguishing hydrocarbon fires.

Note 1: - When selecting dry chemical powders for use with foam, care must be exercised to ensure compatibility.

Note 2: - Alternate complementary agents having equivalent fire fighting capability may be utilized. Additional information on extinguishing agents is given in the Airport Services Manual, Part 1.

2.16.13 The amounts of water for foam production and the complementary agents to be provided on the rescue and fire fighting vehicles shall be in accordance with the aerodrome category determined under **2.16.5, 2.16.6, 2.16.7, 2.16.7 and Table 2-8,** except that these amounts may be modified as follows:

a) For aerodrome categories 1 and 2 up to 100 per cent of the water may be replaced by complementary agent; or

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

For the purpose of agent substitution, the following equivalents shall be used:

1 kg foam complimentary agent	= 1.0 L water for production of a foam meeting performance level A.
1 kg Complementary agent	= 0.66 L water for production of a foam meeting performance level B

Note 1: - The amounts of water specified for foam production are predicated on an application rate of 8.2 L/min/m² for a foam meeting performance level A, and 5.5 L/min/m² for a foam meeting performance level B.

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

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

2.16.15 The amount of foam concentrate provided on a vehicle shall be sufficient to produce at least two loads of foam solution.

2.16.16 Supplementary water supplies, for the expeditious replenishment of rescue and fir fighting vehicles at the scene of an aircraft accident, shall be provided.

2.16.17 When both a foam meeting performance level A and a foam meeting performance level B are to be used, the total amount of water to be provided for foam production shall first be based on the quantity which would be required if only a foam meeting performance level A were used, and then reduced by 3 L for each 2 L of water provided ,for the foam meeting performance level B.

2.16.18 The discharge rate of the foam solution shall not be less than the rates shown in **Table 2-8.**

Table 2-8 Minimum usable amount of extinguishing agents

Foam meeting performance level A			Foam meeting performance level B		Complementary agent
Aerodrome category	Water[1] (L)	Discharge rate Foam solution/minute (L)	Water[1] (L)	Discharge rate Foam solution/minute (L)	Dry[2] Chemical powder (Kg)
(1)	(2)	(3)	(4)	(5)	(6)
1	350	350	230	230	45
2	1000	800	670	550	90
3	1800	1300	1200	900	135
4	3600	2600	2400	1800	135
5	8100	4500	5400	3000	180
6	11800	6000	7900	4000	225
7	18200	7900	12100	5300	225
8	27300	10800	18200	7200	450
9	36400	13500	24300	9000	450
10	48200	16600	32300	11200	450

Note: -1 The quantities of water shown in column 2 and 4 are based on the average overall length of aeroplanes in a given category, where operations of an aeroplane larger than the average size are expected, the quantities of water would need to be recalculated .See the Airport Services Manual, Part 1 for additional guidance.

Note: - 2 any other complementary agent having equivalent fire fighting capability may be used.

2.16.19 The complementary agents shall comply with the appropriate specifications of the International Organization for Standardization (ISO). **{See ISO Publications 5923 (Carbon Dioxide), 7201 (Halogenated Hydrocarbons) and 7202 (Powder)}.**

2.16.20 The discharge rate of complementary agents shall be selected for optimum effectiveness of the agent.

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

2.16.22 Rescue equipment commensurate with the level of aircraft operations shall be provided on the rescue and fire fighting vehicle(s).

Note. - Guidance on the rescue equipment to be provided at an aerodrome is given in the Airport Services Manual, Part I.

Response time

2.16.23 The operational objective of the rescue and fir fighting service shall be to achieve a response time **not exceeding three minutes** to any point of each operational runway, in the optimum visibility and surface condition.

2.16.24 The operational objective of the rescue and fire fighting service shall be to achieve a response times **not exceeding two minutes to any point** of each operational runway, in optimum visibility and surface conditions.

2.16.25 The operational objective of the rescue and fire fighting service shall be to achieve a response time **not exceeding three minutes to any other part of the movement area** in optimum visibility and surface conditions.

Note 1: - Response time is considered to be the time between the initial call to the rescue and fire fighting 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 9-2.

Note 2: - To meet the operational objective as nearly as possible in less than optimum conditions of visibility, it may be necessary to provide guidance and/or procedures for rescue and fire fighting vehicles.

Note 3: - Optimum visibility and surface conditions are defined as daytime, good visibility, no precipitation with normal response route free of surface contamination e.g. water, ice or snow.

2.16.26 Any other vehicles required to deliver the amounts of extinguishing agents specified in Table 9-2 shall arrive no more than one minute after the first responding vehicle(s) so as to provide continuous agent application,

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

Emergency access roads

2.16.28 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 shall be given to the provision of ready access to approach areas up to 1000 m 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.

Note: - Aerodrome service roads may serve as emergency access roads when they are suitably located and constructed.

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

2.16.30 When the surface of the road is indistinguishable from the surrounding area, or in areas where snow may obscure the location of the roads, edge markers shall be placed at intervals of about 10 m.

Fire stations

2.16.31 All rescue and fire fighting vehicles shall normally be housed in a fire station. Satellite fire stations shall be provided whenever the response time cannot be achieved from a single fire station.

2.16.32 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.

Communication and alerting systems

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

2.16.34 An alerting system for rescue and fire fighting 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.

Number of rescue and fire fighting vehicles

2.16.35 The minimum number of rescue and fire fighting vehicles provided at an aerodrome shall be in accordance with the following tabulation:

Aerodrome Category	Rescue and Fire Fighting Vehicles
1	1
2	1
3	1
4	1
5	1
6	2
7	2
8	3
9	3
10	3

Note: - Guidance on minimum characteristics of rescue and fire fighting vehicles is given in the Airport Services Manual, Part 1.

Personnel

2.16.36 All rescue and fire fighting 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 fire fighting equipment in use at the aerodrome, including pressure-fed fuel fires.

Note 1: - Guidance to assist the appropriate authority in providing proper training is given in Attachment A, Section 17; Airport Services Manual, Part I: and Training Manual, Part E-2.

Note 2: - Fires associated with fuel discharged under very high pressure from a ruptured fuel tank are known as “pressure-fed fuel fires “

2.16.37 The rescue and tire fighting personnel training programme shall include training in human performance, including team coordination.

Note: - Guidance material to design training Programmes on human performance and team coordination can be found in the Human Factors Training Manual.

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

2.16.39 In determining the number of personnel required to provide for rescue, consideration shall be given to the types of aircraft using the aerodrome.

2.16.40 All responding rescue and tire fighting personnel shall be provided with protective clothing and respiratory equipment to enable them to perform their duties in an effective manner.

2.16.41 Information concerning the level of protection provided at an aerodrome for aircraft rescue and fire fighting purposes shall be made available.

2.16.42 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 described in **2.16.5,2.16.6,2.16.7 & 2.16.8** and in accordance with the types and amounts of extinguishing agents normally available at the aerodrome.

2.16.43 Significant 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 aeronautical information units to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been corrected, the above units shall be advised accordingly.

Note: - A significant change in the level of protection is considered to be a change in the category of the rescue and fire fighting service from the category normally available at the aerodrome, resulting from a change in availability of extinguishing agents, equipment to deliver the agents or personnel to operate the equipment, etc.

2.16.44 A significant change shall be expressed in terms of the new category of the rescue and fire fighting service available at the aerodrome.

2.17 Visual approach slope indicator systems

2.17.1 The following information concerning a visual approach slope indicator system installation shall be made available:

a) associated runway designation number;

b) type of system according to **5.3.5.2**. For an AT-VASIS, PAPI or APAPI installation, the side of the runway on which the lights are installed, i.e. left or right, shall be given;

c) where the axis of the system is not parallel to the runway centre line, the angle of displacement and the direction of displacement, i.e. left or right shall be indicated;

d) nominal approach slope angle(s). For a T-VASIS or an AT-VASIS this shall be angle □ according to the formula in Figure 5-14 and for a PAPI and an APAPI this shall be angle (B + C) ÷ 2 and (A + B) ÷ 2, respectively as in **Figure 5-16**; and

e) minimum eye height(s) over the threshold of the on-slope signal(s). For a T-VASIS or an AT-VASIS this shall be the lowest height at which only the wing bar(s) are visible; however, the additional heights at which the wing bar(s) plus one, two or three fly down light units come into view may also be reported if such information would be of benefit to aircraft using the approach. For a PAPI this shall be the setting angle of the third unit from the runway minus 2', i.e. angle B minus 2', and for an APAPI this shall be the setting angle of the unit farther from the runway minus 2', i.e. angle A minus 2'.

2.18 Coordination between aeronautical information services and aerodrome authorities

2.18.1 To ensure that aeronautical information services units obtain information to enable them to provide up-to-date pre-flight information and to meet the need for in-flight information, arrangements shall be made between aeronautical information services and aerodrome authorities responsible for aerodrome services to report to the responsible aeronautical information services unit, with a minimum of delay:

a) information on aerodrome conditions (ref**. 2.11, 2.15, 2.16 and 2.17** above);

b) the operational status of associated facilities, services and navigation aids within their area of responsibility;

c) any other information considered to be of operational significance.

2.18.2 Before introducing changes to the air navigation system, due account shall be taken by the services responsible for such changes of the time needed by the aeronautical information service for the preparation, production and issue of relevant material for promulgation. To ensure timely provision of the information to the aeronautical information service, close coordination between those services concerned is therefore required.

2.18.3 Of a particular importance are changes to aeronautical information that affect charts and/or computer-based navigation systems which qualify to be notified by the aeronautical information regulation and control (AIRAC) system, as specified in ICAO Annex 15, Chapter 6 and Appendix 4. The predetermined, internationally agreed AIRAC effective dates in addition to 14 days postage time shall be observed by the responsible aerodrome services when submitting the raw information/data to aeronautical information services.

2.18.4 The aerodrome services responsible for the provision of raw aeronautical information/data to the aeronautical information services shall do that while taking into account accuracy and integrity requirements for aeronautical data as specified in Appendix 5 to this Standard.

Note 1: - Specifications for the issue of a NOTAM and SNOWTAM are contained in ICAO Annex 15, Chapter 5, Appendices 6 and 2 respectively.

Note 2: - AIRAC information is distributed by the AIS at least 42 days in advance of the AIRAC effective dates with the objective of reaching recipients at least 28 days in advance of the effective date.

Note 3: - The schedule of the predetermined internationally agreed AIRAC common effective dates at intervals of 28 days, including 6 November 1997 and guidance for the AIRAC use are contained in the ICAO Aeronautical Information Services Manual (Doc 8126, Chapter 3, 3.1.1 and Chapter 4, 4.4).

- END OF CHAPTER 2 -