CIVIL AVIATION AUTHORITY OF FIJI

STANDARDS DOCUMENT

Appendix 8
Electrical Systems

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ELECTRICAL SYSTEMS

1.0 INTRODUCTION

1.1 This appendix expands on the requirements of SD-AD chapter 2 pertaining to aerodrome electrical system requirements.

1.2 The safety of operations at aerodromes depends on the quality of the supplied power. The total electrical power supply system may include connections to one or more external sources of electric power supply, one or more local generating facilities and to a distribution network including transformers and switchgear. Many other aerodrome facilities supplied from the same system need to be taken into account while planning the electrical power system at aerodromes.

2.0 Electrical power supply systems for air navigation facilities

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

2.2 The design and provision of electrical power systems for aerodrome visual and radio navigation aids shall be such that an equipment failure will not leave the pilot with inadequate visual and non-visual guidance or misleading information.

Note. — The design and installation of the electrical systems need to take into consideration factors that can lead to malfunction, such as electromagnetic disturbances, line losses, power quality, etc. Additional guidance is given in the Aerodrome Design Manual (Doc 9157), Part 5.

2.3 Electric power supply connections to those facilities for which secondary power is required *should* be so arranged that the facilities are automatically connected to the secondary power supply on failure of the primary source of power.

2.4 The time interval between failure of the primary source of power and the complete restoration of the services required by 2.10 *should* be as short as practicable, except that for visual aids associated with non-precision, precision approach or take-off runways the requirements of Table 1 for maximum switch-over times *should* apply.

Note. — Switch-over time is 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.

2.5 For installation of a secondary power supply, the electric power supply connections to those facilities for which secondary power is required shall be so arranged that the facilities are capable of meeting the requirements of Table 1 for maximum switch-over times.

Visual aids

2.6 For a precision approach runway, a secondary power supply capable of meeting the requirements of Table 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 primary source of power.

2.7 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 1 shall be provided.

2.8 At an aerodrome where the primary runway is a non-precision approach runway, a secondary power supply capable of meeting the requirements of Table 1 *should* be provided except that a secondary power supply for visual aids need not be provided for more than one non- precision approach runway.

2.9 At an aerodrome where the primary runway is a non-instrument runway, a secondary power supply capable of meeting the requirements of 2.4 *should* be provided, except that a secondary power supply for visual aids need not be provided when an emergency lighting system in accordance with Appendix 5 section 4.8 is provided and capable of being deployed in 15 minutes.

2.10 The following aerodrome facilities *should* 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;

Note. — The requirement for minimum lighting may be met by other than electrical means.

(b) all obstacle lights which, in the opinion of the appropriate authority, are essential to ensure the safe operation of aircraft;

(c) approach, runway and taxiway lighting as specified in 2.6 to 2.9;

(d) meteorological equipment;

(e) essential security lighting, if provided in accordance with Appendix 9 section 12.0;

(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.

Note. — Specifications for secondary power supply for radio navigation aids and ground elements of communications systems are given in ICAO Annex 10, Volume I, Chapter 2.

2.11 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.

Note. — Guidance on electrical systems is included in the Aerodrome Design Manual (Doc 9157), Part 5.

3.0 System design

3.1 For a runway meant for use in runway visual range conditions less than a value of 550m, the electrical systems for the power supply, lighting and control of the lighting systems included in Table 1 shall be so designed that an equipment failure will not leave the pilot with inadequate visual guidance or misleading information.

Note. — Guidance on means of providing this protection is given in the Aerodrome Design Manual (Doc 9157), Part 5.

3.2 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.

3.3 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.

Table 1- Secondary power supply requirements

Runway	Lighting aids requiring power	Maximum switch-over time
Non-instrument	Visual approach slope indicators [a] Runway edge [b] Runway threshold [b] Runway end [b] Obstacle [a]	Refer 2.4 and 2.9
Non-precision approach	Approach lighting system Visual approach slope indicators [a, d] Runway edge [d] Runway threshold [d] Runway end Obstacle [a]	15 seconds
Precision approach category I	Approach lighting system Runway edge [d] Visual approach slope indicators [a, d] Runway threshold [d] Runway end Essential taxiway [a] Obstacle [a]	15 seconds
Precision approach category II/III	Inner 300 m of the approach lighting system Other parts of the approach lighting system Obstacle [a] Runway edge Runway threshold Runway end Runway centre line Runway touchdown zone All stop bars Essential taxiway	1 second 15 seconds 15 seconds 15 seconds 1 second 1 second 1 second 1 second 1 second 15 seconds
Runway meant for take-off in runway visual range conditions less than a value of 800 m	Runway edge Runway end Runway centre line All stop bars Essential taxiway [a] Obstacle [a]	15 seconds [c] 1 second 1 second 1 second 15 seconds 15 seconds

[a.] Supplied with secondary power when their operation is essential to the safety of flight operation.
[b.] See SD-AD Appendix 4 (4.8), regarding the use of emergency lighting.
[c.] One second where no runway centre line lights are provided.
[d.] One second where approaches are over hazardous or precipitous terrain.

4.0 Monitoring

Note. — Guidance on this subject is given in the Aerodrome Design Manual (Doc 9157), Part 5.

4.1 A system of monitoring should be employed to indicate the operational status of the lighting systems.

4.2 Where lighting systems are used for aircraft control purposes, such systems shall be monitored automatically so as to provide an indication of any fault which may affect the control functions. This information shall be automatically relayed to the air traffic services unit.

4.3 Where a change in the operational status of lights has occurred, an indication should be provided within two seconds for a stop bar at a runway-holding position and within five seconds for all other types of visual aids.

4.4 For a runway meant for use in runway visual range conditions less than a value of 550m, the lighting systems detailed in Table 1 should be monitored automatically so as to provide an indication when the serviceability level of any element falls below the minimum serviceability level specified in Appendix 10 sections 5.7 to 5.11, as appropriate. This information should be automatically relayed to the maintenance crew.

4.5 For a runway meant for use in runway visual range conditions less than a value of 550m, the lighting systems detailed in Table 1 should be monitored automatically to provide an indication when the serviceability level of any element falls below the minimum level specified by the appropriate authority below which operations should not continue. This information should be automatically relayed to the air traffic services unit and displayed in a prominent position.

Note. — Guidance on air traffic control interface and visual aids monitoring is included in the Aerodrome Design Manual (Doc 9157), Part 5.