

CHAPTER 8. ELECTRICAL SYSTEMS

8.1 Electrical power supply systems for air navigation facilities

Note: - 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 supply, one or more local generating facilities and to a distribution network including transformers and switchgear. Many other aerodromes facilities supplied from the same system need to be taken into account while planning the electrical power system at aerodromes.

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

8.1.2 The design and provision of electrical power system for aerodromes 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 system need to take into consideration factor that can lead to malfunction, such as electromagnetic disturbances, line losses, power quality, etc. Additional guidance is given in the Aerodrome Design Manual Part-5.

8.1.3 **Recommendation:** - 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

8.1.4 **Recommendation:** - The time interval between failure of the primary source of power and the complete restoration of the services required by 8.1.10 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 8-1 for maximum switch-over times should apply.

Note: - Definition on switch over time is given in Chapter 1.

8.1.5 The provision of a definition of switch-over time shall not require the replacement of an existing secondary power supply before **1 January 2010**. However, for a secondary power supply installed after **4 November 1999**, 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 8- 1 for maximum switch-over times as defined in Chapter 1.

Visual aids

Application

- 8.1.6 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 primary source of power.
- 8.1.7 For a runway meant for take-off in runway visual range conditions less than a value of 800 m, a secondary power supply capable of meeting the relevant requirements of Table 8-1 shall be provided.
- 8.1.8 **Recommendation:** - At an aerodrome where the primary runway is a non-precision approach runway, a secondary power supply capable of meeting the requirements of Table 8-1 should be provided except that a secondary power supply for visual aids need not be provided for more than one non-precision approach runway.
- 8.1.9 **Recommendation:** -At an aerodrome where the primary runway is a non-instrument runway, a secondary power supply capable of meeting the requirements of 8.1.4 should be provided, except that a secondary power supply for visual aids need not be provided when an emergency lighting system in accordance with the specification of 5.3.2 is provided and capable of being deployed in 15 minutes.
- 8.1.10 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 signaling 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 8.1.6 to 8.1.9;
- d) Meteorological equipment installed (**ATC tower only**);
- e) Essential security lighting, if provided in accordance with 9.11;
- f) Essential equipment and facilities for the aerodrome responding emergency agencies;
- g) Floodlighting on a designated isolated aircraft parking position if provided in accordance with 5.3.21.1; 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 Chapter 2 of Annex IO, Volume I, Part I,

8.1.11 Requirements for a secondary power supply shall be met by either of the following:

- 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
- Standby power unit(s)**, which are engine generators, batteries, etc., from which electric power can be obtained.

Note: - Guidance on secondary power supply is given in the Aerodrome Design Manual, Part 5.

8.2 System design

8.2.1 For a runway meant for use in runway visual range conditions less than a value of 550 m, the electrical systems for the power supply, lighting and control of the lighting systems included in Table 8-1 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, Part 5

- 8.2.2 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.

Note: - Guidance on acceptable power source arrangements for the use of duplicate feeders for a secondary power supply is given in the Aerodrome Design Manual, Part 5

- 8.2.3 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.

8.3 Monitoring

Note: - Guidance on this subject is given in the Aerodrome Design Manual, Part 5.

- 8.3.1 A system of monitoring shall be employed to indicate the operational status of the lighting system.

- 8.3.2 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.

- 8.3.3 **Recommendation:** - 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 **5 seconds** for all other types of visual aids.

- 8.3.4 **Recommendation:** -For a runway meant for use in runway visual range conditions **less than a value of 550 m**, the lighting systems detailed in Table 8-1 should be monitored so as to provide an immediate indication when the serviceability level of any element falls below the minimum serviceability level specified in **10.4.7** to **10.4.11**, as appropriate. This information should be immediately relayed to the maintenance crew.

- 8.3.5 **Recommendation:** -For a runway meant for use in runway visual range conditions less than a value of 550 m, the lighting systems detailed in Table 8-1 should be monitored automatically to provide an immediate 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, Part 5.

**Table 8-1 Secondary Power Supply requirements
(See 8.1.4)**

Runway	Lighting aids requiring power	Maximum Switch over time
Non –instrument	Visual approach slope indicator ^a	See 8.1.4 and 8.1.9
	Runway edge ¹	
	Runway threshold ¹	
	Runway end ¹	
	Obstacle ^a	
Non-precision approach	Approach lighting system	15 Seconds
	Visual approach slope indicator system ^{a, 3}	15 Seconds
	Runway edge ³	15 Seconds
	Runway threshold ³	15 Seconds
	Runway end	15 Seconds
	Obstacle ^a	15 Seconds
Precision approach category-I	Approach lighting system	15 Seconds
	Visual approach slope indicator system ^{a,3}	15 Seconds
	Runway edge ³	15 Seconds
	Runway threshold ³	15 Seconds
	Runway end	15 Seconds
	Essential taxiway ^a	15 Seconds
Precision approach category-II/III	Inner 300 m of approach lighting system	01 Second
	Other parts of the approach lighting system	15 Seconds
	Obstacle ^a	15 Seconds
	Runway edge	15 Seconds
	Runway threshold	01 Second
	Runway end	01 Second
	Runway center line	01 Second
	Runway touchdown zone	01 Second
	All stop bars	01 Second
Essential taxiway	15 Seconds	
Runway meant for take-off in runway visual range conditions less than a value of 800 m	Runway edge	15 Seconds ²
	Runway end	01 Second
	Runway center line	01 Second
	All stop bars	01 Second
	Essential taxiway ^a	15 Seconds
	Obstacle	15 Seconds

^a Supplied with secondary power when their operation is essential to the safety of flight operation.

¹ see chapter 5,5.3.2 regarding the use of emergency lighting.

² one second where no runway center line lights are provided

³ one second where approaches are over hazardous or precipitous terrain.