

CHAPTER (8)

ELECTRICAL SYSTEMS

8.1 ELECTRICAL POWER SUPPLY SYSTEMS FOR AIR NAVIGATION FACILITIES

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.

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 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 CARC Guidance Material Aerodrome Electrical System 34/ADES.

8.1.3 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 primary source of power.

8.1.4 The time interval between failure of the primary source of power and the complete restoration of the services required by paragraph 8.1.10 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.

Note: A definition of switch-over time is given JCAR Part139 Paragraph 139.3.

8.1.5 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 JCAR Part 139 Paragraph 139.3.

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 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 shall 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 At an aerodrome where the primary runway is a non-instrument runway, a secondary power supply capable of meeting the requirements of paragraph 8.1.4 at this chapter 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 Chapter 5 paragraph 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;

The requirement for minimum lighting shall 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 Section 8.1.6 to 8.1.9;
- d) meteorological equipment;
- e) essential security lighting, if provided in accordance with Chapter 9 section 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 Chapter 5 section 5.3.24.1; 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 the ICAO Annex 10, Volume I, Chapter 2.

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 electrical systems is included in the CARC Guidance Material Aerodrome Electrical System 34/ADES.

8.2 SYSTEM DESIGN

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 CARC Guidance Material Aerodrome Electrical System 34/ADES.

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.

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 CARC Guidance Material Aerodrome Electrical System 34/ADES.

3.1 A system of monitoring shall be employed to indicate the operational status of the lighting systems.

3.2 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 service unit.

3.3 Where a change in the operational status of lights has occurred, an indication shall 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.

3.4 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 shall be monitored automatically so as to provide an indication when the serviceability level of any element falls below the minimum serviceability level specified in Chapter 10 paragraph 10.5.7 to 10.5.11, as appropriate. This information shall be automatically relayed to the maintenance crew.

3.5 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 shall be monitored automatically to provide an indication when the serviceability level of any element falls below the minimum level specified in Chapter 10 paragraph 10.4.7 to 10.4.11 (in which operation shall not continue). This information shall 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 CARC Guidance Material Aerodrome Electrical System 34/ADES.

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 indicators ^a	
	Runway edge ^b	See
	Runway threshold ^b	8.1.4 and
	Runway end ^b	8.1.9
	Obstacle ^a	
Non-precision approach	Approach lighting system	15 seconds
	Visual approach slope indicators ^{a, d}	15 seconds
	Runway edge ^d	15 seconds
	Runway threshold ^d	15 seconds
	Runway end	15 seconds
	Obstacle ^a	15 seconds
Precision approach category I	Approach lighting system	15 seconds
	Runway edge ^d	15 seconds
	Visual approach slope indicators ^{a, d}	15 seconds
	Runway threshold ^d	15 seconds
	Runway end	15 seconds
	Essential taxiway ^a	15 seconds
	Obstacle ^a	15 seconds
Precision approach category II / III	Inner 300 m of the approach lighting system	1 second
	Other parts of the approach lighting system	15 seconds
	Obstacle ^a	15 seconds
	Runway edge	15 seconds
	Runway threshold	1 second
	Runway end	1 second
	Runway center line	1 second
	Runway touchdown zone	1 second
	All stop bars	1 second
	Essential taxiway	15 seconds
	Runway meant for take-off in runway visual range conditions less than a value of 800 m	Runway edge
Runway end		1 second
Runway center line		1 second
All stop bars		1 second
Essential taxiway ^a		15 seconds
Obstacle ^a		15 seconds

- a. Supplied with secondary power when their operation is essential to the safety of flight operation.
- b. See Chapter 5 Section 5.3.2 regarding the use of emergency lighting.
- c. One second where no runway center line lights are provided.
- d. One second where approaches are over hazardous or precipitous terrain.

