RA 3520 - Permanent Fixed Wing Aerodrome - Aerodrome Electrical Systems

Rationale

The safety of operations at aerodromes is dependent on the quality of the power supplied through safety-related electrical systems. In order to protect the electrical power supply the 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.

Contents

Regulation 3520(1)

Aerodrome Electrical System Design

3520(1) Heads of Establishments (HoEs) and Aviation Duty Holder (ADH) Facing organizations **shall** ensure that the design and provision of electrical power systems for aerodrome visual and radio navigation aids is such that normal and non-normal operation does not result in inadequate visual and non-visual guidance or misleading information.

Acceptable Means of Compliance 3520(1)

Aerodrome Electrical System Design

1. Adequate primary electrical power supply **should** be available at aerodromes for the safe functioning of air navigation facilities.

2. Secondary power supplies **should** be provided for the following:

   a. Precision and Non-Precision approach runways;

   b. Runways designed for take-offs with Runway Visual Range (RVR) less than 800 m.

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.

4. 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;

   b. Obstacle lights which are essential to ensure the safe operation of Air Systems;

   c. Approach, runway and taxiway lighting as specified in Table 1;

   d. Meteorological equipment and navigation aids;

   e. Essential equipment and facilities for the parking position if provided, in accordance with the Aerodrome Emergency Plan; and

   f. Illumination of apron areas over which passengers may walk.

5. The time interval between failure of the primary source of power and the complete restoration of the services required by Table 1 **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.

Acceptable Means of Compliance 3520(1)

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]	
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	15 seconds
	Obstacle [a]	15 seconds
Precision approach category II/III	Inner 300m 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 centre-line	1 second
	Runway touchdown zone	1 second
	All stop bars	1 second
	Essential taxiway	15 second
Runway meant for take-off in runway visual range conditions less than a value of 800m	Runway edge	15 seconds[c]
	Runway end	1 second
	Runway centre-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 International Civil Aviation Organization (ICAO) Annex 14 Vol I 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 of precipitous terrain.

6. 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

Acceptable Means of Compliance 3520(1)

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 units, which are engine generators, batteries, etc, from which electric power can be obtained.

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

8. Where the secondary power supply of an aerodrome is provided using duplicate feeders, such supplies **should** be physically and electrically separate to ensure the required level of availability and independence.

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

10. Where lighting systems are used for Air System control purposes, such systems **should** be monitored automatically to provide an indication of any fault which may affect the control functions. This information **should** be automatically relayed to the air traffic services unit.

11. 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.

Guidance Material 3520(1)

Aerodrome Electrical System Design

12. The recommended current settings may be different for LED light units.

13. The Maximum Switchover Time is the time required for the actual intensity of a light measured in each direction to fall from 50% and recover to 50% during a power supply changeover, when the light is being operated at intensities of 25% or above.

14. In order to provide the Interleaving Aerodrome Ground Lighting (AGL) operational luminous intensity the AGL services are to be provided with a range of recommended output current steps in accordance with Table 2.

Table 2. Recommended AGL Luminous Intensity Control Stages

Lighting Service	Information	6 Stage Brilliancy (+NVG)							2 Stage Brilliancy (+NVG)		
		Max	2	3	4[b]	5	Min	NVG			
HI Approach	Luminous Intensity %	100	30	10	3	1	0.3[a]	-			
	Primary Current (A)	12.0	9.72	8.28	7.08	6.12	5.28	2.8			
Supplementary Approach	Luminous Intensity %	100	30	10	3	1	0.3	-			
	Primary Current (A)	12.0	9.72	8.28	7.08	6.12	5.28	N/A			
Wing Threshold	Luminous Intensity %	100	30	10	3	1	0.3[a]	-			
	Primary Current (A)	12.0	9.72	8.28	7.08	6.12	5.28	2.8			
Precision Approach Path Indicator (PAPI)	Luminous Intensity %	100	80	30	10	3	1	-			
	Primary Current (A)	12.0	11.52	9.72	8.28	7.08	6.12	N/A			
Touchdown Zone	Luminous Intensity %	100	30	10	3	1	0.3[a]	-			
	Primary Current (A)	12.0	9.72	8.28	7.08	6.12	5.28	N/A			
Rwy Centre-Line	Luminous Intensity %	100	30	10	3	1	0.3[a]	-			
	Primary Current (A)	12.0	9.72	8.28	7.08	6.12	5.28	N/A			

Guidance Material 3520(1)

Threshold Bar	Luminous Intensity %	100	30	10	3	1	0.3[a]	-			
	Primary Current (A)	12.0	9.72	8.28	7.08	6.12	5.28	3.2			
HI Rwy Edge	Luminous Intensity %	100	30	10	3	1	0.3[a]	-			
	Primary Current (A)	12.0	9.72	8.28	7.08	6.12	5.28	3.0			
Rwy End Bar	Luminous Intensity %	100	30	10	3	1	0.3[a]	-			
	Primary Current (A)	12.0	9.72	8.28	7.08	6.12	5.28	3.2			
LI Rwy Edge	Luminous Intensity %	100	30	10	3	1	0.3[a]	-			
	Primary Current (A)	12.0	9.72	8.28	7.08	6.12	5.28	3.2			
									Max	Min	NVG
Twy Edge	Luminous Intensity %								100	10	-
	Primary Current (A)								6.0[d]	4.4[d]	-
Twy Centre-Line	Luminous Intensity %								100	10	-
	Primary Current (A)								6.0[d]	4.4[d]	2.5

a. If required, this brilliancy stage may be replaced with a 0.05 stage (Primary Current 4.4A).
b. Where NVG compatible lighting is ►operationally◄ justified then the Stage 4 brilliancy stage may be omitted and Stages 4 and Min. moved up one stage with the new NVG setting being inserted at the Min. setting. The given primary currents may require adjusting to suit local environmental conditions.
c. Where NVG compatible taxiway lighting is required an additional brilliancy stage is required. This will require the Modular Control System (MCS) to be modified.
d. These current values may need to be adjusted where LED technology is used.

15. The current control for an Illuminated Runway Distance to go Marker (IRDM) is to be in accordance with Table 3. Where LED technology is used, these values may need to be adjusted.

Table 3 IRDM Brilliancy Levels

Brilliancy Levels and Current Values				
Primary			**Secondary**	
Brilliancy %	**Current(A)**		**Current(A)**	**Brilliancy %**
100	12.0	=	6.60	100
30	9.72	=	6.60	100
10	8.28	=	6.34	80
3	7.08	=	5.90	50
1	6.12	=	5.02	20
0.3	5.28	=	4.55	10

Civil Equivalence.

16. This regulation is in line with ICAO Annex 14 Vol I para 8.1.

Regulation 3520(2)

Interleaving Aerodrome Ground Lighting

3520(2) HoEs and ADH Facing organizations **shall** ensure that the configuration of the electrical circuits that make up the AGL system is designed so that a failure of a single circuit will not cause a total lack of guidance.

Acceptable Means of Compliance 3520(2)

Interleaving Aerodrome Ground Lighting

17. Where interleaved circuits are provided, alternate lights **should** be connected to the same circuit. However, care needs be taken in the design of interleaved circuits to ensure that in the event of the failure of one or more circuits, a recognisable pattern and any colour coding is retained.

Guidance Material 3520(2)

Interleaving Aerodrome Ground Lighting

18. Interleaving techniques are to be used where alternate light units and/or lamps are controlled separately. The minimum requirement is to be:

a. At least two separate interleaved circuits for each of the following systems:

(1) Approach lighting (including Wing Threshold Bars) on precision approach runways;

(2) Supplementary approach lighting;

(3) High Intensity runway edge (including IRDM);

(4) High Intensity runway centre-line lighting;

(5) Touch down zone lighting;

(6) Runway end lighting;

(7) Low Intensity runway edge lighting; and

(8) Stop bar.

b. At least one circuit for the following services:

(1) High Intensity simple approach lighting;

(2) Approach lighting on non-precision approach runways;

(3) Threshold;

(4) PAPI (Per Wing Bar); and

(5) Taxiway and apron edge lighting

19. Interleaved circuits may be provided for the services listed in sub-paragraph 18b to increase integrity or to overcome a technical difficulty. However, PAPI installations may be limited to two circuits per runway end.

Civil Equivalence.

20. This regulation is in line with ICAO Annex 14 Vol I para 8.2.

Regulation 3520(3)

Truck Runway Control Electrical Services

3520(3) HoEs and ADH Facing organizations **shall** ensure that when a runway control position is established, a suitable electrical supply is provided to support the Truck Runway Control (TRC).

Acceptable Means of Compliance 3520(3)

Truck Runway Control Electrical Services

21. Where a TRC is established, a minimum 16 Ampere, Residual Current Device (RCD) and Portable Emissions Measurement System (PEMS) protected, IP67, IEC 60309, switched socket outlet **should** be provided to enable an electrical supply suitable for the truck runway control, positioned as follows:

a. On runway aerodromes - to the left or right of the runway a minimum of 45m from the runway edge and 70m from the threshold; and

b. On non-runway aerodromes - at the downwind side of the airfield, and so positioned that two or more Air Systems may land simultaneously to the right of the truck with sufficient space available to the left of the truck to enable Air Systems to take off (left/right as seen by a pilot in the approach).

Guidance Material 3520(3)

Truck Runway Control Electrical Services

22. Nil.

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