Civil Aviation Safety Authority
of Papua New Guinea

Advisory Circular

AC139-10.7

Maintenance – Electrical Systems

Initial Issue

23 April 2025

GENERAL

Civil Aviation Authority Advisory Circulars (AC) contain information about standards, practices and procedures that the Director has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

PURPOSE

This Advisory Circular provides specific guidance acceptable to the Director, for the monitoring and maintenance of airport lighting systems, as specified with Civil Aviation Rule 139.H.3 Monitoring Requirements of Airport Electrical Systems requirements and explanatory material to assist in showing compliance.

RELATED CAR

This AC relates specifically to Civil Aviation Rule Part 139.H.3 Monitoring

CHANGE NOTICE

There was no previous issue of this AC, consequently no change is in effect.

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CHAPTER 1 - GENERAL

This Civil Aviation Advisory Circular provides essential guidance on the monitoring and maintenance of airport lighting systems. The objective is to ensure the operational reliability and safety of these systems, which are critical for the safe operation of aircraft within the airport environment.

Airport lighting systems, including runway and taxiway lights, play a vital role in providing visual guidance to pilots during takeoff, landing, and taxiing operations, especially under low visibility conditions. Proper monitoring and maintenance of these systems are crucial to prevent malfunctions that could compromise safety.

This advisory circular outlines the requirements and best practices for implementing effective monitoring systems, automatic fault detection, and regular maintenance schedules. It incorporates the latest updates from the PNG Civil Aviation Rules and the ICAO Airport Services Manual, ensuring that aerodrome operators are equipped with the necessary information to maintain high standards of safety and efficiency.

By adhering to the guidelines and recommendations provided in this advisory circular, aerodrome operators can enhance the serviceability of their lighting systems, minimize the risk of malfunctions, and ensure a safe operating environment for all airport users. This document serves as a valuable resource for maintaining the integrity and functionality of critical airport infrastructure.

CHAPTER 2 - Electrical Systems Monitoring and Maintenance.

2.1 Monitoring of Airport Electrical Systems.

2.1.1 Monitoring System Requirement for Electrical System

- **Implementation**:
  - Install a robust monitoring system to continuously track the operational status of all lighting systems.
  - Ensure the system provides real-time monitoring and immediate alerts for any malfunctions or failures.
- **Maintenance**:
  - Regularly maintain and test the monitoring system to ensure its reliability and accuracy.
  - Schedule periodic inspections and calibrations to prevent potential issues.
- **Training**:
  - Train staff on the use and interpretation of the monitoring system.
  - Ensure staff are familiar with procedures for responding to alerts and addressing identified issues.

2.1.2 Automatic Monitoring for Aircraft Control

- **System Requirements**:
  - Install automatic monitoring systems for lighting used in aircraft control.
  - Ensure these systems can detect faults impacting control functions and relay this information to the air traffic services unit.

- **Integration**:
  - Ensure seamless integration between the monitoring system and the air traffic services unit.
  - This integration is crucial for timely relay of information and effective coordination.
- **Response Protocols**:
  - Develop and implement response protocols for addressing faults detected by the monitoring system.
  - Ensure these protocols are well-documented and accessible to relevant personnel.

2.1.3 Indication of Operational Status Changes

- **Time-Sensitive Indications**:
  - Ensure the monitoring system provides indications of operational status changes within specified time frames:
  - Within two seconds for a stop bar at a runway-holding position.
  - Within five seconds for all other types of visual aids.
- **Alert Mechanisms**:
  - Implement clear and effective alert mechanisms to notify relevant personnel of status changes.
  - Alerts should be both audible and visual to ensure prompt notice.
- **Documentation**:
  - Keep detailed records of all status changes and corresponding responses.
  - This documentation can be valuable for identifying patterns and improving system reliability.

2.1.4 Monitoring for Runways with Low RVR Conditions

- **Serviceability Levels**:
  - For runways used in conditions with a runway visual range (RVR) of less than 550 meters, ensure lighting systems are monitored to meet minimum serviceability levels specified in sections J.5.7 to J.5.11.
- **Automatic Alerts**:
  - Set up the monitoring system to automatically relay information about any drop in serviceability levels to the maintenance crew.
  - This ensures prompt maintenance to restore optimal conditions.
- **Preventive Maintenance**:
  - Conduct regular preventive maintenance on lighting systems to minimize the risk of serviceability levels falling below required standards.
  - This includes cleaning, replacing bulbs, and checking electrical connections.

2.1.5 Automatic Monitoring and Indication for Low RVR Conditions

- **Minimum Levels**:
  - Ensure lighting systems for runways with RVR less than 550 meters are monitored to provide an indication when serviceability levels fall below the minimum specified by the appropriate authority.

- **Information Relay**:
  - Automatically relay this information to the air traffic services unit and ensure it is displayed prominently.
  - This visibility is crucial for air traffic controllers to take necessary actions to maintain safety.
- **Coordination**:
  - Foster close coordination between maintenance crews and air traffic services to address issues promptly and effectively.
  - Regularly review and update coordination protocols to reflect best practices and any changes in regulations.

2.2 Maintenance of Airport Electrical Systems.

2.2.1 General

- The serviceability and operational reliability of air navigation equipment and installations are essential for the safe operation of aircraft in the airport area. This includes visual aids, electronic landing aids, navigation equipment, radar, and meteorological services equipment.
- Regular maintenance is required for airport equipment and installations distributing primary and secondary power to ensure constant power supply.

2.2.2 Personnel

- Maintenance work on airport electrical systems should be assigned to skilled electricians who are fully acquainted with the work and safety measures required.
- Maintenance personnel should be present or on call during airport operating hours and may be responsible for both electrical systems and visual aids.

2.2.3 Schedule of Maintenance

- **Routine Maintenance**: Schedules should be based on manufacturers' recommendations and adjusted to the operator's experience regarding the frequency of malfunctions. Records of maintenance work should be maintained.
- **Power Cables and Distributors**: Semi-annual checks for cleanliness, moisture, good contact, and insulation resistance.
- **Transformers and Regulators**: Monthly and annual checks for cleanliness, oil losses, noise, condition, insulators, collector bar system, voltage, and amperage.
- **Transformer Stations**: Weekly, semi-annual, and annual checks for overall condition, fuse boxes, insulators, electrical connections, dirt, moisture, locks, protection relay, high voltage cable insulation, earthing, noise, damage, rust, corrosion, warning signs, safety devices, and grids.
- **Relay and Switch Cabinets**: Semi-annual and annual checks for cleanliness, good electrical contact, positive closing of contacts, corrosion, wear, cabinet condition, monitoring relay, voltage switch-over, fuses, voltage output, and cabinet outer condition.
- **Control Cables, Monitoring Units, Control Desk:** Daily, weekly, monthly, quarterly, annual, and unscheduled checks for optical and acoustical signals, nominal control voltage, battery charging, voltage and ammeter readings, acid level in batteries, monitoring unit functions, cleanliness, loose

connections, overall operation, mimic panel indications, mechanical structure, cables, distributors, relays, control and monitoring units, connections, and insulation.

- **Secondary Power Supplies (Generators):** Monthly test runs and checks for switch-over time, voltmeter readings, transfer equipment, generator vibrations, diesel engine irregularities, fuel level, abnormal performance, and recording meter readings.
- **Ground Power Supplies:** Daily, weekly, monthly, quarterly, and semi-annual checks for plugs, cables, cable holdings, proper functioning, tightness, loose connections, control lamps, screw connectors, cleanliness, ventilator flaps, cone belts, current-input cables, connector boxes, mechanical damage, plug sockets, contact clips, lubrication, wires, insulation, temperature rise, connectors, plugs, cable holdings, switches, fixings, regulator, and switch cabinet housings.
- **Apron Floodlighting:** Daily and annual checks for lamp outage, switching operation, cleanliness, good electrical contact, relay serviceability, corrosion, wear, relay cabinet condition, fuses, fuse sockets, and relay cabinet outside condition.

2.3 Maintenance Checklist for Airport Electrical Systems.

This checklist should help ensure that all necessary maintenance tasks are performed regularly to keep the airport electrical systems in optimal condition.

COMPONENT	FREQUENCY	TASKS
Power Cables and Distributors	Semi-Annually	• Check distributors in manholes for cleanliness and moisture; clean and dry as needed. • Inspect plug-in and clamp connections in distributors for good contact; tighten and spray as needed. • Check manholes for interior condition; pump out, dry, or clean as needed. • Measure insulation resistance by earthing resistance of each circuit; record readings and take corrective action.
Transformers and Regulators (Including Standby Units)	Monthly	• Inspect power supply transformers and regulators for cleanliness and oil losses; clean and replace oil as needed. • Check switches at all light intensity positions for malfunctions; restore as needed. • Switch over to standby units for serviceability; restore as needed.
	Annually	• Inspect transformers for noise; investigate and repair any unusual sounds. • Check overall condition of transformers; repair as needed. • Inspect insulators; repair or replace as needed. • Clean collector bar system. • Measure and record voltage and amperage at all intensity levels; adjust voltage to nominal level.
Transformer Stations for Electric Power Supply	Weekly	• Visually inspect overall condition; restore as needed.

COMPONENT	FREQUENCY	TASKS
		• Check fuse boxes for completeness; add missing fuses.
	Semi-Annually	• Clean and restore insulators and electrical connections. • Clean and dry station for dirt and moisture. • Repair and lock station locks for serviceability.
	Annually	• Adjust protection relay. • Record condition of high voltage cable insulation; take preventive measures. • Clean earthing and measure resistance. • Inspect electrical supply system for noise and damage; repair as needed. • Clean and paint for rust, corrosion, or defective coating. • Ensure warning signs and safety devices are present and in correct positions; clean or replace as needed. • Inspect safety grids for completeness, rust, or coating deficiencies; complete, clean, and paint as needed. • Tighten and restore proper earthing for safety grids.
Relay and Switch Cabinets (Including Switch Cabinets in Sub-Stations)	Semi-Annually	• Clean turn and plug-in connections for good electrical contact. • Inspect relays for positive closing of contacts; clean or replace as needed. • Clean and replace electrical contacts for corrosion and wear. • Inspect cabinet condition including weather seal, cleanliness, and mechanical damage; clean and repair as needed. • Repair monitoring relay of series circuits for proper feedback. • Repair voltage switch-over of two circuits for serviceability.
	Annually	• Clean and dry cabinet outer condition for dirt, moisture, and easy access. • Clean and spray fuse sockets; replace fuses as needed. • Record voltage output for all series circuits; take corrective action as needed.
Control Cables, Monitoring Units, Control Desk	Daily	• Restore optical and acoustical signal for feedback.
	Weekly	• Charge battery for nominal control voltage. • Adjust voltage and ammeter readings. • Add distilled water to acid level in batteries.
	Monthly	• Check functions of the monitoring unit.

COMPONENT	FREQUENCY	TASKS
		• Clean and repair or replace parts for cleanliness and condition.
	Quarterly	• Tighten, repair, or replace loose connections in system components. • Investigate and repair any malfunctions in control desk for overall operation. • Correct or adjust mimic panel indications to conform to field conditions. • Repair mechanical structure of the desk for stability.
	Annually	• Clean and repair cables and distributors. • Clean relays. • Replace control and monitoring units. • Tighten and spray connections.
	Unscheduled	• Improve insulation of cables after each lightning strike.
Secondary Power Supplies (Generators)	Monthly	• Test run and check switch-over time from primary to secondary power supply. • Ensure voltmeter readings remain within acceptable tolerances. • Check transfer equipment for excessive heating and malfunctions. • Inspect generator for vibrations and excessive heating. • Check diesel engine for irregularities and oil leakage. • Refill fuel tank after test run if necessary. • Take corrective action and repair any abnormal or undesirable performance. • Record meter readings of the test run and compare with former records to detect potential deficiencies.
Ground Power Supplies	Daily	• Repair plugs, cables, and cable holdings.
	Weekly	• Ensure proper functioning. • Repair tightness (oil spillage) and loose connections.
	Monthly	• Replace serviceability of control lamps. • Improve contact at screw connectors at the contact rail for potential temperature rise. • Clean cables. • Clean ventilator flaps and orifices. • Adjust belt stress for cone belts driving the ventilator system.

COMPONENT	FREQUENCY	TASKS
	Quarterly	• Remove deficiencies in current-input cables for potential deformation. • Inspect connector boxes for mechanical damage, proper mounting of plug sockets, and condition of contact clips in the plug sockets. • Lubricate bearings.
	Semi-Annually	• Repair or replace cables (wires and insulation) for serviceability. • Remove discovered deficiencies in main conductor cables for temperature rise under nominal electric power. • Adjust and tighten connectors, plugs, and cable holdings. • Remove dust and dirt from switch elements for proper operation. • Tighten mounting screws or bolts holding the regulator and switch cabinet housings.
Apron Floodlighting	Daily	• Replace lamps for lamp outage. • Repair switching operation from remote control.
	Annually	• Clean turn and plug-in connections for good electrical contact. • Clean or replace relays for serviceability. • Clean or replace contacts for corrosion and wear. • Clean, dry, and repair relay cabinet condition including proper weather seal, moisture, and mechanical damage. • Clean and spray fuse sockets; replace fuses as needed. • Ensure free access to relay cabinet outside condition.