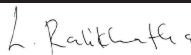


PERFORMANCE SPECIFICATION: LED PANEL LUMINAIRES WITH INTEGRATED CONTROLS (TYPE 1)

Signatures						
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1.0 SCOPE

- 1.1 This specification defines the performance and technical requirements for the supply of LED panel luminaires with integrated motion sensors for TNPA facilities.
- 1.2 This includes luminaire construction, materials and finishes, LED light sources, power supplies/drivers, motion sensor integration, optics, ingress protection, wiring, earthing, electromagnetic compatibility, packaging, and associated documentation.
- 1.3 The luminaires are intended for use in TNPA port facilities, which are characterised by high humidity and saline atmospheres. All equipment supplied shall be designed and manufactured to withstand these conditions and provide reliable, long-term service.
- 1.4 This specification covers LED panel luminaires in sizes, suitable for multi-use indoor environments including public and commercial buildings, offices, foyers, corridors, and similar applications, as indicated in the relevant lighting design schedules.
- 1.5 The luminaires shall be supplied complete with all necessary mounting hardware, LED drivers, and all required certification and test documentation as specified herein. Where specified, luminaires shall be supplied with integrated emergency battery backup systems.

2.0 REFERENCES

All materials and manufacturing shall comply with the latest editions of the following standards, codes, and regulations, unless otherwise specified:

Luminaires & Performance

SANS 475 – Luminaires for interior lighting, street lighting and flood lighting – Performance requirements

SANS 60598-1 – Luminaires – Part 1: General requirements and tests

SANS 60598-2-1 – Luminaires – Part 2-1: Particular requirements – Fixed general purpose luminaires

SANS 60598-2-22 – Luminaires – Part 2-22: Particular requirements – Luminaires for emergency lighting

Enclosures & Protection

SANS 60529 – Degrees of protection provided by enclosures (IP Code)

Electrical Safety & Wiring

SANS 10142-1 – The wiring of premises – Part 1: Low-voltage installations
SANS 61347-1 – Lamp controlgear – Part 1: General and safety requirements
SANS 61347-2-13 – Lamp controlgear – Part 2-13: Particular requirements for DC or AC supplied electronic controlgear for LED modules

Emergency Lighting (where applicable)

IEC 61347-2-7 – Lamp controlgear – Part 2-7: Particular requirements for battery supplied electronic controlgear for emergency lighting (self-contained)
IEC 62034 – Automatic test systems for battery powered emergency escape lighting

Photometry & Lighting Design

IES LM-79 – Optical and Electrical Measurements of Solid-State Lighting Products
IES LM-80 – Measuring Lumen Maintenance of LED Light Sources
IES TM-21 – Projecting Long-term Lumen Maintenance of LED Light Sources
SANS 10098 – Public lighting: The lighting of public thoroughfares and certain specific areas

Electromagnetic Compatibility (EMC)

SANS 61000-3-2 – Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions
SANS 61000-3-3 – Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems
SANS 61000-4-5 – Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test
IEC 55015 – Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
IEC 61547 – Equipment for general lighting purposes – EMC immunity requirements

Materials & Finishes

EN 1706 – Aluminium & aluminium alloys: Castings
ISO 12944 – Paints and varnishes – Corrosion protection of steel structures by protective paint systems

Quality & Compliance

ISO 9001 – Quality management systems – Requirements
OHSACT (Act 85 of 1993) – Occupational Health and Safety Act – Electrical Machinery Regulations (Earthing requirements)

3.0 SERVICE CONDITIONS

3.1 The luminaires shall be designed and manufactured to operate reliably under the following indoor service conditions typically encountered in TNPA port facilities (e.g., offices, corridors, reception areas and commercial spaces):

3.1.1 Environmental Conditions

- a. Ambient temperature range: 0°C to +45°C
- b. Relative humidity: 10% to 95% (non-condensing)
- c. Coastal environment: Saline coastal environment with potential for airborne salt spray, dust, and moisture ingress
- d. Dust and particulate matter: Moderate levels, typical of Port facilities

3.1.2 Electrical Supply Conditions

- a. Nominal supply voltage: 220V to 240V AC
- b. Supply frequency: 50 Hz $\pm$ 5%
- c. Voltage fluctuations and surges: Typical of industrial power networks with potential for switching transients

3.1.3 Mechanical Conditions

- a. Vibration: Low to moderate levels typical of buildings
- b. Mounting: Recessed mounting in exposed grid suspended ceilings (standard);
Surface mounting optional

3.2 All luminaires supplied shall be suitable for continuous operation under the above conditions without degradation of performance, reduction of service life, or failure of components.

3.3 The luminaire's thermal management system shall be capable of maintaining LED junction temperatures within acceptable limits at the maximum specified ambient temperature of 45°C.

3.4 The luminaire's corrosion protection (aluminium housing, powder coating, etc.) shall be sufficient to withstand the saline coastal atmosphere without deterioration during the warranted period.

4.0 STANDARD OF EQUIPMENT

4.1 Equipment shall be of a high-quality design and manufacture and shall comply with the relevant specifications and recommendations mentioned in this specification.

4.2 Every reasonable precaution and provision shall be incorporated in the design of the

equipment for the safety and security of the system and of those concerned with its operation and maintenance.

- 4.3 Any proposed alternative equipment or material not strictly complying with the specified requirements shall be submitted to the TNPA's Technical Officer for prior written approval. Such approval will not diminish the tenderer's responsibility to meet the performance requirements.

5.0 MATERIALS AND FINISHES

- 5.1 The luminaire housing shall be manufactured from aluminium, providing excellent thermal management and corrosion resistance.
- 5.2 The luminaire shall be supplied with a matt white powder-coated finish, providing a durable, corrosion-resistant surface suitable for indoor applications.
- 5.2.1 The powder coating shall be applied over a suitable pre-treatment process to ensure optimal adhesion.
- 5.2.2 The powder coating shall be applied over a suitable pre-treatment process to ensure optimal adhesion.
- 5.2.3 The powder coating shall have a minimum thickness of 60 microns.
- 5.2.4 The powder coating shall be UV-stabilised to prevent chalking and discolouration over time.
- 5.2.5 The colour shall be as specified in the tender schedule or as agreed with the Engineer.
- 5.2.6 The powder coating shall comply with the corrosion protection requirements of ISO 12944 for the relevant environment.
- 5.3 The diffuser shall be manufactured from acrylic PMMA (opal), providing uniform light distribution and optimum visual comfort.
- 5.4 The luminaire shall have a very slim aluminium housing design.
- 5.5 All external fasteners (bolts, screws, nuts, washers) shall be manufactured from stainless steel grade AISI 304 or higher.

6.0 SYSTEM DESCRIPTION

- 6.1 The luminaire shall be an LED panel fitting with a slim, modern design, utilising LCD backlight technology.
- 6.2 The luminaire shall bear the SANS 60598-1 safety mark and shall comply with the specifications as per SANS 60598-2-1.
- 6.3 The luminaire shall be of the totally enclosed type with an ingress protection rating of IP20.

- 6.4 The luminaire shall be suitable for recessed mounting as standard, with an optional surface-mounted version available, and shall be available in standard dimensions of 600mm × 600mm and 1200mm × 600mm.
- 6.5 Luminaires shall be delivered fully assembled with housing, LED driver, LED module and diffuser.
- 6.6 The luminaire shall be designed for recessed mounting in exposed grid suspended ceilings (T-bar ceilings) as standard.
- 6.7 The luminaire shall be designed to be easy to install and for suspended mounting as standard.
- 6.8 An optional surface-mounted mild steel powder-coated enclosure shall be available for surface mounting requirements.
- 6.9 Where specified, the luminaire shall be supplied with an integrated emergency battery backup system.
- 6.10 The luminaire shall incorporate an integrated motion sensor for standalone energy management in high-traffic, intermittent-use zones.
- 6.11 The luminaire shall be power factor corrected to ≥0.95 at full load.

7.0 FUNCTIONAL AND PERFORMANCE REQUIREMENTS

7.1 Luminaire Construction

- 7.1.1 The luminaire housing shall be manufactured from aluminium, providing excellent thermal management and corrosion resistance.
- 7.1.2 The slim aluminium housing and matt white frame shall provide an aesthetically appealing appearance.
- 7.1.3 The luminaire shall incorporate LCD backlight technology for uniform light distribution.
- 7.1.4 The design of the external surfaces shall prevent the accumulation of dirt and dust, ensuring continuous effective cooling.
- 7.1.5 All parts requiring maintenance and cleaning shall be easily accessible.
- 7.1.6 The luminaire shall be designed for maximum visual comfort and optimum light distribution.

7.2 LED Light Source

- 7.2.1 The luminaire shall utilise high-efficiency LEDs with a minimum efficacy of 90 lumens per watt.
- 7.2.2 The effective lumen package and wattage of the fitting shall be as specified in the tender schedule.
- 7.2.3 The light source shall have a correlated colour temperature (CCT) of 4000K, 5000K

or 6500K as specified in the tender schedule.

- 7.2.4 The Colour Rendering Index (CRI) shall be 80 minimum (CRI ≥ 80).
- 7.2.5 The luminaire shall provide uniform light distribution suitable for multi-use indoor environments.
- 7.2.6 The luminaire shall be designed to operate LED light sources of up to 65W.
- 7.2.7 The LED life expectancy @ Tq 25°C shall be 50,000 hours minimum (L70B10)
- 7.2.8 LED driver design life shall be not less than 100 000 hours at Tq 25°C and 220 to 240 V AC, 50Hz.

7.3 **Power Supply / Driver**

- 7.3.1 The luminaire shall be equipped with an integrated constant-current LED driver with integrated motion and daylight detection.
- 7.3.2 The driver shall be of the constant-current type with integrated step dimming capabilities.
- 7.3.3 The driver shall be dimmable and programmable for use with the integrated motion sensor.
- 7.3.4 The driver shall incorporate the following protection features:
 - Overload protection
 - No load protection
 - Short circuit protection
- 7.3.5 The driver shall have a nominal lifetime of 100,000 hours at a maximum ambient temperature (Ta max) of 50°C.
- 7.3.6 The driver shall operate at a Power Factor (PF) of 0.95 or greater.
- 7.3.7 The Total Harmonic Distortion (THD) of the driver shall not exceed 15%.
- 7.3.8 The driver shall be flicker-free in all operating modes.
- 7.3.9 The driver shall provide step dimming levels of 10%, 30%, and 100%.
- 7.3.10 The driver shall support the following surge protection levels:
 - Mains surge capability (between L - N): 1 kV minimum
 - Mains surge capability (between L/N - PE): 2 kV minimum
 - Surge voltage at output side (against PE): 4 kV minimum
- 7.3.11 The driver shall have overvoltage protection of 320 V AC for 1 hour minimum.
- 7.3.12 The driver shall support the following electrical characteristics:
 - Rated supply voltage: 220 – 240 V AC
 - Mains frequency: 50 / 60 Hz
 - Rated power: As specified in the tender schedule

- Output LF current ripple (< 120 Hz) at full load: $\pm 3\%$ maximum
- Starting time (at 230 V, 50 Hz, full load): ≤ 0.5 s
- Turn off time (at 230 V, 50 Hz, full load): ≤ 0.5 s

7.4 Emergency Battery Backup System (Where Specified)

- 7.4.1 Where specified, the luminaire shall be equipped with an integrated emergency battery backup system, complying with SANS 60598-2-22 / IEC 60598-2-22.
- 7.4.2 The emergency control gear shall be suitable for operation with LED modules.
- 7.4.3 The emergency system shall automatically provide illumination during mains failure sufficient to achieve the emergency lighting levels required by applicable regulations.
- 7.4.4 The emergency duration shall be a minimum of as specified in the tender schedule.
- 7.4.5 The battery type shall be suitable for the specified emergency duration and shall be replaceable.
- 7.4.6 Charging indication shall be provided via an external LED pilot light indicating active battery charging status.
- 7.4.7 The emergency control gear shall incorporate the following protection features:
- Battery reverse polarity protection
 - Overcharge protection
 - Over-discharge protection
 - Short circuit protection
- 7.4.8 The emergency system shall be designed to automatically switch to emergency mode upon mains supply failure and automatically revert to normal operation upon mains restoration, with seamless transition between modes.
- 7.4.9 The battery type shall be Lithium-ion (Li-ion) or equivalent.
- 7.4.10 The emergency control gear shall have a hardware warranty as specified in Section 9.0.

7.5 Motion Sensor

- 7.5.1 The luminaire shall be equipped with an integrated high-frequency (HF) microwave motion sensor operating at 5.8 GHz.
- 7.5.2 The sensor shall be capable of detecting motion through plastic, polycarbonate, or glass diffusers.
- 7.5.3 The sensor shall incorporate a daylight sensor with adjustable lux threshold.
- 7.5.4 The sensor shall be field-adjustable via DIP switches or similar user-accessible controls.

7.5.5 The sensor shall provide the following adjustable parameters as detailed in Table 1:

Table 1: Sensor Adjustment Settings (DIP Switch Configuration)

DIP Switch	Parameter	Setting Options	Default Setting
1	Detection Area / Sensitivity	100% / 50%	50%
2 & 3	Hold Time	5 s / 90 s / 300 s / 600 s	600 s
4	Daylight Sensor	30 lux / Disable	Disable
5	Standby Dimming	10% / 30%	10%
6	Second-Order Delay	∞ (Infinite) / 10 min	∞

7.5.6 The DIP switches shall be set to the state as per Table 1.

7.5.7 The sensor shall be configured with the DIP switches only when the mains supply is switched off.

7.5.8 Hot plug-in (connecting or disconnecting the sensor while the mains is energised) shall not be permitted. Suitable warning labels shall be provided on the luminaire.

7.6 Optics and Diffuser

7.6.1 The luminaire shall be equipped with an opal acrylic PMMA diffuser, providing uniform light distribution and low glare.

7.6.2 The diffuser shall provide optimum visual comfort and light distribution suitable for multi-use indoor environments.

7.6.3 The diffuser shall be UV-stabilised to prevent discolouration over time.

7.7 Ingress Protection and Impact Resistance

7.7.1 The luminaire shall have an Ingress Protection (IP) rating of IP20, suitable for indoor applications in dry environments.

7.7.2 Where emergency battery backup is supplied, the emergency system shall be housed within the luminaire enclosure, protected to the same IP rating.

7.7.3 The IP rating shall be certified by a test report for the specific luminaire model.

7.8 Wiring and Electrical Connections

7.8.1 The internal wiring of the luminaires shall be flexible and suitably insulated to withstand the voltage and temperature encountered in service.

7.8.2 The supply terminals shall accept the appropriate conductor sizes and be easily accessible.

7.9 Earthing

- 7.9.1 Luminaires shall be designed to facilitate earthing as per the Electrical Machinery Regulations of the OHSACT (Act 85 of 1993).
- 7.9.2 Metal parts that may become live in the event of an insulation fault shall be permanently and reliably connected to an earthing terminal, complying with the test specified in SANS 60598-2-1.
- 7.9.3 Earthing terminals shall comply with clause 7.2 of SANS 60598-1. All parts of an earth terminal shall be made of brass or other corrosion-resistant metal, with bare (unpainted/varnished) contact surfaces.
- 7.9.4 Earth connections shall be by means of suitable lugs, designed to prevent electrolytic corrosion.

7.10 Electromagnetic Compatibility

- 7.10.1 The luminaire shall comply with IEC 55015 (Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment).
- 7.10.2 The sensor operating at 5.8 GHz shall comply with applicable radio frequency (RF) emissions and immunity standards.
- 7.10.3 The luminaire shall comply with EN 61000-3-2 (harmonic current emissions) and EN 61000-3-3 (voltage fluctuations and flicker).

7.11 Packaging and Transport

- 7.11.1 The luminaires shall be packed in a manner that ensures protection during handling and transport by road, rail, or sea.
- 7.11.2 The packaging shall be designed to prevent vibration damage to the LED modules and control gear during transit.
- 7.11.3 Where sea transport is involved, a suitable dehydrating agent (desiccant) shall be included in the packaging to prevent corrosion.
- 7.11.4 Lithium-ion battery packs (where specified) shall be transported in accordance with applicable dangerous goods regulations.

8.0 CERTIFICATION AND TEST REPORTS

- 8.1 The tenderer shall provide the following documentation:
 - a. Product data sheets and catalogues.
 - b. Type Test Report conforming to SANS 60598-1.
 - c. Test reports for the SANS 60598-2-1 safety mark.
 - d. Test reports for the SANS 60598-2-22 emergency lighting safety mark (where

applicable).

- e. LM-80 (Measuring Lumen Maintenance of LED Light Sources) report.
- f. LM-79 (Electrical and Photometric Measurements of Solid-State Lighting Products) report.
- g. TM-21 (LED Lifetime prediction extrapolation method) report.
- h. IP rating test reports for the complete luminaire.
- i. Photometric test reports and photometric data files (IES/LDT format).
- j. Where specified, emergency lighting test report conforming to SANS 60598-2-22, including:
 - Emergency duration test report
 - Battery charging and discharge characteristics
 - Battery temperature range compliance
 - Compliance with IEC 61347-2-7

9.0 WARRANTY AND DOCUMENTATION

- 9.1 The tenderer shall guarantee all equipment supplied against this specification for a period of five (5) years (60 months) from the date of delivery or as otherwise agreed in the purchase order. The tenderer shall explicitly state their compliance herewith.
- 9.2 This guarantee shall cover all materials, parts, workmanship, performance, and efficiency of the equipment supplied, including the LED module, driver, and powder-coated finish.
- 9.3 Where emergency battery backup is supplied, the emergency battery pack warranty shall be held with the battery manufacturer and shall cover the battery for the full warranty period.
- 9.4 Should any part or equipment fail during the guarantee period due to defective materials or workmanship, the supplier shall immediately replace such part or equipment free of charge, including all costs for transport and associated logistics.
- 9.5 The Contractor shall submit all required documentation as detailed in Section 8.0.

10.0 QUALITY ASSURANCE

- 10.1 The design, assembly, and testing of the luminaire shall be undertaken in an ISO 9001:2015 certified facility.
- 10.2 The Contractor's quality management system shall comply with the requirements of SANS/ISO 9001. These requirements are mandatory for all items supplied against this specification.
- 10.3 All products shall be factory tested and quality-assured prior to dispatch.

- 10.4 All devices shall operate without perceptible delay, flicker, or interference under normal service conditions.
- 10.5 Prior to bulk delivery, the Contractor shall supply a full set of sample luminaires for inspection and approval by the Engineer. Samples shall be subject to testing to verify compliance with the performance requirements specified herein.
- 10.6 The emergency lighting function, where specified, shall be tested at the factory prior to dispatch to verify:
- Correct transition to emergency mode upon mains failure
 - Minimum specified emergency duration
 - Correct recharging function upon mains restoration
- 10.7 Prior to bulk delivery, the Contractor shall supply a full set of sample luminaires for inspection and approval by the Engineer. Samples shall be subject to testing to verify compliance with the performance requirements specified herein.