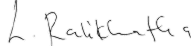


PERFORMANCE SPECIFICATION: LED TASK LUMINAIRES WITH INTEGRATED CONTROLS

Signatures						
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1.0 SCOPE

- 1.1 This specification defines the performance and technical requirements for the supply of LED task luminaires with integrated motion sensors and emergency battery backup for TNPA facilities.
- 1.2 This includes luminaire construction, materials and finishes, LED light sources, power supplies/drivers, motion sensor integration, emergency battery backup systems, ingress protection, wiring, earthing, electromagnetic compatibility, packaging, and associated documentation.
- 1.3 The luminaires are intended for installation in indoor locations within TNPA port environments. All equipment supplied shall be designed and manufactured to withstand these environmental conditions and provide reliable, long-term service.
- 1.4 This specification covers linear LED task luminaires with integrated motion sensors and emergency lighting capability, suitable for general task lighting, corridor lighting, and stairwell lighting applications where emergency egress lighting is required, as indicated in the relevant lighting design schedules.
- 1.5 The luminaires shall be supplied complete with all necessary mounting hardware for the specified mounting method, integrated motion sensors, emergency battery backup systems, and all required certification and test documentation as specified herein.

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)

SANS 62262 – Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK Code)

Electrical Safety & Wiring

SANS 10142-1 – The wiring of premises – Part 1: Low-voltage installations

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

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

Emergency Lighting

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

SANS 1186-1 – Symbolic safety signs – Part 1: Standard signs and general requirements

SANS 1186-3 – Symbolic safety signs – Part 3: Internally illuminated signs

Materials & Finishes

SANS 121 – Hot-dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods

EN 10025 – Hot rolled products of structural steels (Mild steel)

ISO 12944 – Paints and varnishes – Corrosion protection of steel structures by protective paint systems

Communication & Control

Applicable standards for radio frequency (RF) and microwave sensors operating in the 5.8 GHz ISM band

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., warehouses, workshops, storage areas, administrative buildings, corridors, and stairwells):

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
- d. Dust and particulate matter: Low to moderate levels typical of industrial port facilities

3.1.2 Electrical Supply Conditions

- a. Nominal supply voltage: 230 V AC $\pm$ 10%
- 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 industrial buildings
- b. Mounting: Fixed installation to ceilings, walls, trunking, or Unistrut systems

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 (powder coating, stainless steel fasteners, 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 body shall be manufactured from mild steel, suitably treated and finished to ensure durability in a Port environment.
- 5.2 The luminaire shall be supplied with a powder-coated finish, providing a durable, corrosion-resistant surface suitable for indoor port applications.
 - 5.2.1 The powder coating shall be applied over a suitable pre-treatment process (e.g., degreasing, phosphating, or sandblasting) to ensure optimal adhesion.
 - 5.2.2 The powder coating shall have a minimum thickness of 60 microns.
 - 5.2.3 The colour shall be as specified in the tender schedule or as agreed with the Engineer.
- 5.3 The LED heat sink shall be manufactured from aluminium, designed for passive cooling of the LED light source.
- 5.4 The diffuser shall be manufactured from white Plexiglas (acrylic) with a minimum light transmission of 70%.
- 5.5 All external fasteners (bolts, screws, nuts, washers) shall be manufactured from stainless steel.

6.0 SYSTEM DESCRIPTION

- 6.1 The luminaire shall be a linear task LED fitting with an integrated motion sensor and emergency battery backup where specified.
- 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 Emergency lighting functions shall comply with SANS 60598-2-22.
- 6.4 The luminaire shall be of the totally enclosed type, IP20.
- 6.5 Luminaires shall be delivered fully assembled with housing, driver, LED module, diffuser, integrated motion sensor, and emergency battery backup system.
- 6.6 The luminaire shall be designed for flexible mounting options, including:
 - Surface mounting directly to ceilings or walls
 - Pendant mounting using a stainless steel suspension system
 - Mounting onto Unistrut channel systems
 - Mounting onto P2000 trunking systems via a bolt-on bracket
- 6.7 The luminaire shall be designed to be fully serviceable, with all major components (driver, LED module, sensor, emergency battery pack) replaceable without discarding the entire unit.
- 6.8 The luminaire shall be manufactured from materials that are recyclable at end of life.
- 6.9 The luminaire shall be locally manufactured and assembled.

7.0 FUNCTIONAL AND PERFORMANCE REQUIREMENTS

7.1 Luminaire Construction

- 7.1.1 The luminaire body shall be manufactured from mild steel with a powder-coated finish.
- 7.1.2 The luminaire shall incorporate an aluminium heat sink for passive cooling of the LED light source. Active cooling (fans) or liquid cooling is prohibited.
- 7.1.3 The design of the external surfaces shall prevent the accumulation of dirt and dust, ensuring continuous effective cooling.
- 7.1.4 Thermal protection shall be incorporated in the luminaire to prevent overheating.
- 7.1.5 All parts requiring maintenance and cleaning shall be easily accessible.
- 7.1.6 The design shall allow for servicing of the LED unit, driver, sensor, and emergency battery pack without removing the entire luminaire from its mounting.

7.2 LED Light Source

- 7.2.1 The LEDs shall be high efficiency, delivering minimum effective lumens of 121 lm/W at 25°C or better.
- 7.2.2 The effective lumen package 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 ($\pm$ 3000K).
- 7.2.4 The Colour Rendering Index (CRI) shall be 80+.
- 7.2.5 The optical distribution shall be 90° to 100°.

7.2.6 LED life expectancy shall be:

- L90 B10: 75,000 hours minimum
- L80 B20: 140,000 hours minimum

7.2.7 The luminaire shall be tested and certified for an ambient temperature (T_a) of 35°C, with the ability to operate up to 45°C as per the service conditions in Section 3.0.

7.3 Power Supply / Driver

7.3.1 The power supply (driver) compartment shall be designed with sufficient space to allow for the safe and easy replacement of components or repairs.

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 (T_a 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

- 7.4.1 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 of the constant-current (CC) type, suitable for operation with LED modules.
- 7.4.3 The emergency control gear shall be compatible with premium LED modules operating alongside independent external drivers.
- 7.4.4 The emergency system shall provide high-power emergency lighting illumination for LED strips and modules operating within a voltage range of 80 Vdc to 300 Vdc.
- 7.4.5 The emergency output shall be capable of driving the standard luminaire output up to 50% during mains failure transitions to maintain regulatory emergency lux levels (load dependent).
- 7.4.6 The emergency duration shall be a minimum of 30 minutes at full emergency output rating.
- 7.4.7 The battery type shall be 11.1 V Lithium-ion (Li-ion) or equivalent.
- 7.4.8 Battery discharge current: Up to 2 A maximum.
- 7.4.9 Battery charging current: >300 mA minimum.
- 7.4.10 Mains power consumption of the emergency module: 10 VA maximum.
- 7.4.11 Charging indication shall be provided via an external LED pilot light indicating active battery charging status.
- 7.4.12 The emergency control module shall feature an integrated safety start circuit designed to prevent accidental emergency discharge during installation until the mains supply is sequence-connected and disconnected.
- 7.4.13 The emergency control gear shall have a maximum ambient temperature (T_a) rating of +70°C.
- 7.4.14 The emergency control gear shall incorporate the following protection features:
 - Battery reverse polarity protection
 - Overcharge protection
 - Over-discharge protection
 - Short circuit protection
- 7.4.15 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.
- 7.4.16 The emergency control gear shall have a hardware warranty of 5 years (held with the battery manufacturer).

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 a white Plexiglas (acrylic) diffuser with a minimum light transmission of 70%.
- 7.6.2 The diffuser shall provide a wide optical distribution of 90° to 100°.
- 7.6.3 The diffuser shall be impact-resistant and UV-stabilised.

7.7 Ingress Protection

- 7.7.1 The luminaire shall have an Ingress Protection (IP) rating of IP20 minimum, suitable for indoor applications in Port facilities.

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.
- 7.8.3 The sensor connection shall be via low-voltage auxiliary output from the driver, using suitable connectors.
- 7.8.4 Warning labels shall be provided indicating that sensor connections shall not be connected or disconnected while the mains power is energised.
- 7.8.5 The emergency battery backup system shall be connected in accordance with the manufacturer's instructions, ensuring correct polarity and connection sequence.

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.

7.11 **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 shall be transported in accordance with applicable dangerous goods regulations (e.g., IATA, IMDG, ADR).

8.0 CERTIFICATION AND TEST REPORTS

- 8.1 The tenderer shall provide the following documentation:
- a. Product data sheets and catalogues.
 - b. Full Type Test Report conforming to SANS 60598-2-1 (or applicable part) read in conjunction with SANS 60598-1, explicitly confirming the stated IP rating and T_a rating (e.g., 35°C).
 - c. Test reports for the SANS 475 performance mark (if applicable).
 - d. Emergency lighting test report conforming to SANS 60598-2-22, including:
 - Emergency duration test report confirming minimum 30-minute operation
 - Battery charging and discharge characteristics
 - Battery temperature range compliance
 - e. LM-79-19 compliant absolute photometric report (incorporating IES/LDT files reflecting true fixture performance, not nominal, chip, or raw data).
 - f. Chip manufacturer LM-80 data along with a corresponding TM-21 lifetime extrapolation report calculated at the luminaire's actual in-situ drive current and measured thermal junction temperature.
 - g. ISO 12944 paint quality and verification report.
 - h. Lighting photometric data files (IES/LDT format).

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, sensor, powder-coated finish, and emergency battery backup system hardware.
- 9.3 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 60-month 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 All products shall be factory tested and quality-assured prior to dispatch.
- 10.2 All devices shall operate without perceptible delay, flicker, or interference under normal service conditions.
- 10.3 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.
- 10.4 The luminaire shall be manufactured and tested according to SANS 60598 general requirements.
- 10.5 The emergency lighting function shall be tested at the factory prior to dispatch to verify:
 - Correct transition to emergency mode upon mains failure
 - Minimum 30-minute emergency duration
 - Correct recharging function upon mains restoration