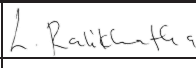


**PERFORMANCE SPECIFICATION: LED DECORATIVE BULKHEAD LUMINAIRE
(TYPE 1)**

Signatures						
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Date	Rev.	Status	Prepared By	Reviewed By	Approved By	Authorised By

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REVISION CONTROL

Date	Rev No	Description	Revised By
14/07/2026	A	Internal Review	Sifiso Dlamini
22/07/2026	0	Authorised for use	M.Mlonzi

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1.0 SCOPE

- 1.1 This specification defines the performance and technical requirements for LED decorative bulkhead luminaires for use in TNPA facilities.
- 1.2 The luminaires are intended for use in TNPA port environments, which are characterised by high humidity, saline atmospheres, and demanding operational conditions. All equipment supplied shall be designed and manufactured to withstand these conditions and provide reliable, long-term service.
- 1.3 This includes luminaire construction, materials and finishes, LED light sources, power supplies/drivers, optics, ingress protection, wiring, earthing, electromagnetic compatibility, packaging, and associated documentation.
- 1.4 The luminaires shall be supplied complete with all necessary mounting hardware for the specified mounting method, 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

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

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 and aluminium alloys – Castings – Chemical composition and mechanical properties (AC-44300 grade)

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)

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

3.0 SERVICE CONDITIONS

3.1 The luminaires shall be designed and manufactured to operate reliably under the following service conditions typically encountered in TNPA Port facilities (e.g., warehouses, workshops, storage areas, administrative buildings, corridors, external covered walkways and stairwells):

3.1.1 Environmental Conditions

- a. Ambient temperature range: 0°C to +35°C
- b. Relative humidity: 10% to 95% (non-condensing)
- c. Coastal environment: Saline coastal environment with potential for airborne salt spray and dust ingress. (Corrosion category C5-M in accordance with ISO 12944)
- d. Dust and particulate matter: moderate to high levels typical of industrial port facilities

3.1.2 Electrical Supply Conditions

- a. Nominal supply voltage: 230 V AC $\pm$ 3%
- 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 walls or ceilings

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 corrosion protection (marine-grade aluminium, protective 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 marine-grade aluminium alloy EN 1706 AC-44300 (or superior), specifically designed for coastal and harsh environmental conditions. A certified Metallurgical Test Report (MTR) confirming the grade and quality of the aluminium shall be provided with the tender submission.
- 5.2 The luminaire shall be supplied with a textured powder-coated finish in black (RAL 9017) or as specified in the tender schedule.
 - 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 UV-stabilised to prevent chalking and discolouration over time.
 - 5.2.3 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 high-impact acrylic, providing uniform light distribution and low glare.
- 5.4 All external fasteners (bolts, screws, nuts, washers) shall be manufactured from stainless steel grade AISI 304 or higher.
- 5.5 To prevent galvanic and dissimilar metal corrosion between stainless steel fasteners and the aluminium base, all trim ring fixing holes shall be provided with stainless steel helicoil inserts.

6.0 SYSTEM DESCRIPTION

- 6.1 The luminaire shall be an LED surface-mounted fitting with a low-profile, highly aesthetic appearance.
- 6.2 The luminaire shall bear the SANS 60598-1 safety mark and shall be tested in accordance with SANS 60598 and SANS 62262.
- 6.3 The luminaire shall be of the totally enclosed type.
- 6.4 Luminaires shall be delivered fully assembled with housing, driver, LED module, and diffuser.
- 6.5 The luminaire shall be designed for wall or ceiling surface mounting.
- 6.6 The luminaire shall be designed to be future-proof and upgradable, allowing for servicing of the LED unit and driver without discarding the entire unit.
- 6.7 Preference may be given to locally manufactured products where permitted by

procurement requirements.

- 6.8 The luminaire shall have a design for ease of installation without compromising product lifetime.

7.0 FUNCTIONAL AND PERFORMANCE REQUIREMENTS

7.1 Luminaire Construction

- 7.1.1 The luminaire housing shall be manufactured from marine-grade aluminium alloy EN 1706 AC-44300 (or superior).
- 7.1.2 The low-profile housing design shall provide a highly aesthetic appearance suitable for interior applications.
- 7.1.3 The luminaire shall incorporate an aluminium heat sink for passive cooling of the LED light source. Active cooling (fans) or liquid cooling is prohibited.
- 7.1.4 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 design shall allow for servicing of the LED unit and driver without removing the entire luminaire from its mounting.

7.2 LED Light Source

- 7.2.1 The LEDs shall be highly efficient, with a luminaire efficacy of 122 lm/W minimum.
- 7.2.2 The effective lumen package of the fitting shall be as specified in the tender schedule.
- 7.2.3 The delivered luminaire flux measured according to LM-79 shall be not less than 2,250 lumens.
- 7.2.4 The light source shall be available in the following correlated colour temperatures (CCT):
- 4000K (Neutral white 840)
 - 3000K (Warm white 830)
- 7.2.5 The Colour Rendering Index (CRI) shall be 80 minimum (CRI ≥80).
- 7.2.6 The luminaire shall provide uniform light distribution with low glare.
- 7.2.7 The LED lifetime @ Tq 25°C shall be 50,000 hours minimum (L70B10).
- 7.2.8 The driver lifetime @ Tq 25°C shall be 100,000 hours minimum (≤10% failure rate).

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.

- 7.3.3 The driver shall incorporate the following protection features:
- Overload protection
 - Short circuit protection
 - Internal surge protection
- 7.3.4 The driver shall operate at a Power Factor (PF) of 0.90 or greater.
- 7.3.5 The driver shall be flicker-free in all operating modes.
- 7.3.6 The driver shall have a lifetime of 100,000 hours minimum ($\leq 10\%$ failure rate) at Tq 25°C.
- 7.3.7 The driver shall support the following electrical characteristics:
- Rated supply voltage: 220 – 240 V AC
 - Mains frequency: 50 Hz
 - Rated power: As specified in the tender schedule
- 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 provide emergency lighting illumination during mains failure transitions to maintain regulatory emergency lux levels
- 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 Optics and Diffuser

- 7.5.1 The luminaire shall be equipped with a high-impact acrylic diffuser.
- 7.5.2 The diffuser shall provide uniform light distribution with low glare.
- 7.5.3 The diffuser shall be UV-stabilised to prevent discolouration over time.

7.6 Ingress Protection and Impact Resistance

- 7.6.1 The luminaire shall have an Ingress Protection (IP) rating of IP65 minimum, suitable for applications in the Port environment.
- 7.6.2 The luminaire shall be tested in accordance with SANS 62262 for impact resistance, having an IK rating of IK08.
- 7.6.3 The LED compartment shall form a seal to prevent the entry of dust and moisture.
- 7.6.4 The IP and IK ratings shall be certified by test reports for the specific luminaire model.

7.7 Wiring and Electrical Connections

- 7.7.1 The internal wiring of the luminaires shall be flexible and suitably insulated to withstand the voltage and temperature encountered in service.
- 7.7.2 The supply terminals shall accept the appropriate conductor sizes and be easily accessible.

7.8 Earthing

- 7.8.1 Luminaires shall be designed to facilitate earthing as per the Electrical Machinery Regulations of the OHSACT (Act 85 of 1993).
- 7.8.2 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.
- 7.8.3 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.
- 7.8.4 Earth connections shall be by means of suitable lugs, designed to prevent electrolytic corrosion.

7.9 Electromagnetic Compatibility

- 7.9.1 The luminaire shall comply with IEC 55015 (Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment).

7.10 Packaging and Transport

- 7.10.1 The luminaires shall be packed in a manner that ensures protection during handling and transport by road, rail, or sea.
- 7.10.2 The packaging shall be designed to prevent vibration damage to the LED modules and control gear during transit.
- 7.10.3 Where sea transport is involved, a suitable dehydrating agent (desiccant) shall be included in the packaging to prevent corrosion.

8.0 CERTIFICATION AND TEST REPORTS

- 8.1 The tenderer shall provide the following documentation:
 - a. Product data sheets, catalogues, and operation/maintenance manuals
 - b. Full Type Test Report conforming to SANS 60598-2-1 (or applicable part) read in conjunction with SANS 60598-1, explicitly confirming the declared Ingress Protection (IP) rating and mechanical impact resistance (IK rating)
 - c. Test reports for the SANS 475 performance mark (if applicable).
 - d. LM-79 compliant absolute photometric report (including IES/LDT files reflecting true fixture performance, not nominal, chip, or raw data).
 - e. Source chip manufacturer LM-80 data paired with a TM-21 lifetime prediction extrapolation report.
 - f. Metallurgical test reports confirming the housing material conforms strictly to EN 1706 AC-44300 or an approved equivalent marine-grade alloy. If an alternative alloy is proposed, the contractor shall submit independent laboratory certification proving equivalent chemical composition, mechanical properties, and atmospheric corrosion resistance relative to EN 1706 AC-44300.
 - g. Powder coating performance test report confirming film thickness, cross-hatch adhesion, and corrosion resistance.
 - h. 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 three (3) years (36 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 36-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 guarantee terms and conditions shall be provided with the tender submission.
- 9.6 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 luminaire shall be manufactured and tested according to SANS 60598 general requirements.