

PERFORMANCE SPECIFICATION: LED CIRCULAR DOWNLIGHT LUMINAIRES (TYPE 1)

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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	Phila Mkhize
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 the supply of LED circular aluminium reflector downlights for TNPA facilities.
- 1.2 This includes luminaire construction, materials and finishes, LED light sources, power supplies/drivers, optics, ingress protection, impact resistance, surge protection, emergency battery backup (where specified), wiring, earthing, electromagnetic compatibility, packaging, and associated documentation.
- 1.3 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.
- 1.4 This specification covers LED circular aluminium reflector downlights, suitable for general indoor lighting applications, including offices, corridors, reception areas, and commercial spaces, 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

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

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: 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 buildings
- b. Mounting: Recessed mounting (standard) or surface mounting

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 (aluminium housing, acrylic diffuser, 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 high-quality aluminium, providing excellent durability and corrosion resistance.
- 5.2 The luminaire reflector shall be manufactured from specular aluminium, providing high light output and controlled distribution with low glare.
- 5.3 The luminaire shall be available with a specular reflector with white trim ring configuration.
- 5.4 The diffuser shall be manufactured from acrylic, providing uniform light distribution and low glare.

6.0 SYSTEM DESCRIPTION

- 6.1 The luminaire shall be a circular aluminium reflector LED downlight with a classic elegant design.
- 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 available in more than one size and shall be suitable for recessed mounting as the standard configuration. An optional surface-mounted version shall also be available.
- 6.4 Luminaires shall be delivered fully assembled with housing, LED driver, and LED modules.
- 6.5 Preference may be given to locally manufactured products where procurement regulations permit.
- 6.6 Where specified, the luminaire shall be supplied with an integrated emergency battery backup system.

7.0 FUNCTIONAL AND PERFORMANCE REQUIREMENTS

7.1 Luminaire Construction

- 7.1.1 The luminaire housing shall be manufactured from high-quality aluminium, providing excellent durability and corrosion resistance.
- 7.1.2 The luminaire reflector shall be manufactured from specular aluminium, providing high light output ratio (LOR) of up to 86%.
- 7.1.3 The luminaire shall incorporate a white trim ring.
- 7.1.4 The luminaire shall incorporate an aluminium heat sink for passive cooling of the LED

light source.

- 7.1.5 All parts requiring maintenance and cleaning shall be easily accessible.

7.2 LED Light Source

- 7.2.1 The LEDs shall be high efficiency, delivering minimum effective lumens of 140 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 3000K or 4000K.
- 7.2.4 The Colour Rendering Index (CRI) shall be 80 minimum (CRI ≥80).
- 7.2.5 The luminaire shall provide low glare lighting suitable for indoor applications.
- 7.2.6 The LED life expectancy @ Tq 25°C shall be 50,000 hours minimum (L70B10).
- 7.2.7 The LED driver life expectancy @ Tq 25°C; 230V ±10% 50Hz shall be 50,000 hours minimum (≤10% failure rate).

7.3 Power Supply / Driver

- 7.3.1 The power supply (driver) compartment shall be designed 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
 - Surge protection
- 7.3.4 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
 - Power Factor ≥0.90
 - THD ≤10%
 - Flicker-free operation under normal operating conditions

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 an acrylic diffuser, providing uniform light distribution.
- 7.5.2 The specular aluminium reflector shall provide high light output ratio (LOR) of up to 86%.
- 7.5.3 The reflector and diffuser combination shall provide low glare illumination.
- 7.5.4 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 IP20, suitable for indoor applications.
- 7.6.2 The IP rating shall be certified by a test report 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.
- 7.10.4 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 in accordance with SANS 60529.
- 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 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 surge protection device.
- 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 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