

## 1. Technical Specifications of the Solar Photovoltaic Powered LED Luminaire

### 1.1 Scope

The LED Luminaires shall be designed, manufactured and tested for dusk to dawn operation and such that they can be incorporated with a Telemangement system in the future. Although the Telemangement system does not form part of scope of work in this tender, the bidder shall ensure that the offered LED luminaires are compatible to a Telemangement system.

### 1.2 Normative References

The following standards contain provision that, whether referenced in the text or not, constitute requirements of this specification.

ARP 035	Guidelines for the installation and maintenance of streetlighting
IEC 62471	Photo biological safety of lamps and lamp systems
IES LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products
IES TM 21-11	Projecting Long Term Lumen Maintenance of LED Light Sources
SANS 121	Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods
SANS 215	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
SANS 475	Luminaires for interior lighting, street lighting and floodlighting — Performance requirements
SANS 529	Heat-resisting wiring cables
SANS 1088	Luminaire entries and spigots
SANS 1091	National Colour Standard
SANS 10098-1	Public lighting Part 1: The lighting of public thoroughfares
SANS/IEC 51706	Aluminium and aluminium alloys – Castings – Chemical composition and mechanical properties
SANS/IEC 60529	Degrees of Protection provided by Enclosures (IP Code)
SANS/IEC 60598-1	Luminaires: Part 1. General Requirements and Tests
SANS 60598-2-3	Luminaires Part 2-3: Particular requirements - Luminaires for road and street lighting
SANS/IEC 60598-2-5	Luminaire: Particular requirements – luminaires for Floodlights
SANS/IEC 61000-3-2	Electromagnetic compatibility(EMC) Part 3-2: Limits — Limits for harmonic current emissions
SANS/IEC 61000-3-3	Electromagnetic compatibility (EMC) Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flickering public low-voltage supply systems
SANS/IEC 61000-4-5	Surge immunity test – Testing and measurement
SANS/IEC 61347-1	Lamp control gear Part 1: General and safety requirements

SANS/IEC 61347-2-13	Lamp control gear Part 2-13: Particular requirements for d.c. or a.c. supplied electronic control gear for LED modules
SANS/IEC 61547	Equipment for general lighting purposes – EMC immunity requirements
SANS/IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
SANS/IEC 62384	DC or AC supplied electronic control gear for LED modules - Performance requirements
SANS 10098-2	Lighting of certain specific areas of street and highways
ISO 9001: 2008	Quality management systems

**NB:** Bids offering equipment to standards other than those listed above may be considered provided it is clearly indicated in which respects the equipment offered does not comply and the likely consequences of such non-compliance.

Note that the International (IEC) equivalence of SANS standards are generally the same but may include specific variations to be taken into account. Information on currently valid national and international standards can be obtained from the South African Bureau of Standards (<https://www.sabs.co.za/>).

**Definitions and Abbreviations**

The definitions and abbreviation given in SANS/IEC 60598-1/SANS/IEC 60598-2-5/SANS 475 or equivalent shall apply.

**3. General Requirements**

The LED Flood/Street light Luminaire shall comply with the requirements of SANS/IEC 60598 and SANS475 or equivalent. This shall be supported by documentary evidence in the form of Type Test reports/Product certification. The LED luminaire shall be supplied as a complete unit, ready for use with all components fully assembled, including the luminaire housing, driver, LED modules, lenses, reflectors, wiring, mounting brackets, etc.

**4. Electrical Performance Requirements**

**4.1 Solar Photovoltaic Panel**

The PV module should have crystalline silicon solar cells and must have a certificate of testing conforming to IEC 61215 Edition II / BIS 14286. The power output of the module under STC should be a minimum of value that is enough to safely power and charge the battery.

## **4.2 Battery and Management System**

The battery to be made of Lithium Ferro Phosphate. Battery pack should have proper 'Battery management System' (BMS) for cell balancing, over charge and over temperature protection. The Minimum capacity should allow for 12 hour operation and 2 day autonomy.

## **4.3 Charge Controller**

Maximum Power Point Tracking (MPPT).

## **4.4 LED Driver**

The LED Driver shall comply with the requirements of SANS/IEC 61000-3-2, SANS/IEC 61000-3-3, SANS/IEC 61000-4-5, SANS/IEC 61347-1, SANS/IEC 61347-2-13 and SANS/IEC 61547 or equivalent. The LED Driver shall be mounted inside the control gear compartment and be easily replaceable. The LED driver for the offered luminaire shall be dimmable.

## **5. Mechanical Performance Requirements**

### **5.1 Construction**

The luminaire housing must be robustly constructed from non-corrosive aluminium material to SANS/IEC 51706 or equivalent; and shall be weatherproof, hail proof, corrosion proof and vandal resistant.

All metal components must be suitably treated against corrosion. Ferrous components must be hot-dip galvanised to SANS/IEC 121 or equivalent. Hinge pins, clips, clamps, set screws, bolts, nuts and washers must be manufactured from an appropriate grade of stainless steel (grade 304 or better).

The luminaire must be tilt adjustable relative to the horizontal plane. The luminaire shall be supplied with necessary mechanical accessories (bolts, nuts, brackets, etc.) to be securely fitted on a flat horizontal or vertical surface. The bidder shall provide the instructional installation manual as part of the returnable documents in this tender. For powder coating, the bidder shall provide in the Product Technical Datasheet of the Luminaire the list of colour codes options available complying with SANS 1091 or equivalent.

The optical compartment of the luminaire must be completely enclosed with a clear tempered glass protector or impact resistant non-degrading material to minimum of IP65 tightness to maintain optimal photometric performance over its lifetime.

The LED luminaire shall be so designed and constructed that there is sufficient space to permit easy repairs/replacement of components and reassembly without difficulty, and without removal of the luminaire from its mounting position.

## 5.2 Ingress Protection and Impact Rating

The complete LED Luminaire shall have a minimum IP Rating of 65 or better in accordance with SANS/IEC 60529 or equivalent. The complete LED luminaire shall have a minimum IK rating of 08 or better in accordance with SANS/IEC 62262 or equivalent.

## 5.3 Control Gear Compartment

The LED driver, Surge Protection Device and Terminal Block shall be housed within its compartment complying with the required Luminaire IP rating  $\geq$  IP65. The control gear compartment shall form part of the complete luminaire or be attached to the luminaire.

## 6. Photometric Performance Requirements

### 6.1 Luminous flux

The luminaire output shall be provided as nominal flux at  $T_a$  of 25 °C.

### 6.2 Luminous Efficacy

The total system efficiency shall be at least 100lm/W operating at ambient temperature  $T_a$  of 25C.

## 7. Colour Rendering

The colour rendering index shall be equal to or greater than 70.

## 8. Lumen maintenance

The lumen maintenance of the LED modules must be measured in accordance with IES LM-80-08 or equivalent. The measured data must be extrapolated to L70 using the method of IES TM-21-11 or equivalent. The bidder shall provide lumen depreciation graphs as part of the returnable documents in this tender. The documents should indicate the time it takes for the LED luminaire to reach L90, L80, L70 and L50.

## 9. Colour Temperature

The average maintained correlated colour temperature of the luminaire shall be a greater than 4000K.

The variation in the correlated colour temperature of the LEDs must be restricted in accordance with ANSI C78-377A or equivalent with the variation limited to within 250K of the nominal average correlated colour temperature.

**10. Lifetime**

The useful life of the luminaire shall be stated as the operating hours before the light output of the complete luminaire (not the LEDs only) has reached 70% (L70) of the initial light output at the performance ambient temperature specified.

**11. Thermal Management requirements**

The LED luminaire shall contain a heatsink. The design of the luminaire and the heat sink shall ensure continuous effective cooling. The power supply should incorporate a thermal switch to prevent exceeding the case temperature for the maximum lifetime of the luminaire. The bidder shall provide with this tender a detailed temperature testing report indicating how the luminaire manages its temperature and the effect it has on lumen maintenance.

**12. Marking**

Except as specified otherwise, the method of marking must comply with SANS/IEC 60598-1 or equivalent. A self-adhesive foil label must be applied to the outside of the luminaire in a position readily visible when the luminaire is mounted in position. The label must identify the type and the rating of the luminaire.

**13. Indicative Abridged Technical Data**

<b>LIGHTING</b>			
Efficiency(LM/W)	≥ 100		
CCT(K)	≥ 4000		
CRI	≥ 70		
Life span	50 000 hours (12 years)		
Max power(W)	40	60	80
Nominal power(W)	20	30	40
Typical Luminous Flux(LM)	4000 – 4800	6000-7200	8000 – 9600
Beam angle	80°x150°		
Working way	Motion Sensor/Time Schedule		
<b>PHOTOVOLTAIC PANEL</b>			
Technology	XXXX-crystalline photovoltaic panels		
Power of PV Module(Wp)	50	70	100

Life span	25 years		
<b>BATTERY</b>			
Technology	LiFePO4(Lithium Iron Phosphate)		
Lithium Battery(Wh)	231	384	538
Autonomy	2+ Rainy days		
Life span	12 years		
<b>CHARGING CONTROLLER</b>			
Technology	MPPT(Maximum Power Point Tracking)		
Life span	12 years		
<b>GENERAL</b>			
IP	IP65		
Mounting	Independent Tilt / Adjustable Sprocket		
Work Temperature(°C )	-20~+60		
Recommended Installation Height(m)	4 - 6	5 - 7	6 - 8
Recommended Installation Distance(m)	15-20	20-25	25-30
Recommended Diameter of Top mounting(mm)	55-60	55-60	55-60

#### 14. Health and Safety

Safety during construction is paramount, and the Contractor must adhere to the statutory construction regulations and other regulatory requirements.

The following serves as a guideline to the access and safety scaffolding:

- The successful bidder will be expected to submit the SHE file after the the work has been awarded and accepted. Site hand over van only be scheduled after induction has been concluded.
- All roof structures must be inspected prior to erection of working platforms or scaffolding onto roof structures. Any discrepancies must be reported to the Building Supervisor for assessment.
- Work platforms: Adequate and secure work platforms from which to carry out the work are required where necessary.
- Fall mitigation: Providing adequate platforms and edge protection may not always be possible or reasonably practicable. If so, safety nets, soft landing systems, or other measures may be necessary to minimise the consequences of any potential injury. If nets are used it must be properly installed by competent riggers as close under the work surface as possible to minimise the distance fallen.
- Falling material: A tidy site must be maintained to prevent material which could fall from accumulating. Material may never be thrown from a roof or scaffold, and enclosed

rubbish chutes are to be used if lowering material to the ground in containers is not possible. Rubbish chutes must discharge into skips to dispose of spoil material to spoil level.

- Public safety must be maintained throughout, and all scaffolding and pedestrian walkways must be barricaded to prevent accidental or unauthorised access. Where necessary, the contractor must obtain permission from council to barricade sidewalks.