

Annexure A



KEETMANSHOOP MUNICIPALITY

KEETMANSHOOP ELECTRICITY BUSINESS UNIT (KEBU)

SPECIFICATION FOR
STREETLIGHT LUMINAIRES

Reference:
KEBU_SPEC_007.1

Revision: 1

December 20

CONTENTS

Foreword	3
1 Scope	3
2 Normative References	3
3 Definitions and Abbreviations	4
4 Requirements.....	4
4.1 General.....	4
4.2 Construction of Streetlight Luminaires	5
4.2.1 General.....	5
4.2.2 Mounting.....	6
4.2.3 Diffusers	6
4.2.4 Lamp-holders and brackets.....	7
4.2.5 Reflectors	8
4.2.6 Control Gear	8
4.2.7 Ballasts	9
4.2.8 Capacitors	9
4.2.9 Ignition Devices	9
4.3 Electrical Requirements	10
4.4 Photometric Performance	11
4.5 Guarantee	11
4.6 Samples	11
5 Tests	11
6 Marking and Packaging	12
7 Documentation	13
8 Training	13
9 Quality Assurance.....	14
Annex B – Technical Schedules A and B	15

FOREWORD

Street lighting luminaires are used for the lighting of public thoroughfares and roadways, contributing to road safety as well as public safety. The reliability and safety of these luminaires have a direct impact on levels of customer satisfaction as well as quality of supply.

This specification covers Keetmanshoop Electricity Business Unit (KEBU) requirements for streetlight luminaires in accordance with relevant standards.

Bidder shall complete the technical schedules as detailed in Annex B – Technical Schedules A and B. All deviations from the requirements shall be stated in the tender documentation. In the absence of such a statement, it shall be understood that all requirements of this specification are fulfilled without exception.

Specifications are referenced in the normative references section; the list of standards may be used as a guide, but should not be regarded as a complete list. Tenderers shall be responsible for obtaining copies of NRS documents and any other relevant and current national and international standards.

Streetlight luminaires shall comply with the relevant SANS and/or IEC equivalent standards or similar approved.

1 SCOPE

This specification covers KEBU requirements for the manufacture, testing, supply and delivery of streetlight luminaires in accordance with SANS 475 and/or IEC 60598.

2 NORMATIVE REFERENCES

Parties using this specification shall apply the most recent edition of the documents listed below.

BS 1490, *Specification for aluminium and aluminium ingots and castings for general engineering purposes.*

CIE Publication 27, *Photometry of luminaires for street lighting.*

ISO 4762, *Hexagon socket head cap screws*

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

SANS 60598-2-3, *Luminaires – Part 2: Particular requirements – Section 3: Luminaires for road and street lighting*

SANS 10098-1, *Public lighting – Part 1: The lighting of public thoroughfares*

SANS 529, *Heat-resistant wiring cables*

SANS 1088, *Luminaire entries and spigots*

SANS 1091, *National colour standards for paints*

SANS 1277, *Street lighting luminaires*

SANS 1507, *Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V) Part 1 - General and Part 2 – Wiring cables.*

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

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

VC 8011, *Lampholders*

3 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations shall apply to this specification:

HPS: High Pressure Sodium.

PECU (Photoelectric control unit): A device, which comprises a photoelectric sensor responding to variations in illuminance combined with means for switching an electric load.

Socket (NEMA base): A receptacle into which a one-part control unit may be inserted.

/E (suffix): Elliptical e.g. 100 W HPS/E

/T (suffix): Tubular e.g. 100 W HPS/T

4 REQUIREMENTS

4.1 GENERAL

4.1.1 The luminaires shall comply with IEC 60598-1, IEC 60598-2-3 and/or SANS 475.

4.1.2 The luminaires shall be Class 1 as per IEC 60598-1 and shall be of the totally enclosed type.

4.1.3 Luminaires shall be designed for use under conditions of heavy atmospheric pollution and exposure to high levels of solar (including ultraviolet) radiation, at an mean altitude of up to 1500 m, and be suitable for operation at ambient temperatures of -5 °C to +45 °C. The luminaires may also be exposed to wind, rain, hail and sleet in service.

4.1.4 Luminaires shall have a lamp, control gear and spigot compartment and shall have a degree of protection rating of a minimum of IP65 rating on the lamp compartment and a minimum of IP54 on the control gear compartment. These are minimum ratings and preference may be given to luminaires offered with IP ratings exceeding the minimum requirements, particularly on the control gear compartment.

4.1.5 All ratings must be certified by a test report confirming compliance with SANS IEC 60598-1, as well as clause **Error! Reference source not found.** (Tests) of this specification. The test reports shall be issued by an SANS or IEC accredited test authority.

4.1.6 Luminaires offered shall bear the SABS certification mark for approved performance and shall be tested to the SANS 475 standard, or the IEC 60598 mark.

4.1.7 Luminaires shall be delivered completely assembled with control gear, lamp holder, reflectors, diffuser (bowl) and housing. The requirement for inclusion of Photoelectric cells, where used, and Lamps shall be as specified in schedule A.

4.2 CONSTRUCTION OF STREETLIGHT LUMINAIRES

4.2.1 General

4.2.1.1 Luminaires shall be robustly constructed, weatherproof, hail proof, insect proof, corrosion proof, solar (including ultra-violet) resistant and vandal resistant.

4.2.1.2 In order to prevent risks associated with road safety, luminaires shall be designed to avoid disintegration in the event of vehicular impact. Luminaire housings shall be secured to the pole spigot in such a manner that the control gear compartment remains attached to the pole spigot even after a severe impact.

4.2.1.3 All external parts and components of the luminaire shall be designed to shed water and no accumulation of condensation or precipitation shall occur.

4.2.1.4 Luminaires shall be constructed from durable lightweight materials and shall be accompanied by comprehensive test reports certifying that the luminaires have successfully passed accelerated ageing tests (also refer to 4.8 and 5.6 of SANS 475) and shall provide proof that the luminaires have a satisfactory performance history. Deterioration shall not occur due to electrolytic action or by differential thermal expansion.

4.2.1.5 Luminaire housings shall be manufactured from ultraviolet stabilized engineering polymer. Luminaires made of DMC (Dough Moulding Compound) shall not be accepted. The luminaire housing shall be warranted to operate without distortion and deterioration for a minimum period of 5 years.

4.2.1.6 Luminaires shall be a colour that is an acceptable match to colour number F48 (cloud grey) of SANS 1091 or as otherwise specified. Painted luminaires shall not be accepted.

4.2.1.7 Ferrous components shall be hot-dip galvanized in accordance with SABS ISO 1461 for heavy-duty applications. External small components (clips, screws, bolts, nuts, washers, etc.) shall be manufactured from stainless steel (grade 304 or better).

4.2.2 Mounting

4.2.2.1 Spigot entries shall be designed to fit easily over the bracket pipe and shall be truly parallel to the fitting axis and shall comply with Table 1 of SANS 1088 as follows:

- a) For Type 2 luminaires (side entry): Nominal size 42 mm
- b) For Type 3 luminaires (bottom entry): Nominal size 76 mm

4.2.2.2 Spigot entries shall be designed to fit easily over the spigot and shall be truly parallel to the fitting/lamp axis. Spigot entries shall be constructed of corrosion-resistant materials and compatible with the galvanized mild steel spigot such that deterioration by electrolytic action shall not occur.

4.2.2.3 Unless otherwise specified in schedule A, luminaires shall be secured to the spigot by means of easy-release hinges. The construction of the housing shall be such that cracking cannot occur during the process of fixing the luminaire to the pole or bracket.

4.2.2.4 Luminaires should incorporate a positive and substantial means of fixing to the pole or bracket, designed to allow adjustment and to ensure that once set to the required position, the luminaires remain locked in that position.

4.2.3 Diffusers

4.2.3.1 Diffusers shall have no external prisms that could accumulate dirt and thus reduce the light output of the luminaire. Diffusers shall be constructed in such a manner that the wall thickness of the material is maintained at a constant thickness, hence preventing the projection of lines of patterns onto the road surface.

4.2.3.2 Diffusers shall be heat-resistant and shall not discolour, even after prolonged exposure to light, both atmospheric and artificial. The mechanical strength shall be sufficient to prevent warping or distortion to occur. Diffusers shall be manufactured from injection moulded high impact acrylic. Tenderers shall submit documentation with respect to the properties of the material under service conditions (i.e. Depreciation in light transmission over time and material degradation). Diffusers made of polycarbonate shall not be acceptable.

4.2.3.3 Devices for locking the bowl to the luminaire shall be at least three stainless steel clips thus ensuring that it remains closed in the event of the failure of one clip. Hinges and clips shall be robust and simple to operate. Devices such as wing nuts and those requiring the use of a tool (e.g. screws) shall be rejected. Bowls that are completely flat, i.e. do not project below the luminaire body, will not be acceptable.

4.2.3.4 Diffusers shall have a means to prevent direct contact by rainwater with the one-piece gasket, which shall be permanently fitted into the housing (e.g. in a tongue and groove arrangement). The gasket shall form a seal when the diffuser is in the closed position, preventing the entry of dust, moisture and insects into the lamp compartment. The gasket shall be made from silicon sponge, which shall not be subject to permanent compression or deterioration in service. The gasket should be fitted into a groove in the housing and should be kept in place by a tongue provided on the diffuser, thus ensuring the integrity of the IP rating and shall not work loose during maintenance of the luminaire.

4.2.3.5 Luminaire bowls shall be capable of being removed from the luminaire body simply by unclipping for cleaning purposes. The bowl shall not detach from the luminaire body in the unlikely event of the bowls being left in the open or hanging position when mounted on the pole. The diffuser should also remain attached to the housing when hinged open for maintenance or lamp replacement. This hinge mechanism should be incorporated into housing to ensure that it is protected against damage during transport, installation and maintenance.

4.2.4 Lamp-holders and brackets

4.2.4.1 Lamp-holders shall comply fully with VC 8011 and be of the type (E27 or E40) as specified in schedule A, and shall be capable of maintaining efficient electrical contact with the lamp terminals without deterioration due to temperature, climatic conditions and vibration which will be encountered in service.

4.2.4.2 For additional insulation against ignitor spark-over a suitable fibre washer for E40 GES lamp holders shall be used.

4.2.4.3 Lamp-holders shall be rated to withstand 240 °C and be rated at the appropriate lamp ignition voltage.

4.2.4.4 A lamp fully inserted into the lamp-holder shall be rigidly held with its axis substantially coincident with that of the lamp-holder under conditions of wind, vibration and mechanical shock to be expected in service. It shall be possible to insert and withdraw the lamp without undue stress.

4.2.4.5 The lamp-holder shall have zero degree rake i.e. its axis shall be parallel to that of the spigot entry.

4.2.4.6 Lamp holder brackets and lamp supports shall accept and retain lamps which are within the dimensional tolerances stated in the appropriate lamp standard and shall locate the light source in the correct relationship to the optical control devices of the luminaire. With luminaires for lamps of greater rating than 150 W, the lamp holder shall be mounted firmly to an aluminium bracket.

4.2.4.7 Alternatively the lamp holder is to be mounted directly onto aluminium bosses, which protrude into the lamp housing from the gear compartment.

4.2.5 Reflectors

4.2.5.1 Reflector surfaces shall be of high-grade 99,98% super pure deep anodised aluminium. Full details of the material used including properties (e.g. in the form of datasheets) shall be supplied.

4.2.5.2 Reflectors or any other light-controlling component shall be such that they can only be fitted or replaced in the correct relationship to their light source.

4.2.5.3 Reflectors in luminaire bowls shall not deform due to heat from the lamp. Reflectors shall be well secured into position to prevent it from deforming thus causing false photometric performance of the luminaire.

4.2.5.4 Where provision is made for alternative reflector positions, the adjustment means shall be positive and be firmly retained in clearly identified positions.

4.2.6 Control Gear

4.2.6.1 Control gear shall be fully housed within the body of the luminaire and be suitable for operation with the specified rating of lamp. Under no circumstances shall control gear be mounted above the lamp or in a position where it may be adversely affected by the heat generated by the lamp.

4.2.6.2 For 250 W and 400 W luminaires: For safety and thermal reasons, the control gear compartment shall be manufactured from a sturdy and reliable housing of high-pressure die cast, corrosion resistant, aluminium of grade LM6 (EC1706 AC 44100) or higher. For 150 W luminaires: Luminaires offered manufactured of one piece material shall submit detailed reports of material compliance to required thermal tests.

4.2.6.3 The control gear compartment shall be so designed that there is sufficient space to permit repairs, replacement of components and reassembly without difficulty, without the removal of the luminaire from its mounting. To this end, and for maintenance reasons, preference will be given to luminaires where all control gear is mounted onto a removable tray. Where this is provided, removable connectors are required for disconnecting the supply to the tray for easy removal and subsequent replacement. Control gear wiring is to be terminated in a five-way termination block to facilitate the removal of the gear tray in the control gear compartment.

4.2.6.4 Control gear compartment (containing the ballast, capacitor, ignition devices if applicable, and terminal connectors) shall be sealed by a hinged, lightweight, non-corroding cover and shall be accessible from underneath. No components shall be mounted onto this cover. Access to the gear compartment, via the gear tray cover, shall not be possible without the use of a screwdriver or key, thus protecting unqualified staff, doing lamp replacement, against electric shock.

4.2.6.5 Where specified, luminaires shall be supplied with a thermal circuit breaker, which conforms to SANS 556-1, rated 5 A/2.5 kA, incorporated inside the luminaire and mounted on the removable gear tray. The exposed lever shall be accessible from the outside of the luminaire and shall be protected in a manner ensuring the integrity of the IP54 rating requirement for the control gear compartment.

4.2.6.6 All control gear shall be suitable for operation with the specified rating of the lamp on a 230 V $\pm 10\%$ 50 Hz single-phase system.

4.2.7 Ballasts

4.2.7.1 Ballasts shall comply with SANS 1266, SABS IEC 922 and SABS IEC 60923 and shall bear the SABS mark or IEC mark.

4.2.7.2 Ballasts shall be of the encapsulated or vacuum impregnated type. The process of vacuum impregnation shall be such that the interstices of the windings are completely filled with the impregnating material. Connections shall be brought out to a suitable brass screw terminal block mounted on the ballast housing. Terminal blocks with steel screws will not be acceptable.

4.2.7.3 Vacuum impregnated ballasts shall be constructed in such a manner that the lamination is engaged within a galvanised steel cover which cover shall withstand the test specified in SABS ISO 1461.

4.2.8 Capacitors

4.2.8.1 Capacitors shall comply with SANS 1250, SABS IEC 61048 and SABS IEC 61049 and shall bear the SABS mark or IEC mark.

4.2.8.2 Capacitors shall only be connected to the primary (line) side of transformer ballasts. After connection of the power factor correction capacitor, the power factor shall not be less than 0,85 (lagging).

4.2.8.3 All capacitors shall be fully encapsulated and filled with self-extinguishing resin.

4.2.9 Ignition Devices

4.2.9.1 Ignitors shall comply with SANS 101630 and shall bear the SABS mark or IEC mark. Ignitors shall be of the superimposed-pulse solid-state electronic trigger type.

4.2.9.2 Ignitors shall be of the standard type to allow striking of the lamp without switching the power off after replacement of a faulty ignitor.

4.2.9.3 Ignitors shall be suitable for operating any make of lamp in conjunction with any make of ballast at temperatures up to 90 °C. The ignitor shall be connected in series with the ballast and installed between the ballast and lamp holder. Systems that operate with the ignitor in parallel with the lamp, or with special tapped ballasts, will not be acceptable.

4.2.9.4 All ignitors shall be suitable for connection in the circuit so that the ignition pulse is confined between the ignitor and lampholder.

4.3 ELECTRICAL REQUIREMENTS

4.3.1.1 All internal wiring of the luminaires shall comply with clause 3.10 of IEC 60598-2-3. It shall be flexible and suitably rated and insulated to withstand the voltages and temperatures encountered in service. All wiring shall comply with the requirements of SANS 1507 and, where applicable, SANS 529. The wiring colours to be used shall be as follows: live - red (or brown), neutral – black (or blue) and earth – green/yellow.

4.3.1.2 The neutral conductor of the incoming supply shall be connected to the screw thread portion of Edison screw type lampholders and the live conductor shall be connected to the central contact and the internal wiring shall be arranged accordingly.

4.3.1.3 Terminals and electric connections shall comply with clause 3.9 of IEC 60598-2-3. In addition, the luminaire shall incorporate a terminal block mounted in a reasonably accessible position as close to the point of entry as possible. The material of the terminal block shall be non-tracking and the terminals shall be made of non-corroding material such as brass. Terminals made of aluminium shall not be acceptable.

4.3.1.4 Any wiring passing through metal shall have suitable grommets or otherwise protected to avoid abrasion of the insulation.

4.3.1.5 Luminaires shall be earthed in accordance with clause 3.8 of IEC 60598-2-3.

4.3.1.6 Metal parts of luminaires which may become alive in the event of an insulation fault and which are not accessible, when the luminaire is mounted, but which are liable to come into contact with the supporting surface, shall be permanently and reliably connected to an earth terminal and shall withstand the test specified in IEC 60598-2-3. An earth terminal shall be provided in all instances, even if the luminaire is fully insulated and even if all conductive parts, which could become alive in the event of an insulation fault, are not accessible. This is to facilitate future wiring should a unit, which requires an earth connection, replace the luminaire.

4.3.1.7 Protection against electric shock (of at least IP 2X) shall be maintained for all methods and positions of installation in normal use. Protection shall also be maintained after removal of all parts that can be removed by hand.

4.3.1.8 All parts of an earth terminal shall be made of brass or similar corrosion-resistant material and the contact surfaces shall be bare metal and not painted or varnished surfaces.

4.3.1.9 All earth connections shall be effected by means of suitable lugs. All possibility of electrolytic corrosion shall be avoided.

4.4 PHOTOMETRIC PERFORMANCE

4.4.1 Photometric data shall be supplied with the tender. This data shall be issued by the SABS or SANAS accredited lighting laboratory. The photometric requirements as listed in SANS 475, Clause 4.7.1.1, shall be provided.

4.4.2 Tenders shall be accompanied by a CD, containing the following data: luminous intensity tables in accordance with CIE Publication 27, in a form compatible with CIE 140 compatible computer software.

4.4.3 Tenders shall be accompanied by other relevant data, i.e. additional technical data and luminaire performance tables for various parameters. The applicable luminaire spacing charts and horizontal illumination diagrams shall be included.

4.4.4 Tenderers shall provide full details of the optical and thermal properties of the diffuser as well as light transmission depreciation over a period of not less than 10 years.

4.5 GUARANTEE

4.5.1 Tenderers shall guarantee each street lighting luminaire for a minimum period of five years from the date of manufacture. Street lighting luminaires bearing a date of manufacture exceeding four (4) months prior to the date of delivery shall not be accepted.

4.6 SAMPLES

4.6.1 Tenderers shall provide fully labelled samples as and when requested by KEBU. KEBU reserves the right to submit such samples to such tests as deemed reasonable and necessary.

4.6.2 The supplier shall supply all samples at their own cost.

5 TESTS

5.1.1 The tests for ingress of dust, solid objects and moisture shall be carried out in accordance with section 9 of IEC 60598-1 and clause 3.13 of IEC 60598-2-3. Test reports confirming that the tests have been carried out as prescribed shall be the only acceptable verification of IP ratings.

5.1.2 Test reports shall have been issued by SABS or a test authority accredited by SANAS. International test reports shall be acceptable at sole discretion of KEBU provided details of the international accreditation body and details of accreditation are supplied.

5.1.3 Tests as described in clauses 3.6.3 through 3.6.5 and clauses 3.7 through 3.15 of IEC 60598-2-3 shall be carried out and the test reports shall be supplied with the tender.

5.1.4 Luminaire housings shall also be subjected to resistance to corrosion and accelerated ageing testing and hence give a reasonable indication of premature failure and life expectancy of luminaires.

5.1.5 The acceptance criteria for the accelerated ageing test are as follows:

- a) No signs of material degradation
- b) No cracks on any part of the luminaire; and
- c) No compromise of any of the IP ratings of the luminaire.

5.1.6 The list of test certificates required are:

- a) Static wind-force test
- b) External and internal wiring
- c) Protection against electric shock
- d) Thermal tests
- e) Resistance to dust, solid objects and moisture
- f) Power factor and lamp voltage
- g) Photometric requirements
- h) Resistance to corrosion
- i) Insulation resistance and electric strength
- j) Resistance to heat, fire and tracking; and
- k) Accelerated ageing tests.

6 MARKING AND PACKAGING

6.1.1 Each luminaire shall be individually packed in a sturdy cardboard box in order to prevent damage during handling, transportation and storage.

6.1.2 The cartons shall be clearly marked and colour-coded with the appropriate description of the luminaire and lamp type (for which luminaire is designed) contained therein (e.g. 250 W HPS/T).

6.1.3 Each luminaire shall be marked by means of a suitable sticker or similar, in 25 mm lettering.

6.1.4 Since the markings will be exposed to weather, the stickers should be of a material suitable for use in this application e.g. UV stabilised vinyl.

6.1.5 Each luminaire shall be accompanied by a comprehensive instruction leaflet containing information as detailed in clause 3.5 of IEC 60598-2-3.

7 DOCUMENTATION

7.1.1 Full technical information and descriptive literature relating to the items offered shall be submitted in order that the items can be fully evaluated.

7.1.2 Test reports from a test authority recognised by KEBU with respect to the following tests shall be provided:

- a) Type tested in accordance with SANS 475 or IEC 60598-2-3;
- b) IP rating in accordance with the requirements of section 3.13 of IEC 60598-2-3; and
- c) Certified data with respect to degradation (optical and thermal) of the material of the housing and diffuser of the luminaire and light transmission depreciation under operational conditions (4.2.1.4 and 4.4.4).

7.1.3 Full photometric data relating to the luminaire offered shall be supplied (see clause 4.4). This shall include ISO-lux diagrams, utilisation curves, polar curves and/or ISO-candela diagrams. Data shall be expressed, where applicable, in units of cd/klm.

7.1.4 All offers shall be accompanied by luminous intensity tables in accordance with CIE Publication 27, in an electronic medium (i.e. CDs) in a form compatible with the SABS 098 Road Lighting computer program software.

7.1.5 The following documentation shall also be provided:

- a) All test reports required in terms of clause 5;
- b) Details of luminaire design in terms of road safety (clause 4.2.1.2);
- c) Datasheets with respect to the grade of aluminium used (clause 4.2.6.2)
- d) If a gasket material other than silicon sponge is offered, full details of its suitability in this application and supporting documentation shall be provided (clause 4.2.3.4); and
- e) Full details of reflector material used (clause 4.2.5.1).

7.1.6 In addition to the items listed above, copies of the certificates confirming that tenderers bear one of the marks required shall be supplied, as well as any ISO marks in terms of quality (9000 series) or environmental management (14000 series) that the tenderer may possess.

8 TRAINING

8.1.1 If required, the following certified training courses shall be offered for KEBU staff:

- a) Correct handling and care of the luminaires; and
- b) Correct and safe installation and maintenance of the luminaires.

8.1.2 The associated costs for the certified training courses in 8.1.1 shall be given per person and shall be fixed for the period of the contract.

9 QUALITY ASSURANCE

A quality management system shall be set up in order to assure the quality of the luminaires during design, development, production, installation and service. Guidance on the requirements for a quality management system may be found in the following standards: SABS ISO 9000 and SABS ISO 9001. The details shall be subject to agreement between KEBU and the supplier.

ANNEX B – TECHNICAL SCHEDULES A AND B