Kenya Power

*The Kenya Power & Lighting Co. Ltd*
*Central Office – P.O. Box 30099 Nairobi, Kenya*
*STIMA PLAZA, KOLOBOT ROAD, PARKLANDS, NAIROBI.*
*Telephone – 24-20-3201000 – Fax No. 254 – 20 – 3514485*

***Our Ref:*** ***KP1/9AA-3/PT/87/14-15*** **Date:** 4th *June, 2015*
***Your Ref:***
TO:
ALL PROSPECTIVE BIDDERS

Dear Sirs/ Madams

**RE: ADDENDUM NO. 1 TO THE TENDER NO. KP1/9AA-3/PT/87/14-15 FOR SUPPLY OF MATERIALS FOR STREET LIGHTING.**

Please refer to the above Tender.

The following amendments are made to the specified provisions of the Tender document for the Supply of materials for street lighting dated 14th May, 2015.

## 1. RELATIONSHIP WITH THE PRINCIPAL TENDER DOCUMENT

Save where expressly amended by the terms of this Addendum, the PTD shall continue to be in full force and effect. The provisions of this Addendum shall be deemed to have been incorporated in and shall be read and construed as part of the PTD.

## 2. SECTION IV – SCHEDULE OF REQUIREMENTS

The following amendments are made to the schedule of requirements

***SCHEDULE A-Delivery to Likoni Store***

| ITEM NO | CODE | ITEM DESCRIPTION | Quantity in PCS | Sample Required/ Not |
|---|---|---|---|---|
| 1 | 108890 | 1.5mm2 Twin with Earth Cable PVC | 10,000 | Yes, One metre |
| 2 | 108898 | 10mm2 AL PVC SWA Cable | 10,000 | Yes, One metre |
| 3 | 149723 | Insulating Tape | 1000 | Yes |
| 4 | 154000 | 100W Ignitors for Luminaires | 500 | Yes |

| | | | | |
|---|---|---|---|---|
| 5 | 154002 | 250W Ignitors for Luminaires | 500 | Yes |
| 6 | 154005 | 150W High Intensity Discharge Ballasts | 500 | Yes |
| 7 | 154006 | 250W High Intensity Discharge Ballasts | 500 | Yes |
| 8 | 154007 | 400W High Intensity Discharge Ballasts | 500 | Yes |
| 9 | 154008 | 45 UF Capacitors for Luminaires | 500 | Yes |
| 10 | 154011 | 150W High Pressure Sodium Luminaires c/w Control Gear | 1,000 | Yes |
| 11 | 154012 | 250W High Pressure Sodium Luminaires c/w Control Gear | 1,000 | Yes |
| 12 | 154015 | 150W High Pressure Sodium (HPS) Lamps | 1000 | Yes |
| 13 | 154016 | 250W High Pressure Sodium (HPS) Lamps | 1000 | Yes |
| 14 | 154019 | MCB 15A | 500 | Yes |
| 15 | 154020 | 25A Clear Cut-Out | 500 | Yes |
| 16 | 154021 | 16A Photo Electric Cell Units (PECUs) | 500 | Yes |
| 17 | 154022 | 16A Timers for Street Lighting | 500 | Yes |
| 18 | 154023 | 40A DP Lighting Contactor | 500 | Yes |
| 19 | 154024 | Earth Leakage Circuit Breaker | 500 | Yes |
| 20 | 154025 | Copper Clad Earth Rods 5ft | 500 | Yes |
| 21 | 154027 | 63A MCB | 500 | Yes |
| 22 | 154028 | 63A DP Lighting Contactor | 1500 | Yes |
| 23 | 186126 | Column 10m Street Lighting C/W Bracket | 1000 | No |
| 24 | 186128 | Pole Mounted Control Pillar | 200 | Yes |
| 25 | 186129 | Street Lighting Bracket without Columns 2.5m | 10000 | No |
| 26 | 186133 | Street Lighting Double Bracket without Columns 2.5m | 2500 | No |
| 27 | 154036 | 4-Way Circular Brackets | 1000 | No |
| 28 | 154037 | 6- Way Circular Brackets | 800 | No |
| 29 | 186131 | 8M Street Lighting C/W Bracket | 2000 | No |

**ITEMS IN LOTS**

**Lot 1-Delivery to Likoni Store**

| ITEM NO | CODE | ITEM DESCRIPTION | Quantity in PCS | Sample Required/ Not |
|---|---|---|---|---|
| 1 | 154010 | LED Luminaire c/w Control Gear 170W | 4,000 | Yes |

**Lot 2- Delivery to Bulk Store**

| ITEM NO | CODE | ITEM DESCRIPTION | Quantity in PCS | Sample Required/ Not |
|---|---|---|---|---|
| 1 | 154010 | LED Luminaire c/w Control Gear 170W | 3,000 | Yes |

**Lot 3- Delivery to Generation Store (Nairobi South)**

| ITEM NO | CODE | ITEM DESCRIPTION | Quantity in PCS | Sample Required/ Not |
|---|---|---|---|---|
| 1 | 154010 | LED Luminaire c/w Control Gear 170W | 3,000 | Yes |

The following amendments are made to the Delivery schedule.

***Part B – Delivery Schedule of Goods Required***

| ITEM NO | CODE | ITEM DESCRIPTION | QTY | EX-STOCK QUANTITY | DELIVERY DATE OF ITEMS NOT IN STOCK |
|---|---|---|---|---|---|
| 1 | 108890 | 1.5mm2 Twin with Earth Cable PVC | 10,000 | | |
| 2 | 108898 | 10mm2 AL PVC SWA Cable | 10,000 | | |
| 3 | 149723 | Insulating Tape | 1000 | | |
| 4 | 154000 | 100W Ignitors for Luminaires | 500 | | |
| 5 | 154002 | 250W Ignitors for Luminaires | 500 | | |
| 6 | 154005 | 150W High Intensity Discharge Ballasts | 500 | | |
| 7 | 154006 | 250W High Intensity Discharge Ballasts | 500 | | |
| 8 | 154007 | 400W High Intensity Discharge Ballasts | 500 | | |
| 9 | 154008 | 45 UF Capacitors for Luminaires | 500 | | |
| 10 | 154011 | 150W High Pressure Sodium Luminaires c/w Control Gear | 1,000 | | |
| 11 | 154012 | 250W High Pressure Sodium Luminaires c/w Control Gear | 1,000 | | |
| 12 | 154015 | 150W High Pressure Sodium (HPS) Lamps | 1000 | | |
| 13 | 154016 | 250W High Pressure Sodium (HPS) Lamps | 1000 | | |
| 14 | 154019 | MCB 15A | 500 | | |
| 15 | 154020 | 25A Clear Cut-Out | 500 | | |
| 16 | 154021 | 16A Photo Electric Cell Units (PECUs) | 500 | | |
| 17 | 154022 | 16A Timers for Street Lighting | 500 | | |

| | | | | | |
|---|---|---|---|---|---|
| 18 | 154023 | 40A DP Lighting Contactor | 500 | | |
| 19 | 154024 | Earth Leakage Circuit Breaker | 500 | | |
| 20 | 154025 | Copper Clad Earth Rods 5ft | 500 | | |
| 21 | 154027 | 63A MCB | 500 | | |
| 22 | 154028 | 63A DP Lighting Contactor | 1500 | | |
| 23 | 186126 | Column 10m Street Lighting C/W Bracket | 1000 | | |
| 24 | 186128 | Pole Mounted Control Pillar | 200 | | |
| 25 | 186129 | Street Lighting Bracket without Columns 2.5m | 10000 | | |
| 26 | 186133 | Street Lighting Double Bracket without Columns 2.5m | 2500 | | |
| 27 | 154036 | 4-Way Circular Brackets | 1000 | | |
| 28 | 154037 | 6- Way Circular Brackets | 800 | | |
| 29 | 186131 | 8M Street Lighting C/W Bracket | 2000 | | |

**ITEMS IN LOTS**

**Lot 1-Delivery to Likoni Store**

| ITEM NO | CODE | ITEM DESCRIPTION | QTY | EX-STOCK QUANTITY | DELIVERY DATE OF ITEMS NOT IN STOCK |
|---|---|---|---|---|---|
| 1 | 154010 | LED Luminaire c/w Control Gear 170W | 4,000 | | |

**Lot 2- Delivery to Bulk Store**

| ITEM NO | CODE | ITEM DESCRIPTION | QTY | EX-STOCK QUANTITY | DELIVERY DATE OF ITEMS NOT IN STOCK |
|---|---|---|---|---|---|
| 1 | 154010 | LED Luminaire c/w Control Gear 170W | 3,000 | | |

**Lot 3- Delivery to Generation Store (Nairobi South)**

| ITEM NO | CODE | ITEM DESCRIPTION | QTY | EX-STOCK QUANTITY | DELIVERY DATE OF ITEMS NOT IN STOCK |
|---|---|---|---|---|---|
| 1 | 154010 | LED Luminaire c/w Control Gear 170W | 3,000 | | |

**Notes:**

1. Deliveries to be made to KPLC Stores as indicated in the above tables.
2. **Ex-Stock Quantity and delivery date of items not in stock will be part of the evaluation criteria. Bidder to attach a Statement of Commitment to completion of delivery which translates to one week after signing of contract.**

## 3. SECTION V - PRICE SCHEDULE FOR GOODS

The following amendments are made to the Price Schedule of Goods.

***(TENDERER MUST INDICATE THE CURRENCY OF THE OFFER PRICE)***

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Code | Description | Qty | Country of origin | Unit price VAT exclusive | Total price VAT exclusive | Total price VAT Inclusive |
| | **ITEMS IN SCHEDULE A -Delivery to Likoni Stores** | | | | | |
| 108890 | 1.5mm2 Twin with Earth Cable PVC | 10,000 | | | | |
| 108898 | 10mm2 AL PVC SWA Cable | 10,000 | | | | |
| 149723 | Insulating Tape | 1,000 | | | | |
| 154000 | 100W Ignitors for Luminaires | 500 | | | | |
| 154002 | 250W Ignitors for Luminaires | 500 | | | | |
| 154005 | 150W High Intensity Discharge Ballasts | 500 | | | | |
| 154006 | 250W High Intensity Discharge Ballasts | 500 | | | | |
| 154007 | 400W High Intensity Discharge Ballasts | 500 | | | | |
| 154008 | 45 UF Capacitors for Luminaires | 500 | | | | |
| 154011 | 150W High Pressure Sodium Luminaires c/w Control Gear | 1,000 | | | | |
| 154012 | 250W High Pressure Sodium Luminaires c/w Control Gear | 1,000 | | | | |
| 154015 | 150W High Pressure Sodium (HPS) Lamps | 1,000 | | | | |
| 154016 | 250W High Pressure Sodium (HPS) Lamps | 1,000 | | | | |
| 154019 | MCB 15A | 500 | | | | |
| 154020 | 25A Clear Cut-Out | 500 | | | | |
| 154021 | 16A Photo Electric Cell Units (PECUs) | 500 | | | | |
| 154022 | 16A Timers for Street Lighting | 500 | | | | |
| 154023 | 40A DP Lighting | 500 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Contactor | | | | | |
| 154024 | Earth Leakage Circuit Breaker | 500 | | | | |
| 154025 | Copper Clad Earth Rods 5ft | 500 | | | | |
| 154027 | 63A MCB | 500 | | | | |
| 154028 | 63A DP Lighting Contactor | 1,500 | | | | |
| 186126 | Column 10m Street Lighting C/W Bracket | 1,000 | | | | |
| 186128 | Pole Mounted Control Pillar | 200 | | | | |
| 186129 | Street Lighting Bracket without Columns 2.5m | 10000 | | | | |
| 186133 | Street Lighting Double Bracket without Columns 2.5m | 2,500 | | | | |
| 154036 | 4-Way Circular Brackets | 1,000 | | | | |
| 154037 | 6- Way Circular Brackets | 800 | | | | |
| 186131 | 8M Street Lighting C/W Bracket | 2,000 | | | | |

**ITEMS IN LOTS**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Code | Description | Qty | Country of origin | Unit price VAT exclusive | Total price VAT exclusive | Total price VAT Inclusive |
| | **Lot 1 -Delivery to Likoni Stores** | | | | | |
| 154010 | LED Luminaire c/w Control Gear 170W | 4,000 | | | | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Code | Description | Qty | Country of origin | Unit price VAT exclusive | Total price VAT exclusive | Total price VAT Inclusive |
| | **Lot 2 -Delivery to Bulk Stores** | | | | | |
| 154010 | LED Luminaire c/w Control Gear 170W | 3,000 | | | | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Code | Description | Qty | Country of origin | Unit price VAT exclusive | Total price VAT exclusive | Total price VAT Inclusive |
| | **Lot 1 -Delivery to Generation Stores** | | | | | |
| 154010 | LED Luminaire c/w Control Gear 170W | 3,000 | | | | |

Name of Tenderer

_____

Name and Capacity of authorised person signing the Tender

_____

Signature of authorised person signing the Tender

_____

Stamp of Tenderer and date

_____

***NOTES:-**

The offered unit price **MUST** be rounded to two decimal places. Where the Tenderer fails to round the offered unit price as required, then, the offered unit price shall be rounded down-wards to two decimal places and used for the purposes of this tender.

## 4. SECTION XIX - THE TECHNICAL SPECIFICATIONS

## PART B – DETAILED TECHNICAL SPECIFICATIONS (DTS)

The Detailed Technical Specifications have been amended as per the attached copy.

## 4. DEADLINE FOR SUBMISSION OF TENDER.

The tender closing date has been extended to **Tuesday, 9th June 2015 at 10.00 a.m** at **Stima Plaza Auditorium** The procuring entity will open the bids thereafter on the same day in the auditorium Stima Plaza.

Tenders must be received by the procuring entity not later than **10.00a.m** at **Stima Plaza Auditorium**. The procuring entity will open the bids immediately thereafter on the same day in the **auditorium Stima Plaza.**

All other terms and conditions remain as per the Principal Tender Document.

Yours faithfully,
**FOR: THE KENYA POWER & LIGHTING COMPANY LIMITED**

**BERNARD NGUGI**
**Ag.GENERAL MANAGER, SUPPLY CHAIN.**

TABLE OF CONTENTS

## 0.1 Circulation List

| COPY NO. | COPY HOLDER |
|---|---|
| 1 | Manager, Standards |
| Electronic copy (pdf) on Kenya Power server (http://172.16.1.40/dms/browse.php?fFolderId=23) | |

## 0.2 Amendment Record

| Rev No. | Date (YYYY-MM-DD) | Description of Change | Prepared by (Name & Signature) | Approved by (Name & Signature) |
|---|---|---|---|---|
| 0 | 2014-10-30 | Issue No. 1 | Eng. Stephen Nguli | Godfrey Gathige |
| 0 | 2015-05-15 | To replace Issue No. 1 | 1. Michael Apudo<br>2. Nancy Wairimu | Eng. Dr. Peter Kimemia |
| Rev 1 | 2015-05-29 | 1. To include LED ratings from 150W, 170W, 190W, 215W and 250W.<br>2. Removed the dimmable feature of the luminaires<br>3. To amend the GTP to capture all guaranteed technical particulars for all items | 4. Michael Apudo | Eng. Dr. Peter Kimemia |
| | | | | |

## FOREWORD

This specification has been prepared by the Standards Department in collaboration with Street Lighting Section, both of The Kenya Power and Lighting Company Limited (abbreviated as KPLC), and it lays down requirements for street lighting accessories to be used in overhead street lighting. It is intended for use by KPLC in purchasing the items.

## 1. SCOPE

1.1. This specification is for lighting columns and brackets made from steel including lighting columns mounted on other structures, and luminaires and their accessories

1.2. This specification covers the following items:

a) Lighting columns and brackets
   (i) Lighting columns (8m, 10m & 12m columns)
   (ii) Straight and curved outreach brackets
   (iii) Pole & Concrete mounted outreach brackets
   (iv) Circular brackets for floodlights
b) Luminaires (Lanterns) categories shall be as follows:-
   (i) 150W, 170W, 190W, 215W and 250W LED Luminaires complete with control gear;
   (ii) 150W, 250W and 400W, High Pressure Sodium (HPS) Luminaires complete with control gear
   (iii) 400W High Pressure Sodium Floodlight Luminaires complete with control gear (with integral ballast)
c) 150W 250W and 400W, High Pressure Sodium (HPS) Lamps;
d) Photo electric cell units (PECU)
e) Streetlight Control Timers
f) High intensity discharge ballasts for HPS luminaires
g) Capacitors for HPS luminaires
h) Ignitors for HPS luminaires
i) Consumer Units
j) Earth leakage circuit breakers
k) Lighting contactors
l) Clear cutouts & Isolators
m) Fuses
n) Cables
o) Control pillars (Surface and pole mounted)
p) Earth rods

1.3. The specification stipulates the minimum requirements for street lighting accessories, for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the

design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the items for the KPLC.

1.4. The specification does not purport to include all the necessary provisions of a contract.

## 2. REFERENCES

The following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) shall apply:

| | |
|---|---|
| ISO 9001: | Quality management systems – Requirements |
| ISO 1461: | Hot dip galvanized coatings on fabricated iron and steel articles -- Specifications and test methods |
| ISO 2409: | Paints and varnishes. Cross-cut test |
| IEC 62031: | LED modules for general lighting (solid state lighting) -Safety specifications |
| IEC 60598-2-3: | Particular requirements – Luminaires for road and street lighting |
| IEC 60598-2-5: | Luminaires - Particular requirements — Flood lights |
| IEC/PAS 62717/ PNW 34A-1445: | LED modules for general lighting- Performance requirements |
| IEC 60662: | High Pressure Sodium Vapor Lamps specifications |
| IEC 61439-3: | Low-voltage switchgear and control gear assemblies |
| IEC 60235: | Discharge Lamps safety specifications |
| IEC 60923: | Ballasts for discharge lamps (excluding tubular fluorescent lamps) Performance requirements |
| IEC 60926: | Auxiliaries for lamps–Starting devices: General and safety requirements |
| IEC 60927: | Starting devices (other than glow starters) - Performance requirements |
| IEC 61048: | Capacitors for use in tubular fluorescent and other discharge lamp circuits: General and safety requirements |

| | |
|---|---|
| IEC 61049: | Capacitors for use in tubular fluorescent and other discharge lamp Circuits: Performance requirements |
| IEC 60947-4-1: | Low voltage switchgear and control gear—Contactors and motor Starters |
| IEC 61095: | Electromechanical contactors for household and similar purposes |
| IEC 61439: | Low Voltage switchgear and Control gear assemblies |
| IEC 61008: | Residual current operated circuit breaker without integral overcurrent protection for household and similar use |
| IEC 61547: | Equipment for general lighting purposes - EMC immunity |
| IEC 62471: | Photo biological safety of lamps and lamp systems |
| IEC 62262: | Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code) |
| EN 55014-1: | Electromagnetic Compatibility –Requirements for Household Appliances, Electric Tools and Similar Apparatus –Part 1: Emission |
| IES LM-80-08: | Method for Measuring Lumen Maintenance of LED Light sources |
| IESNA TM-16-05: | IESNA technical memorandum on light emitting diode (led) sources and systems |
| BS EN 40: | Lighting Columns: –Part 1: Definitions and terms –Part 2: General requirements and dimensions –Part 3-1: Design and verification – Specification for characteristic loads –Part 3-2: Design and verification – Verification by testing –Part 3-3: Design and verification – Verification by calculation –Part 5: Requirements for steel lighting columns |
| BS 5649: | Lighting columns (All parts) |
| BS EN 1991-1-4: | Actions on structure. Part 1.4 Wind Actions |
| BS EN 1993-1-1: | Euro code 3: Design of Steel Structures: Part 1.1: General Rules and Rules for Buildings |
| BD 94/07: | Design of minor structure |
| PD 6547: | Guidance on the use of BS EN 40-3-1 and BS EN 40-3-3 |
| BS 7430: | Code of practice for protective earthing of electrical installations |

BS EN 1011-1 & 2: Welding. Recommendations for welding of metallic materials.—Part 1: General guidance for arc welding – Part 2: Arc welding of ferritic steels

BS EN 288-1 & 2: Specification and approval of welding procedures for metallic materials –Part 1: Fusion welding – Part 2. Welding procedure specification for arc welding

BS EN 287-1: Qualification test of welders —Fusion welding —Part 1: Steels

BS 4800: Paint Colour Chart

KS 04 – 744: Specification for earth rods and their connectors. Part 1: Copper clad earth rods

## 3. TERMS AND DEFINITIONS

For the purpose of this specification, the definitions given in the reference standards shall apply.

## 4. REQUIREMENTS

### 4.1. Service Conditions

The street lighting accessories shall be suitable for continuous use outdoors in tropical areas of:

(i) altitude up-to 2200m above sea level,
(ii) humidity of up to 90%,
(iii) average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C and
(iv) Heavy saline conditions along the coast.

### 4.2. LIGHTING COLUMNS AND BRACKETS

#### 4.2.1. General Requirements

4.2.1.1. The design, manufacture and installation of lighting columns and brackets shall comply with BS EN 40-1 & 2; BS EN 40-3-1 and BS EN 40-3-3 (BS 5649 – relevant parts) for the design; BS EN 1991-1-4 for wind actions; BS EN 1993-1-1 for structural strength as per Table 1.

4.2.1.2. The design life shall not be less than 25 years, unless otherwise required by the Technical Approval Authority in accordance with BD 94/07.

4.2.1.3. Columns and brackets shall be designed to satisfy the relevant ultimate limit states and the serviceability limit state, including, for steel structures, meeting fatigue criteria in accordance with EN 1993-1-1 especially for:

(i) The flanges – at the weld throat between the column and flange; in the parent metal adjacent to the weld; any stiffening between the column and the flange
(ii) Door openings - at welded attachments and at poorly finished cut edges;
(iii) Shoulder joints - at the weld throat and in the parent metal adjacent to the weld.

4.2.1.4. The dimensional requirements for lighting columns shall be in accordance with EN40-2 and Annex B. The overall dimensional limitations for the lighting brackets and columns covered by this specification shall be:

(i) Post top columns (for floodlights) – 12m nominal height
(ii) Columns with brackets (for HPS and LED luminaire) 8m and 10m nominal height
(iii) Bracket projections - not exceeding the lesser of 0.25 x nominal height or 3m

4.2.1.5. The minimum thickness of structural steel sections used in column and bracket design shall be as follows:

(i) Plates and sections other than hollow sections shall be 6 mm
(ii) Hollow sections effectively sealed by welding, other than a small drain hole with a diameter of between 10mm and 15mm shall be 5 mm

4.2.1.6. The end plates measuring 375 x 375mm shall be joined by continuous structural quality welding to BS EN 1011: Parts 1 and 2. Should there be a possibility of water entering and subsequently freezing, then drain holes shall be provided. The size of the hole shall be appropriate to the void being drained, but shall not be less than 10 mm or greater than 15 mm diameter. Hollow sections in non-corrosive or galvanized steel shall be provided with such drain holes at all low points.

4.2.1.7. The method of joining the base section and the shaft shall be by a swage joint with an internal centralizing washer. All welding procedures shall be in accordance with the requirements of BS EN 288 and all welders approved to the requirements of BS EN 287 with welding carried out in accordance with BS EN 1011: Parts 1 and 2.

4.2.1.8. Where a separate bracket is fixed to a column, the assembly of the column shaft and bracket shall incorporate a mechanical locking system using stainless steel bolts, in addition to high tensile socket headed securing screws and it shall be possible to fix the bracket in any of 4 x 90° positions relative to the door opening.

4.2.1.9. When correctly fixed, the design of the bracket shall not allow any movement of the bracket either vertically or horizontally with respect to the column. At the point of interconnection, the cross-section of the bracket shall, preferably, equal that of the

column shaft. Brackets shall blend with their columns, in material, finish and colour and shall be as short as practicable.

4.2.1.10. Base compartments shall afford easy access to cable terminations and wiring. All electrical equipment mounted in the base compartment shall be securely fixed to a 15mm minimum thickness backboard which shall be of a non-hygroscopic material of sufficient size to accommodate any control gear and cable termination units.

4.2.1.11. Doors, shall be sealed to minimum IP33, shall be provided with a substantial and positive, triangular-headed, tamper proof lock. The locking mechanism shall be lubricated with grease immediately following installation and if necessary prior to adoption. Two keys per 10 columns, with a minimum requirement of two keys shall be provided to the Street Lighting Engineer at time of delivery to KPLC stores.

4.2.1.12. The earthing terminal shall be provided for steel columns and their doors shall comprise a brass or stainless steel bolt, size M8, complete with nuts and washers. The column shall have a cable entry slot 75mm in width.

4.2.1.13. Columns and brackets shall be manufactured from welded carbon steel tube to BS EN 10210, steel grade S355J2, with minimum tensile strength of 470-630 MPa, minimum yield strength of 355 MPa and minimum percentage elongation of 22% or equivalent as detailed below and as stated in Annex B:

(i) Circular tubular steel manufactured from cold-formed hollow sections without heat treatment with constant shaft diameter above the base compartment.

(ii) Continuously tapered steel with either circular cross-section

### 4.2.2. Protection against corrosion

4.2.2.1. Steel columns and brackets shall be protected against corrosion at the fabricator's works by the following system:

a) Surface preparation: the complete column and/or bracket shall be hot-dip galvanized to comply with the requirements of ISO 1461. The average coating mass shall not be less than 610 g/m², (equivalent to a nominal coating thickness of 85 microns) for flat articles (tubes included) and not be less than 390 g/m², (equivalent to a nominal coating thickness of 55 microns) for centrifuged articles.

b) When specified on the tender, further treatment of the galvanized surface shall then be degreased and left with a smooth finish to prepare for painting. The paint system shall comprise:

(i) 1st Coat - On the internal root section, to 250mm above ground level and on the overall external surfaces, one coat of Mordant Solution, T wash.

(ii) 2nd Coat - On the internal root section, to 250mm above ground level, one coat of modified vinyl micaceous iron oxide with high solids to give a high build coating colour grey to provide a minimum dry film thickness of 60 microns.

(iii) 3rd Coat - On the external surface overall, one coat of two pack high build epoxy zinc phosphate primer, light grey to provide a minimum dry film thickness of 75 microns.

(iv) 4th Coat - On the external root section to 250mm above ground level, one coat of modified vinyl micaceous iron oxide with high solids to give a high build coating, coloured grey to provide a minimum dry film thickness of 75 microns.

(v) 5th Coat - On the external surface overall, one coat of modified vinyl with high solids to give a sheen finish to the dried film colour grey from BS 4800 shade 18B25 to provide a minimum dry film thickness of 60 microns. A line on the circumference of the base section shall denote ground level. The minimum dry film thickness shall be:

- Root - 60µm (internal) 210µm (external to 250mm)
- External - 135µm (from 250mm)

4.2.2.2. In general, galvanized steel columns shall be left unpainted; however, where columns require painting the developer shall submit details of the proposed paint system to be used to the Chief Engineer, Street Lighting for approval before undertaking any work.

**Table 1: Technical particulars of the columns and brackets as per EN 40 (relevant parts)**

| Particulars | | Requirements |
|---|---|---|
| Performance under vehicle impact (Impact tested at km/h) | Untested | Class 0 |
| | Tested | 100:NE:3 |
| Partial load factor class | | B |
| Deflection class | | 3 |
| Maximum wind velocity withstand, m/s | | 26 |
| Maximum luminaire weight , Kg. | >10m | 20 |
| | <10m | 10 |
| Maximum luminaire windage, $m^2$ | | 0.25 |
| Minimum terrain category | | II |

4.2.3. **Marking and labeling of columns and brackets**

4.2.3.1. All columns and brackets shall carry a unique identification mark which indicates:

a) The name or symbol of the manufacturer,
b) Year of production and manufacturer's batch number.
c) Standard of manufacture
d) The identification mark shall be permanent, legible and clearly visible and shall be located within the base compartment of the column.

4.2.3.2. There shall be a CE marking with the following mandatory requirements

a) Resistance to horizontal loads (type of verification i.e. testing (T) – EN 40-3-2 or calculation (C)- EN 40-3-3;
b) Reference wind velocity;
c) Windage area;
d) Weight at top
e) Deflection class
f) Terrain category if different to II

4.2.4. **Sizes**

4.2.4.1. **Street lighting columns complete with bracket**

4.2.4.1.1. The size of the columns shall be 8m, 10m and 12m and the brackets shall be 1.5m, 2.0m, 2.5m and 3.0m in accordance with the drawings and dimensions in Annex B and shall be specified in the tender.

4.2.4.1.2. Columns complete with brackets shall be supplied together already fixed at the time of delivery.

4.2.4.1.3. All columns shall have a root for planting to a depth shown by the middle range as stated in Clause 5 of Part 2 of BS 5649 and Annex B as follows:

a) The columns shall have a root for planting to a depth 1200mm, 1500mm and 1700mm for 8m, 10m and 12m columns respectively.
b) The columns shall have a cable entry slot of 65mm x 150mm with the top of the slot 350mm below ground level.

4.2.4.2. **Street lighting bracket without columns**

4.2.4.2.1. The brackets (lighting heads) without columns shall be classified in the following categories and the KPLC requirement shall be specified in the tender:

(i) Outreach brackets for lighting columns for mounting on columns.
- Single straight or curved brackets
- Double straight or curved brackets

(ii) Curved outreach brackets for wood and/or concrete mountings.

(iii) Circular floodlight brackets for mounting on columns and masts.
- 4-way circular brackets
- 6-way circular brackets

4.2.4.2.2. The outreach brackets shall be designed; manufactured and tested in accordance with clauses 4.2.1, 4.2.2 and 4.2.3 of this specification and shall have the following dimensions: 1,0m, 1,5m, 2,0m, 2,5m, 3,0m as per the drawings in Annex B – for straight and curved brackets

4.2.4.2.3. The circular floodlight brackets shall be suitable for top post mounting on the 12m steel columns and shall have dimensions matching with the columns. The spigot lengths shall be as per Table 3 of Annex B, with the fixing diameters matching with that of the 12m columns. The spigot shall be fixed using two (2) stainless steel bolts properly spaced for stability after fixing. The diameters of circular floodlight brackets shall not be fixed but vary from 0.9-1.15m for 4-way and 1.15-2.0m for 6-way brackets.

**NOTE:** *The drawings in Annex B are only for illustrative purposes and not restrictive to the design. Bidders shall be required to submit design drawings for columns and brackets with full matching dimensions that conform to the requirements of this specification during tender to KPLC for purposes of tender evaluation.*

## 4.3. LUMINAIRES (LANTERNS)

### 4.3.1. General design and construction.

4.3.1.1. Luminaires (lanterns) in this specification shall include High Pressure Sodium (HPS), Light Emitting Diode (LED) and Floodlight lanterns complete with their control gear. The luminaire shall include the reflector, the refractor, and the housing.

4.3.1.2. The luminaires shall be manufactured to IEC 60598-1 and IEC 60598-2-3 standards and shall incorporate an efficient optical system to direct the light onto the highway to ensure minimum environmental pollution of the night sky of the upward light emitted. Luminaires will be specified with due consideration of the Institution of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light and shall be of the side entry type.

4.3.1.3. All luminaires shall be constructed from LM5 marine grade aluminium or equivalent with a polyester powder coating, grey, silver or black, over a ROHS compliant chrome passivation substrate; the polyester powder coat finish that shall withstand the standard cut tests as defined in ISO 2409.

4.3.1.4. Luminaires shall have an integral flexible mounting system and be capable of being mounted 42mm to 60mm diameter side entry and 60mm to 76mm post top mounted without the need for separate spigot adaptors.

4.3.1.5. Luminaires shall be environmentally friendly and all component parts shall be 98% recyclable at the end of life.

4.3.1.6. Bowls/protectors shall be vandal resistant and stabilized to minimize loss of transparency due to weathering and exposure to ultra violet light.

4.3.1.7. Fully assembled luminaires shall weigh 10kg maximum, with a maximum windage of 0.15m$^2$ and impact rating shall be IK08 minimum in accordance with IEC 62262.

4.3.1.8. The luminaires shall have double insulation with a protection class of at least class II in accordance with IEC 60598-1 and the luminaire optical system and the control gear compartment shall have a minimum protection rating of IP66 in accordance with IEC 60529.

4.3.1.9. Luminaires shall be reasonably weather and dust-proof and shall be fitted with a suitable gasket between the body of the lantern and the bowl. The IP Rating of the lantern shall not be less than IP 65 in accordance with IEC 60529.

4.3.1.10. Luminaires shall be self-clean and be designed to prevent jamming injuries during installation and be free of sharp edges. Luminaires shall be designed to prevent the supply cable being damaged during installation.

4.3.1.11. Luminaires shall have integral control gear and an option to retrofit proprietary from and/or rear shields, which shall reduce unwanted spill. The colour of the shields shall match the luminaire.

4.3.1.12. Photometric data must be based on test results from a verified lab using absolute photometry in accordance with methods and conditions detailed in LM-79-08 or equivalent.

4.3.1.13. All luminaires shall be fitted with bowls of sound and robust construction capable of being easily dismantled for maintenance or repair purposes. All lanterns shall be

fitted with bowls manufactured from vandal resistant material and stabilized to minimise loss of transparency due to weathering and exposure to ultra violet light.

4.3.1.14. The bowl or other component giving access to the interior of the lantern shall, when in a closed position, be firmly attached to the body of the lantern; in the open position it shall be attached in such a way that there is no likelihood of it becoming accidentally detached.

4.3.1.15. All hinges, toggle catches, captive screws and nuts shall be made of non-corrosive material. A proof of the same shall be submitted for purposes of tender evaluation.

4.3.1.16. The optical equipment controlling distribution shall include high purity aluminium reflectors and/or prismatic refractors and these shall have a smooth exterior surface or be protected by hermetically sealed cover plates to prevent an accumulation of dirt and to facilitate cleaning. Refractors wholly within a totally enclosed lantern need not be sealed.

4.3.1.17. All luminaires shall be fitted with integral control gear and have a heat barrier between the lamp enclosure and gear compartment. The control gear shall be fitted to a tool-less, quick release gear tray, equipped with a plug and socket connector for ease of maintenance or replacement purposes.

4.3.1.18. Electrical equipment shall be installed so that levels of radio interference given in IEC 55014-1 are not exceeded.

4.3.1.19. Luminaires shall provide a light output ratio of 90% with and upward lighting output ratio of no more that 0.5% and IESNA Type 2 or 3 distributions.

4.3.1.20. Luminaires shall be securely fitted to bracket arms or columns and the lamp and all parts affecting the photometric performance shall be in a clean condition and correctly orientated.

### 4.3.2. LED Luminaires complete with Control Gear

4.3.2.1. The LEDs luminaires shall fully comply with the provisions of clause 4.3.1 and it shall be designed, manufactured and tested in accordance with IEC 60598-2-3, LED safety shall conform to IEC 62031 and IEC 62035 with performance requirements complying fully with provisions of IEC/PAS 62717 and PNW 34A-1445.

4.3.2.2. The LEDs & LED Modules-Drivers shall comply with IEC 61000-3-2, IEC 61347-2-13, IEC 61000-3-3, IEC 61347-1, IEC 61347-2-1, IEC 61347-2-8, IEC 61347-2-9, IEC 60921 and IEC 60923 and subsequent amendments as appropriate and be tap selected to specified operating voltage.

4.3.2.3. All LED drivers shall be contained within the lanterns housing and shall have a voltage range of 220-250V, 50Hz with other ratings as per Table 2.

4.3.2.4. The LED driver, operating at constant current, shall be housed in a separate gear compartment to LED modules. The driver shall have a minimum operating efficiency of 90%.

4.3.2.5. The driver shall be independently tested and EN-EC certified in accordance with IEC 60598-1 and IEC 60598-2-3 by an independent approval body recognized by the European Community; current validation certification must be provided during tender.

4.3.2.6. LED luminaires shall have a facility to fit additional LED's or modify existing fittings to provide surround light to properties to extend the field of luminance and when post top mounted must be capable of being set at adjustable inclinations.

4.3.2.7. Luminaires for use with LED's shall be suitable for the operation of both the standard and higher lumen output arrays.

4.3.2.8. The LED luminaire must include surge protection by means of a transient voltage suppression chip or equivalent, designed to provide uniformity of lighting output in the event of individual LED failures and effectively control of thermal management suitable for the use at an ambient temperature of $15^0$ C.

4.3.2.9. The driver shall be tested in accordance with NEN-EN-IEC62471 (2006-07) for Photo-Biological Safety and shall comply with Group 1 classification; current validation must be provided.

4.3.2.10. All terminals shall be shrouded to IP2X so that live parts cannot be accidently touched. They shall be fitted with group 1 classification, current valid certification must be provided.

4.3.2.11. Drivers shall be electronic with the capability of being altered to multiple output levels in electronic, stepless 1% increments via a PDA, central management system, or similar device without having to change the driver.

4.3.2.12. Drivers shall be compatible with all other components including LED and Photo-Electric Control Units (PECU) with a stable power consumption over full operating voltage range.

4.3.2.13. Drivers shall indicate all wiring connections and operating voltages via indelible markings in accordance with IEC/PAS 62717 and PNW 34A-1445. .

4.3.2.14. The LED driver shall be protected against overheating by an over-temperature sensing system and with a surge protection of 6 kV in accordance with IEC 61010.

4.3.2.15. Failure rate of external control gear shall be included in the overall assessment of total life/failure rate.

4.3.2.16. Lumen maintenance life time testing shall be in accordance with LM80 or equivalent and extrapolated methodologies as per TM-21; current validation must be provided. The measured lumen maintenance shall correspond with the "lumen maintenance code" as defined and provided by the manufacturer.

4.3.2.17. LED flux and luminaire data shall be presented for an ambient temperature of $15^0$ Celsius and the light source data shall be measured at a junction temperature of $25^0$Celsius.

4.3.2.18. The LED module efficacy shall not be less than 90% of the rated LED module efficacy as declared by the manufacturer in accordance with clause 8.3 of IEC/PAS 62717.

4.3.2.19. Colour temperature (CCT) of the LED's shall be equal to or greater than 4000K (Kelvin) with tolerances beyond a 5 step Macadam ellipse shall not be acceptable as per Table 5 of IEC/PAS 62717 Part PNW 34A-1445.

4.3.2.20. Rated Colour Rendering Index shall be code 7 (CRI) range 67-76) or greater and shall be measured in accordance with CIE 13.3 and CIE 177.

4.3.2.21. Each LED shall be mounted beneath an individual lens providing photometric footprint base on an overlay methodology and mounted within a self-contained module (LED module) that can be removed, replaced using simple tools and lenses and manufactured from optical grade polycarbonate or PMMA acrylic thermoplastic.

4.3.2.22. In order to maximize opportunities for KPLC to benefit from advances in LED technology and product developments, the proposed equipment shall be flexible and allow for easy installation of upgrades and replacements.

4.3.2.23. The system power factor shall be greater than 0.85 at full power.

4.3.2.24. All luminaires shall be supplied fully assembled in all respects with LED and photo electric control unit at 70/35 lux.

4.3.2.25. The LEDs shall be of Hi-flux/Hi-power white LEDs producing a minimum of 95% of initial intensity at 100,000 hours of life / 20year minimum.

4.3.2.26. The LEDs shall be 100% mercury and lead free.

4.3.2.27. The LEDs micro-lens systems shall produce IESNA Type 2 or Type 3 distributions. The Luminaire shall produces 0% total lumens above $90^0$ (BUG Rating, U=0). The BUG rating shall be B2 U0 G2

4.3.2.28. The LED luminaires with LED arrays shall have a 5 year limited warranty covering the LED arrays and LED drivers. Emergency components and batteries shall he a 1 year warranty.

4.3.2.29. The LED & LED Modules-Drivers shall comply with the following minimum system performance criteria and a proof of the same shall be submitted together with the tender for evaluation:

a) The $T_c$ life shall be + 65°C,
b) The LEDs shall have a system lifetime @$T_c$ life (min 90%) of at least 50,000 hrs
c) The $T_c$ min shall be at least - 20 °C (start up at - 40°C)
d) The $T_c$ max shall be + 75 °C
e) The $T_c$ thermal cutoff module shall be + 75°C (starts dimming)
f) The $T_c$ thermal cutoff driver shall be + 85°C (maximum dimming)
g) The input voltage shall be 180-250V
h) Shall be suitable for at least class II

**Table 2: LED performance ratings in accordance with IESNA TM-16-05**

| Sr. No. | Ratings | | | | | |
|---|---|---|---|---|---|---|
| | Input Power (W) | Input Current (mA) | Lumens (Lm), min | Lumen Efficacy (lm/W), min | Input Power (W/lamp) | Flux Lm/lamp) |
| 1 | 150 | 700 | 16,500 | 110 | 6.7 | 900 |
| 2 | 170 | 700 | 18,700 | | | |
| 3 | 190 | 700 | 20,900 | | | |
| 3 | 215 | 700 | 23,650 | | | |
| 4 | 250 | 700 | 27,500 | | | |

### 4.3.3. High Pressure Sodium Luminaires complete with Control Gear

#### 4.3.3.1. General requirements

4.3.3.1.1. High Pressure Sodium (HPS) luminaires shall comply with IEC 60598-2-3, IEC 60235 and IEC 60662 for the lamps with all the luminaire qualities described in clause 4.3.1.

4.3.3.1.2. It shall have EC Declaration mark to ascertain conformity and a certificate shall be provided by the bidder during tender for confirmation.

#### 4.3.3.2. Specific requirements

4.3.3.2.1. High pressure sodium (HPS) luminaires shall be of the "Plus" type with higher xenon pressure for increased lm/W.

4.3.3.2.2. The HPS luminaire shall have a means of supporting the lamp so designed that the position of the lamp in the lantern relative to any optical equipment remains substantially the same under all conditions of service and throughout the life of the lantern.

4.3.3.2.3. HPS luminaires shall be fitted with a porcelain terminal block, earth terminal, cable clamp and lamp holder ready wired to connector block with heat resisting type cable.

4.3.3.2.4. The construction shall be sturdy and robust with as few welds as possible in order to reduce the risk of early failures due to external shock and vibration during transportation and installation.

4.3.3.2.5. The ballasts specification shall be as per clause 4.7 and shall be approved for use under the Balancing and Settlement Code (BSC) Unmetered Supplies Arrangements and shall have all necessary UMSUG codes.

4.3.3.2.6. The ballasts used in the luminaire shall comply with IEC 61000-3-2, IEC 61347-2-12, IEC 61000-3-3:2001, IEC 61347-1, IEC 61347-2-1, IEC 61347-2-8, IEC 61347-2-9 and IEC 60921 or IEC 60923 as appropriate and be tap selected to the specified operating voltage of the network.

4.3.3.2.7. The minimum performance criteria of HPS Luminaire shall be as per Table 3.

**Table 3: Minimum Performance Criteria of HPS Luminaire**

| High Pressure Sodium Lamps | Rated Luminous Efficacy lm/W (100hrs) | Lumens Lm | LSF @ 16,000hrs | LLMF @ 16,000hrs | Correlated Color Temp. Tc (K) | Max. Color Rendering (Ra) |
|---|---|---|---|---|---|---|
| 150W | 110 | 16,500 | 0.96 | 0.94 | 2000 | 25 |
| 250W | 110 | 27,500 | 0.96 | 0.94 | 2000 | 25 |
| 400W | 110 | 44,000 | 0.96 | 0.94 | 2000 | 25 |

### 4.3.4. High Pressure Sodium (HPS) Floodlight Luminaires complete with Control Gear

4.3.4.1. The High Pressure Sodium (HPS) flood lights units shall be designed manufactured and tested in accordance with IEC 60598-2-5 and shall have all the luminaire qualities described in clause 4.3.1. It shall be of rated voltage/frequency of 220-250V, 50HZ.

4.3.4.2. Floodlight luminaires shall be fitted with a porcelain terminal block, earth terminal, cable clamp and lamp holder ready wired to connector block with heat resisting type cable.

4.3.4.3. The HPS floodlight luminaires shall be compact in size, attractively styled contemporary design, rugged and dependable, easy to install and service.

4.3.4.4. The HPS floodlight luminaires shall have a built-in control gear complete with 400W HPS lamps described in clause 4.4, with a separate one (1)-piece housing for control gear and one (1)-piece lens cover.

4.3.4.5. The HPS floodlight luminaires shall be secured by four 6.35mm (1/4") diameter captive stainless steel slotted hex-head bolts.

4.3.4.6. The HPS floodlight luminaires shall have thermal shock and impact resistant glass lens sealed with heavy duty, high temperature silicone rubber gasket, firmly seated.

4.3.4.7. The HPS floodlight luminaires shall have a heavy duty mogul-base porcelain socket with heavy gauge brass, nickel-plated, double lamp-grip screw shell and spring loaded center contact.

4.3.4.8. The HPS floodlight luminaires shall have a compound parabolic, double segment, finished aluminum reflector for optimum efficiency.

4.3.4.9. The HPS floodlight luminaires shall be for pole mounting, built-in slip-fitter, for internal wiring, adjustable laterally and vertically, with bronze polyester finish.

4.3.4.10. The HPS floodlight luminaires shall have a high pressure aluminium die-cast housing with a high purity anodized hammered finish aluminium reflector

4.3.4.11. The HPS floodlight luminaires shall have a frameless thermal resistant tempered glass and a steel mounting bracket coated with epoxy powder

4.3.4.12. The ballasts specification shall be as per clause 4.7 and shall be approved for use under the Balancing and Settlement Code (BSC) Unmetered Supplies Arrangements and shall have all necessary UMSUG codes.

4.3.4.13. The ballasts shall comply with IEC 61000-3-2, IEC 61347-2-12, IEC 61000-3-3:2001, IEC 61347-1, IEC 61347-2-1, IEC 61347-2-8, IEC 61347-2-9 and IEC 60921 or IEC 60923 as appropriate and be tap selected to the specified operating voltage of the network.

## 4.4. HIGH PRESSURE SODIUM (HPS) LAMPS;

4.4.1. The HPS lamps shall be designed manufactured and tested in accordance with IEC 60662 and shall comply with the safety requirements of IEC 62035 with the HPS Lamp technical characteristics as per Table 4.

4.4.2. High pressure sodium (HPS) lamp shall be of the single arc-tube type to ensure the light source is always at the centre of the luminaire optic for consistent photometric performance. Elements within the lamp construction shall not give rise to shadows cast.

4.4.3. The HPS lamp shall be so designed that its performance is reliable in normal and accepted use.

4.4.4. High pressure sodium lamp shall incorporate a solid state getter with clear lamp bases (getter -blackened lamp bases shall not be accepted).

4.4.5. High pressure sodium (HPS) lamp shall be of the single arc-tube type to ensure the light source is always at the centre of the luminaire optic for consistent photometric performance. Elements within the lamp construction shall not give rise to shadows cast.

4.4.6. Lamp starting shall be with external ignitor. The circuit connections for lamp starting shall be such that the pulse is applied to the lamp through the eyelet terminal of the cap and with the shell substantially at earth potential.

4.4.7. The lamps shall be clear and tubular with the cap on finish of type E39 for 150W lamp and E40 for 250W, 400W & 1,000W and shall comply with IEC 60061-1.

4.4.8. The dimensional values for outlines of E40 capped lamps shall as per Table I.2 and the dimensional values for outlines of E39 capped lamps shall as per Table I.2 of IEC 60662.

4.4.9. Mechanical acceptance of the lamp cap and adjoining part of the lamp neck in the holder shall be ensured by compliance of the lamp with the gauges for testing contact-making as given in IEC 60061-3.

**Table 4: HPS Lamp technical characteristics**

| Sr. No | Particulars | 150W | 250W | 400W |
|---|---|---|---|---|
| 1 | Nominal wattage, W | 150 | 250 | 400 |
| 2 | Circuit | With external ignitor | | |
| A | **Starting and warm-up characteristics - Starting** | | | |
| 1 | Test voltage (r.m.s.), Vmax | 198 | 198 | 198 |
| 2 | Starting time, s | 5 | 5 | 5 |
| 3 | Pulse characteristics | | | |
| 4 | Height (peak) A, V | 2475-2,500 | 3,300 | 3,300 |
| 5 | Width $T_2$ at 50 % of A, µs | 1.0 | 2.0 | 2.0 |
| 6 | Repetition rate | 1/half cycle | 1/full cycle | 1/full cycle |

| Sr. No | Particulars | 150W | 250W | 400W |
|---|---|---|---|---|
| 7 | Phase angle, ° | 60-90 | 90 | 90 |
| B | **Starting and warm-up characteristics - Warm-up** | | | |
| 1 | Test voltage, V | 198 | 198 | 198 |
| 2 | Time required to reach 45 V minimum at lamp terminals, min | 5 | 7 | 7 |
| C | **Electrical characteristics** | | | |
| 1 | Wattage, W | 148 | 245 | 380 |
| 2 | Voltage (r.m.s.) at lamp terminals, V | 90 | 85-115 | 85-115 |
| 3 | Current (r.m.s.) , A | 2.0 | 2.95 | 4.5 |
| 4 | Extinguishing voltage r.m.s., V | 111 | 120 | 125 |
| D | **Photometric characteristics** | | | |
| 1 | Correlated colour temperature (nominal), K | - | 2,170 | 2,170 |
| 2 | Chromaticity co-ordinates x/y (nominal) | - | 0.510/0.420 | 0.510/0.420 |
| 3 | Colour rendering index Ra (nominal) | - | ≥60 | ≥60 |

## 4.5. PHOTO ELECTRIC CELL UNIT (PECU)

4.5.1. All Photo Electric Cell Units (PECUs) shall conform to BS 5972 and be manufactured under the QA System and Procedures of BS 5750, ISO 9002 or EN 29002 with the technical characteristics as per Table 5.

4.5.2. The PECU shall be suitable for mounting at 5m and/or 6m and be of the miniature type fitted to the lantern with conduit thread fixing.

4.5.3. The PECU shall be guaranteed for a minimum life of 6 years from the date of manufacture and this date shall be clearly marked on the unit.

4.5.4. The PECU shall provide Class 2 protection against electric shock, with a minimum enclosure protection rating of IP67 to IEC60529.

4.5.5. The PECU shall operate on 220V- 250V 50Hz AC and shall be capable of switching discharge lighting load of 1000W high pressure sodium lamps with a pre-set switch on/off level of 35/18 lux and a negative switching differential of 1:0.5.

4.5.6. The PECU shall incorporate a time delay circuit to ensure lamps are not switched on by transient changes of illuminance; the delay shall be between 15 and 30 seconds.

4.5.7. The PECU shall be designed to fail in the ON position, such that in the event of a fault in the cell, the controlled lights will switch on.

4.5.8. The PECU shall be switched by a relay assisted a triac or a synchronous switch method and be fully solid state with switching activated by a filtered silicon photo diode to match the CIE photopic response. A method of ensuring that the load remains switched to the on state must be provided in the event of an overload destroying the device.

4.5.9. The PECU shall have zero drift over its guaranteed life, have a power consumption not exceeding 0.5W under load conditions and be capable of operating within a temperature range of -20°C to +80°C, comply with European EMC Emission Directives and conform to BS 2011 in respect to vibration.

4.5.10. Photoelectric control shall fit an EEI/NEMA standard 3-terminal polarized twist lock type receptacle and shall be furnished complete with a neoprene receptacle gasket.

4.5.11. Photo-electric controllers must be manufactured using non-hazardous materials

4.5.12. All units must be indelibly marked with the switch setting, the manufacturer's identification mark, model number and the date of installation.

**Table 5: Photo Electric Cell Units (PECUs) technical characteristics**

| Sr. No | Parameter | Specification |
|---|---|---|
| 1 | Operating Voltage | 220-250V, 50Hz |
| 2 | Contacts | Single-pole/single-throw; normally closed at night |
| 3 | Contact load rating | 1000 Watts incandescent; 1800 VA H.I.D |
| 4 | Surge Protection | Expulsion or Metal-Oxide-Varistor type arrestor |
| 5 | Turn-on level | 1.0-1.5 lumens |
| 6 | Turn-on to Turn-off ratio | 1:2- 1:5 |
| 7 | Temperature range | -20°C to +80°C. |

## 4.6. TIMERS FOR STREET LIGHTING

### 4.6.1. Design

4.6.1.1. The timer for street lighting shall be a digital-type timer rated 230V AC, 50Hz in single frame of size capable of carrying a load of 6 kW to 12 kW manufactured to IEC60439-3.

4.6.1.2. The timers shall be of type 50Hz net-synchronization or type quartz control with a self-power reserve to secure the time setting and program storage in case a power interruption does occur.

4.6.1.3. The timers shall allow one to set the ON and OFF time. The switching of street lights shall be repeated every day as per the set time through Programmable 24 hours' Time Switch / Programmable Astronomical Time Switch. The program shall consist of a closing time and an opening time for a circuit.

4.6.1.4. The timers shall have a Programmable Time Switch (PTS) that shall automatically adjust the set time along with seasonal variation to control ON /OFF for lighting on purpose of realizing that light is turned ON when sun sets & turned OFF when sun rises. This time switch is programmed on latitude base for whole year for sun rise and sun set timing.

4.6.1.5. The timer selection mode shall be by Auto or Manual Selector switch

4.6.1.6. The timers shall be for wall mounting on cubicles and shall be pre-wired ready for use

4.6.1.7. The technical characteristics (depending on type) of the timers shall be:

a) Modular design.
b) Time adjustment by 50 Hz net, quartz.
c) Maximum two (2) channel output.
d) Manual override switching function.
e) Power reserve for all quartz and DCF controlled timers.

4.6.2. **Features**

The following features shall be present:

a) Easily programmable on front of device.
b) Computer aided programming software available.
c) Compact 18 mm design for restricted space opportunities.
d) Separate IP40 covers are available for direct wall mounting.
e) High level of accuracy.
f) Maximum lamp load test data for reference.
g) Automatic summer and winter time adjustment.
h) Holiday & Random program settings.
i) High power reserve up to 10 years.

## 4.7. HIGH INTENSITY DISCHARGE BALLASTS

4.7.1. Ballasts shall comply with IEC 61000-3-2, IEC 61347-2-12, IEC 61000-3- 3, IEC 61347-1, IEC 61347-2-1, IEC 61347-2-8, IEC 61347-2-9 and IEC 60921 or IEC 60923 as appropriate and be tap selected to the specified operating voltage of the network.

4.7.2. Ballasts shall bear the CE Mark and wiring connection type on the casing and shall also be approved for use under the Balancing and Settlement Code (BSC) Unmetered Supplies Arrangements and shall have all necessary UMSUG codes.

4.7.3. Ballasts shall be vacuum-pressure impregnated with a silica-filled polyester varnish to re-enforce the electrical insulation, preclude moisture, inhibit noise, and dissipate heat. The process of vacuum impregnation shall be such that the interstices of the windings are completely filled with the impregnating material.

4.7.4. 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.

4.7.5. The HID ballasts shall be constructed in such a manner that the lamination is engaged within a galvanized steel standard and the insulation system shall be rated class H (180°C maximum coil hot spot temp.)

4.7.6. The bidders shall provide the HID ballasts characteristic curves to support their offers during tender in accordance with IEC 60662.

4.7.7. The HID ballasts shall date stamped on either the top surface or the side surface of the ballast core.

4.7.8. The HID ballasts shall be component recognized by the UL (underwriter's Laboratory) and shall meet the 88% efficiency requirements of EISA (ACT, 2007).

4.7.9. The ballast shall be matched to the actual supply voltage within 2.5 % of this voltage in order to obtain optimum performance regarding colour characteristics and life as per Table 6.

4.7.10. The ballasts connection shall be a constant wattage autotransformer with the following electrical characteristics as per Table 4 and shall be capable of operating capable of operating lamps of the following wattage range - 150W, 250W and 400W as described in clause 4.4..

**Table 6: Characteristics of ballasts**

| Sr. No | Characteristics | Ratings | | |
|---|---|---|---|---|
| 1 | Nominal lamp wattage | 150 | 250 | 400 |
| 2 | Frequency, Hz | 50 | 50 | 50 |
| 3 | Rated voltage, V | 200 | 220 | 220 |
| 4 | Calibration current, A | 2.0 | 3.0 | 4.6 |
| 5 | Voltage/current ratio | 81.0 ± 0.5% | 60.0 | 39 |
| 6 | Power factor | 0.060±0.010 | 0.06±0.005 | 0.06±0.005 |
| 7 | Pulse width | 2.0-3.6 | 3.0-5.2 | 4.6-7.5 |
| 8 | Lamp warm-up current (r.m.s.), A | 2,700-4,500 | <5,000 | <5,000 |
| 9 | Pulse height (peak), luminaire requirement, V | 10 | 10 | 12 |
| 10 | Temperature rise | 180 | 180 | 180 |

## 4.8. CAPACITORS FOR LUMINAIRES

4.8.1. Capacitors shall comply with IEC 61048 and IEC 61049 and shall bear the CE mark and fully capable for use in HPS lamps rated 150W, 250W and 400W as described in clause 4.4.

4.8.2. 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 0.88 (lagging).

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

4.8.4. The capacitors shall be of the ratings shown in the table below for the corresponding High Pressure Sodium lamps

4.8.5. The characteristics of capacitors shall be as per Table 7.

**Table 7: Technical characteristics of capacitors for Luminaires**

| Lamp | | Capacitor |
|---|---|---|
| Wattage | Current | µF± 5% |
| 150 | 1.8 | 21 |
| 250 | 3.0 | 33 |
| 400 | 4.4 | 46 |

## 4.9. IGNITORS FOR LUMINAIRES

4.9.1. Ignitors shall comply with IEC 60926 and IEC 60927 and shall bear the CE mark. Ignitors shall be of the superimposed-pulse solid-state electronic trigger type.

4.9.2. The ignitors shall be capable of operating lamps of the following wattage range - 150W, 250W and 400W in clause 4.4.

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

4.9.4. Ignitors shall be suitable for operating any make of lamp in conjunction with any make of ballast at temperatures up to $90^0$ 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.

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

4.9.6. The ignitors shall conform to the following electrical characteristics as per Table 8.

**Table 8: Ignitor characteristics**

| Sr. No. | Characteristics | Ratings | | |
|---|---|---|---|---|
| 1 | Lamp wattage , W | 150, | 250 | 400 |
| 2 | Switch on voltage , V | ≤ 200 | | |
| 3 | Switching off voltage, V | > 168 | | |
| 4 | Voltage peak, kV | 3.4 | | |
| 5 | Load capacitance, pF | 155 | | |
| 6 | Losses at peak current of 4.5A , W | 2.7 | | |
| 7 | Pulse width | 2.0-3.6 | 3.0-5.2 | 4.6-7.5 |
| 8 | Lamp warm-up current (r.m.s.), A | 2,700-4,500 | <5,000 | <5,000 |
| 9 | Pulse height (peak), luminaire requirement, V | 10 | 10 | 12 |

## 4.10. CONSUMER UNIT (CU)

4.10.1. The consumer unit shall be manufactured in accordance with IEC 61439-1 and IEC 61439-3. The consumer unit shall be rated voltage is under or equal to 600/1000V AC 50Hz or 1500 V DC.

4.10.2. The consumer unit will be factory assembled (with the exception of miniature circuit breakers) and shall comply with the requirements of IEC 60439-3.

4.10.3. The consumer unit shall have a 6 number of outgoing ways with 6 spare ways suitable for fitting MCBs, contactors etc.

4.10.4. It shall be fitted with main controlling DP isolator switch rated at no less than 63 Amps mounted on DIN rails with spare space on DIN rail for mounting the circuit breakers and contactors.

4.10.5. The various circuits shall be arranged to comply with the requirements of the latest IEE wiring Regulations (BS 7671:2008).

4.10.6. The unit shall be complete with blanking plates, bus-bars, bus-bar cover, terminal bars, and installation instructions. The bus-bars shall be of high purity copper material.

4.10.7. The consumer unit shall be of flash mounting type and suitable for outdoor installation inside a street-lighting control pillar.

4.10.8. The consumer unit shall comply with the following technical requirements as per Table 9.

**Table 9: Technical requirements on Consumer Units**

| Sr. No. | Description | Requirement |
|---|---|---|
| 1 | Standard of manufacture | IEC 61439-1 & 3 |
| 2 | Max load/ No of ways | 100A, 6-Way SPN |
| | Maximum voltage | 220-250 V AC , 50Hz |
| 3 | Degree of protection | IP 46 |
| 4 | Enclosure material | Aluzinc steel sheet or galvanized steel |
| 5 | Steel thickness – Box and cover | 1 mm |
| 6 | Knock-outs - body | Top, bottom and rear |
| 6 | Enclosure finish | Gray, RAL 7035 Polyester epoxy powder paint |
| 7 | Paint thickness | 60-80 microns |
| 8 | Incomer | Switch isolator, 100A |
| | | RCCBO (see clause 4.11) , Frame size 100A : 50mm$^2$ |
| 9 | Neutral terminal bar | 16mm$^2$ |
| 10 | Earth terminal bar | 16mm$^2$ |
| 11 | Minimum clearances in air | Phase to phase - |
| | | Phase to earth - |
| 13 | Minimum creepage distances | Phase to phase - |

| Sr. No. | Description | Requirement |
|---|---|---|
| | | Phase to earth - |
| 15 | EMC requirements | Performance requirements criteria for environment class A as per Table J.1 of IEC 61439 |
| 16 | Rated power frequency withstand | AC - 2 kVrms / 5s |
| | | DC – 2.83 kV |
| 18 | Rated impulse voltage | 2.5 kV peak |
| 19 | Short circuit withstand capacity | 10kA/1s |

## 4.11. EARTH LEAKAGE CIRCUIT BREAKER

### 4.11.1. Design

4.11.1.1. The Earth Leakage Circuit Breaker (ELCB) shall be current operated with a sensitivity of 30mA and shall conform to IEC 61008 and BS 4293.

4.11.1.2. The ELCB shall incorporate a residual current operated electromagnetic release which operates without any auxiliary source of supply to open a circuit automatically in the case of an earth leakage fault between phase and earth greater than or equal to IΔn.

4.11.1.3. The ELCB shall operate and switch off the circuit within 30 milliseconds in case of a fault.

4.11.1.4. The ELCB shall be suitable for the circuit of 50Hz, rated voltage 230/400V, and rated current at least 40Amps.

### 4.11.2. Features

The ELCB shall have the following features;

a) Overload, short circuit and over voltage protect functions.
b) Electrical distribution system to prevent electric shock.
c) A trip free mechanism that operate even on neutral failure.
d) A test button to simulate leakage and to test the ELCB.

4.11.3. The characteristic performance of ELCB shall be as per Table 10.

**Table 10: Technical characteristics of ELCB**

| Sr. No. | Particulars | Requirements |
|---|---|---|
| 1 | Number of Poles | 1P+N |
| 2 | Rated Current(A) | 40 |
| 3 | Rated Residual Operating Current(I n)(mA) | 30 |
| 4 | Rated Residual Non-operation Current(I no)(mA) | 0.5IΔ n |
| 5 | Rated Voltage(V) | 230/400 |
| 6 | Residual Current Off-time | 0.1S |
| 7 | Short Circuit Capacity(Icu) | 3000A |
| 8 | Mechanical Endurance | 4000 |
| 9 | Tripping Curve | C,D |
| 10 | Degree of protection | IP20 |

## 4.12. LIGHTING CONTACTORS

### 4.12.1. General construction and performance requirements

4.12.1.1. The contactor shall be two-pole contactors on single-phase a.c designed and manufactured in accordance with IEC 61095 and IEC 60947-4-1 standards. The contactor shall be suitable for switching of lamp loads in both utility as well as industrial areas.

4.12.1.2. The contactor shall be very specific due to the applied operating coil and the construction of the main contacts. They shall be designed with AC coils to ensure silent operation and enhanced low power consumption.

4.12.1.3. The contactor with its enclosure shall be designed and constructed to withstand the stresses occurring during installation and normal use and, in addition, shall provide a specified degree of resistance to abnormal heat and fire as per clause 8.1 of IEC 61095.

4.12.1.4. The moving contacts of the contactors intended to make and break together shall be so mechanically coupled that all poles make and break substantially together whether operated manually or automatically.

4.12.1.5. The contactors shall close satisfactorily at any value between 85 % and 110 % of their rated control supply voltage Us. Where a range is declared, 85 % shall apply to the lower value and 110 % to the higher as per clause 8.2 of IEC 61095

4.12.1.6. The contactors shall offer optimal contacts and low heat dissipation to guarantee a long lifetime and a wide range of characteristics.

### 4.12.2. Features

The following features shall be part of the design of the lighting contactors:

a) It shall be an AC current operated type rated 40A and 63A with double-pole contacts and optional add-on auxiliary contact.
b) The coil voltages shall be at least 230 V ac
c) Shall have a DIN modular profile.
d) Spacers available to extend lifetime (it is recommended to use 1 spacer between every 2 contactors installed).
e) Day/night operation with manual override function.
f) Low inrush power for all ac types.
g) Integral contact indication.

### 4.12.3. Ratings

The contactor shall be suitably rated for operating lighting circuits of luminaires rated 150W, 200W and 400W respectively and shall be rated as per Table 11.

**Table 11: Technical parameters for lighting contactors**

| No | Description | Requirements | |
|---|---|---|---|
| 1 | Current rating, | 40A | 63A |
| 2 | Type | AC operated double pole | |
| 3 | Utilization category | AC-1/AC-7a | |
| 4 | Rated operational voltage Umax | 600V | |
| 5 | Rated frequency, Hz | 50 | |
| 6 | Rated insulation voltage, kVrms | 2,500V for 1s as per Table 19 of IEC 61095 | |
| 7 | Rated operational current | 40A | 63 A |
| 8 | Impulse withstand voltage, kVpk | 4 kV/s as per Table F.1 of IEC 61095 | |
| 9 | Rated making/breaking capacity, Ic/ Ie = 1.5, A | 60 | 94.5 |
| 10 | Maximum breaking capacity, A | 250A | |
| 11 | Short circuit current, kA | 3 kA as per Table 21 of IEC 61095 | |
| 12 | Maximum electrical switching frequency for AC-1/AC-7a, | 300 cycles/h as per clause 5.3.4.2 of IEC 61095 | |
| 13 | Coil operating limits as per IEC 60947-4-1 | 0.85...1.1xUc (at Ø<=55C | |
| 14 | Heat dissipation per pole, W | 4 | 6 |

| No | Description | Requirements |
|---|---|---|
| 15 | Electrical durability, cycles | 1,500,000 |
| 16 | Mechanical durability, operating cycles | 1,000,000 |
| 17 | Degree of enclosure | IP 20 |
| 18 | Air temperature close to contactor, $^0$C | -25 to +55 |
| 19 | Climatic withstand | According to IEC 60082-2-30 |

4.12.4. **Markings**

4.12.4.1. The following indelible and easily legible mandatory markings shall be made on the contactor, preferably on the nameplate if any, to enable complete data to be obtained from the manufacturer.

a) Marking of the manufacturer's name or trade mark and
b) Type designation or serial number shall be mandatory.

4.12.4.2. The following information shall also be marked and visible after mounting:
a) Direction of movement of the actuator
b) Indication of the position of the actuator;
c) Approval or certification mark, if applicable;
d) Terminal identification and marking ;
e) IP code and class of protection against electric shock.

4.12.5. The contactors shall comply with the technical parameters shown in the following Table 9. The bidder shall provide the relevant electrical durability curves to support the offer.

## 4.13. CLEAR CUT OUTS AND ISOLATORS.

4.13.1. All cut-outs shall be clear and incorporate a double pole isolation switch complying with BS 5419 having a rating of 32Amps, 63 Amps and 100Amps with adequate short circuit withstand for the position in the circuit in which it is installed.

4.13.2. The isolation switch shall be capable of being positively and visibly locked off by means of a padlock or locking bar and it shall not be possible to remove the outgoing fuse(s) unless the isolation switch is in the off position.

4.13.3. The cut-outs shall be of the all insulated type with drip proof enclosure affording a minimum degree of protection to IP22 as per IEC 60529 and have a high mechanical and a dielectric strength of 6 kV. The terminals shall be capable of accepting conductors with crimped lug connectors.

4.13.4. The incoming phase terminals shall be shrouded when all connections have been made, the shroud shall be capable of removal for inspection or disconnection of cable ends, but shall not be capable of accidental detachment or be of a push fit type. Movement of cables shall be prevented by the use of bushes or inserts. Fuse carriers shall utilize HRC fuse links to BS 88.

4.13.5. The units shall be provided with separate terminals for phase and neutral conductors manufactured from solid brass and electro-tinned and are entirely suitable for connecting the requisite cables.

4.13.6. Where connection is made into any cut-out for supplying a sub-circuit the cut-out shall incorporate a second fuse link to protect the sub-circuit.

4.13.7. The cut-outs shall be securely fitted to the baseboard with non-corrodible screw fixings.

## 4.14. FUSES

4.14.1. The fuses in specification shall conform to IEC 60269, BS 88 and KP1/3CB/TSP/11/022 and this specification.

4.14.2. No rewirable fuses shall be used. All fuses to be HRC to BS 88 Part 2 operating on 240 volts 50Hz supply. Fuse ratings shall be 6 amps for lamps up to and including 100W and 10A for lamps greater than 100W.

## 4.15. CABLES

4.15.1. The cables in this specification shall conform to IEC 60228, BS 6004, KS 04-194 and KP1/3CB/TSP/05/016 for 1.5mm$^2$ and 2.5mm$^2$, KS 04-187 and KP1/3CB/TSP/05/032 for 6mm$^2$ PVC SWA cable.

4.15.2. Underground cables shall consist of stranded copper conductors, PVC extruded bedding, a concentric layer of steel wire armour, overall PVC sheathing suitable for operation in an earthed system and of rated voltage 600/1000 volts at 50Hz, all in accordance with BS 6346 for metric cable.

4.15.3. All luminaires shall be delivered pre-wired with 8m of 1.5 mm$^2$ - 3 core arcticflex: 16.16 Standards: BS7919 Table 44, VDE281.

4.15.4. The conductor shall be Class 5 flexible plain copper conductors to IEC 60228 size 2 x 1.5mm$^2$ and size 2.5mm2 with earth but shall be class 2 for armoured 2-core cables in accordance with IEC 60228.

4.15.5. All armoured cable cores shall be of equal cross sectional area of 6 $mm^2$ minimum and be of such a size that the requirements of the current IEE Wiring Regulation, BS 7671, are met and allow for a disconnection time not exceeding 5 seconds.

4.15.6. Internal wiring between the terminal block in the lantern and the components in the base of the column shall be PVC insulated and sheathed cable of 300/500V grade, have a copper conductor size of not less than 2.5 $mm^2$.

4.15.7. Where approved, cable to a two part photo electric cell detector unit shall be 1.5 $mm^2$ two (2)-core flat with white sheath.

4.15.8. All cores shall be correctly colour coded and cables for continuous earth bonding shall be green/yellow PVC insulated single core copper cable of minimum cross section 6 $mm^2$ PVC SWA cable rated 600/1000V grade conforming to BS 6004 and KS 04-1122.

## 4.16. CONTROL PILLARS

### 4.16.1. General

4.16.1.1. The control pillars shall be designed and manufactured in accordance with IEC 61439-1 and IEC 61439-3.

4.16.1.2. The pillar shall be constructed from not less than 3mm thick galvanized mild steel with the minimum galvanization thickness of 85µm in accordance with ISO 1461, and a further treatment of the galvanized surface by degreasing and left with a smooth finish to prepare for painting.

4.16.1.3. The control pillar shall be equipped with a 12-way mounting rails and shall be rated 200A for surface mounted and 45A for pole mounted designs. The normal rating shall be at a maximum temperature of $40^0$C.

4.16.1.4. The pillar shall be sealed to minimum IP65 on the doors and IP45 on the vent louvres. They shall include a full size backboard of varnished marine plywood at least 15mm thick or other approved non-hygroscopic material. Alternatively, a purpose-designed equipment mounting system may be used.

4.16.1.5. The designed to have a double door (surface mounted) and single door (pole mounted) and shall be fitted with tamper-proof "O locks", all locks being identical in pattern. The locking mechanism shall be lubricated with grease immediately following installation. Two sets of keys shall be provided to the Street Lighting Engineer prior to the adoption of the installation. All doors are to be provided with an earthing strap.

4.16.1.6. The ventilation shall be provided to prevent the build-up of condensation and in such cases the control pillar shall be protected by vermin proof screens.

4.16.2. **Ground mounted control pillars**

4.16.2.1. The control pillars shall be suitable for mounting on a 250mm thick foundation of concrete ST2 mix complying with BS 5328 – 1:1997. They shall be rooted or provided with fixing bolts to enable the unit to be securely located. The entry for cables shall be via the root.

4.16.2.2. The control pillars shall be a minimum of 110mm x 150mm x 700mm size but shall be sufficient to accommodate:

a) The incoming supply cable including cut-out.
b) A lockable double pole isolator [if not included in the cut-out].
c) Any contactor and/or photocell relay.
d) A distribution board for all highways electrical feeds including sufficient spare capacity to accommodate at least one extra circuit.
e) All necessary fuses and the like.
f) At least 25% spare space on the backboard upon completion.
g) Heater
h) RCD (Residual Current Device)
i) Interior light
j) 13A Socket

4.16.2.3. Distribution fuse boards of the HRC type shall be provided with an external earth, phase barrier and colour coded (red-phase; black-earth). They shall be fitted with the same number of live and neutral bus bar terminals as there are outgoing circuits plus at least one spare way.

4.16.2.4. A circuit diagram and labeling showing details of interconnection of equipment and the connection of cables to and from the pillar, all indelibly drawn or engraved on a material not subject to damage by the environment or normal use, shall be securely fixed internally to each feeder pillar after completion of the installation.

4.16.2.5. An earthing system shall be provided in each control pillar. It shall accept the incoming earth facility from the supply authority onto an earthing bar or terminal strip and interconnect all outgoing cable earth connections and the bonding of the feeder pillar. The earthing facility shall accommodate up to 25mm$^2$ earth conductors.

4.16.2.6. All control pillars shall be fitted with a durable warning sign, fitted externally and in a prominent position, indicating **"DANGER 415 VOLTS"** or **"DANGER 240 VOLTS"** as appropriate and a 'lightning flash' in black on yellow.

### 4.16.3. Pole mounted control pillars

4.16.3.1. This shall be a Type A-Distribution board which is fully type tested with a conditional short circuit rating of 15kA to IEC 61439.

4.16.3.2. It shall be mounted on wooden or concrete poles and shall have a mounting bracket suitable for pole diameters of 190mm to 230mm.

4.16.3.3. It shall be complete with a 'full form' blanking modules for unused MCB ways to provide a secure shrouding of unused bus-bar stabs for increased electrical safety. Blanking modules shall have interlinking form for improved positional security.

4.16.3.4. The main bus-bar shall be removable for flexible installation and a fully shrouded Neutral bus-bar for increased safety.

4.16.3.5. It shall be suitable for metering and to suit application needs and aid compliance with latest Building Regulation – part L2.

4.16.3.6. The doors shall open 180° to provide easy access and device operation.

4.16.3.7. It shall be supplied complete with an incomer switch disconnector rated 125A to provide a higher rated solution for street lighting.

4.16.3.8. There shall be a provision to electrically connect two distribution boards together vertically from a single supply cable to expand number of MCB ways.

**Table 12: Technical parameters for Control pillars**

| Particulars | | Requirement | |
|---|---|---|---|
| | | Surface mounting | Pole mounting |
| Type of pillar | | Type A as per IEC 61439-1 | |
| Standard of manufacture | | IEC 61439-1 & 3 | |
| Rated current (In) | | 200A | 125 A |
| Rated short circuit withstand current | | 15 kA for 1s | 10 kA for 1s |
| Rated frequency | | 50 Hz | |
| Rated diversity factor | | 0.8 | |
| Power frequency withstand voltage, Vrms | AC | 1.8 kVrms | |
| | DC | 2.67 kV | |

| Particulars | Requirement | |
|---|---|---|
| Impulse withstand voltage | 2.5 kVpk | |
| Type of coordination overload characteristics | | |
| Pollution degree | III | |
| Types of system earthing | Solidly earthed system | |
| Indoor and/or outdoor installation | Outdoor | |
| Stationary or movable | Removable | |
| Degree of protection | IP 54 | |
| Intended for use by skilled or ordinary persons | Ordinary persons | |
| Electromagnetic compatibility (EMC) classification | Performance criterion B as per IEC 61439-1 | |
| External design | Specify | |
| Mechanical impact protection | At least IK 08 as per IEC 62262 | |
| The type of construction | Specify | Specify |
| The nature of short-circuit protective device(s) | Specify | Specify |
| Measures for protection against electric shock | Specify | Specify |
| Overall dimensions (including projections e.g handles, covers, doors) | Specify | Specify |
| The weight | Specify | Specify |

## 4.17. EARTH RODS

### 4.17.1. Design

4.17.1.1. The copper-clad earth rod shall be manufactured in accordance with to BS 7430, KS 04–744 and KP1/3CB/TSP/06/031-1 standard requirements. This will include an assessment of the safety, reliability and long term performance of the items tendered.

4.17.1.2. The copper clad earth rod shall be manufactured from a steel rod reference symbol P of a grade with tensile strength of 550 MPa to 700 MPa in accordance with BS PD 970: 2005 standard requirements; a Brinell hardness shall be 248 to 302 HBW as recommended by BS 7430 standard.

4.17.1.3. An earth electrode shall be designed to have a loading capacity adequate for the system of which it forms a part, i.e. it shall be capable of dissipating the electrical energy in the earth path at the point at which it is installed under any condition of operation on the system.

4.17.1.4. Copper-clad steel earth rods shall be made by molecularly bonding 99.9% pure copper onto the high carbon, low tensile steel rods to achieve a minimum copper thickness of 0.254 mm (254 µm). The application of the copper sheath shall prevent any electrolytic action to be initiated by moisture ingress between the copper and the steel.

4.17.2. **Sizes**

4.17.3. The sizes of the earth rods shall be in accordance with KS 04–744 and Table 13.

**Table13: Earth rod sizes**

| Nominal size | | Rod length | |
|---|---|---|---|
| mm | Inches* | mm | Feet* |
| 12.5 | ½ " | 1,200 | 4' |
| 16.0 | 5/8" | 1,500 | 5' |
| 20.0 | ¾ " | 2,100 | 7' |
| 25.0 | 1" | 3,000 | 12' |
| ** The imperial sizes have been replaced by the metric sizes in this specification for clarity.* | | | |

## 4.18. QUALITY MANAGEMENT SYSTEM

4.18.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the cable guard physical, tests and documentations, will fulfill the requirements stated in the contract documents, standards, specifications and regulations.

4.18.2. The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications shall be submitted with the tender for evaluation.

## 5. TESTS AND INSPECTION.

5.1. The street lighting accessories shall be inspected and tested in accordance with the requirements of the respective standards of manufacture and the requirements of this specification. It shall be the responsibility of the supplier to perform or to have performed all the tests specified.

5.2. Copies of previous **Test Reports and Test Certificates confirming compliance to clause 4 requirements for the street lighting accessories issued by a third party testing laboratory that is accredited to ISO/IEC 17025** shall be submitted with the tender for the purpose of technical evaluation. The accreditation certificate for the third party testing laboratory shall also be submitted with the tender (all in English Language).

5.3. Test Reports and Certificates for the street lighting accessories to be supplied under the contract shall be submitted to The Kenya Power& Lighting Company for approval before shipment/delivery.

5.4. The street lighting accessories shall be inspected and tested as per clause 5.1 and the specification requirements before acceptance to The Kenya Power & Lighting Company stores. The supplier shall replace any items which fail to meet any of the requirements during inspection/test at the stores or when used.

5.5. On receipt of the street lighting accessories, KPLC will inspect them and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The supplier shall replace without charge to KPLC, street lighting accessories which upon examination, test or use fail to meet any of the requirements in the specification.

## 6. MARKING AND PACKING

### 6.1. Marking

The street lighting accessories shall be indelibly and permanently marked with the following information given in the respective standards of manufacture and shall include the following:

a) The manufacturer or supplier identity,
b) The designation of lighting accessory,
c) The product dimensions in millimetres;
d) The words **"Property of KPLC".**

### 6.2. Packing

6.2.1. The packaging of the street lighting accessories shall vary from item to item and it shall be at the manufacturer discretion to pack the items the best way possible so that to avoid damages during transportation, handling and storage.

6.2.2. The packages shall be clearly marked with the following information;

a) The manufacturer's and/or supplier's identification;
b) Name of country of manufacture;
c) Dimensions in millimeters;
d) Quantity per box;
e) The words **"Property of KPLC".**

## 7. DOCUMENTATION

7.1. The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The technical documents to be submitted (all in English Language) for tender evaluation shall include the following:

a) Fully filled clause by clause description of the item on offer as per Annex A (Guaranteed Technical Particulars) and signed by the manufacturer;
b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
c) Sales records for the last five years and customer reference letters;
d) Details of manufacturing capacity and the manufacturer's experience;
e) Copies of required type test reports by a third party testing laboratory accredited to ISO/IEC 17025;
f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
g) Manufacturers letter of authorization, quality certificate and other technical documents required in the tender.

7.2. The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

a) Guaranteed Technical Particulars signed by the manufacturer;
b) Design Drawings with details of accessories to be manufactured for KPLC.
c) Quality assurance plan (QAP) that will be used to ensure that the design, material; workmanship, tests, service capability, maintenance and documentation will fulfill the requirements stated in the contract documents, standards, specifications and regulations.
d) Detailed test program to be used during factory testing
e) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the accessories for The Kenya Power & Lighting Company;
f) Packaging details and quantity per package.

7.3. The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the street lighting accessories to KPLC stores

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**ANNEX A: Guaranteed Technical Particulars** *(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for past five years, four customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the third party testing laboratory for tender evaluation, all in English Language)*

**Tender No. .....**

| Clause | Description | KPLC REQUIREMENTS | | Bidder's offer (indicate full details of the values offered) |
|---|---|---|---|---|
| | Bidder's Name and address | | | State |
| 1 | Scope | | | State |
| 4 | Requirements | | | State |
| 4.1 | Service conditions - compliance | | | State |
| 4.2 | Lighting columns and Brackets | | | State |
| | Name of Manufacturer | | | State |
| | Country of manufacture | | | State |
| | Type/Model Reference Number | | | State |
| | Manufacturing standards complied with | | | State |
| | Compliance to all clauses | | | |
| 4.2.1. | **General requirements** | | | |
| | Design life | | 25 years | |
| | Dimensional limits | Post top columns (for floodlights) | 12m nominal height | State |
| | | Columns with brackets (HPS and LED luminaire) | 8m & 10m nominal height | |
| | | Bracket projections | <Lesser of 3m or 0.25 x nominal height | |
| | minimum thickness of structural steel sections | Plates and sections other than hollow sections | 6mm | State |
| | | Hollow section | 5mm | State |
| | End plates dimensions | | 375 x 375mm | State |
| | Drain hole size | | 10mm < size < 15mm | State |
| | minimum thickness backboard | | 15mm | State |
| | IP rating of doors | | IP 33 | State |
| | Keys per 10 columns | | 2 | State |
| | Size of brass or stainless steel bolt | | M8 | State |
| | Width of cable entry slot | | 75mm | State |
| | Material of brackets and columns | Carbon steel grade S355J2 in accordance with EN 10210 | | State |
| 4.2.2. | **Protection against corrosion** | | | |
| | Level of galvanization | >610 g/m², for flat articles | | State |
| | | >390 g/m², for centrifuged articles | | |
| | Paint colour | Grey of shade 18B25 | | State |
| | **Technical particulars of the brackets as per EN 40 (relevant parts)** | | | |
| | Performance under vehicle impact (impact tested at km/h) | Untested | Class 0 | State |
| | | Tested | 100:NE:3 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Partial load factor class | | | B | | State |
| | Deflection class | | | 3 | | State |
| | Maximum wind velocity withstand, m/s | | | 26 | | State |
| | Maximum luminaire weight, kg | >10m | | 20 | | State |
| | | < 10m | | 10 | | |
| | Maximum luminaire windage,$m^2$ | | | 0.25 | | State |
| | Minimum terrain category | | | II | | State |
| 4.2.3 | **Marking and labeling of columns and brackets** | | | | | State |
| 4.2.4 | **Sizes** | | | | | |
| | Sizes of columns | 8m | 10m | 12m | | State |
| | Depth of root for planting | 1200mm | 1500mm | 1800mm | | State |
| | Cable entry slot | 65mm X 150mm | | | | State |
| | Depth of top of slot below ground level | 350mm | | | | State |
| | Sizes of brackets | 1.5m, 2.0m, 2.5m and 3.0m | | | | State |
| | Diameter of curved and straight brackets | 0.9-1.15m | | | | State |
| | Diameter of circular brackets | 1.15-2.0m | | | | State |
| | Drawings and dimensions of columns complete with bracket | As per Annex B | | | | State |
| 4.3 | **Luminaires (LED, HPS and Floodlight)** | | | | | |
| 4.3.2 | **LED & LED modules- Drivers** | | | | | State |
| | Name of Manufacturer | | | | | State |
| | Country of manufacture | | | | | State |
| | Type/Model Reference Number | | | | | State |
| | Standard of manufacture | IEC 60598-1 | | | | State |
| | Compliance to all clauses | Attach test report | | | | State |
| | Components of luminaire | Reflector, refractor and housing | | | | State |
| | Body material | LMN marine grade aluminium, or equivalent with polyester powder coating | | | | State |
| | Colour | Grey, silver or black over ROHS compliant chrome passivation | | | | State |
| | Finish | Polyester powder coating | | | | State |
| | Components | Control gear fitted with tool-less guide release gear tray, equipped with a plug ,socket and heat barrier | | | | State |
| | Mounting diameter: Side entry | State | | | | State |
| | Mounting diameter: Post top entry | State | | | | State |
| | Integral flexible mounting system | As per clause 4.3.1.4 | | | | State |
| | Bowl protection | UV and vandal resistant | | | | State |
| | Maximum weight | 10kg | | | | State |
| | Maximum windage | 0.15$m^2$ | | | | State |
| | Minimum impact rating | IK08 | | | | State |
| | Insulation type | Double insulation | | | | State |
| | Class of protection | At least class II | | | | State |
| | Self-cleaning capability | Yes/No | | | | State |
| | Photometric data | As per LM-78-08 (attach test report) | | | | State |
| | IESNA distribution type | Type 2 or 3 | | | | State |
| | Light output percentage | >90% | | | | State |

| | | | |
|---|---|---|---|
| Upward light output ratio | | <0.5% | State |
| $I_{MAX}$ above 95 | | 0 | State |
| IP rating of lantern | | IP 65 | State |
| **Specific requirements** | | | |
| Rated input power (in W) | | | State |
| Rated luminous flux (in lm) | | | State |
| LED luminaire efficacy (in lm/W) | | | State |
| Minimum operating efficiency | | 90% | State |
| Terminals IP rating | | IP2X | State |
| Surge protection voltage | | 6 kV | State |
| System power factor | | >0.85 at full power and when dimmed. | State |
| Minimum initial intensity at 100,000 hours of life / 20year minimum | | 95% | State |
| Total lumens above $90^0$ | | Specifiy | State |
| Photometric code | | 840/359 | State |
| a | Correlated Colour Temperature (CCT in K | =>4000K (Code 40) | State |
| b | Rated Colour Rendering Index (CRI) | Code 7 (CRI) range 67-76) or greater | State |
| c | Rated chromaticity co-ordinate values (initial and maintained) | within a 3-step MacAdam ellipse – code 3 and within a 5-step MacAdam ellipse – code 5 | State |
| d | Maintained luminous flux | >90% , code 9 | State |
| Rated life (in h) of the LED module and the associated rated lumen maintenance (Lx) | | 80 | State |
| Failure fraction (Fy) corresponding to the rated life of the LED module in the luminaire | | 10 | State |
| Ambient temperature (ta) for a luminaire, $^0C$ | | 15 | State |
| Power Factor | | >0.85 | State |
| Intensity Distribution | | Relative Photometry as per EN13032-1 | State |
| Drive Current, mA | | 700 | State |
| Optical Risk, min | | Risk group 2 as per IEC 62472 | State |
| Ageing time (h), if different to 0 h | | | State |
| Temperature cycling, energized | | | State |
| Minimum system performance criteria | | | State |
| Accelerated operation life test | | | State |
| The $T_c$ life | | $65^oc$ | State |
| System life @ $T_c$ life (min 90%) | | 50.000hrs | State |
| The $T_c$ min | | $-20^oc$ (start up at $-40^oc$) | State |
| The $T_c$ Max | | $+75^oc$ | State |
| The $T_c$ thermal cutoff module | | $+75^oc$ (starts dimming) | State |
| The $T_c$ thermal cutoff driver | | $+85^oc$ (maximum dimming) | State |
| Input voltage | | 220 – 250V | State |
| Class of protection | | II | State |
| Dimensions, including dimensional tolerances | | | State |
| Availability of heat sink | | | State |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4.3.3 | **High Pressure Sodium (HPS) Lamps** | | | | | | | | |
| | Name of Manufacturer | | | | | | | | State |
| | Country of manufacture | | | | | | | | State |
| | Type/Model Reference Number | | | | | | | | State |
| | Standard of manufacture | | IEC 60598-1 | | | | | | State |
| | Compliance to all clauses | | Attach test report | | | | | | State |
| | Components of luminaire | | Reflector, refractor and housing | | | | | | State |
| | Body material | | LMN marine grade aluminium, or equivalent with polyester powder coating | | | | | | State |
| | Colour | | Grey, silver or black over ROHS compliant chrome passivation | | | | | | State |
| | Finish | | Polyester powder coating | | | | | | State |
| | Components | | Control gear fitted with tool-less guide release gear tray, equipped with a plug ,socket and heat barrier | | | | | | State |
| | Mounting diameter | Side entry | 42mm to 60mm | | | | | | State |
| | | Post top entry | State | | | | | | |
| | Integral flexible mounting system | | As per clause 4.3.1.4 | | | | | | State |
| | Bowl protection | | UV and vandal resistant | | | | | | State |
| | Maximum weight | | 10kg | | | | | | State |
| | Maximum windage | | 0.15m$^2$ | | | | | | State |
| | Minimum impact rating | | IK 08 as per IEC 62262 | | | | | | State |
| | Insulation type | | Double insulation | | | | | | State |
| | Class of protection | | Class II | | | | | | State |
| | Self-cleaning capability | | Yes/No | | | | | | State |
| | Photometric data | | As per LM-78-08 (attach test report) | | | | | | State |
| | IESNA distribution type | | Type 2 or 3 | | | | | | State |
| | Light output percentage | | >90% | | | | | | State |
| | Upward light output ratio | | <0.5% | | | | | | State |
| | $I_{MAX}$ above 95% | | 0 | | | | | | State |
| | IP rating of lantern | | IP 65 | | | | | | State |
| | **Minimum Performance Criteria** | | | | | | | | |
| | Ratings in W | | | 150 | 250 | 400 | 150 | 250 | 400 |
| | Rated Luminous Efficacy lm/W (100hrs), min | | | 110 | 110 | 110 | Fill | | |
| | Luminance, Lm, min | | | 16,500 | 27,500 | 44,00 | Fill | | |
| | LSF @ 16,000hrs | | | 0.96 | 0.96 | 0.96 | Fill | | |
| | LLMF @ 16,000hrs | | | 0.94 | 0.94 | 0.94 | Fill | | |
| | Correlated Color Temp.Tc (K) | | | 2000 | 2000 | 2000 | Fill | | |
| | Max. Color Rendering (Ra) | | | 25 | 25 | 25 | Fill | | |
| 4.3.4 | **High Pressure Sodium (HPS) Flood lights with integral ballast.** | | | | | | | | |
| | Name of Manufacturer | | | | | | | | State |
| | Country of manufacture | | | | | | | | State |
| | Type/Model Reference Number | | | | | | | | State |
| | Standard of manufacture | | IEC 60598-1 | | | | | | State |
| | Compliance to all clauses | | Attach test report | | | | | | State |
| | Components of luminaire | | Reflector, refractor and housing | | | | | | State |
| | Body material | | LMN marine grade aluminium, or equivalent with polyester powder coating | | | | | | State |
| | Colour | | Grey, silver or black over ROHS compliant chrome | | | | | | State |

| | | | | |
|---|---|---|---|---|
| | | | passivation | |
| | Finish | | Polyester powder coating | State |
| | Components | | Control gear fitted with tool-less guide release gear tray, equipped with a plug ,socket and heat barrier | State |
| | Mounting diameter | Side entry | 42mm to 60mm | State |
| | | Post top entry | 60mm to 76mm | State |
| | Integral flexible mounting system | | As per clause 4.3.1.4 | State |
| | Bowl protection | | UV and vandal resistant | State |
| | Maximum weight | | 10kg | State |
| | Maximum windage | | 0.15m$^2$ | State |
| | Minimum impact rating | | IK08 as per IEC 62262 | State |
| | Insulation type | | Double insulation | State |
| | Class of protection | | Class II | State |
| | Self-cleaning capability | | Yes/No | State |
| | Photometric data | | As per LM-78-08 (attach test report) | State |
| | IESNA distribution type | | Type 2 or 3 | State |
| | Light output percentage | | >90% | State |
| | Upward light output ratio | | <0.5% | State |
| | $I_{MAX}$ above 95 | | 0 | State |
| | IP rating of lantern | | IP 65 as per IEC 60529 | State |
| | **Specific requirements** | | | |
| | Design | | Compact rugged design | State |
| | Power ratings | | 250W , 400W and 1000W | State |
| | Fixing design | | 6.35mm captive stainless steel slotted hex-head bolts | State |
| | Socket and lamp contact material | | h/duty mogul-base porcelain, heavy gauge brass, nickel plated double lamp-grip screw and spring loaded centre contact | State |
| | Reflector design | | Compound parabolic, double segmented finished aluminum | State |
| | Mounting design | | Built-in slip fitter, adjustable laterally with steel mounting | State |
| | Inner housing | | HP aluminium die-cast with high purity anodized hammered finish | State |
| | Glass design | | Frameless thermal resistant tempered glass | State |
| 4.4. | **Photo Electric Cell Units (PECUs)** | | | |
| | Name of Manufacturer | | | State |
| | Country of manufacture | | | State |
| | Type/Model Reference Number | | | State |
| | Manufacturing standards complied with | | | State |
| | Compliance to all clauses | | | State |
| | Guaranteed for a minimum life | | 6 years | State |
| | Protection against electric shock | | Class 2 | State |
| | IP rating | | IP67 as per IEC 60529 | State |
| | Operating voltage, frequency | | 220-250V, 50Hz | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Contacts | Single-pole/single-throw; normally closed at night | | | | | | State |
| | Contact load rating | 1000 Watts incandescent; 1800 VA H.I.D | | | | | | State |
| | Surge Protection | Expulsion or Metal-Oxide-Varistor type arrestor | | | | | | State |
| | Turn-on level | 1.0-1.5 lumens | | | | | | State |
| | Turn-on to Turn-off ratio | 1:2- 1:5 | | | | | | State |
| | Temperature range | -20°C to +80°C. | | | | | | State |
| | Pre-set switch on/off level | 35/18 lux | | | | | | State |
| | Negative switching differential | 1:0.5. | | | | | | State |
| | Power consumption | <0.5W | | | | | | State |
| 4.5 | **Timers for Street Lighting** | | | | | | | |
| | Name of Manufacturer | | | | | | | State |
| | Country of manufacture | | | | | | | State |
| | Type/Model Reference Number | | | | | | | State |
| | Manufacturing standards complied with | | | | | | | State |
| | Compliance to all clauses | | | | | | | State |
| | **Design** | | | | | | | |
| | Rated voltage and frequency | 230V AC, 50 Hz | | | | | | State |
| | Load carrying capacity | 6-12 kW | | | | | | State |
| | **Features** | | | | | | | |
| | IP rating | IP 40 as per IEC 60529 | | | | | | State |
| 4.6. | **High intensity discharge ballasts** | | | | | | | |
| | Name of Manufacturer | | | | | | | State |
| | Country of manufacture | | | | | | | State |
| | Model/Reference Number | | | | | | | State |
| | Manufacturing standards complied with | | | | | | | State |
| | Ballast type | Vacuum pressure impregnated | | | | | | State |
| | Insulation rating | Class H | | | | | | State |
| | Efficiency | 88% | | | | | | State |
| | Characteristic curve | As per IEC 60662 | | | | | | State |
| | Voltage tolerance | +2.5% | | | | | | State |
| | **Characteristics of ballasts** | | | | | | | |
| | Wattage (W) | 150 | 250 | 400 | 150 | 250 | 400 | |
| | Connection type | CWA | CWA | CWA | | | | |
| | Nominal lamp wattage | 150 | 250 | 400 | | | | |
| | Frequency, Hz | 50 | 50 | 50 | | | | |
| | Rated voltage, V | 200 | 220 | 220 | | | | |
| | Calibration current, A | 2.0 | 3.0 | 4.6 | | | | |
| | Voltage/current ratio | 81.0 ± 0.5% | 60.0 | 39 | | | | |
| | Power factor(λ) | 0.060±0.010 | 0.06±0.005 | 0.06±0.005 | | | | |
| | Pulse width | 2.0-3.6 | 3.0-5.2 | 4.6-7.5 | | | | |
| | Lamp warm-up current (r.m.s.), A | 2,700-4,500 | <5,000 | <5,000 | | | | |
| | Pulse height (peak), luminaire requirement, V | 10 | 10 | 12 | | | | |
| | Temperature rise | 180 | 180 | 180 | | | | |
| 4.7 | **Capacitors for Luminaires** | | | | | | | |
| | Name of Manufacturer | | | | | | | State |
| | Country of manufacture | | | | | | | State |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Type/Model/Reference Number | | | | | State | | | |
| | Manufacturing standards complied with | | | | | State | | | |
| | Connection type | | | Primary side of transformer ballast | | State | | | |
| | Type | | | Resin encapsulated | | State | | | |
| | Power factor(λ) | | | 0.88 lagging | | State | | | |
| | **Characteristics of capacitors for Luminaires** | | | | | | | | |
| | Lamp | Wattage | 150 | 250 | 400 | 150 | 250 | 400 | |
| | | Current | 1.8 | 3.0 | 4.4 | | | | |
| | Capacitor | μF± 5% | 21 | 33 | 46 | | | | |
| 4.8 | **Ignitors for luminaires** | | | | | | | | |
| | Name of Manufacturer | | | | | State | | | |
| | Country of manufacture | | | | | State | | | |
| | Type/Model Reference Number | | | | | State | | | |
| | Manufacturing standards complied with | | | | | State | | | |
| | Compliance to all clauses | | | | | State | | | |
| | Operating temperature | | 90°C | | | State | | | |
| | **Ignitors electrical characteristics** | | | | | | | | |
| | Lamp wattage , W | | 150, | 250 | 400 | 150 | 250 | 400 | |
| | Switch on voltage , V | | ≤ 200 | | | State | | | |
| | Switching off voltage, V | | > 168 | | | State | | | |
| | Voltage peak, kV | | 3.4 | | | State | | | |
| | Load capacitance, pF | | 155 | | | State | | | |
| | Losses at peak current of 4.5A , W | | 2.7 | | | State | | | |
| | Pulse width | | 2.0-3.6 | 3.0-5.2 | 4.6-7.5 | | | | |
| | Lamp warm-up current (r.m.s.), A | | 2,700-4,500 | <5,000 | <5,000 | | | | |
| | Pulse height (peak), luminaire requirement, V | | 10 | 10 | 12 | | | | |
| 4.9 | **Consumer unit** | | | | | | | | |
| | Name of Manufacturer | | | | | State | | | |
| | Country of manufacture | | | | | State | | | |
| | Type/Model Reference Number | | | | | State | | | |
| | Manufacturing standards complied with | | | | | State | | | |
| | Compliance to all clauses | | | | | State | | | |
| | Standard of manufacture | | IEC 61439-1 & 3 | | | State | | | |
| | Max. load/ No of ways | | 100A, 6-Way SPN | | | State | | | |
| | Maximum voltage | | 220-250 V AC , 50Hz | | | State | | | |
| | Degree of protection | | IP 46 | | | State | | | |
| | Enclosure material | | Aluzinc steel sheet or galvanized steel | | | State | | | |
| | Steel thickness – Box and cover | | 1 mm | | | State | | | |
| | Knock-outs - body | | Top, bottom and rear | | | State | | | |
| | Enclosure finish | | Gray, RAL 7035 Polyester epoxy powder paint | | | State | | | |
| | Paint thickness | | 60-80 microns | | | State | | | |
| | Incomer | | Switch isolator, 100A | | | State | | | |
| | | | RCCBO (see clause 4.11) , Frame size 100A : 50mm$^2$ | | | State | | | |
| | Neutral terminal bar | | 16mm$^2$ | | | State | | | |
| | Earth terminal bar | | 16mm$^2$ | | | State | | | |
| | Minimum clearances in air | | Phase to phase – 25.4mm | | | State | | | |
| | | | Phase to earth – 25.4mm | | | State | | | |
| | Minimum creepage distances | | Phase to phase -50.8mm | | | State | | | |

| | | | |
|---|---|---|---|
| | | Phase to earth -25.4mm | State |
| | EMC requirements | Performance requirements criteria for environment class B as per Table J.1 of IEC 61439 | State |
| | Rated power frequency withstand | AC - 2 kVrms / 5s | State |
| | | DC – 2.83 kV | State |
| | Rated impulse voltage | 2.5 kV peak | State |
| | Short circuit withstand capacity | 10kA/1s | State |
| 4.10. | **Earth leakage circuit breaker** | | |
| | Name of Manufacturer | | State |
| | Country of manufacture | | State |
| | Type/Model Reference Number | | State |
| | Manufacturing standards complied with | | State |
| | Compliance to all clauses | | State |
| | **Technical characteristics of ELCB** | | |
| | Number of Poles | 1P+N | State |
| | Rated Current(A) | 40 | State |
| | Rated Residual Operating Current(I n)(mA) | 30 | State |
| | Rated Residual Non-operation Current(I no)(mA) | 0.5IΔ n | State |
| | Rated Voltage(V), frequency | 230/400, 50Hz | State |
| | Residual Current Off-time | 0.1S | State |
| | Short Circuit Capacity(Icu) | 3000A | State |
| | Endurance | 4000 | State |
| | Tripping Curve | C,D | State |
| | Degree of protection | IP20 | State |
| | Operating time | 30ms | State |
| 4.11 | **Lighting contactors** | | |
| | Name of Manufacturer | | State |
| | Country of manufacture | | State |
| | Type/Model Reference Number | | State |
| | Manufacturing standards complied with | | State |
| | Compliance to all clauses | | State |
| | **Technical parameters for lighting contactors** | | |
| | Type | AC operated double pole | State |
| | Rated operational voltage Umax | 690V | State |
| | Rated insulation voltage | 1000V | State |
| | Rated operational current | 40A | State |
| | Impulse withstand voltage | 8KV | State |
| | Maximum breaking capacity | 250A | State |
| | Maximum electrical switching frequency for AC-1 | 600 cycles/h | State |
| | Heat dissipation per pole | 1.8W | State |
| | Mechanical durability | 3 million operating cycles | State |
| | Degree of enclosure | IP 20 | State |
| 4.12 | **Clear Cut Outs and Isolators** | | |
| | Name of Manufacturer | | State |
| | Country of manufacture | | State |

| | | | |
|---|---|---|---|
| | Type/Model Reference Number | | State |
| | Manufacturing standards complied with | | State |
| | Compliance to all clauses | | State |
| | Current rating | 40A and 63A amps | State |
| | Minimum degree of protection | IP 22 | State |
| 4.13 | **Fuses** | | |
| | Name of Manufacturer | | State |
| | Country of manufacture | | State |
| | Type/Model Reference Number | | State |
| | Manufacturing standards complied with | | State |
| | Compliance to all clauses | | State |
| | Operating voltage, frequency | 240 V, 50 Hz | State |
| | Current ratings | 6A, for lamps up to and including 100W | State |
| | | 10A, for lamps greater than 100W | |
| 4.14 | **Cables** | | |
| | **1.5 mm$^4$ twin with earth** | | |
| | Name of Manufacturer | | State |
| | Country of manufacture | | State |
| | Type/Model Reference Number | | State |
| | Manufacturing standards complied with | | State |
| | Number & nominal area of conductor | 2 x 1.5 with earth | State |
| | Number size of wires , No/mm | Phase - 1/1.38 , earth 1/1/0 | State |
| | Thickness of insulation, mm | 0.7 | State |
| | Thickness of sheath , mm | 0.9 | State |
| | Nominal wire diameter, mm | 4.3 x 8.3 – 5.4 x 10.0 | State |
| | Maximum insulation resistance, at 70$^0$C Ω/km | 0.11 | State |
| | Max. d.c resistance of the wire at 20$^0$C, Ω/km | 13.3 | State |
| | Insulator material | TI 2 | State |
| | Bedding material | TI 2 | State |
| | Oversheath material | TM 1 | State |
| | Conductor class as per IEC 60228 | Class 5 | State |
| | **2.5 mm$^4$ twin with earth** | | |
| | Name of Manufacturer | | State |
| | Country of manufacture | | State |
| | Type/Model Reference Number | | State |
| | Manufacturing standards complied with | | State |
| | Number & nominal area of conductor | 2 x 2.5 with earth | State |
| | Number size of wires , No/mm | Phase - 7/0.67 , earth 7/0.46 | State |
| | Thickness of insulation, mm | 0.8 | State |
| | Thickness of sheath , mm | 1.0 | State |
| | Nominal wire diameter, mm | 5.2 x 9.8 – 6.6 x 12.5 | State |
| | Maximum insulation resistance, at 70$^0$C Ω/km | 0.010 | State |
| | Insulator material | TI 2 | State |
| | Bedding material | TI 2 | State |
| | Over-sheath material | TM 1 | State |
| | Max. d.c resistance of the wire at 20$^0$C, Ω/km | 7.98 | State |
| | Conductor class as per IEC 60228 | Class 5 | State |
| | **6.0 mm$^4$ Cu PVC SWA cable** | | |
| | Name of Manufacturer | | State |
| | Country of manufacture | | State |

| | | | | |
|---|---|---|---|---|
| | Type/Model Reference Number | | | State |
| | Manufacturing standards complied with | | | State |
| | Conductor nominal sectional area | $mm^2$ | 6 | State |
| | Number of cores | No. | 2 | State |
| | Voltage Designation Uo/U (Um) | 600/1000 (1200) V | | |
| | Conductor shape | Stranded shaped compacted | | |
| | Nominal insulation thickness | mm | 0.8 | State |
| | Bedding thickness | mm | 0.8 | State |
| | Average outer sheath thickness | mm | 1.5 | State |
| | Armour wire diameter | mm | 0.9 | State |
| | Maximum Armour wire resistance at 20°C | Ω/Km | 7.0 | State |
| | Minimum number of wires in the conductor | No | 7 | State |
| | Diameter of wire | mm | 1.04 | State |
| | Approx. overall diameter of cable | mm | 16.5 | State |
| | Maximum conductor resistance at 20°C | Ω/Km | 3.08 | State |
| | Minimum insulation resistance of cable for 1000m at 20°C | Ω/Km | 7 | State |
| | Approximate weight of cable | Kg/Km | 541 | State |
| | Insulating material | PVC/A | | State |
| | Bedding material | Extruded layers of polymeric material compatible with the underlying insulation | | State |
| | Over sheath material | ST 1 | | State |
| | Conductor class as per IEC 60228 | Class 2 | | State |
| | **10.0 $mm^2$ Al PVC SWA cable** | | | |
| | Name of Manufacturer | | | State |
| | Country of manufacture | | | State |
| | Type/Model Reference Number | | | State |
| | Manufacturing standards complied with | | | State |
| | Conductor nominal sectional area | $mm^2$ | 10 | State |
| | Number of cores | No. | 2 | State |
| | Voltage Designation Uo/U (Um) | 600/1000 (1200) V | | |
| | Conductor shape | Stranded shaped compacted | | |
| | Nominal insulation thickness | mm | 1.0 | State |
| | Bedding thickness | mm | 0.8 | State |
| | Average outer sheath thickness | mm | 1.6 | State |
| | Armour wire diameter | mm | 1.25 | State |
| | Maximum Armour wire resistance at 20°C | Ω/Km | 6.0 | State |
| | Minimum number of wires in the conductor | No | 7 | State |
| | Diameter of wire | mm | 1.35 | State |
| | Approx. overall diameter of cable | mm | 20.1 | State |
| | Maximum conductor resistance at 20°C | Ω/Km | 3.08 | State |
| | Minimum insulation resistance of cable for 1000m at 20°C | Ω/Km | 7 | State |
| | Approximate weight of cable | Kg/Km | 235 | State |
| | Insulating material | | PVC/A | State |
| | Bedding material | Extruded layers of polymeric material compatible with the underlying insulation | | State |
| | Over sheath material | ST 1 | | State |

| | | | | |
|---|---|---|---|---|
| | Conductor class as per IEC 60228 | | Class 2 | State |
| 4.15 | **Control Pillars** | | | |
| 4.15.1 | **Ground mounted control pillars** | | | |
| | Name of Manufacturer | | | State |
| | Country of manufacture | | | State |
| | Type/Model Reference Number | | | State |
| | Manufacturing standards | | | State |
| | Minimum thickness of galvanized mild steel | | 3mm | State |
| | Minimum galvanization thickness | | 85µm | State |
| | Number of ways | | 12-way | State |
| | Maximum temperature | | 40°C | State |
| | Degree of protection | | IP 65 , min on the doors | State |
| | | | IP 45, min on the vent louvers | State |
| | | | IK 08, min | State |
| | Thickness of marine plywood or equivalent backboard | | 15mm | State |
| | Door design | | Double door with tamper proof "O" locks | State |
| | Protection | | Vermin proof screens | State |
| | Minimum size | | 110mm x 150mm x 700mm | State |
| | Application | | Shall accommodate all items specified in clause 4.15.2.2 (a to j) | State |
| | Provision for earthing | | Y/N | State |
| | Labeling including circuit diagram in accordance to clause 4.15.2.4 | | Y/N | State |
| | A durable warning signs | | Y/N | State |
| | Type of pillar | | Type A as per IEC 61439-1 | State |
| | Standard of manufacture | | IEC 61439-1 & 3 | State |
| | Rated current (In) | | 200A | State |
| | Rated short circuit withstand current | | 10 kA for 1s | State |
| | Rated frequency | | 50 Hz | State |
| | Rated diversity factor | | 0.8 | State |
| | Power frequency withstand voltage, Vrms | A.C | 1.8 kVrms | State |
| | | D.C | 2.67 kV | State |
| | Impulse withstand voltage | | 2.5 kVpk | State |
| | Type of coordination overload characteristics | | | State |
| | Pollution degree | | III | State |
| | Types of system earthing | | Solidly earthed system | State |
| | Indoor and/or outdoor installation | | Outdoor | State |
| | Stationary or movable | | Removable | State |
| | Degree of protection | | IP 54 | State |
| | Intended for use by skilled or ordinary persons | | Ordinary persons | State |
| | Electromagnetic compatibility (EMC) classification | | Performance criterion B as per IEC 61439-1 | State |
| | External design | | Specify | State |
| | Mechanical impact protection | | At least IK 08 as per IEC 62262 | State |
| | The type of construction | | Specify | State |
| | The nature of short-circuit protective device(s) | | Specify | State |
| | Measures for protection against electric shock | | Specify | State |

| | | | | |
|---|---|---|---|---|
| | Overall dimensions (including projections e.g handles, covers, doors) | | Specify | State |
| | The weight | | < | State |
| 4.15.2 | **Pole mounted control pillars** | | | |
| | Name of Manufacturer | | | State |
| | Country of manufacture | | | State |
| | Type/Model Reference Number | | | State |
| | Type of distribution board | | Type A | State |
| | Manufacturing standards | | IEC 61439-1 & 3 | State |
| | Minimum thickness of galvanized mild steel | | 3mm | State |
| | Minimum galvanization thickness | | 85µm | State |
| | Number of ways | | 12-way. | State |
| | Control pillar rating | | 200A | State |
| | Maximum temperature | | 40°C | State |
| | Degree of protection | | IP 65 , min on the doors | State |
| | | | IP 45, min on the vent louvers | State |
| | | | IK 08, min as per IEC 62262 | State |
| | Door design | | Double door with tamper proof "O" locks | State |
| | Complete with blanking plates | | Y/N | State |
| | Removable main bus-bar | | Y/N | State |
| | Suitable for protection and metering | | Y/N | State |
| | Doors open at 180° | | Y/N | State |
| | Supplied complete with a disconnector rated 125A | | Y/N | State |
| | Provision to electrically connect two DBs together | | Y/N | State |
| | Standard of manufacture | | IEC 61439-1 & 3 | State |
| | Rated current (In) | | 125A | State |
| | Rated short circuit withstand current | | 10 kA for 1s | State |
| | Rated frequency | | 50 Hz | State |
| | Rated diversity factor | | 0.8 | State |
| | Power frequency withstand voltage, kVrms | AC | 1.8 kVrms | State |
| | | DC | 2.67 kV D.C | State |
| | Impulse withstand voltage | | 2.5 kVpk | State |
| | Type of coordination overload characteristics | | Specify | State |
| | Pollution degree | | III | State |
| | Types of system earthing | | Solidly earthed system | State |
| | Indoor and/or outdoor installation | | Outdoor | State |
| | Stationary or movable | | Removable | State |
| | Intended for use by skilled or ordinary persons | | Ordinary persons | State |
| | Electromagnetic compatibility (EMC) classification | | Performance criterion B as per IEC 61439-1 | State |
| | External design | | Specify | State |
| | The type of construction | | Specify | State |
| | The nature of short-circuit protective device(s) | | Specify | State |
| | Measures for protection against electric shock | | Specify | State |
| | Overall dimensions (including projections e.g handles, covers, doors) | | Specify | State |
| | The weight | | < | State |
| 4.16 | **Copper clad earth rods** | | | |
| | Name of Manufacturer | | | State |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Country of manufacture | | | | | | State |
| | Type/Model Reference Number | | | | | | State |
| | Manufacturing standards complied with | | | | | | State |
| | Compliance to all clauses | | | | | | State |
| | Tensile strength | | | 550MPa to 700 MPa | | | State |
| | Brinell hardness | | | 248 to 302 HBW | | | State |
| | minimum copper thickness | | | 0.254 mm (254 µm) | | | State |
| | **Sizes** | | | | | | State |
| | Nominal size | mm | 12.5 | 16.0 | 20.0 | 25.0 | State |
| | | Inches * | ½ " | 5/8" | ¾ " | 1" | |
| | Rod length | mm | 1200 | 1500 | 2100 | 3000 | State |
| | | Feet* | 4' | 5' | 7' | 12' | |

| | | |
|---|---|---|
| 4.17 | Quality Management System | |
| | Quality Assurance Plan | Provide |
| | Copy of ISO 9001:2008 Certificate | Provide |
| 5.1 | Test standards and responsibility of carrying out tests | Provide |
| 5.2 | Copies of Type Test Reports submitted with tender | Provide |
| 5.3 | Acceptance tests to be witnessed by KPLC at factory before shipment | Provide |
| 5.4 | Test reports to be submitted by supplier to KPLC for approval before shipment | Provide |
| 5.5 | Replacement of rejected insulators | State |
| 6.1 | Marking | State |
| 6.2 | Packing | State |
| 7.1 | Documents submitted with tender | State |
| 7.2 | Documents to be submitted by supplier to KPLC for approval before manufacture | State |
| 7.3. | Recommendations for use, care, storage and routine inspection/testing procedures | Provide |
| 8.0 | Manufacturer's Guarantee and Warranty | Provide |
| 9.0 | List catalogues, brochures, technical data and drawings submitted to support the offer | Provide |
| 10.0 | List customer sales records and reference letters submitted to support the offer. | Provide |
| 11.0 | List Test Certificates submitted with tender | Provide |
| 12.0 | Manufacturer's experience and Manufacturing Capacity (units per month) | Provide |
| 13.0 | Statement of compliance to specification (indicate deviations if any & supporting documents) | Provide |

.....

**Manufacturer's Name, Signature, Stamp and Date**

**NOTE:**

1) *Bidders shall give full details and the offered values of the items on order as per Annex A. The details provided shall conform to the test reports and their certificates as required by clause 5.2., well labeled drawings complete with dimensions, catalogues or brochures for the purpose of tender evaluation.*
2) *Bidder who shall have not complied by this requirement in bullet 1 shall be automatically disqualified from bidding this item.*

## ANNEX B: Drawings and dimensions of columns and brackets

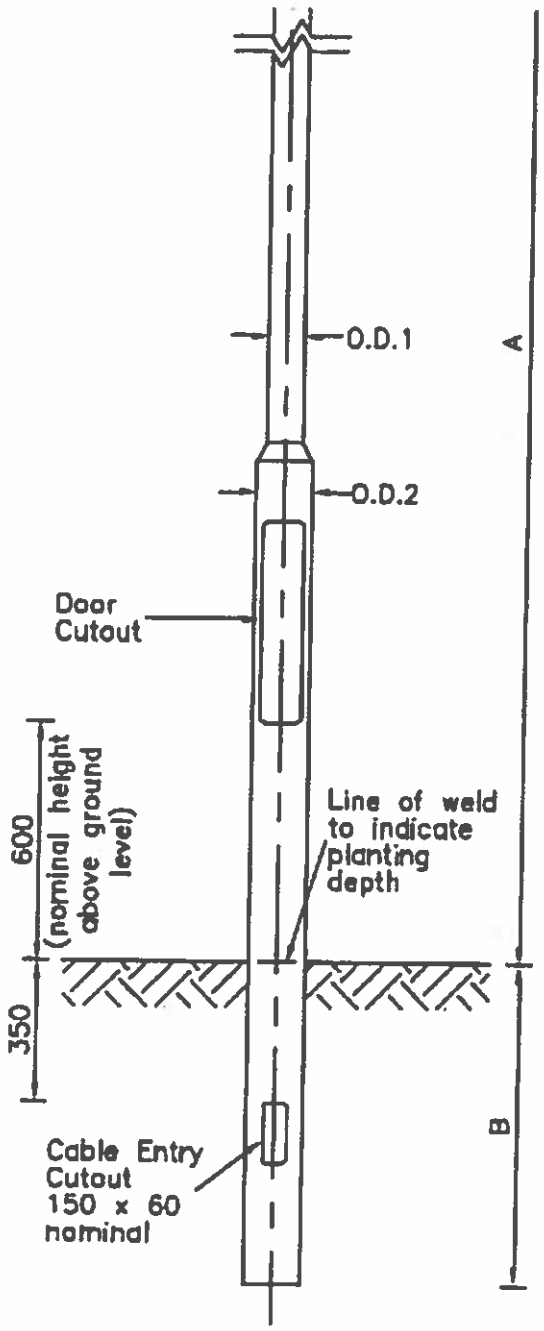


Fig. 1: Illustration of the lower design of the streetlight column

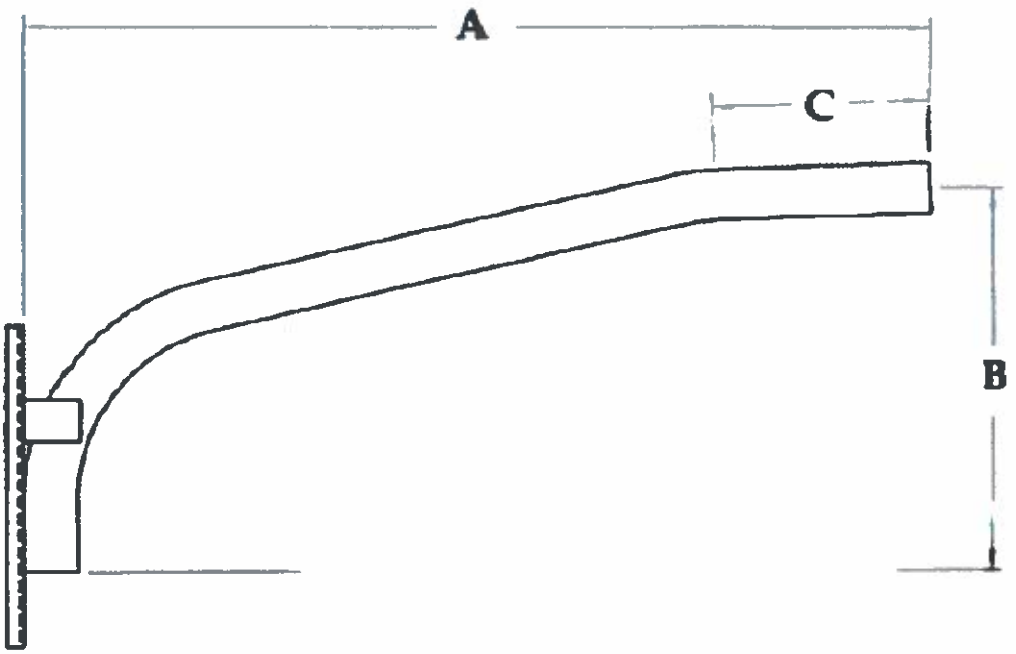


**Fig. 2: Illustration of the lower design of the streetlight column**

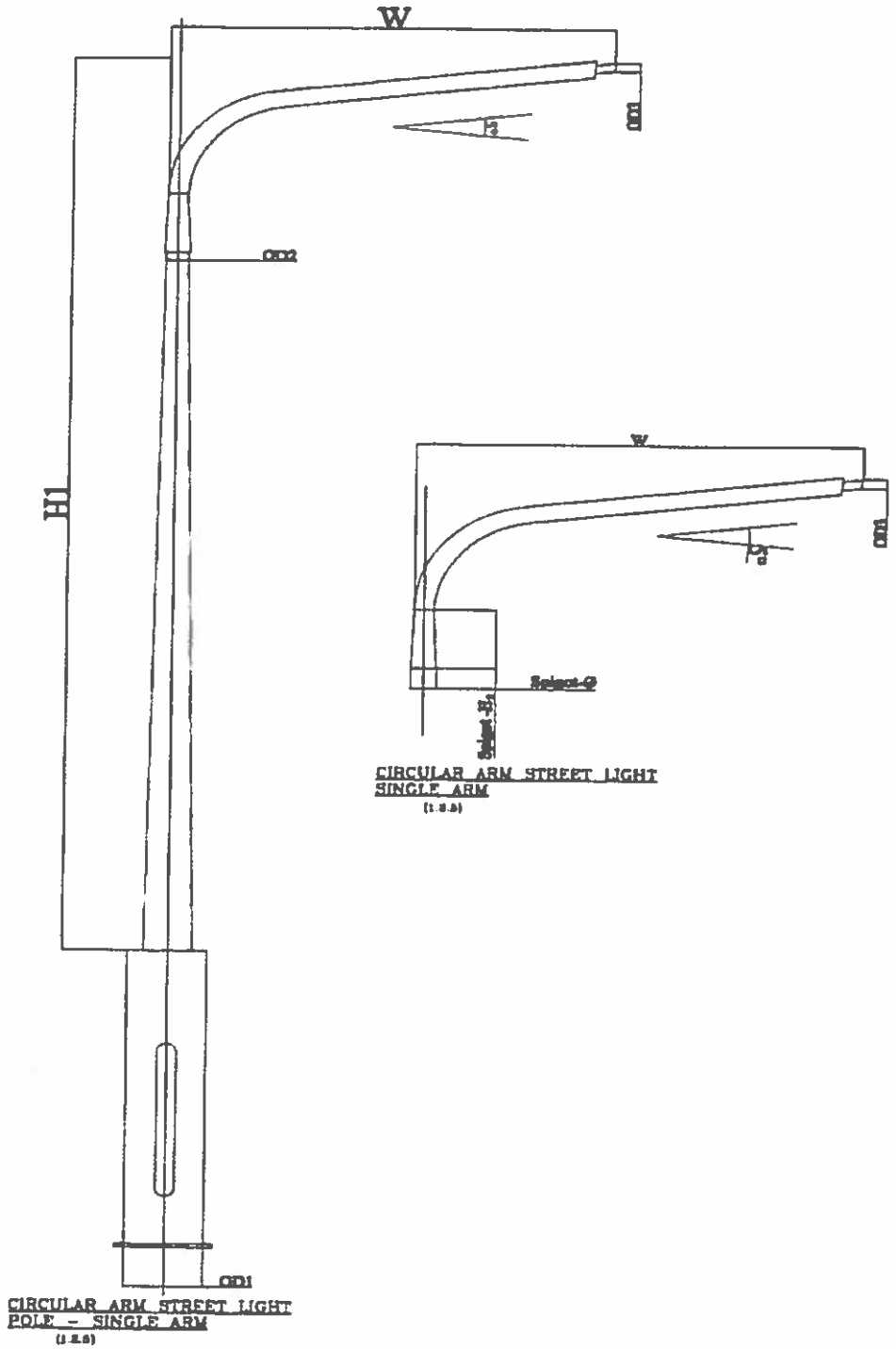


Fig. 3: Illustration of the upper part of a curved single outreach streetlight column

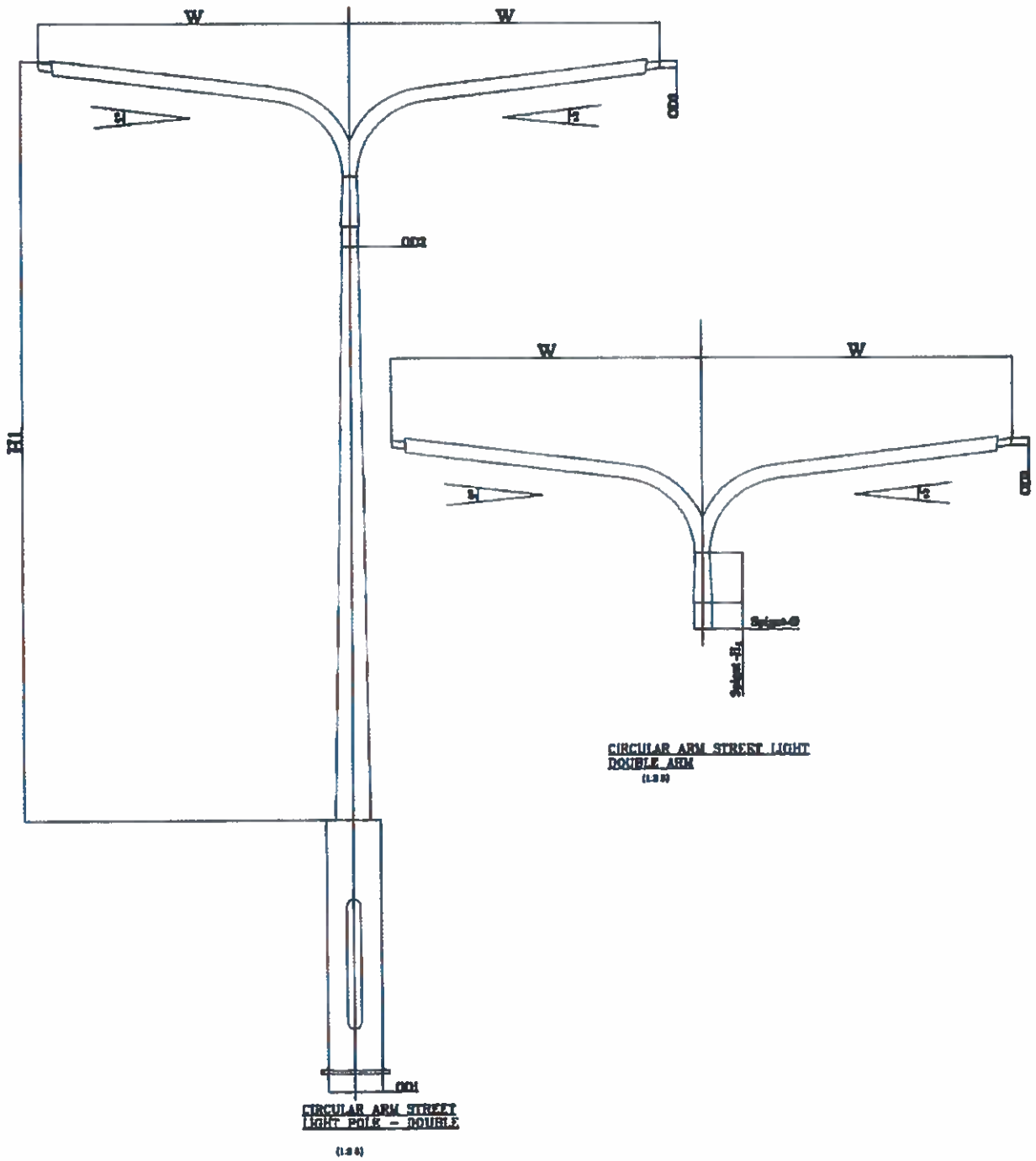


**Fig. 4: Illustration of the upper part of a curved double outreach c/w streetlight column**

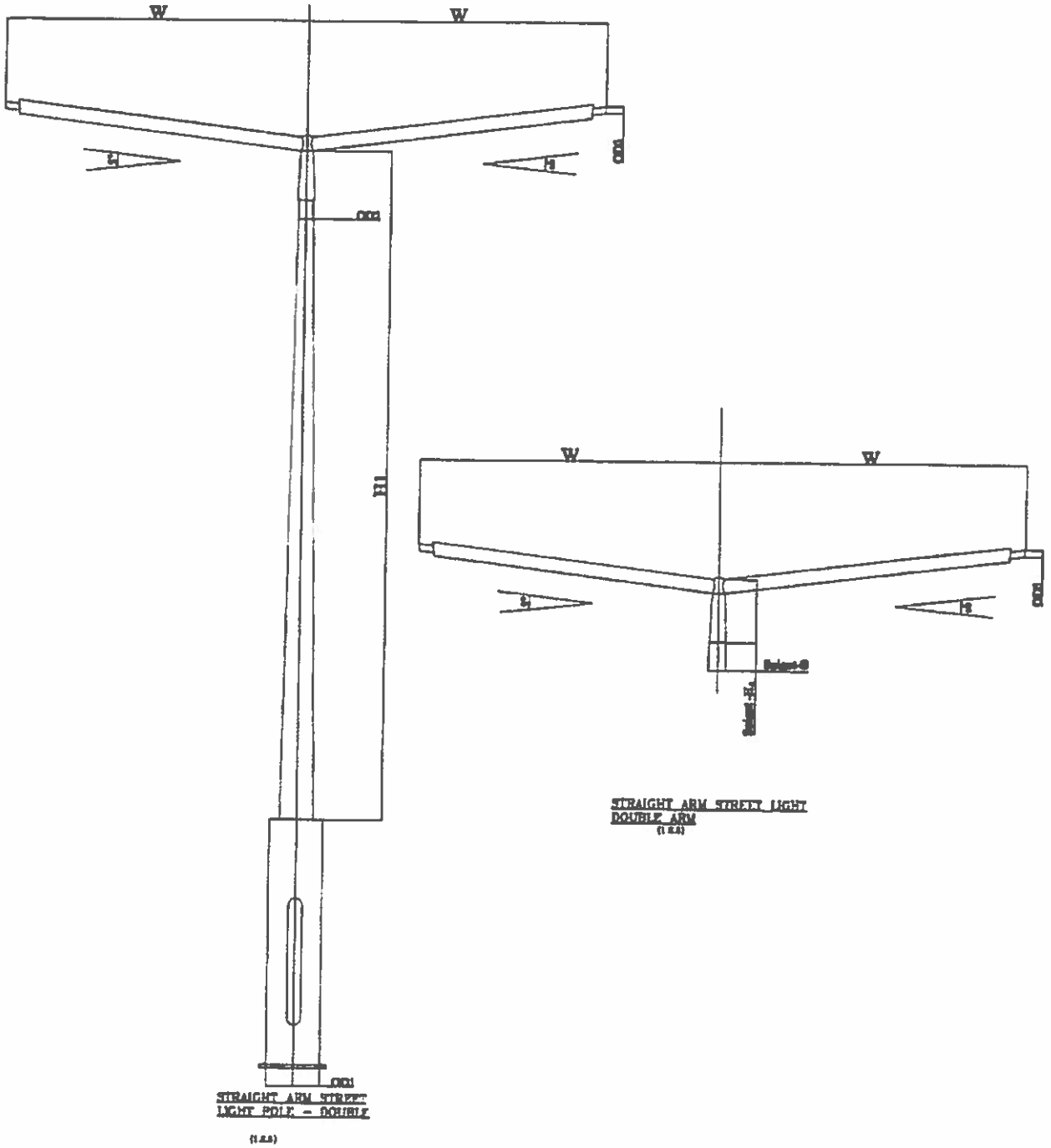


Fig. 5: Illustration of the upper part of a straight double outreach c/w streetlight column

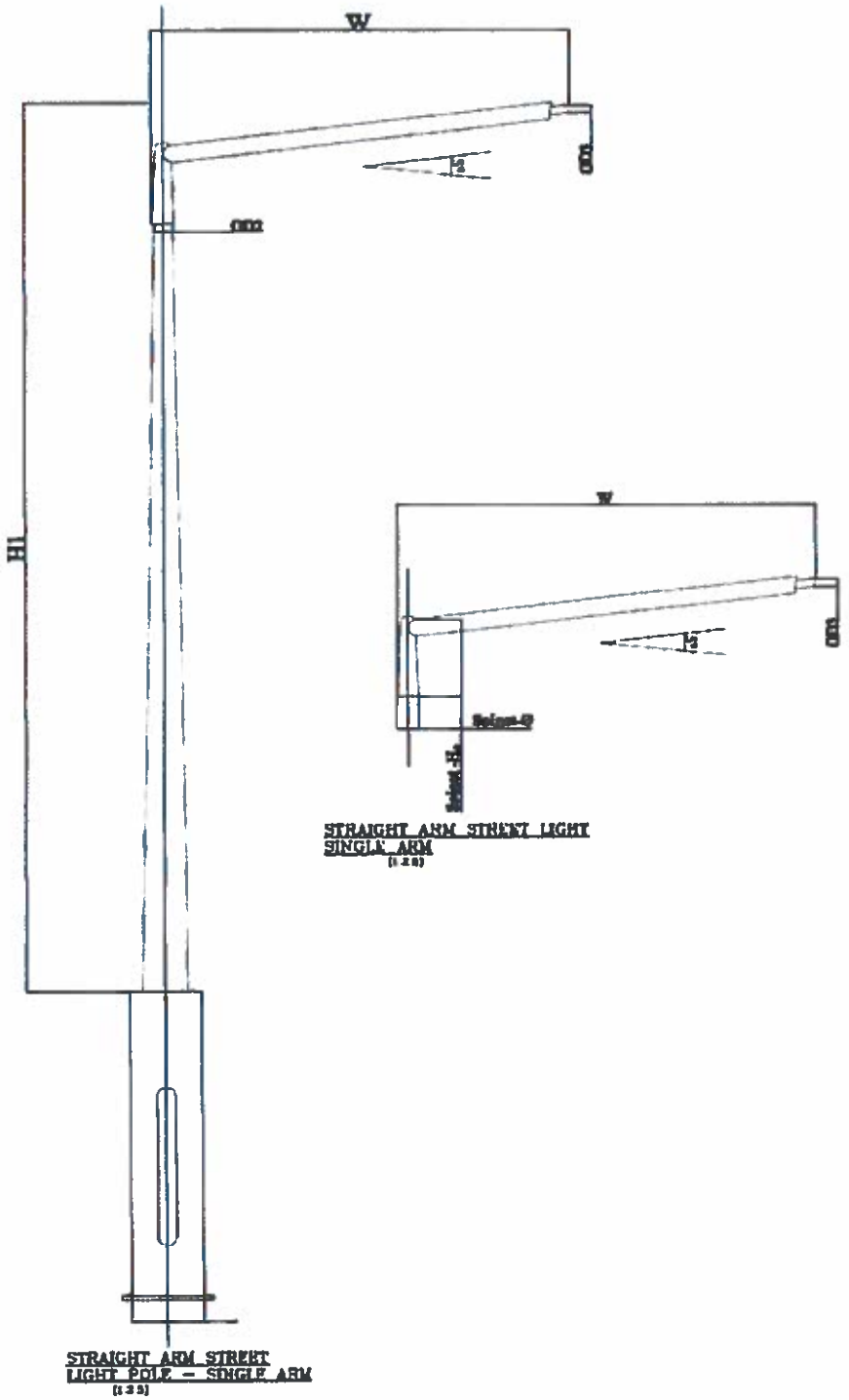


**Fig. 6: Illustration of the upper part of a straight single outreach c/w streetlight column**

**1.0. Dimensions of the columns for Fig. A. in accordance with BS EN 40-1 & 2**

| Column Height m | Dimensions A/H mm | Dimensions B mm | O.D. 1 mm | O.D.2 mm | Door Aperture mm |
|---|---|---|---|---|---|
| 8 | 8,000 | 1,200 | 89 | 168 | 600 x 120 |
| 10 | 10,000 | 1,500 | 114 | 168 | 600 x 120 |
| 12 | 12,000 | 1,700 | 140 | 194 | 600 x 120 |
| Tolerance – Dimensional tolerance shall be ±10mm | | | | | |

**2.0. Dimensions of the brackets (both straight and circular) for Figs. 3 to 6 in accordance with BS EN 40-1 & 2**

| Outreach length, W mm ±10mm | Spigot Ø diameter mm min | O.D.2 mm min | O.D.3 mm min | Tube Thickness mm min | Inclination angle °C min |
|---|---|---|---|---|---|
| 1,500 | 76 | 42 | 42 | 5 | 5 |
| 2,000 | 76 | 42 | 42 | 5 | |
| 2,500 | 76 | 42 | 42 | 5 | |
| 3,000 | 76 | 50 | 50 | 5 | |

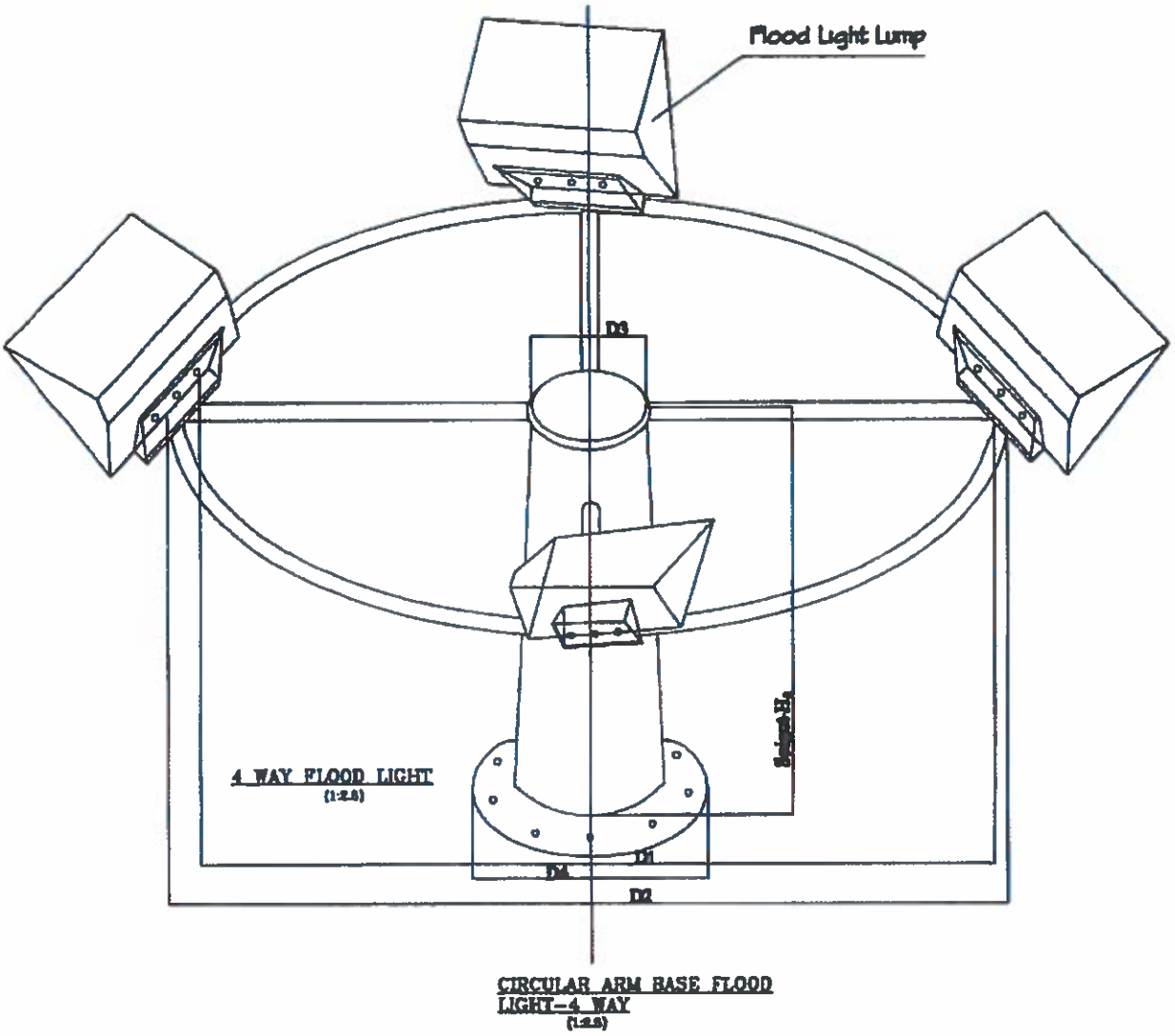


**Fig. 7: Illustration of a 4-way circular bracket for mounting floodlights**

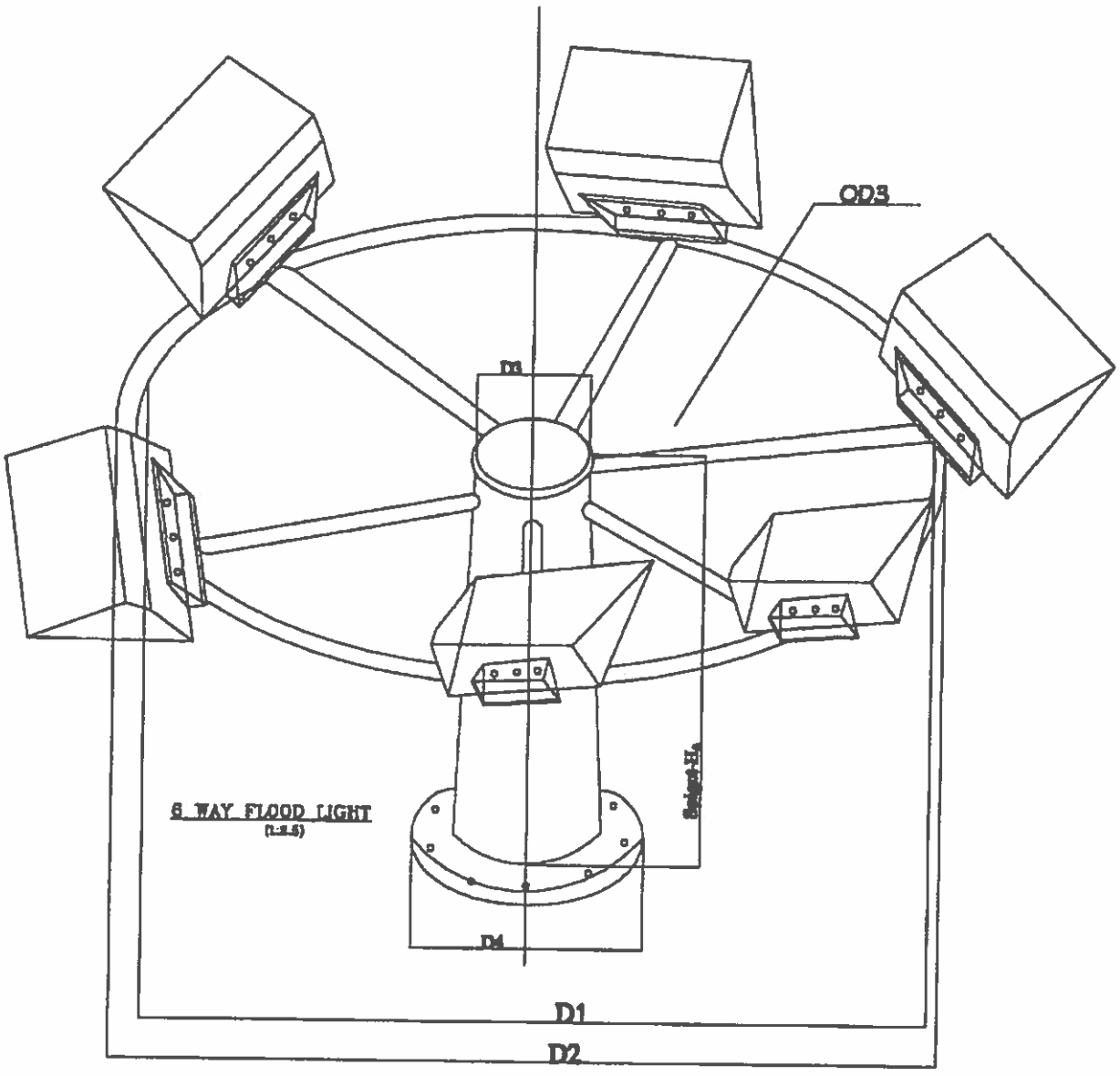


Fig. 8: Illustration of a 6-way circular bracket for mounting floodlights

### 3.0. Dimensions of the circular brackets

| Diameter, D1 m | Diameter, D2 m | D3 mm | D4 mm | Spigot height $H_1$ | Tube Thickness mm |
|---|---|---|---|---|---|
| 0.9-1.15 | 1.15-2.0 | 76 | 86 | 150 | 5 |
| 0.9-1.15 | 1.15-2.0 | 76 | 86 | 150 | 5 |
| 0.9-1.15 | 1.15-2.0 | 76 | 86 | 150 | 5 |
| 0.9-1.15 | 1.15-2.0 | 76 | 86 | 150 | 5 |

**NOTE:**

*3) Bidders shall give full details and the offered values of the items on order as per Annex A. The details provided shall conform to the test reports and their certificates as required by clause 5.2., well labeled drawings complete with dimensions, catalogues or brochures for the purpose of tender evaluation.*

*4) Bidder who shall have not complied by this requirement in bullet 1 shall be automatically disqualified from bidding this item.*