



**TITLE:**  
**SPECIFICATION FOR END BOARD**  
(for single-phase service connections of single room dwellings and similar premises)

Doc. No.	KP1/6C.1/13/TSP/14/051
Issue No.	2
Revision No.	0
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**0.1 Circulation List**

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1	Manager, Standards
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**0.2 Amendment Record**

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue No. 1 Rev. 2	2010-01-21	1) Included layout drawing to provide space for prepaid metering keypad 2) Reduced board thickness from 25mm to 20mm and revised design to lower cost	S. Kimitei	George Owuor
Issue No. 2 Rev. 0	2015-07-21	Issue No. 2, cancels and replaces Issue No. 1	Michael Apudo	Dr. Eng. Peter Kimemia 

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## FOREWORD

This specification has been prepared by the Standards Department in collaboration with the Design & Development Department both of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for End Boards to be used for single-phase service connections to single room dwellings and similar premises. It is intended for use by KPLC in purchasing the end boards.

The manufacturer shall submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

## 1. SCOPE

- 1.1. This specification is for end boards for use in electrical installations for single-phase service connections of single room dwellings and similar premises.
- 1.2. The specification stipulates the minimum requirements for end boards acceptable for use in the company.
- 1.3. The specification also covers inspection and test of the end board as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation. It shall be the responsibility of the supplier to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the end boards for KPLC. The supplier shall also submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

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

## 2. REFERENCES

The following standard contains provisions which, through reference in the text constitute provisions of this specification. Unless otherwise stated, the latest edition (including amendments) shall apply.

IEC 60669-1: Switches for Household and Similar Fixed electrical Installations –Part 1: General requirements

IEC 60884-1: Plugs and socket-outlets for household and similar purposes - Part 1: General requirements

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- BS 1363-1, 2 & 3: 13 A plugs socket-outlets, adaptors and connection units — Part 2: Specification for 13 A switched and unswitched socket-outlets Part 3: Specification for adaptors
- KS 179-1: Specification for rigid PVC conduits and fittings for electrical wiring – Part 1: Conduits; –Part 2: Fittings
- KS 04-662: Kenya Wiring Regulations

### 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 end-board shall be suitable for use in the following conditions:

- a) Continuous outdoor operation in tropical areas at altitudes of up to 2200m above sea level,
- b) Humidity of up to 95%,
- c) Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C;
- d) Heavy saline conditions along the coast and
- e) Isokeraunic levels of up to 180 thunderstorm days per year.

#### 4.2. MATERIALS AND CONSTRUCTION

4.2.1. The end-board shall be a wooden block board (3mm laminations) of minimum length of 300mm, width of 250mm and thickness of 20mm or equivalent insulation base plate of the same minimum dimensions complete with accessories (see clause 4.3) mounted and wired in accordance with ready for use KS 04-662. The circuit protection and pre-paid metering keypad to be provided/fixed by KPLC.

4.2.2. The end board shall be suitable for wall mounting on either concrete or timber wall.

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- 4.2.3. All the accessories/fitings shall be easily operated from the front. The general arrangement shall be as per drawing attached in Annex B
- 4.2.4. All materials and components used shall be in accordance with this specification and the relevant Kenya Standards (KEBS).
- 4.2.5. The finish shall have no sharp edges that may cause injury to personnel.
- 4.2.6. The End Board shall comprise and be complete with the following components/accessories:
- a) Provision for incoming 3x2.5sq.mm s/c copper PVC cables;
  - b) 1x single switched 13A socket outlet;
  - c) 1x 6A light switch;
  - d) 1x 2A backplate lamp holder;
  - e) Provision for mounting the board on either wooden or concrete wall;
  - f) Piping (20mm heavy gauge PVC conduits) and trunking as per Fig. 1 in Annex B

### 4.3. ACCESSORIES

#### 4.3.1. Socket outlet

- 4.3.1.1. The socket outlet shall be a **Type A** rated 250V, 13A at 50Hz conforming to BS 1363-2 and shall be a one (1) gang; single pole switched socket with neon lamp design.
- 4.3.1.2. The socket outlet shall also be surface-type single socket intended for use where a single earthing circuit provides protective earthing for the equipment and exposed parts of the socket outlet in accordance with IEC 60884-1:2002.
- 4.3.1.3. Socket-outlets shall be so designed and constructed that when they are mounted and wired as for normal use, live parts are not accessible, even after removal of parts which can be removed without the use of a tool. The IP rating shall be IP 5X in accordance with IEC 60529.
- 4.3.1.4. Socket-contact assemblies shall have sufficient resilience to ensure adequate contact pressure on plug pins and shall be tested as per 9, 21 and 22 of IEC 60884-1:2002.

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- 4.3.1.5. Socket-contacts and pins of socket-outlets shall be resistant to corrosion and abrasion and shall be tested as per clause 26.5 of IEC 60884-1:2002.
- 4.3.1.6. Insulating linings, barriers and the like shall have adequate mechanical strength and shall be tested as per clause 24 of IEC 60884-1:2002.
- 4.3.1.7. Socket-outlets shall be so constructed as to permit
  - a) Easy introduction and connection of the conductors in the terminals;
  - b) Easy fixing of the base to mounting base;
  - c) Correct positioning of the conductors;
  - d) Adequate space between the underside of the base and the surface on which the base is mounted or between the sides of the base and the enclosure (cover or box) so that, after installation of the socket-outlet, the insulation of the conductors is not necessarily pressed against live parts of different polarity.
- 4.3.1.8. Socket-outlets shall be so designed that full engagement of associated plugs is not prevented by any projection from their engagement face.
- 4.3.1.9. Covers and cover-plates which are intended to ensure protection against electric shock shall be held in place at two or more points by effective fixings.
- 4.3.1.10. Surface-type socket-outlets shall be so constructed that, when they are fixed and wired as for normal use, there are no free openings in their enclosures other than the entry openings for the pins of the plug or other openings for contacts, for example, side earthing contacts, or locking devices, etc.

**4.3.2. Switch**

- 4.3.2.1. The switch in this specification shall be design A, single pole, normal gap construction, surface type mounting and rocker type actuation with screwless terminals for rigid and flexible in accordance with clause 7 of IEC 60669-1:2007.
- 4.3.2.2. Enclosures of switches shall provide a degree of protection against access to hazardous parts and against harmful effects due to ingress of solid foreign objects (IP 5X) in accordance with the as per IEC 60529.
- 4.3.2.3. Switches shall withstand, without excessive wear or other harmful effect, the mechanical, electrical and thermal stresses occurring in normal use. Number of operations for normal operation test shall be 40,000 in accordance with Table 17 of IEC 60669-1:2007.

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- a) A circuit for a tungsten filament lamp load; or
- b) A circuit for a substantially resistive load with a power factor not less than 0,95;

#### 4.3.3. Lamp-holder

- 4.3.3.1. Shall be of type B15d lamp-holder so designed as to be suitable for mounting, by means of an associated or integral backplate, directly on to a supporting surface or appropriate box (see Figure 4c of IEC 61184:2011).
- 4.3.3.2. The lamp holder shall be ordinary, non-switched and enclosed with backplate fixing and without T marking, suitable for rated operating temperatures up to and including 135 °C for B15d lamp holders rated 250V, 2A at 50Hz.
- 4.3.3.3. Terminal/contact assembly shall be a **Rising Type**, where the terminal is allowed to rise parallel with the lamp axis on insertion of a lamp cap to provide a means of connection between the termination of a supply conductor and the contact-making surfaces of the corresponding lamp cap as well as resilient means to maintain contact pressure.
- 4.3.3.4. The construction shall be such that no metal parts of the lamp holder other than the terminals and contact mechanism shall become live in normal service either before, during or after insertion of the lamp.
- 4.3.3.5. Lamp holders shall be provided with a tabs or pins for push-on connection; the terminals shall permit the connection of conductors with nominal cross-sectional – 0.5 mm<sup>2</sup> to 2.5 mm<sup>2</sup>

**NOTE:** *The terminal and the barrel may be a unique element.*

#### 4.3.4. Conduits and fittings

- 4.3.4.1. The conduits and their fittings shall be made of a non-metallic; either rigid Polyvinyl Chloride (PVC) conduit or High Density Polyethylene (HDPE) conduits in accordance with KS 179-1 & 2.
- 4.3.4.2. All conduits and fittings shall be of nominal size 16 as per standard sheet 16 & 17 of KS 179-2 and Fig. 1 of Annex B.

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4.3.4.3. The mechanical and electrical properties of the materials for conduits and fittings shall be as per clause 8, 9, 10 and 11 of KS 179-1 & 2

**4.4. WIRING**

**4.4.1. General**

The wiring of the End Board shall be in accordance with KS 04-662 (all the relevant parts.

**4.4.2. Cables**

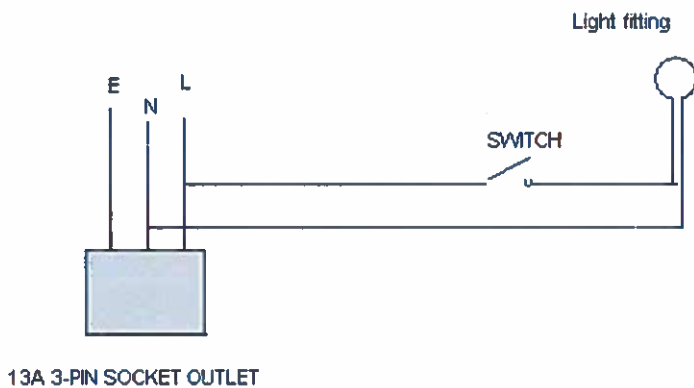
4.4.2.1. The cables for the socket outlets shall be wired in 2.5mm<sup>2</sup> S/C copper PVC insulated flexible cables conforming to KS 04-192.

4.4.2.2. The light fitting shall be wired in 1.5mm<sup>2</sup> S/C copper PVC insulated flexible cables conforming to KS 04-192.

4.4.2.3. The service cable connection and installation of the prepaid metering keypad shall be done by KPLC. The wiring for the socket outlet, light switch and light fitting shall be done by the supplier of the end board.

4.4.2.4. Wiring shall be as per diagram below:

APPENDIX 3: END BOARD SCHEMATIC



*Note: Switch rating = 5A*

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#### 4.5. QUALITY MANAGEMENT SYSTEM

- 4.5.1. The bidder shall submit a quality assurance programme (QAP) that will be used to ensure that the cable accessories design, material, workmanship, tests, service capability, maintenance and documentation, will fulfill the requirements stated in the contract documents, standards, specifications and regulations.
- 4.5.2. The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications shall be submitted with the tender for evaluation.

#### 5. TESTS AND INSPECTION

- 5.1. The End Boards and its components shall be inspected and tested in accordance with IEC 60669-1, IEC 60884-1, BS 1363-1, 2 & 3, KS 179-1, KS 04-662 and the requirements of this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the relevant tests.
- 5.2. Copies of previous Type Tests Reports 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 to ISO/IEC 17025 for the same third party testing laboratory used shall also be submitted with the tender (all in English Language).
- A type test certificate signed by the representative of a competent witnessing body, or a type test certificate issued by an independent test laboratory accredited to ISO/IEC 17025 shall be acceptable as evidence of type testing.
- 5.3. Routine and sample test reports to this specification, IEC 60669-1, IEC 60884-1, BS 1363-1, 2 & 3, KS 179-1, KS 04-662 of the End Board and its components manufactured for KPLC shall be submitted by the supplier to KPLC for approval before shipment of the goods. KPLC Engineers (2) will witness routine tests sample tests.
- 5.4. During delivery of the End Board and its components, 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/rectify without charge to KPLC, End Board and its components which upon examination, test or use fail to meet any of the requirements in the specification.

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## 6. MARKING AND PACKAGING

### 6.1. MARKING

The following information shall be marked indelibly and legibly on the:

- a) End Board shall be marked with:
  - (i) Manufacturer's Name or Trademark;
  - (ii) The letters "KPLC"
  
- b) Sockets shall have the following marking shall be placed on the main part:
  - (i) Rated current, rated voltage and nature of supply;
  - (ii) Either the name, trade mark or identification mark of the manufacturer or of the responsible vendor;
  - (iii) Length of insulation to be removed before the insertion of the conductor into the screwless terminal, if any;
  - (iv) The type reference, which may be a catalogue number.
  
- c) Switches shall be marked with:
  - (i) Rated current in amperes (A)
  - (ii) Rated voltages in volts;
  - (iii) Symbol for nature of supply;
  - (iv) Manufacturer's or responsible vendor's name, trade mark or identification mark;
  - (v) Type reference, which may be a catalogue number;
  
- d) Lamp holders shall be marked with:
  - (i) rated voltage, in volts;
  - (ii) mark of origin (this may take the form of a trade mark, or the manufacturer's or responsible vendor's name or identification mark);
  - (iii) either a unique catalogue number or an identifying reference;

### 6.2. Packing

- 6.2.1. End boards shall be packed in a strong non-returnable wooden crate or card board box in such manner to prevent damage to components during transportation and handling up to installation site.

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6.2.2. Packing shall be designed to prevent entry of dust, ingress of moisture and other foreign materials. Each packaging shall have the following information stenciled on it in English language.

- a) Manufacture's name.
- b) Country of origin.
- c) KPLC item number
- d) Weight in kilogram.
- e) Handling instruction.
- f) The word, "**The Property of Kenya Power and Lighting Company**".

**7. DOCUMENTATION**

7.1. The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation.

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,
- b) Design manufacturer's drawings showing outline of End Boards together with all pertinent dimensions. Any variation in these dimensions due to manufacturing tolerances shall be indicated.
- c) Catalog for all the components used. Catalog numbers for the offered items shall be high-lighted.
- d) Construction and method of assembly of End Boards shall be clearly set out in illustrated installation instructions supplied at the time of tendering and included in every product kit during delivery. All documentation shall be in English Language.
- e) Duly completed attached technical data schedule for each offered item.
- f) Quality Assurance Plan (QAP) that will be used to ensure that the End Boards design, material, workmanship, tests, service capability, maintenance and documentation will fulfill the requirements stated in the contract documents, standards, specifications and regulations.
- g) Marking details and method to be used in marking of the End Boards
- h) Supplier's undertaking to ensure adequacy of the design, good workmanship, good engineering practice and adherence to applicable standards in the manufacture of the End Boards for KPLC,
- i) Packaging details (including packaging materials, total number of end-boards per packaging).

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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 End Boards 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	KPLC Requirements	Bidder's offer (indicate full details)
	Bidders Name and Address	state
	Manufacturers name and Country of manufacture	state
	Type Designation/ Catalogue Number	state
2	Standards of Design and Manufacture	state
3	Terms and Definitions	specify
4.1	Service Conditions	state
4.2	Design and Construction	
	End board dimensions	state & provide drawing
	Provision for mounting on concrete or wooden wall	state
	Safely finished	state
4.3	Accessories	
	Socket outlet	
	Rating, type and standard	state
	Surface type	state
	Safety	state
	Resilience	state
	Resistance to corrosion	state
	Mechanical Strength	state
	Easy to fix	state
	Expected normal operations for its lifespan	state
	Switch	
	Surface type	state
	Rocker type	state
	Safety	state
	Expected normal operations for its lifespan	state
	Lamp holder	
	Standard and type	state
	Rating	state
	Maximum operating temperature	state
	Contact assembly type	state
	Resilient	state
	safety	state

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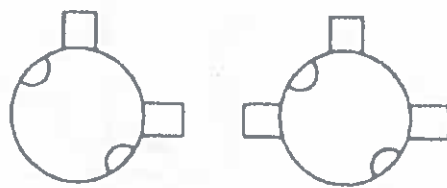
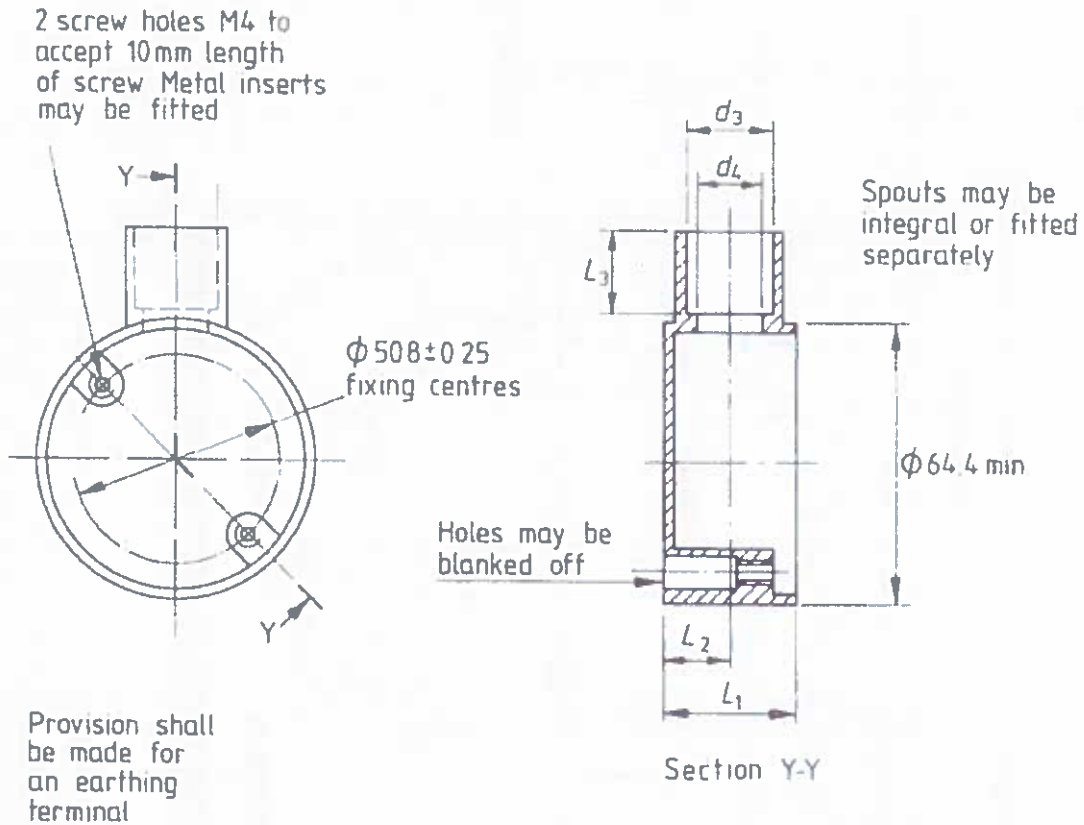
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	Terminal and barrel elements	state
	Conduits and fittings	Material of manufacture
		Size
		Mechanical and electrical properties
4.4	Cables	Socket outlet cable type and size
		Light fitting cable type and size
4.5	Quality Assurance plan	state
	Copy of ISO 9001:2008 Certificate	state
	Manufacturers experience	state
	Manufacturing Capacity (Units per Month)	state
	List of previous customers	state
	Customer reference letters	state
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	Replacement of rejected insulators	specify
6.1	Marking	specify
6.2	Packing	specify
7.1	Documents submitted with tender	provide
7.2	Documents to be submitted by supplier to KPLC for approval before manufacture	provide
7.3	Recommendations	specify

.....  
**Supplier's Name, Signature, Stamp and Date**

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Angle

3 way or tee

Nominal size mm	L1 min mm	L2 min mm	L3 min – Length of entry, mm	d3 max mm	d4 max mm
20	28.6	14.5	20	20.3	18.5

All dimensions are in millimetres

**Fig. 1: Circular conduit fittings**

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