



TITLE:
SPECIFICATION FOR 66kV & 132kV COMPOSITE LINE POST INSULATORS – VERTICAL & HORIZONTAL MOUNTING

Doc. No.	KP1/6C.1/36/TSP/04/001
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ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR OFFERED INSULATORS

(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data & calculations, 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)

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0.1 Circulation List

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1	Standards Manager
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0.2 Amendment Record

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Issue 1	2015-10-01	New Issue	M. Apudo	Dr. Eng. Peter
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FOREWORD

This specification has been prepared by the Standards Department of Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for 66 kV & 132 kV composite line post insulators complete with metallic end fittings and mounting brackets. It is intended for use by KPLC in purchasing the insulators.

The supplier 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 66kV & 132kV composite line post insulators complete with metallic end fittings and mounting brackets for use on overhead power transmission lines operating at a nominal voltage of 66kV & 132kV and frequency of 50Hz.
- 1.2. The specification also covers inspection and test of the 66kV & 132 kV composite line post insulators complete with metallic end fittings and mounting brackets as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation. The insulator category and their mounting brackets in this scope shall be of two types namely:

A. Wood pole mounting

- a) Composite Vertical Line Post Insulator– Rated 72.5kV;
- b) Composite Vertical Line Post Insulator– Rated 145kV;
- c) Composite Horizontal Line Post Insulator– Rated 72.5kV;
- d) Composite Horizontal Line Post Insulator– Rated 145kV.

B. Concrete or Steel pole mounting

- a) Composite Vertical Line Post Insulator– Rated 72.5kV;
- b) Composite Vertical Line Post Insulator– Rated 145kV;
- c) Composite Horizontal Line Post Insulator – Rated 72.5kV;
- d) Composite Horizontal Line Post Insulator– Rated 145kV.

NOTE: The Line Post Insulator type and rating on order shall be specified in the tender

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1.3. The specification stipulates the minimum requirements for 66 kV & 132 kV composite line post insulators acceptable for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the insulators for The Kenya Power & Lighting Company Ltd.

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

2. REFERENCES

The following documents were referred to during the preparation of this specification; in case of conflict, the requirements of this specification shall take precedence.

- IEC 61952: Insulators for Overhead Lines – Composite Line Post Insulators for A.C. Systems with a Nominal Voltage Greater Than 1 000 V – Definitions, Test Methods and Acceptance Criteria
- IEC 62217: Polymeric HV insulators for indoor and outdoor use. General definitions, test methods and acceptance criteria
- IEC 60273: Characteristics of Indoor and Outdoor Post Insulators and Post Insulator Units for systems with nominal voltages greater than 1 000V.
- IEC 61442: Test methods for accessories for power cables with rated voltages from 6kV (Um = 7,2kV) up to 30kV (Um = 36kV)
- IEC 60507: Artificial pollution tests on high-voltage insulators to be used on a.c. systems
- IEC 60437: Radio interference test on high-voltage insulators
- IEC 60587: Electrical insulating materials used under severe ambient conditions – Test methods for evaluating resistance to tracking and erosion
- IEC 60815-1&3: Selection and dimensioning of high-voltage insulators intended for use in polluted conditions -- Part 1: Definitions, information and general principles -- Part 3: Polymer insulators for a.c. systems
- IEC 60383: Insulators for overhead lines with a nominal voltage above 1000V.

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- IEC 60071: Insulation co-ordination – Part 1: Definitions, principles and rules- Part 2: Application guide.
- IEC 60120: Dimensions of ball and socket couplings of string insulator units;
- IEC 60471: Dimensions of clevis and tongue couplings of string insulator units;
- IEC 61466-1: Composite string insulator units for overhead lines with a nominal voltage greater than 1 000 V – Part 1: Standard strength classes and end fittings;
- IEC 60707: Methods of test for the determination of flammability of solid electrical insulating materials when exposed to an igniting source.
- ISO 1461: Metallic Coatings – Hot dip galvanized coatings on fabricated ferrous products – Requirements.
- ISO 48: Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD).
- ISO 8611: Pallets for material handling- Flat pallets.
- ISO 5922: Malleable cast iron.

3. TERMS AND DEFINITIONS

For the purpose of this specification, definitions given in the reference standards shall apply and shall include the following;

3.1. Definitions

Definition	Explanation
Cantilever load	A load applied perpendicular to the longitudinal axis of the insulator.
Certified test report	A certificate of tests performed as specified within the specification, and carried out by an accredited authority or by the manufacturer and witnessed by an accredited authority that has been accredited in accordance with ISO/IEC 17011.
Chips, pits or blisters	Surface marks of insulator shed material usually caused during the manufacturing process.
Connection zone	The interface between the core of the insulating part and the metal fixing devices.
Crack	A surface fracture > 0.1 mm deep.

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Definition	Explanation
Flashover	A disruptive external discharge across the surface of the insulating part between the metallic end fittings across which, the operating voltage is normally imposed.
Insulator length or height	The external dimension measured from bottom flange of earth end fitting to top flange of live end fitting.
Metal fittings of an insulator	Devices that form part of an insulator and intended to connect it to a supporting structure or to a conductor. The two fittings referred to in this specification are the earth end and a line or live end.
Minimum Cantilever Failing Load (MCFL)	Minimum bending load that the insulator has to withstand.
Shed	A projection from the core of the insulating part of an insulator intended to increase the creepage distance. The creepage can further be increased by means of ribs in the lower surface of the shed.

3.2. Abbreviations

Abbreviation	Explanation
g	Acceleration due to gravity
HV	High Voltage
MCFL	Minimum Cantilever Failing Load
PCD	Pitch Circle Diameter
RIV	Radio Influence Voltage
rms	root mean square
SCD	Specific Creepage Distance
USCD	Unified Specific Creepage Distance

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

4.1.1. Environmental conditions

The insulators shall be suitable for continuous operation outdoors in tropical areas at:

- Altitudes of up to 2200m above sea level,
- Humidity of up to 95%,
- Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C,
- Heavy saline conditions along the coast and tropical sunshine conditions.
- Annual mean isokeraunic level of up to 180 thunderstorm days.

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NOTE: The level of galvanizing for all ferrous parts except those that are stainless steel and materials used shall be suitable for these conditions.

4.1.2. System requirements

The following system requirements shall be taken into account for the selection and dimensioning of outdoor insulation.

a)	Type of system	Alternating Current (a.c)	
b)	Nominal system operating voltage	66kV	132kV
c)	Maximum continuous operating voltage	72.5kV	145kV
d)	System frequency	50Hz	50Hz
e)	Phase to phase separation	1,800	2,200mm
f)	Earth fault current with duration of 0.7 sec	7.8kA	7.8kA

4.2. DESIGN AND CONSTRUCTION

4.2.1. General

- 4.2.1.1. The composite line post insulators shall be of type A in accordance with IEC 60383 and shall be designed, manufactured and tested in accordance with IEC 61952, IEC 60815-3 and other applicable /latest IEC standards and the requirements of this specification.
- 4.2.1.2. Line post insulator in this specification shall be a rigid insulator consisting of one piece of insulating material permanently assembled with a metal base cap intended to be mounted rigidly on a supporting structure by means of a central stud or one or more bolts as per IEC 60815-3.
- 4.2.1.3. The composite line post insulators shall have a core, an insulating housing and weather-shed housing both manufactured by the same manufacturer and a forged steel hardware components for attaching it to the support and conductor.
- 4.2.1.4. The composite line post insulators shall be an open shed profile type with excellent self-cleaning properties and a provision for easy cleaning when maintenance is required.

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4.2.1.5. The insulators are required to maintain satisfactory electrical and mechanical performance throughout their lifetime, which is specified as 40 years. Evidence in support of the reliability and performance for this period including information on Failure Mode and Effect Analysis shall be submitted for purposes of tender evaluation.

NOTE: Suppliers/Manufacturers shall be required to comment on the environmental soundness of the design and the materials used in the manufacture of the composite line post insulators offered. In particular, comments should address such issues as recyclability and disposability at the end of service life.

4.2.2. Materials

4.2.2.1. Core

- 4.2.2.1.1. The composite line post insulator core shall be made of brittle fracture-resistant electrical grade solid high density, axially aligned, glass-fibre-reinforced, epoxy resin rod, of uniform cross-section to achieve maximum failing load. The core shall be mechanically and electrically sound, free from voids, foreign substances and manufacturing flaws.
- 4.2.2.1.2. The composite line post insulators design shall ensure that the core is totally encapsulated and fully sealed, from the live to the earthed ends, by the insulating material from the environment, in order to avoid ingress of moisture. If any tacky substances are used as sealers, they shall not be exposed to environmental influence.
- 4.2.2.1.3. A special care shall be taken in connecting the glass-fiber-reinforced, epoxy resin rod, to the metal end fittings that allows having high bending, traction, torsion and compression loads and eliminating water penetration which happens in the usual execution of compression end fittings.
- 4.2.2.1.4. The core material shall have four (4) essential requisites:
 - a) The capacity to withstand mechanical stresses that come from a specific use.
 - b) Sufficient insulating properties to withstand, with an adequate safety-margin, the electrical stresses of usage and those resulting from over voltages of internal and external origin.
 - c) Power arc resistance.
 - d) Positive results at the tests according to the standard IEC 61952.
- 4.2.2.1.5. The minimum required diameter of the core shall be 63.5 mm.

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4.2.2.2. Housing and Weathersheds

4.2.2.2.1. The weathersheds shall be made of polymer materials such as ethylene propylene or silicone elastomers such as:

- a) Reinforced high temperature vulcanized (HTV) silicone rubber based on dimethyl siloxane, which exhibit hydrophobicity with the capability to transfer hydrophobicity to the layer of pollution
- b) HPS silicone rubber compound 1800-120V.

NOTE:

- i) *The silicon rubber shall be treated with additive packages to modify their behavior for satisfactory performance in an outdoor polluted environment. The additives (fillers) shall include but not limited to anti-tracking agents, ultra-violet screens and stabilizers, antioxidants, ionic scavengers, etc.*
- ii) *Proof of the type of base polymer used and the additives shall be provided to support the tender during evaluation.*

4.2.2.2.2. The reinforced HTV silicone rubber shall have a Shore 'A' hardness of not less than 60 as per ISO 48 and the track resistance of the sheath and shed materials shall meet the requirements of IEC 60587 Method 1 Class 1A4.5 or 1B4.5 or Method 2 Class 2A4.5.

4.2.2.2.3. A minimum sheath thickness of 3.0 mm of silicone rubber shall be extruded or injection moulded on the reinforced fiberglass rod. The polymer sleeve and weather-shed insulating material shall have a chemical structure of 100 percent silicone rubber before fillers are added.

4.2.2.2.4. The silicone rubber shall be firmly bonded to the rod, be seamless, smooth and free from imperfections. The strength of the silicone rubber to rod interface shall be greater than the tearing strength of the silicone rubber.

4.2.2.2.5. The weather-sheds shall be firmly bonded to the sheath, vulcanized to the sheath or moulded as part of the sheath and be seamless smooth and free from imperfections. The strength of the silicone rubber weather-shed to sheath interface shall be greater than the tearing strength of the silicone rubber.

4.2.2.2.6. Weather-sheds shall be at intervals to provide optimum electrical performance and the weather-shed designs shall provide a protected bottom surface that tends to keep dry in wet conditions.

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- 4.2.2.2.7. The composite line post insulators shall be capable of withstanding high pressure power washing. A power wash test shall be performed on polymer insulators to demonstrate that the units can be power washed. This test shall be a water spray at a shed seam of approximately 3m from the insulators. The spray shall be a solid stream through a 6mm diameter nozzle at 3.79Mpa for a period of ten minutes. There shall be no signs of water entering through or under the outside weather-shed into the core or at the polymer hardware interface into the core.
- 4.2.2.2.8. The gap between hardware base and the housing shall be sealed by an elastomer with permanent elasticity. The sealing shall stick permanently to the surface of the material as well as to the housing.
- 4.2.2.2.9. Cracks on the insulator surface shall not be allowed. Superficial defects or cavities are allowed provided the total defective area does not exceed 0.2% of the total insulator surface and the individual defective areas do not exceed 25 mm². The depth of any cavities must not exceed 1 mm or 5% of the layer thickness of the blanket material in the area under consideration. Individual protrusions on the insulator surface are allowed up to 2 mm as long as their total protruded area does not exceed 0.2% of the total surface of the insulator and the individual protruded area does not exceed 25 mm².

4.2.2.3. Metallic end fittings

- 4.2.2.3.1. The metallic end fittings placed at the end of the fiberglass rod shall be:
- a) **Clamp- top type** – designation "HC" for Horizontal mounting or designation "VC" for vertical mounting complete with stud base (complete with two (2) trunnion bolts and locknut) as per ANSI C29-7 with:
 - (i) Sufficient mechanical features to take the stresses that insulators are subjected to.
 - (ii) Conventional horizontal and vertical trunnion to accommodate a standard Line Post Insulator, bolted conductor clamp.
 - (iii) A design with an additional eye for the attachment of other devices during installation or maintenance activities.
 - b) **K-Clamp** – designation "C" in drawing in Annex B and made of corrosion resistant aluminum casting with:
 - (i) A long, smooth contoured conductor clamping zone that accommodates a full range of conductor sizes
 - (ii) A single captive live-line operable bolt.

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- (iii) Overall length shall permits standard cover up hoods to effectively cover all insulator sheds.
- (iv) A design can be installed in either a horizontal or vertical configuration

NOTE: All the metallic end fittings shall be supplied with a matching conductor clamp. The drawings of the same shall be provided for tender evaluation and approval.

- 4.2.2.3.2. These terminals shall be manufactured according to the IEC 60120, IEC 60471, and IEC 61466-1 standards and according to the characteristics requested by KPLC or their use. The terminals shall be manufactured from:
- a) Forged steel C 30 or C 40, worked and then hot dip galvanized
 - b) Casting steel C 30 or C 40, worked and then hot dip galvanized

4.2.2.4. Mounting Brackets/ Fixing Base

- 4.2.2.5. The top and bottom flanges of the end fittings shall have PCDs, holes and thread sizes as per the drawings attached in Annex B.
- 4.2.2.6. The liner post insulators shall be supplied complete with a matching mounting bracket with shapes and sizes similar in design to the illustrations in Annex. B.

NOTE: The illustrations in Annex B does not restrict the manufacturer for offering a superior design of the brackets as long as the insulator design remains the same.

4.2.3. Dimensional characteristics

4.2.3.1. Insulation creepage

- 4.2.3.1.1. KPLC has rationalized to three (3) site pollution severity classes as defined in IEC /TS 60815 Part 1 i.e. for nominal voltage upto 132 kV, class 'c – Medium' , class 'd – Heavy' and 'e – Very heavy' are specified.
- 4.2.3.1.2. The minimum specific (SCD) and unified specific (USCD) creepage distances at the maximum continuous system voltage (U_m) for these site pollution severity classes are as indicated in Table 1.

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Table 1: Minimum specific creepage requirements as per IEC/TS 60815-1

Pollution zone	Application area	SCD	USCD
		mm/kV	mm/kV
c – Medium (M)	Inland	25	43.3
d –Heavy (H)	Industrial regions	31	53.7
e – Very heavy (VH)	Coastal regions	40	53.7

4.2.3.2. Insulator shed profile

4.2.3.2.1. Insulator shed profiles shall be designed in accordance with IEC/TS 60815-3. Alternating sheds with an ‘open’ or ‘aerodynamic’ profile are preferred. Designs utilizing ‘Under-ribs’ in order to increase the creepage distance shall not be accepted.

4.2.3.2.2. The following parameters apply to the shed profile and are the recommended minimum values in IEC/TS 60815-3 for full compliance:

- a) The shed spacing-projection (s/p) ratio shall be at least 0.65.
- b) The minimum distance between sheds shall be 30 mm;
- c) The creepage to clearance ratio (l/d) shall not exceed 5.
- d) The shed angle shall be between 5° and 22.5°.
- e) The creepage factor (CF) shall not exceed:
 - 3.75 for SPS Class ‘c’ (‘Medium’ pollution class);
 - 3.875 for SPS Class ‘d’ (‘Heavy’ pollution class);
 - 4.0 for SPS Class ‘e’ (‘Very heavy’ pollution class).

NOTE: Besides the dimensional constraints of the shed profile, the sheds shall be sufficiently robust to withstand reasonable handling and transportation stresses.

4.2.3.3. Overall dimensions

4.2.3.3.1. The length of the horizontal post insulator and height of the vertical post insulator is a critical dimension cases for a given voltage, as there are different specifications for some existing installations, from the electrical performance and mechanical design perspectives, and shall not be deviated from.

4.2.3.3.2. The length and/or height of the insulator and the diameter of the insulating parts are specified in Table 3.

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4.2.3.4. Mechanical characteristics

4.2.3.4.1. Cantilever strength

Post insulators shall be standardized in mechanical strength classes based on the values of the specified minimum cantilever failing load in the bending test according to the classification in IEC 60273.

The minimum values of Minimum Cantilever Failing Load (MCFL) are tabulated in Table 3.

4.2.3.4.2. Torsional strength

Torsional failing load is critical for application in disconnecter switches. The minimum values shall be as per IEC 60273 and are tabulated in Table 3.

4.2.4. Finish

4.2.4.1. The composite line post insulators shall be supplied complete with necessary hardware such as galvanized steel pin with nut spring washer and a lock nut for mounting the insulator to the channel iron cross arms as shown in the drawings in Annex B.

4.2.4.2. The finished product shall be of high resistance to moisture, high salinity, ultraviolet radiation, high temperatures and tropical sunshine conditions.

4.2.4.3. The final colour of the insulator housing shall be BROWN.

4.2.4.4. The under surface and grooves of sheds or skirts shall be easy cleaning. Sheds shall be substantially symmetrical in shape without appreciable warping.

4.2.4.5. The top and side grooves shall be galvanized steel and be designed to accept conductor sizes in the range 7 – 18.2mm overall diameter.

4.2.5. Galvanizing

4.2.5.1. All steel hardware components shall be galvanized after their machined bent or worked operations of any manner. The zinc coating shall adhere tightly to the surface of the base metal. The zinc coated parts shall not have any un-coated spots.

4.2.5.2. The coating shall be uniform and free from blisters, flux, black spots, dross, tear drop edges, flaking zinc, rough appearance and in general shall be smooth, clean and

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unscarred when received. The minimum thickness of the coating of the steel or iron base shall conform to ISO 1461 and Table 3.

4.3. CHARACTERISTICS

The mechanical and electrical characteristics of the insulators shall be as per Table 1:-

Table 3: Mechanical and electrical characteristics of the Composite Line Insulators (Horizontal & Vertical) in accordance with ANSI C19-17 & 18, IEC 61952, IEC/TS 608715-3 and IEC 60071-1

Characteristics		Units	Ratings		
Line Voltage		kV	66	132	
Maximum Line Voltage		kV	72.5	145	
Power Frequency Withstand	Dry	kV _{rms}	230	395	
	Wet	kV _{rms}	185	360	
Lightning Impulse withstand 1.2/50	Positive	kV _{peak}	380	725	
	Negative	kV _{peak}	450	750	
Visible discharge test voltage, min		kV	53	107	
Radio Influence Voltage (RIV) at 100kHz as per IEC 60437:2009	Test	kV	44	88	
	Maximum	µV	200	200	
Specified Cantilever Load – SCL		kN	3.8	7.5	
Maximum Design Cantilever Load - MCDL, 65% of SCL		kN	2.47	4.875	
Specified Tensile Load - STL		kN	15	40	
Maximum Design Compression - MDC		kN	15	40	
Maximum Design Torsion - MDT		daNm	15	20	
Number of Sheds, A		No.	23	43	
Dimensions , L	Vertical	mm	985	1,515	
	Horizontal	mm	975	1,500	
Creepage distance	Inland	25mm/kV	mm	1,812.5	3,625
	Industrial	31mm/kV	mm	2,247.5	4,495
	coastal	40mm/kV	mm	2,900	5,800
Dry Arc Distance (Creepage distance/Creepage factor as per clause 9.7 of IEC/TS 60815)		mm	765	1380	
Mean coating thickness	For iron and steel castings and forgings	g/m ² (µm)	610 (85)		
	For bolts, nuts and washers	g/m ² (µm)	375 (54)		
Approximate weight		Kg	11.5	17.5	

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SPECIFICATION FOR 66kV & 132kV COMPOSITE LINE POST INSULATORS – VERTICAL & HORIZONTAL MOUNTING

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4.4. QUALITY MANAGEMENT SYSTEM

- 4.4.1. The supplier shall submit a 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. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008.
- 4.4.2. The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.
- 4.4.3. The bidder shall indicate the delivery time of the insulators, manufacturer's monthly and annual production capacity and experience in the production of the type and size of insulators being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers outside the country of manufacture for the insulators sold in the last five years together with reference letters from four of the customers shall be submitted with the tender for evaluation.

5. TESTS AND INSPECTION

- 5.1. Type tests, sampling tests and routine tests shall be done in accordance with the requirements of IEC 61952, IEC 60815-1&3, IEC 62217, IEC 61442, IEC 60707, IEC 60383, IEC 60437, IEC 60507, ISO 48, ISO 1461, and this specification. It shall be the responsibility of the supplier to perform or to have performed all the tests specified.
- 5.2. Copies of Type Test Certificates & Type Test Reports issued by a well-recognized Conformity Assessment Body accredited according to ISO / IEC 17020, ISO / IEC 17025 as well as ISO / IEC 17065. The conformity certification shall be submitted with the tender for the purpose of technical evaluation. A copy of the accreditation certificate to ISO/IEC 17025 for the testing laboratory shall also be submitted (all in English language).
- 5.3. Copies of type test reports to be submitted with the tender (by bidder) for evaluation shall be as stated:
 - A. Electrical Tests**
 - a) Visible discharge test;
 - b) Dry lightning impulse withstand voltage test;
 - c) Wet power frequency test;
 - d) Dry power frequency test;
 - e) One minute rain test/wet flashover test;
 - f) RIV tests.

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B. Mechanical Tests – IEC 61952

- a) Mechanical load-time test and tightness test of the interface between end fittings and insulator housing;
- b) Recovery of hydrophobicity test (IEC 61442) ;
- c) Brittle fracture resistance test.
- d) Tests on interfaces and connections of metal fittings;
- e) Assembled core load-time test;
- f) Test of housing: tracking and erosion test The test reports MUST include resistance to ageing tests (under climate chambers to mimic the conditions – sunshine, salinity, temperature, humidity, spray and so on – typical of tropical climate and those stated in clause 4.1 in addition to the highest system voltage) and shall include;
 - (i) Accelerated weathering test (IEC 60099-4)
 - (ii) Tracking and erosion test (IEC 62217).
 - Test specimens “ duration of **1000 hours** ”
 - Test specimens “ duration of **5000 hours annex C** ”
- g) Tests for the core material;

C. Chemical composition test for silicon content;

NOTE: Any translations of certificates and test reports into English language shall be signed and stamped by the third party ISO/IEC 17025 accredited Testing Laboratory that carried out the tests.

5.4. The insulators shall be subject to acceptance tests at the manufactures’ works before dispatch. Acceptance tests (routine & sample tests) will be witnessed by two Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC). Routine and sample test reports for the insulators to be supplied shall be submitted to KPLC for approval before shipment of the goods. Tests to be witnessed by KPLC Engineers at the factory before shipment shall be in accordance with IEC 61952, IEC 62217, IEC 61442, IEC 60815-1&3, IEC 60383, IEC 60437, IEC 60507, ISO 48, ISO 1461, and this specification and shall include the following:

A. Tests on interfaces and connections of end fittings

- a) Pre-stressing
 - (i) Thermal-mechanical pre-stressing
 - (ii) Water immersion test
- b) Verification tests
 - (i) Visual examination
 - (ii) Steep-front impulse voltage test
 - (iii) Dry power frequency voltage test

B. Assembled core load-time tests

- a) Test for verification of the Maximum Design Cantilever Load MDCL
- b) Tensile load test

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- C. Test of sheds and housing material
 - a) Hardness test
 - b) Flammability test acc. to IEC 60707
- D. Test for the core material
 - a) Dye penetration test
 - b) Water diffusion test
 - c) Voltage test

5.5. On receipt of the insulators 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, insulators which upon examination, test or use fail to meet any of the requirements in the specification.

6. MARKING AND PACKING

6.1. Marking

- 6.1.1. The following information shall be marked indelibly and legibly and in a permanent manner on each insulator in English Language.
 - (i) Manufacturer's name or trademark;
 - (ii) Manufacturer's type designation;
 - (iii) Specified electrical characteristics;
 - (iv) Specified mechanical load.
 - (v) The letters '**PROPERTY OF KPLC**'.



6.1.2. All marking shall be by embossing on the insulator housing and marking on metal fittings shall be before galvanizing. The marking shall not affect the performance of the insulator.

NOTE: *Markings on loose tags/ties shall not be accepted.*

6.2. Packing

6.2.1. All insulators shall be packaged in individual Superior Grade Closed Wooden weatherproof crates to protect them against damage during shipping, inland transportation and storage. The crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight. The packages shall be weatherproof and designed to be removable by hand without cutting.

6.2.2. Each container is marked with the number of insulators it contains, the catalog number, description of the containers, the manufacturer's name, and any other customer requests.

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Also, a "Polymer Insulator Handling Instruction" sheet is included with all containers. This sheet states any necessary cautions during handling, transportation, and installation. If corona rings are to be included, a corona ring installation sheet is also provided.

- 6.2.3. Each package shall have a packing list and in addition, shall be marked with the following information in English Language.
- a) Descriptive name
 - b) Rated voltage
 - c) Quantity packed in package
 - d) Contract and lot number
 - e) Gross weight of packager
 - f) Volume of package
 - g) Applicable standards
 - h) Label "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 documents to be submitted (all in English language) for tender evaluation shall include the following:
- a) Guaranteed Technical Particulars fully filled and signed by the manufacturer;
 - b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
 - c) Sales records for previous five years and reference letters from at least four of the customers;
 - d) Details of manufacturing capacity and the manufacturer's experience;
 - e) Copies of required type test certificates and 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) Manufacturer's warranty and guarantee;
 - h) Manufacturer's letter of authorization, copy of the manufacturer's ISO 9001:2008 certificate and other technical documents required in the tender.
 - i) Additional documents to be given by the Tenderers shall include;
 - (i) Summary of exceptions to technical specification,
 - (ii) Manufacturer references and qualifications,
 - (iii) List of spare parts,
 - (iv) List of special tools,
 - (v) Summary of test reports,
 - (vi) Packing / transportation / storage / installation and maintenance manuals,

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- 7.2. The successful bidder (supplier) shall submit the following documents/details (from the manufacturer as per tender) to The Kenya Power & Lighting Company for approval before manufacture:
- a) Guaranteed Technical Particulars fully filled and signed by the manufacturer;
 - b) Design drawings & construction details of the insulators including 3-D views;
 - 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. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008;
 - d) Test Program to be used after manufacture;
 - e) Marking details and method to be used in marking each insulator;
 - f) Manufacturer's undertaking to ensure adequacy of the design, adherence to applicable regulations, standards and specification, ensure good workmanship and good engineering practice in the manufacture of the insulators for The Kenya Power and Lighting Company Limited;
 - g) Packaging details (including packaging materials and marking and identification of component packages).
- 7.2.1. In addition to be submitted by the manufacturer at the point of delivery shall include a set of three (3) number:
- (i) Documents, electrical and mechanical drawings of design, test, packing, labels, transportation, storage, installation, local and operation test of insulators listed below, shall be provided.
 - (ii) Design calculation (if necessary);
 - (iii) Details of packing, transportation and housing;
 - (iv) Test reports and certificates of passed tests;
 - (v) Erection, operation and maintenance manuals;
 - (vi) Drawings showing the outline dimensions, transportation, weight, type and other specifications of them
 - (vii) List of drawings and components parts constituting a complete insulator.

NOTE: *The drawings to be submitted by the supplier to KPLC for approval before manufacture shall be in standard format clearly indicating the drawing number, parts list with material details and quantities, standard of manufacture, ratings, approval details and identity of the manufacturer (as per manufacturer's authorization submitted during tendering).*

8. TRAINING

- 8.1. Training materials in the form of drawings, instructions and/or audio visuals shall be provided for the items accepted under the offer.

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- 8.2. Tenderers shall state the availability of training materials which shall include but is not limited to the following topics:
- a) Handling
 - b) Storage
 - c) Application (particularly in areas of heavy coastal pollution)
 - d) Installation
 - e) Maintenance
 - f) Environmental performance
 - g) Electrical performance
 - h) Mechanical performance
 - i) Disposal

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ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR OFFERED INSULATORS *(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.BIDDER'S NAME & ADDRESS

CLAUSE	Description	Bidders offer		
1.2 a	Composite Vertical Line Post Insulator - Rated 72.5kV			
	Bidders Name & Address			
	Manufacturer's name and Country of manufacture			
	Type Designation/ Catalogue Number			
	Standards of Design and Manufacture			
4.2	Design & Construction	Type	state	
		Rigid	state	
	Insulating housing and weather shed housing from same manufacturer		state	
	Reliability and Performance evidence		provide	
	Recyclability and disposability		comment	
	Core	Material of manufacture		state
		Can withstand mechanical stress		state
		Withstands electrical stress of use and overvoltage		state
		Power arc resistance		state
		Diameter of core		state
	Housing & wethersheds	Material of Manufacture		state
		Hardness		state
		Track resistance		state
		Sheath thickness		state
		Strength of weather-shed to sheath interface		state
		Can withstand a high pressure washing test		state
	Defects		state	
	Metallic end fittings	Clamp top type	Mechanical features	state
			Conventional trunnion	state
			Additional eye	state
K- clamp		Clamping zone properties		state
		Captive live-line bolt		state
		Allows for standard cover up hoods		state
		For vertical or horizontal use		state
Steel used		Forged	C30 galvanization	state
	C40			

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		Casting	C30	galvanization	state
			C40		
Mounting Brackets/ Fixing base	Drawings of top and bottom flanges of end fittings PCDs, holes and thread sizes				Attach
Insulation creepage	Pollution zone	Application area	SCD mm/kV	USCD mm/KV	Specify specify
	Medium	Inland	25	43.3	state
	Heavy	Industrial	31	53.7	
	Very heavy	Coastal Area	40	53.7	state
Insulator shed profile	Design of shed profiles				state
	Shed spacing projection ratio				state
	Minimum distance between sheds				
	Creepage to clearance ratio				
	Shed angle				
	Creepage factor	Medium pollution class			state
	Extra heavy pollution class			state	
Mechanical & electrical characteristics	Line voltage in kV				state
	Maximum Line Voltage in kV				state
	Power frequency with stand	dry (kVrms)			state
		wet (kVrms)			state
	Lightning impulse withstand 1.2/50	positive (kVpeak)			state
		negative (kVpeak)			state
	Visible discharge test voltage, min (kV)				state
	Radio influence Voltage (RIV) at 100kHz	Test (kV)			state
		Maximum (μ V)			state
	Specified cantilever load (SCL) (kN)				state
	Max Design cantilever load MCDL, 65% of SCL				state
	Specified tensile load - STL				state
	Maximum design compression - MDC				state
	Maximum design torsion - MDT				state
	Number of sheds, A				state
	Dimensions	vertical (mm)			state
		horizontal (mm)			state
	Creepage distance (mm)	Inland			state
		Industrial			state
		Coastal regions			state
Dry arc distance (mm)				state	
Mean coating thickness	for iron and steel castings and forgings (g/m^2 (μ m))			state	
	for bolts, nuts and washers (g/m^2 (μ m))			state	
Approximate weight (kg)				state	

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	Finish	Complete post insulators and accessories offered	state	
		High resistance to	moisture	state
			high salinity	state
			ultraviolet radiation	state
			high temperature	state
			tropical sunshine	state
		color	state	
Conductor sizes accommodated on top and side grooves	state			
Galvanizing	Smooth finish	state		
	thickness	state		
4.4	Quality Management System			
	Quality Assurance Plan		state	
	Copy of ISO 9001:2008 Certificate		state	
	Manufacturer's 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	Test reports to be submitted by supplier to KPLC for approval before shipment		provide	
5.5	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	
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	List test reports of the insulators to be submitted to KPLC for approval before shipment		provide	
13.0	Statement of compliance to specification (indicate deviations if any & supporting documents)		provide	

CLAUSE	Description	Bidders offer
1.2 b	Composite Vertical Line Post Insulator Rated - 145kV	
	Bidders Name & Address	
	Manufacturer's name and Country of manufacture	

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	Type Designation/ Catalogue Number					
	Standards of Design and Manufacture					
4.2	Design & Construction	Type		state		
		Rigid		state		
		Insulating housing and weather shed housing from same manufacturer				state
		Reliability and Performance evidence				provide
		Recyclability and disposability				comment
	Core	Material of manufacture			state	
		Can withstand mechanical stress			state	
		Withstands electrical stress of use and overvoltage			state	
		Power arc resistance			state	
		Diameter of core			state	
	Housing & wethersheds	Material of Manufacture			state	
		Hardness			state	
		Track resistance			state	
		Sheath thickness			state	
		Strength of weather-shed to sheath interface			state	
		Can withstand a high pressure washing test			state	
		Defects			state	
	Metallic end fittings	Clamp top type	Mechanical features			state
			Conventional trunnion			state
			Additional eye			state
		K- clamp	Clamping zone properties			state
			Captive live-line bolt			state
			Allows for standard cover up hoods			state
			For vertical or horizontal use			state
		Steel used	Forged	C30	galvanisation	state
				C40		
			Casting	C30	galvanisation	state
	C40					
Mounting Brackets/ Fixing base	Drawings of top and bottom flanges of end fittings PCDs, holes and thread sizes				Attach	
Insulation creepage	Pollution zone	Application area	SCD mm/kV	USCD mm/KV	specify	
			Medium	Inland	25	43.3
	Heavy	Industrial	31	53.7	state	
	Very heavy	Coastal Area	40	53.7	state	
Insulator shed profile	Design of shed profiles				state	
	Shed spacing projection ratio				state	
	Minimum distance between sheds					
	Creepage to clearance ratio					
	Shed angle					

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		Creepage factor	Medium pollution class	state		
			Extra heavy pollution class	state		
		Mechanical & electrical characteristics	Line voltage in kV		state	
			Maximum Line Voltage in kV		state	
			Power frequency with stand	dry (kVrms)	state	
				wet (kVrms)	state	
			Lightning impulse withstand 1.2/50	positive (kVpeak)	state	
				negative (kVpeak)	state	
			Visible discharge test voltage, min (kV)		state	
			Radio influence Voltage (RIV) at 100kHz	Test (kV)	state	
				Maximum (μ V)	state	
			Specified cantilever load (SCL) (kN)		state	
			Max Design cantilever load MCDL, 65% of SCL		state	
			Specified tensile load - STL		state	
			Maximum design compression - MDC		state	
			Maximum design torsion - MDT		state	
			Number of sheds, A		state	
			Dimensions	vertical (mm)	state	
				horizontal (mm)	state	
			Creepage distance (mm)	Inland	state	
		Industrial		state		
		Coastal regions		state		
		Dry arc distance (mm)		state		
		Mean coating thickness	for iron and steel castings and forgings (g/m^2 (μ m))	state		
			for bolts, nuts and washers (g/m^2 (μ m))	state		
		Approximate weight (kg)		state		
		Finish	Complete post insulators and accessories offered		state	
			High resistance to	moisture	state	
				high salinity	state	
				ultraviolet radiation	state	
high temperature	state					
tropical sunshine	state					
color	state					
Conductor sizes accommodated on top and side grooves		state				
Galvanizing	Smooth finish		state			
	thickness		state			
4.4	Quality Management System					
	Quality Assurance Plan		state			
	Copy of ISO 9001:2008 Certificate		state			
	Manufacturer's experience		state			
	Manufacturing Capacity (units per month)		state			

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	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	Test reports to be submitted by supplier to KPLC for approval before shipment	provide
5.5	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
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	List test reports of the insulators to be submitted to KPLC for approval before shipment	provide
13.0	Statement of compliance to specification (indicate deviations if any & supporting documents)	provide

CLAUSE	Description	Bidders offer	
1.2 c	Composite Horizontal Line Post Insulator - Rated 72.5kV		
	Bidders Name & Address		
	Manufacturer's name and Country of manufacture		
	Type Designation/ Catalogue Number		
	Standards of Design and Manufacture		
4.2	Design & Construction	Type	state
		Rigid	state
	Insulating housing and weather shed housing from same manufacturer	state	
	Reliability and Performance evidence	provide	
	Recyclability and disposability	comment	
	Core	Material of manufacture	state
		Can withstand mechanical stress	state
		Withstands electrical stress of use and overvoltage	state
		Power arc resistance	state
		Diameter of core	state
	Housing & wethersheds	Material of Manufacture	state
		Hardness	state
		Track resistance	state
Sheath thickness		state	

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		Strength of weather-shed to sheath interface		state			
		Can withstand a high pressure washing test		state			
		Metallic end fittings	Defects		state		
			Clamp top type	Mechanical features		state	
				Conventional trunnion		state	
				Additional eye		state	
			K- clamp	Clamping zone properties		state	
				Captive live-line bolt		state	
				Allows for standard cover up hoods		state	
				For vertical or horizontal use		state	
			Steel used	Forged	C30	galvanisation	state
					C40		
			Casting	C30	galvanisation	state	
				C40			
		Mounting Brackets/ Fixing base	Drawings of top and bottom flanges of end fittings PCDs, holes and thread sizes			Attach	
		Insulation creepage	Pollution zone	Application area	SCD mm/kV	USCD mm/KV	specify
			Medium	Inland	25	43.3	state
			Heavy	Industrial	31	53.7	
			Very heavy	Coastal Area	40	53.7	state
		Insulator shed profile	Design of shed profiles			state	
Shed spacing projection ratio			state				
Minimum distance between sheds							
Creepage to clearance ratio							
Shed angle							
Creepage factor	Medium pollution class		state				
	Extra heavy pollution class		state				
Mechanical & electrical characteristics	Line voltage in kV			state			
	Maximum Line Voltage in kV			state			
	Power frequency with stand	dry (kVrms)		state			
		wet (kVrms)		state			
	Lightning impulse withstand 1.2/50	positive (kVpeak)		state			
		negative (kVpeak)		state			
	Visible discharge test voltage, min (kV)			state			
	Radio influence Voltage (RIV) at 100kHz	Test (kV)		state			
		Maximum (µV)		state			
	Specified cantilever load (SCL) (kN)			state			
	Max Design cantilever load MCDL, 65% of SCL			state			
	Specified tensile load - STL			state			
	Maximum design compression - MDC			state			
Maximum design torsion - MDT			state				
Number of sheds, A			state				

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			Dimensions	vertical (mm)	state					
				horizontal (mm)	state					
				Creepage distance (mm)	Inland	state				
			Industrial		state					
			Coastal		state					
			Finish			Dry arc distance (mm)		state		
						Mean coating thickness	for iron and steel castings and forgings (g/m ² (μm))	state		
							for bolts, nuts and washers (g/m ² (μm))	state		
						Approximate weight (kg)				state
						Complete post insulators and accessories offered				state
						High resistance to	moisture			state
							high salinity			state
							ultraviolet radiation			state
							high temperature			state
						tropical sunshine				state
color				state						
Conductor sizes accommodated on top and side grooves				state						
Galvanizing			Smooth finish		state					
			thickness		state					
4.4	Quality Management System									
	Quality Assurance Plan				state					
	Copy of ISO 9001:2008 Certificate				state					
	Manufacturer's 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	Test reports to be submitted by supplier to KPLC for approval before shipment				provide					
5.5	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					
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	List test reports of the insulators to be submitted to KPLC for approval before				provide					

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	shipment	
13.0	Statement of compliance to specification (indicate deviations if any & supporting documents)	provide

CLAUSE	Description	Bidders offer			
1.2 d	Composite Horizontal Line Post Insulator - Rated 145kV				
	Bidders Name & Address				
	Manufacturer's name and Country of manufacture				
	Type Designation/ Catalogue Number				
	Standards of Design and Manufacture				
4.2	Design & Construction	Type	state		
		Rigid	state		
	Insulating housing and weather shed housing from same manufacturer		state		
	Reliability and Performance evidence		provide		
	Recyclability and disposability		comment		
	Core	Material of manufacture		state	
		Can withstand mechanical stress		state	
		Withstands electrical stress of use and overvoltage		state	
		Power arc resistance		state	
		Diameter of core		state	
	Housing & wethersheds	Material of Manufacture		state	
		Hardness		state	
		Track resistance		state	
		Sheath thickness		state	
		Strength of weather-shed to sheath interface		state	
		Can withstand a high pressure washing test		state	
	Metallic end fittings	Clamp top type	Mechanical features	state	
			Conventional trunnion	state	
			Additional eye	state	
		K- clamp	Clamping zone properties		state
			Captive live-line bolt		state
			Allows for standard cover up hoods		state
			For vertical or horizontal use		state
Steel used		Forged	C30 galvanisation	state	
			C40		
		Casting	C30 galvanisation	state	
	C40				
Mounting Brackets/ Fixing base	Drawings of top and bottom flanges of end fittings PCDs, holes and thread sizes		Attach		

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Insulation creepage	Pollution zone	Application area	SCD	USCD	Specify
			Mm/kV	mm/KV	Specify
	Medium	Inland	25	43.3	state
	Heavy	Industrial	31	53.7	state
	Very heavy	Coastal Area	40	53.7	state
Insulator shed profile	Design of shed profiles				state
	Shed spacing projection ratio				state
	Minimum distance between sheds				
	Creepage to clearance ratio				
	Shed angle				
	Creepage factor	Medium pollution class			state
	Extra heavy pollution class			state	
Mechanical & electrical characteristics	Line voltage in kV				state
	Maximum Line Voltage in kV				state
	Power frequency with stand	dry (kVrms)			state
		wet (kVrms)			state
	Lightning impulse withstand 1.2/50	positive (kVpeak)			state
		negative (kVpeak)			state
	Visible discharge test voltage, min (kV)				state
	Radio influence Voltage (RIV) at 100kHz	Test (kV)			state
		Maximum (µV)			state
	Specified cantilever load (SCL) (kN)				state
	Max Design cantilever load MCDL, 65% of SCL				state
	Specified tensile load - STL				state
	Maximum design compression - MDC				state
	Maximum design torsion - MDT				state
	Number of sheds, A				state
	Dimensions	vertical (mm)			state
		horizontal (mm)			state
	Leakage distance (mm)				state
	Dry arc distance (mm)				state
	Mean coating thickness	for iron and steel castings and forgings (g/m ² (µm))			state
for bolts, nuts and washers (g/m ² (µm))			state		
Approximate weight (kg)				state	
Finish	Complete post insulators and accessories offered				state
	High resistance to	moisture			state
		high salinity			state
		ultraviolet radiation			state
		high temperature			state
	tropical sunshine			state	
	color				state
Conductor sizes accommodated on top and side				state	

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		grooves	
	Galvanizing	Smooth finish	state
		thickness	state
4.4	Quality Management System		
	Quality Assurance Plan		state
	Copy of ISO 9001:2008 Certificate		state
	Manufacturer's 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	Test reports to be submitted by supplier to KPLC for approval before shipment		provide
5.5	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
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	List test reports of the insulators to be submitted to KPLC for approval before shipment		provide
13.0	Statement of compliance to specification (indicate deviations if any & supporting documents)		provide

NOTE:

- 1) Bidders shall give full GTP values offered for each 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 and/or brochures for the purpose of tender evaluation. Bidders who shall not have complied with this requirement shall be automatically disqualified from bidding for this tender.
- 2) The schedule in Annex A does not in any way substitute for detailed information required elsewhere in the specification.

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

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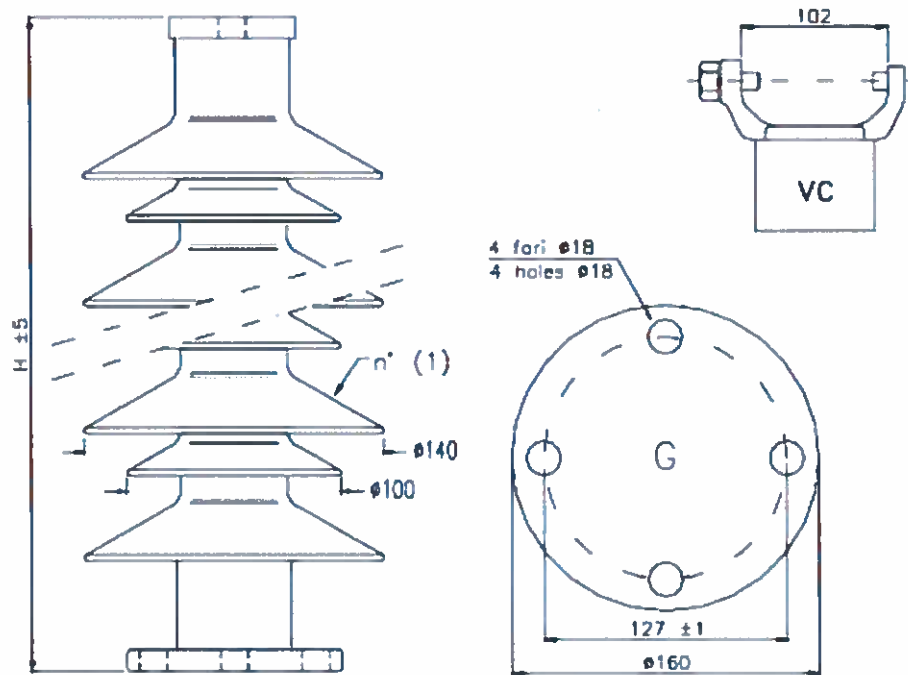
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ANNEX B: DRAWINGS



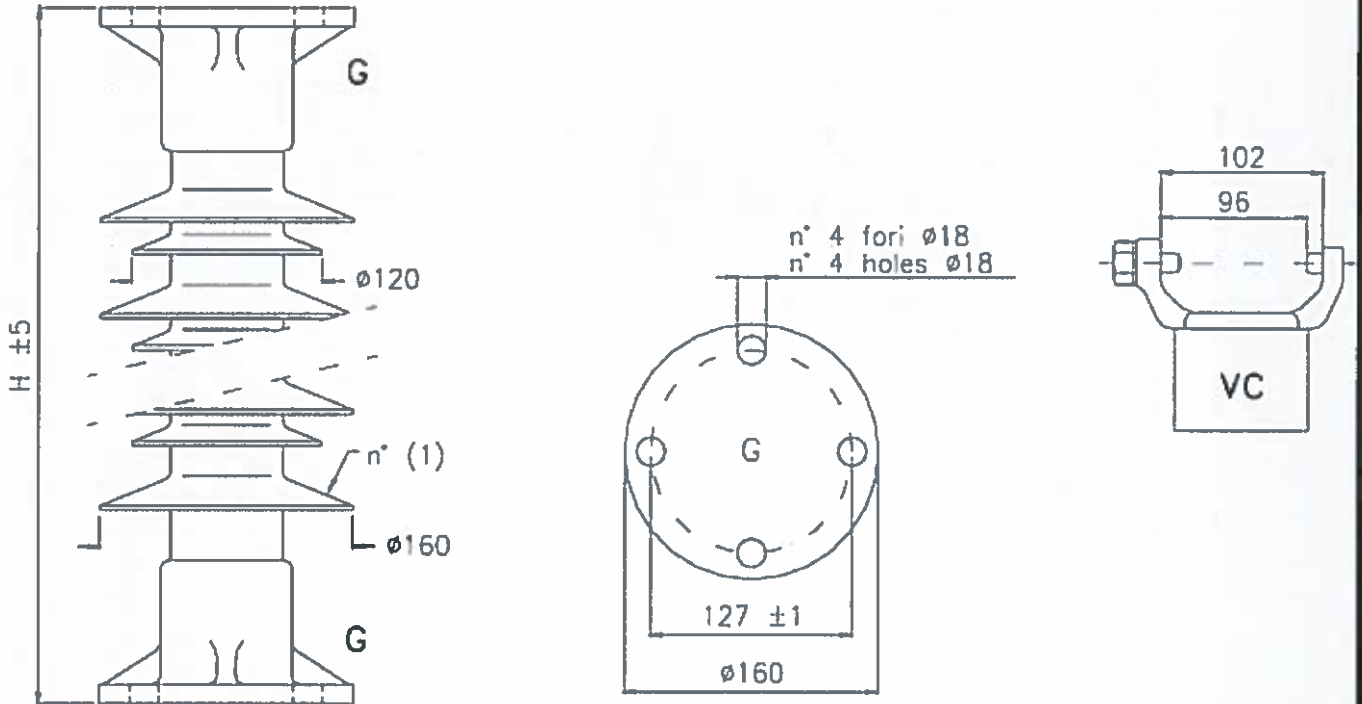
All dimensions are in millimetres
 Dimensions tolerance acc. to IEC 61952

NOTE:

- Recommended line fitting by KPLC is **designation VC**
- Recommended Ground fitting by KPLC is **designation G**

Fig. 1: COMPOSITE VERTICAL LINE POST INSULATOR – Rated 72.5kV

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All dimensions are in millimetres
 Dimensions tolerance acc. to IEC 61952

NOTE:

- Recommended line fitting by KPLC is **designation VC**
- Recommended Ground fitting by KPLC is **designation G**

Fig. 2: COMPOSITE VERTICAL LINE POST INSULATOR – Rated 145kV

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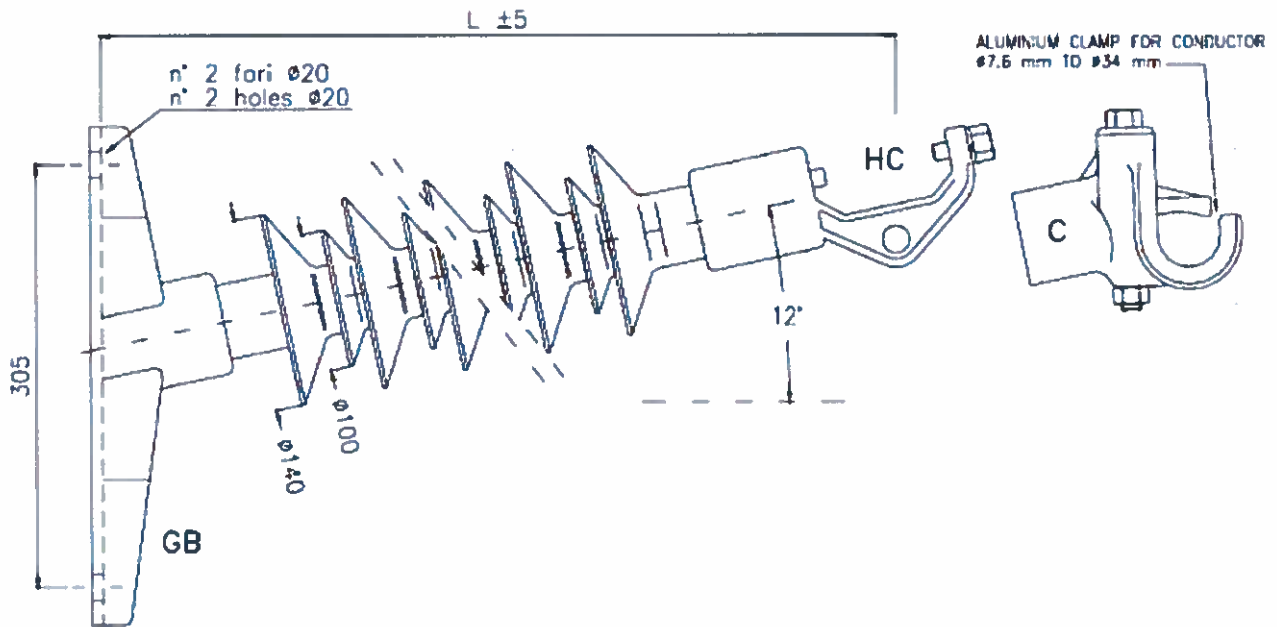


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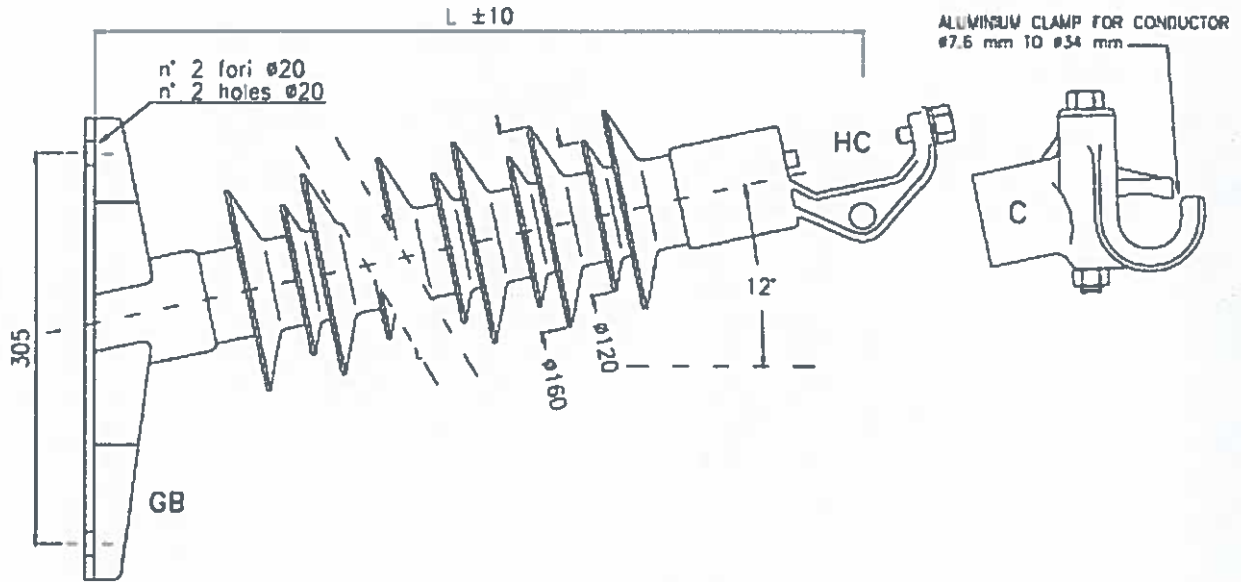
All dimensions are in millimetres
 Dimensions tolerance acc. to IEC 61952

NOTE:

- Recommended line fitting by KPLC is **designation HC**
- Recommended Ground fitting by KPLC is **designation GB**
- The other fittings **designation C** (Line fittings) shall be recommended on request by KPLC during tender

Fig. 3: COMPOSITE HORIZONTAL LINE POST INSULATOR – 72.5kV

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All dimensions are in millimetres
 Dimensions tolerance acc. to IEC 61952

NOTE:

- Recommended line fitting by KPLC is **designation HC**
- Recommended Ground fitting by KPLC is **designation GB**
- The other fittings **designation C (Line fittings)** shall be recommended on request by KPLC during tender

Fig. 4: COMPOSITE HORIZONTAL LINE POST INSULATOR – Rated 145kV

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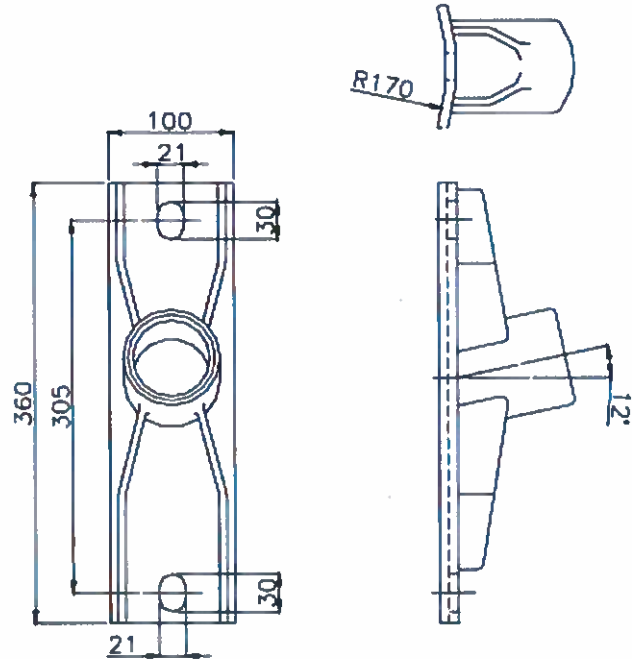


Fig. 5: Galvanized steel Gain Base (GB)

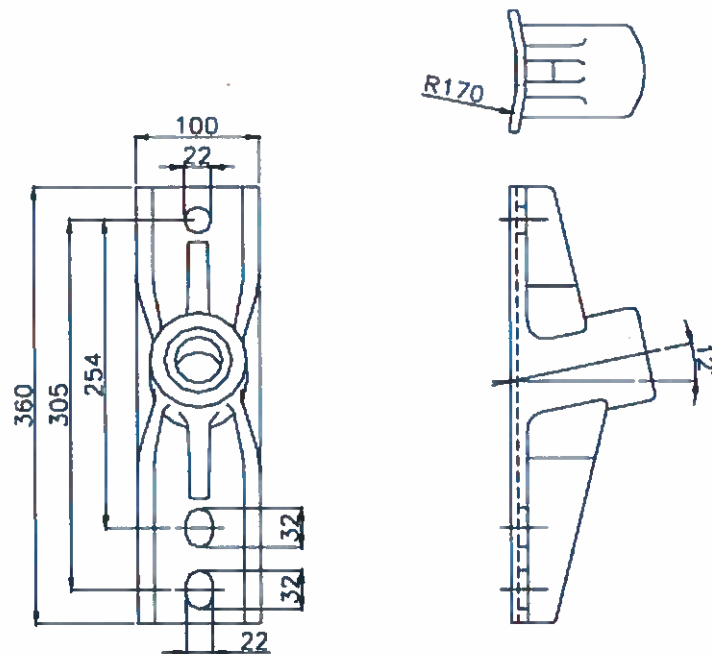


Fig. 6: Aluminium Gain Base (GB)

Dimensions tolerance acc. to IEC 61952

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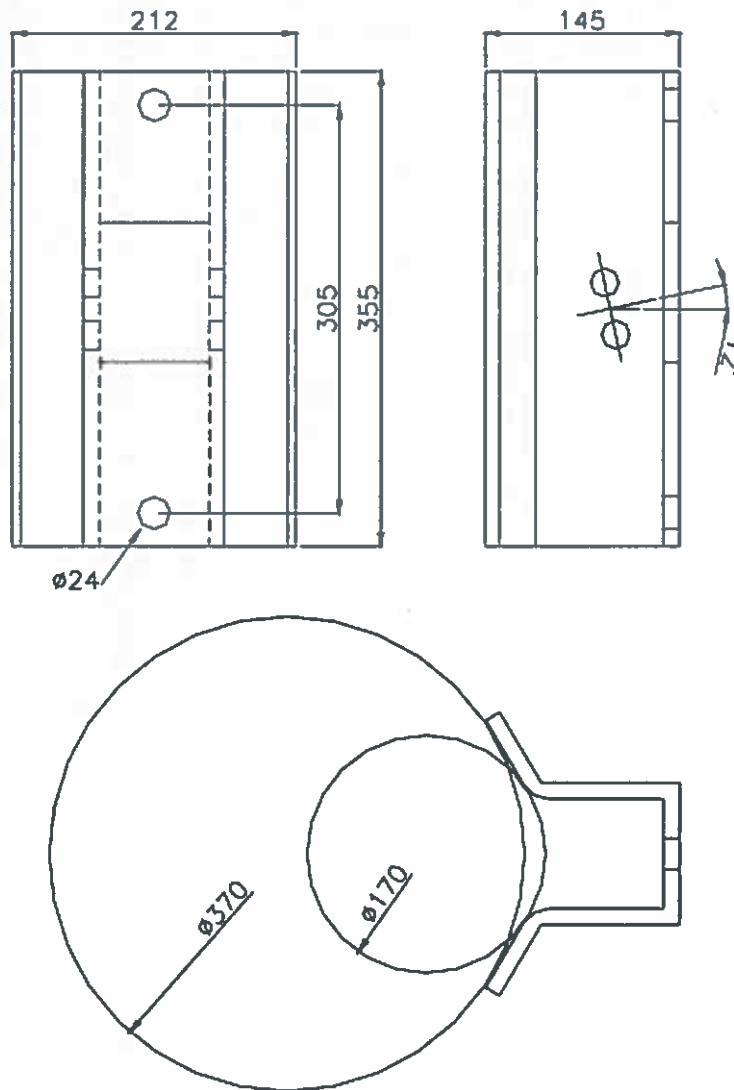


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All dimensions are in millimetres
 Dimensions tolerance acc. to IEC 61952

Fig. 7: Galvanized steel Horizontal Base (HB) for wooden pole

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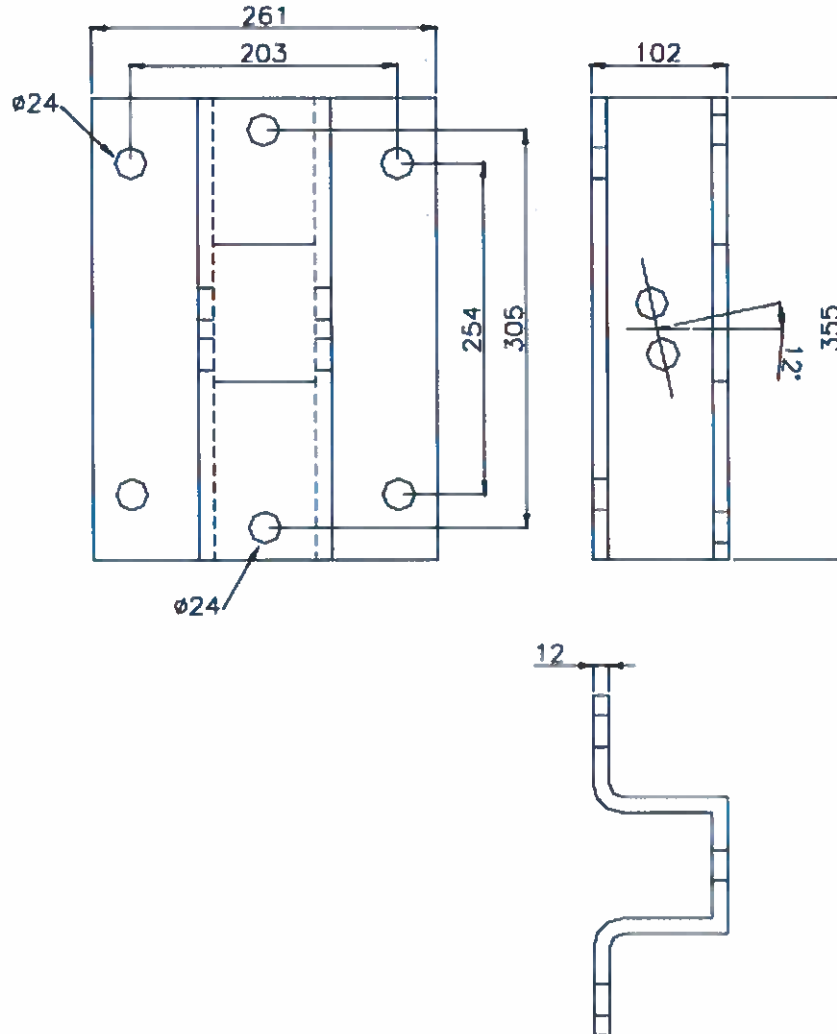


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All dimensions are in millimetres
 Dimensions tolerance acc. to IEC 61952

Fig. 8: Galvanized steel Horizontal Flat Base (HB)for steel pole

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Mounting Bracket

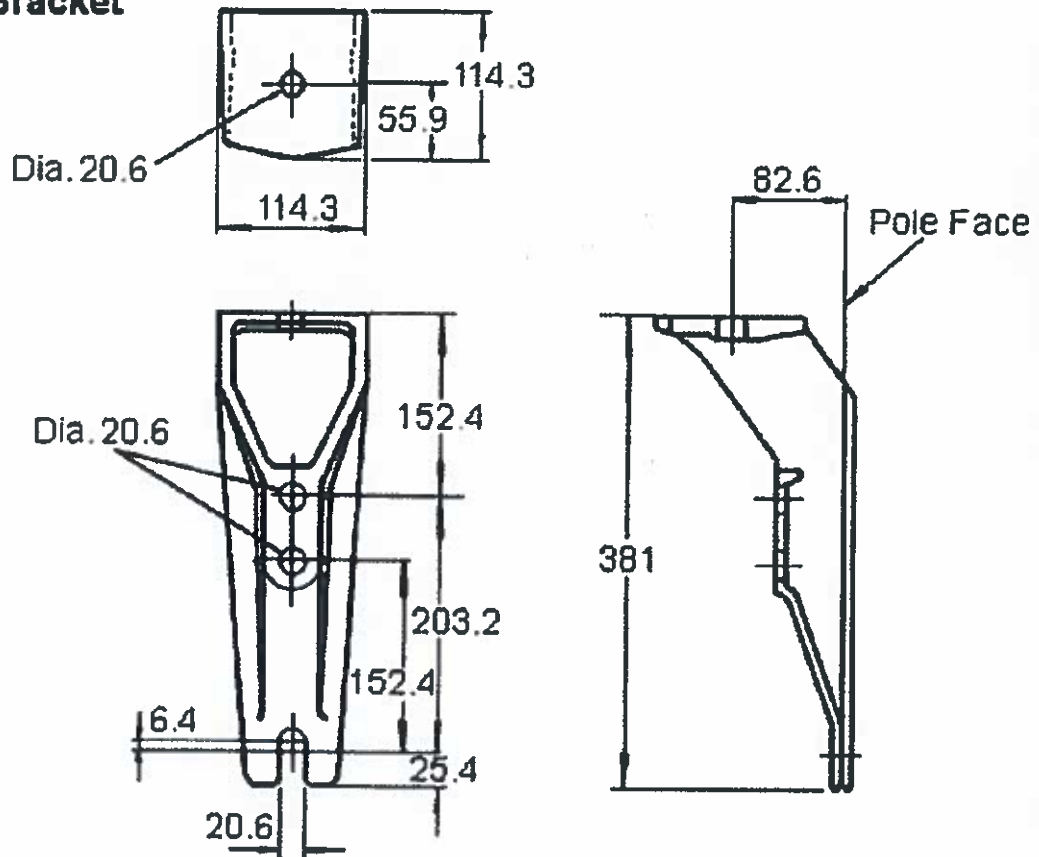


Fig. 8: Vertical mounting base for wood poles

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