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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
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Electronic copy (pdf) on Kenya Power Server (currently :Network-\\stima-fprnt-001\techstd&specs	

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2013-09-06	New issue	Michael Apudo	George Owuor

FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with Common Services Section both of The Kenya Power and Lighting Company Limited (KPLC/Kenya Power) and it lays down requirements for Insulated Hand Tools for live line work. It is intended for use by Kenya Power in purchasing the tools.

1. SCOPE

1.1. This specification is for insulated hand tools for live line work along power lines, in substations and electrical installations operated at 50Hz.

1.2. This specification covers the following insulated hand tools for live line work:-

i) Grip all clamp stick
ii) Wire holding stick
iii) Telescoping measuring/disconnect tool
iv) Tie stick
v) All angle cog wrench
vi) Torque extension stick
vii) Hex socket set
viii) Universal pole
ix) Cross arm tool hanger
x) Wire cutter, Hydraulic
xi) Hot stick tension puller
xii) Tree trimmer tool

1.3. The specification also covers inspection and testing of the insulated hand tools as well as a schedule of Guaranteed Technical Particulars to be filled, signed by the supplier and submitted for tender evaluation.

1.4. The specification stipulates the minimum requirements for insulated hand tools for live line work acceptable 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 tools for The Kenya Power & Lighting Company.

1.5. **Brand names or catalogue numbers referred to in this specification are intended to be descriptive only and not restrictive. The Tenderer may adopt higher standards, brand names, and or catalogue numbers in its Tender, provided that it demonstrates to KPLC's satisfaction that the substitutions ensure equivalence to the requirements.**

1.6. 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 edition of the referenced documents (including any amendments) applies.

IEC 60855-1:	Live working – Insulating foam-filled tubes and solid rods – Part 1: Tubes and rods of a circular cross-section;
IEC 61235:	Live working - Insulating hollow tubes for electrical purposes;
ASTM F711-02:	Standard Specification for Fiberglass-Reinforced (FRP) Rod and Tube Used in Live Lines
IEC 60832-1:	Live Working: Insulating Sticks and attachable devices: Part 1- Insulating sticks
IEC 60832-2:	Live Working: Insulating Sticks and attachable devices: Part 2: Attachable devices
ASTM F1826-00:	Standard Specification for Live Line and Measuring Telescoping Tools
ASTM D877 – 02:	Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes
IEC 62193:	Live Working: Telescopic sticks and telescopic measuring sticks

OSHA Regulation 1910.269: Part J: Live Line Tools

3. TERMS AND DEFINITIONS

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

3.2. Abbreviations

3.2.1. **IEC:** International Electro-technical Commission
3.2.2. **ISO:** International Standards Organization

3.2.3. **OSHA**: Occupational Safety and Health Administration
3.2.4. **ASTM:** American Society for Testing and Materials
3.2.5. **Hollow tube**: an insulating tube that is manufactured from material such as synthetic materials that may be reinforced with mineral or artificial fibres.
3.2.6. **Solid rod**: an insulating rod that is manufactured from material such as synthetic materials that may be reinforced with mineral or artificial fibres.
3.2.7. **Foam filled tube**: an insulating tube filled with unicellular plastic foam and suitably plugged with epoxy to prevent moisture ingress.

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

4.1.1. Physical service conditions

The tools shall be suitable for continuous use outdoors in tropical areas at altitudes of up to 2200m above sea level, humidity of up to 90%, average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C and heavy saline conditions along the coast.

4.1.2. Approach & Insulation Distance Information

MAD = Minimum Approach Distance is the minimum air gap or summation of air gaps measured between any part of the operator and live electrical apparatus. Detailed information can be found in OSHA guidelines in Table R-6 of the Federal Register. An extraction from the standard for minimum distances based on ideal circumstances is tabulated below:

Table 1: Live Working Recommended Minimum Distances at a Glance

Nominal Voltage AC (kV) Auto-reclose Distance	Minimum Approach Distance (MAD)	
	Phase to Earth OFF (mm)	Phase to Phase OFF (mm)
11	350	400
33	450	550
66	600	800
132	900	1300
220	1300	2000

4.2. DESIGN AND CONSTRUCTION

4.2.1. GENERAL REQUIREMENTS

4.2.1.1. Live working tools shall be generically fiberglass tubes with solid unicellular foam filled cores. They shall be factory tested to 100kV/300mm of insulation.

4.2.1.2. The tools shall comply with ASTM F7-11, IEC60855, IEC 60832-1&2, IEC 61235, and OSHA Regulation standards 1910.269: Part J and all applicable IEC, ISO, ASTM, ANSI and KS Standards.

4.2.1.3. Insulating operating sticks shall be manufactured from fiberglass reinforced plastic or other synthetic materials that may be reinforced with mineral or artificial fibers. The sticks shall be telescopic or solid type.

4.2.1.4. Solid type operating stick shall comprise of single or multiple sections of foam filled tubes or solid rods of fiberglass material The foam filled tubes or solid rods of a solid type operating stick shall be designed, manufactured and tested in accordance with IEC 60855 or ASTM F711-02.

4.2.1.5. The live line tool shall achieve its insulation rating when the stick surface is clean, free of moisture, in good condition and hydrophobic (tending to repel and not absorb water).

4.2.1.6. Hollow tubes shall be manufactured using a pullwinding process whereas foam filled tubes shall be manufactured by pultrusion process that results in a product with extremely high electrical and mechanical qualities.

4.2.1.7. The pullwinding process shall be based on fibers that are impregnated with a thermosetting resin and pulled through a heated die where curing takes place.

4.2.1.8. Sections of a multiple section stick shall be so designed that sections can be coupled together by means of:

a) Fiberglass splicing and durable spring-loaded pins to lock the sections in position or,
b) Durable adapters.

4.2.1.9. Operating sticks shall be designed to couple with universal fittings and thumbscrews to accommodate operating, testing and earthing tools.

4.2.1.10. The metallic castings of the end fittings shall be made of heat treatable aluminum alloy of class 6061-6T with properties recommended by Aluminium Association as shown in table 3, unless otherwise stated:

4.2.2. TECHNICAL REQUIREMENTS

Table 2: Properties of Hollow and Foam-filled tubes for electrical applications

Diameter	from 10mm (0.39") to 65mm (2.56") OD (± 1.0mm)	
Wall thickness	from 2mm (0.08") up to 3mm (0.12") (± 1.0mm)	
Length	Shall be specified	
Colours	RAL or Pantone colour	
Electrical work	LIVE WORKING	LIVE WORKING
Tube profile	Hollow	Foam-filled
Manufacturing method	Pullwinding	Pultrusion
Structure	UCUV	FUV
Materials	Glass fibers, epoxy resin	Glass fibers, epoxy resin
Fiber weight content	75-80 %	70 %
E-modulus	> 40 GPa	> 45 GPa
Density	2.0 g/cm^3	2.0 g/cm^3
Surface finish	Nonwoven (exelen)	Nonwoven (exelen)
Water absorption	< 0.2 %	< 0.2 %
Minimum pulling strength	4000 N±5%	4000 N±5%
Consistency of rod	137 gr/m	137 gr/m
Min. Bending Radius	388mm	388mm
U = unidirectional fibers C = cross winded fibers V = surface finish: Nonwoven veil F = foam		

Table 3: Properties of Aluminium Alloy

No	Physical property	Value		Mechanical property	Value
1	Density	2.70 g/cm³		Proof Stress	270 MPa
2	Melting Point	650 °C		Tensile Strength	310 MPa
3	Thermal Expansion	23.4 x10-6 /K		Poisson's ratio	0.33
4	Modulus of Elasticity	70 GPa		Elongation A5	12 %
5	Thermal Conductivity	166 W/m.K		Shear Strength	190 MPa
6	Electrical Resistivity	0.040 x10-6 Ω .m		Hardness Vickers	100 HV

Table 4: Chemical composition of aluminium alloy

Component	Weight %	Component	Weight %	Component	Weight %
Al	95.8-98.6	Mg	0.8-1.2	Si	0.4-0.8
Cr	0.04-0.35	Mn	Max. 0.15	Ti	Max. 0.15
Cu	0.15-0.40	Other, each	Max. 0.05	Zn	Max. 0.25
Fe	Max 0.7	Other, each	Max. 0.15		

4.3. GRIP-ALL CLAMP STICK

4.3.1. The Grip all clamp stick shall be made of a high insulating tube-rods made of polyester resin reinforced fiberglass with external diameter of 32mm and 40mm; and lengths of 8'6" (2.6m) and 9'10" (3.0m) respectively.

4.3.2. The most versatile tool in a line worker's hands, the grip-all clamp stick shall be able to put an easy-to-control "finger" on an insulated pole.

4.3.3. It shall be designed to install hot-line and grounding clamps, for both overhead and underground circuits with various end fittings.

4.3.4. The grip-all clamp stick shall be in accordance with the general arrangement shown in Figure 1.

Figure 1: Grip-all Clamp Stick

4.3.5. Commonly called a "shotgun," the operating mechanism shall incorporate a sliding hand grip that opens the hook to grasp a clamp eye screw and retract it into the tool head.

4.3.6. It shall also have a thumb latch which when depressed shall release the locked hand grip so that it can open the hook.

4.3.7. The tool head shall be made of polycarbonate resin thermoplastic so as to offer greater thermal resistance for close-quarter operations.

4.3.8. While in use, the operator shall be able to maintain recommended working distances solely on the epoxy glass pole sections of the handle as the hook and its actuator are metal parts.

4.3.9. Grip-all clamp sticks shall be easy to care for and shall not require field stripping to clean. All insulated parts including the operating rod shall be outside the main pole, readily accessible to wipe dry.

4.3.10. A notice of caution shall appear on the body of the tool: **CAUTION: Do not clean the plastic head with solvent.**

4.4. WIRE-HOLDING STICK

4.4.1. Wire-holding stick shall be used on or around energized lines for forming, bending and positioning jumper wires; and for holding conductors during splicing operations.

4.4.2. Wire-holding stick shall have a foam filled shaft and solid fiberglass operating rod tested per ASTM F-711 & OSHA. The sizes shall be as shown in table

4.4.3. The wire holding stick shall be in accordance with the general arrangement shown in Figure 2.

4.4.4. The gripper shall be equipped with an eye so that other sticks can assist with heavy bending of 16mm^2 solid copper through 800mm^2 ACSR conductors.

4.4.5. Operation of the wire-holding stick shall be simplified so that it grips much like locking-type pliers.

4.4.6. By tightening the knurled nut at the control lever, the wire holding jaws shall be positioned to firmly grip the conductor. When this is done, the tightening control lever shall have to be relaxed in a position about 25.4mm (1") away from the pole.

4.4.7. To secure the grip on the conductor, the lever shall be pushed down to the pole; and to release the conductor, the lever control shall simply be moved all the way up along the rod.

4.4.8. The head of the tool shall be able to lock in three stop positions so that the lineman can engage and position conductors easily from most angles.

4.4.9. There shall be a knurled screw handle below the jaw opening which shall be used to adjust the head position from straight to right or left as shown in fig. 2.

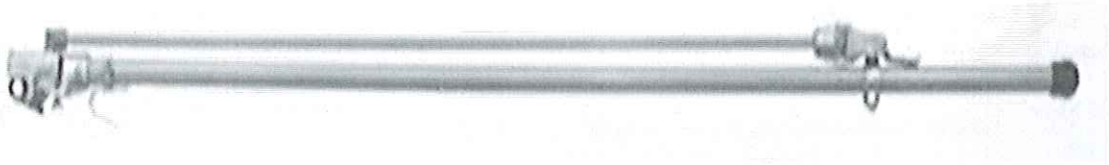
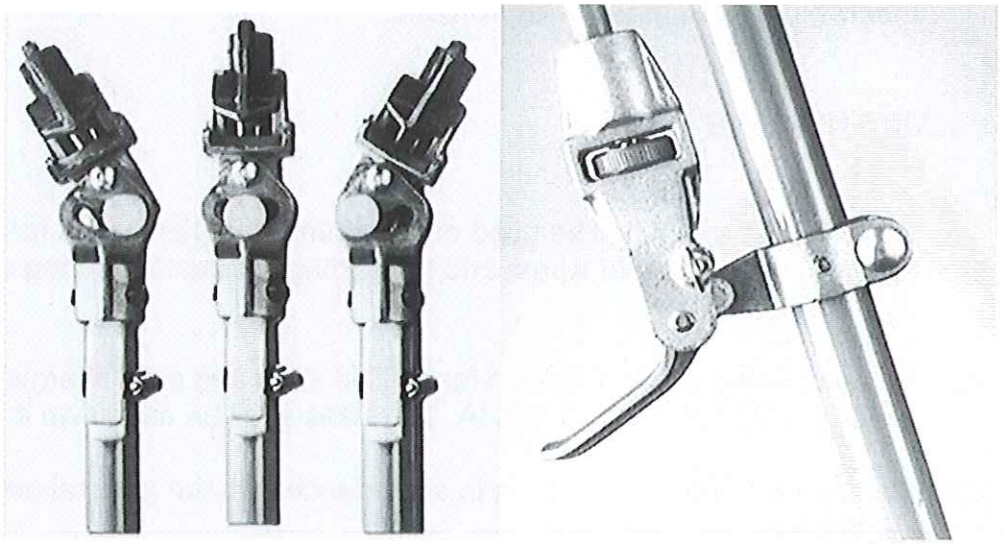


Figure 2: Wire Holding Stick



Details of Figure 2 (Wire holding stick)

Table 5: Sizes of wire-holding stick

No	Pole OD (mm)	Length OAL (mm)	Conductor Capacity (mm)	Weight (kg)
1	32	1955	4.0-38.0	2.7
2	32	2565	4.0-38.0	3.0

4.5. TELESCOPIC OPERATING AND MEASURING STICKS

4.5.1. Design characteristics

4.5.2. Telescopic operating stick shall be manufactured in accordance with IEC 62193 or ASTM F1826-00 and shall comprise of telescopic sections that are locked in position by means of durable spring-loaded pins.

4.5.3. The top section of such a stick shall be of foam filled tubes or solid rods that are designed, manufactured and tested in accordance with IEC 60855 or ASTM F711-02 whereas the rest of the telescopic link stick shall be made of insulating tubes that are designed, manufactured and tested in accordance with IEC 61235 or ASTM F711-02.

4.5.4. The effective visible length of the top section shall be not less than 1200mm when extended whereas the overlapping sections shall not be less than 150mm with springs and pins to lock the extended sections.

4.5.5. The tool shall be supplied complete with disconnect heads for operating switches and cutouts. The heads shall be removable.

4.5.6. The end fitting on insulated top section shall accept other Universal Tool Accessories for various tasks near energized conductors all from the ground.

4.5.7. The tool shall be suitable to perform the following tasks:

a) Prune trees
b) Replace open-link fuses
c) Brush paint
d) Remove pole cover-up
e) Clean conductors
f) Spray aerosols
g) Replace light bulbs
h) Gauge conductor size

4.5.8. The telescoping tool shall be used to measure pole heights and conductor clearances from the ground.

4.5.9. The single tool shall be marked with both Metric and English scales which shall be easy-to-read, and made of large black figures silkscreened on orange fiberglass sections.

4.5.10. English scales shall be marked with each 1-foot increment designated in a box, each inch in bold numbers and half-inches designed by intermediate bars. Metric scales shall similarly display meters, decimeters and centimeters.

4.5.11. Different parts of the body shall constitute of a hook, round section, complete lock assembly, drive/roll pin, pin & spring assembly and base cap.

4.5.12. The telescopic measuring/disconnect tool shall be in accordance with the general arrangements shown in Figure 3, 4 and 5.

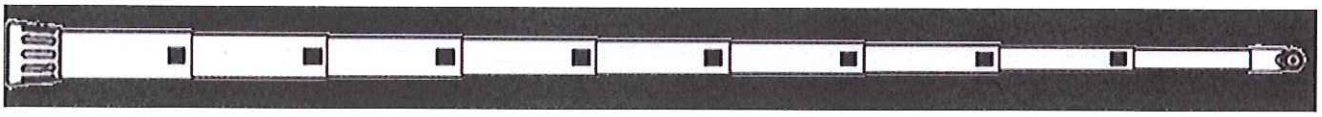


Fig. 3a: Telescopic operating stick

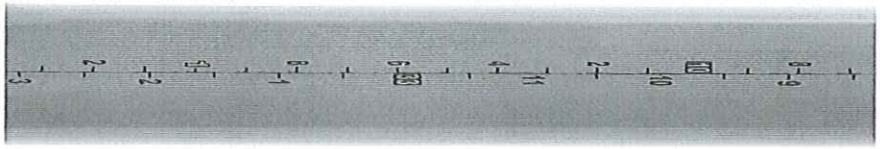


Fig. 3b: - Telescopic operating sticks scale

4.6. TIE STICKS

4.6.1. Tie sticks shall be manufactured from closed cell foam filled tubular fiberglass made in accordance with ASTM F711-02 standard.

4.6.2. The stick shall be of two types of end fittings. The standard head and the heavy duty prong disconnect which shall both be made of durable high strength heat treated aluminum or bronze alloy.

4.6.3. The tie sticks shall be of the following designs:

a) **Rotary Prong Tie Sticks**; these shall be speedy and easy to operate for handling looped ties.
b) **Two-Prong Tie Sticks**; these shall be suitable for handling hot ties with loops.
c) **Rotary Blade Tie Sticks**; these shall have a swivel action that permits greater freedom of movement than the fixed-blade types.

4.6.4. The tie sticks shall be in accordance with the general arrangement shown in Fig. 4.

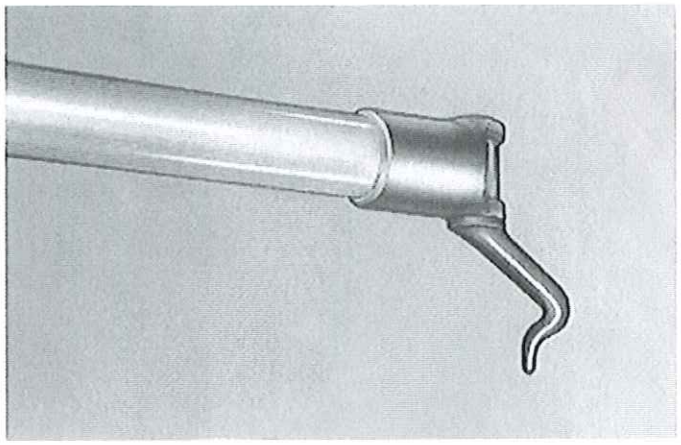


Figure 4: Tie Stick

4.6.5. The tie sticks shall be of the following dimensions:

Table 6: Tie stick sizes

Head	End	Overall Length	Approximate Weight
Rotary Prong	Universal	8' 3" (2515mm)	3 lb./1.4 kg
Two-Prong	Universal	8' 4" (2540mm)	4 lb./1.8 kg
Rotary Prong	Rotary Blade	8' 2" (2489mm)	1/2 lb./1.6 kg

4.7. ALL-ANGLE COG WRENCH

4.7.1. The all-angle cog wrench shall be in accordance with the general arrangement shown in Figure 5.

Figure 5a: All-angle cog wrench

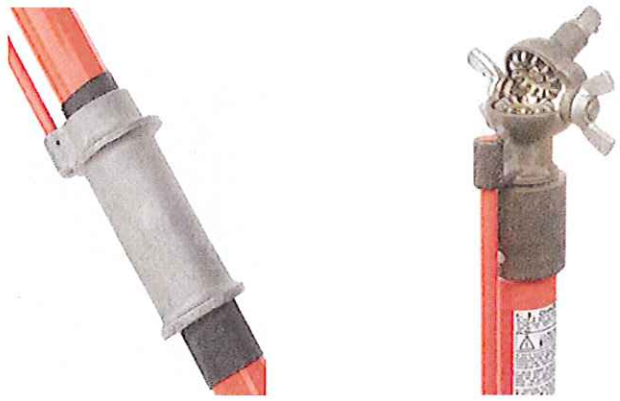


Fig. 5b: 1/2-inch square drive

4.7.2. It shall be designed for tightening of running nuts down on long bolts that don't require a higher torque such as mounting hardware for lightning arresters and static-ground assemblies not under strain conditions. The wrench shall offer 20Nm (15 ft.-lb.) maximum torque rating.

4.7.3. It shall come complete with controls to permit operator efficiency in locating the wrench on energized hardware.

4.7.4. The wrench head's angle relative to the handle shall be adjustable in a 140°range with wing nuts on both sides of the head being tightened by hand to hold the head in a friction-locked position during use. This lets the line worker to efficiently attain the angle needed to reach a fastener.

4.7.5. To start tightening, the hand grip shall steady the tool and hold the cog head in place. Rotating the pole shall turn the cog gears to engage the wrench on the nut or bolt

4.7.6. The body shall be made of epoxy glass hot line tool of about 1 ½" (38.1mm) in diameter with a 3/8" (9.5mm) diameter fiberglass control rod.

4.7.7. The hand-grip shall be made of heat treatable aluminum alloy, the cog housing shall be made of bronze alloy and the gears made of hardened stainless steel.

4.7.8. To provide live-line approach distances required for many system voltages, the All-Angle Cog Wrench shall be available in lengths of 6-, 8- 10- and 12-feet. These easy-to-use tools shall weigh only 7, 7 ½, 8 and 9 lb. (3.2, 3.4, 3.6 and 4.1kg.) respectively.

4.8. TORQUE EXTENSION STICK

4.8.1. The torque extension stick shall be in accordance with the general arrangement shown in Figure 6.

Figure 6: Torque extension stick

4.8.2. The tool shall be insulated extension stick type that permits hot-line work with hydraulic power tools on bucket trucks.

4.8.3. The torque extension stick shall have 7/16" (11.1mm) hexagonal quick-connect fitting that couples with a power tool's drive socket.

4.8.4. On the other end, it shall have a square detent-ball fitting that accepts all ½" (12.7mm) drive wrenches.

4.8.5. The tool shall be complete with 1 ¼" x 4' (32mmx100mm) epoxy glass pole tested as per OSHA & ASTM F711 and a hand guard that is 6 inches (150mm) from the ferrule with hex fitting.

4.8.6. The torque extension stick shall be approximately 75 ft. (22.86m) with weight of about 5 lb. (2.25 kg).

4.9. HEX SOCKET SETS

4.9.1. The hex socket sets shall be designed, manufactured and tested as per OSHA & ASTM F711-02.

4.9.2. The hex socket sets shall be available in metric sizes. Each set shall include sockets to fit any ½ "(12.7 mm) square-shank drive tool such as the All-Angle Cog Wrench and Flexible Insulated Wrench.

4.9.3. The hex socket sets shall be in accordance with the general arrangement shown in Figure 7.

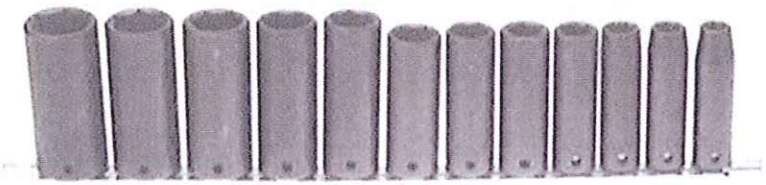


Figure 7: Hex socket sets

4.9.4. The hex socket set shall include 11 deep-well 6-point sockets in sizes from 1/2"(12.7mm) through 1 1/8" (28.6mm) and 10 deep-well 6-point sockets in sizes from 10mm through 19mm.

4.10. UNIVERSAL POLE

4.10.1. The universal pole shall be designed for use as a hot stick handle for Universal Tools and shall be made of epoxy glass rod tested as per OSHA & ASTM F711-02.

4.10.2. It shall have lightweight aluminum castings with external diameter of 32mm and 40mm; 8'6" (2.6m) and 9'10" (3.0m) in length respectively.

4.10.3. The universal pole shall be in accordance with the general arrangement shown in Figure 8.

Figure 8: Universal pole

4.10.4. It shall be able to fit under the thumbscrew of the spline on the Universal Pole and for job versatility, the splines shall allow angling of the tool up to 90° depending upon the individual tool design.

4.10.5. The universal pole shall be supplied complete with universal adapter (Universal Tool) that may be added between the pole and the tool to gain any angle desired.

4.10.6. When this adapter is mounted on a universal stick, and any universal tool is mounted on the adapter, it will be possible to set the tool at almost any angle to the stick. This requirement shall be useful for working in close places.

4.11. CROSS ARM TOOL HANGER

4.11.1. The cross-arm tool hanger shall be in accordance with the general arrangement shown in Figure 9.

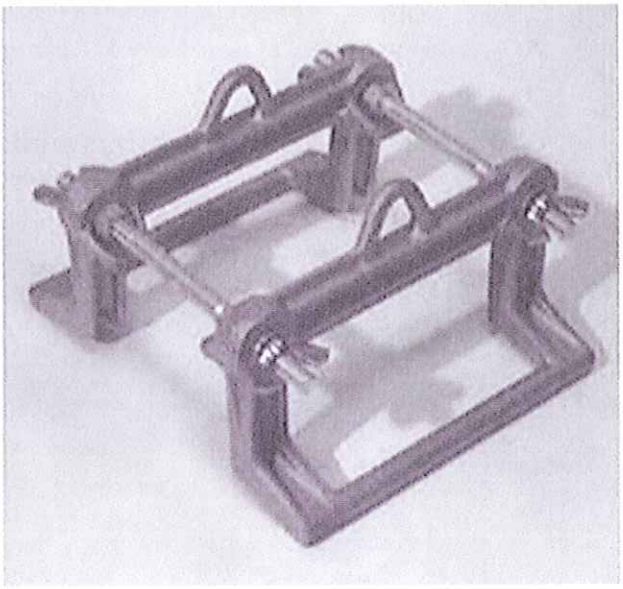


Figure 9: Cross-arm tool hanger

4.11.2. The hanger shall be adjustable to suit cross arms ranging in width from 3¼" (83mm) to 4½" (114mm), with various depths of the cross arm.

4.11.3. The cross-arm tool hanger shall be made of strong, lightweight aluminum alloy with cadmium-plated steel hardware.

4.11.4. The cross-arm tool hanger shall be approximately 2lb./0.9kg in weight.

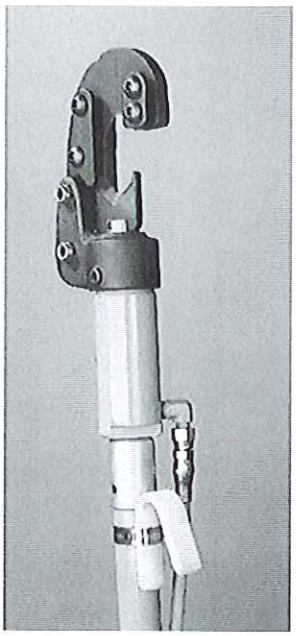
4.12. HYDRAULIC WIRE CUTTER

4.12.1. The wire cutter shall be designed such as to allow a single line worker to easily cut large-gauge conductors with the power-assist of the tool's closed hydraulic system.

4.12.2. The wire cutter shall operate like a hydraulic jack, by simply pumping the handle. Hydraulic ram shall fully retract in the Open position and for efficient cutting, the upper and lower jaw edges shall be made very sharp.

4.12.3. The wire cutter (hydraulic) shall be in accordance with the general arrangement shown in Figure 10.

Figure 10a: Wire cutter, hydraulic



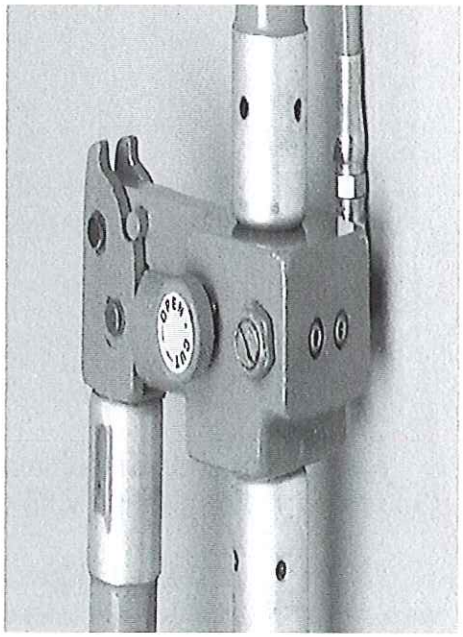


Fig. 10b: Cutting edge **Fig 10c: The control knob**

4.12.4. There shall be a single control knob that selects direction as shown in Fig. 11c.

4.12.5. The notice sign shall be marked on the body of the tool: **When storing tool, be sure to relieve hydraulic pressure by turning knob to the Open position.**

4.12.6. Epoxy glass pole, handle and hydraulic hose shall be tested to 100kV per 300mm as per OSHA & ASTM F711.

4.12.7. The hydraulic oil shall have a dielectric breakdown voltage of more than 25kV as per ASTM D877.

4.12.8. The hose shall have minimum burst strength of 82.74MPa (12,000 psi) whereas the pump shall provide 62.055MPa (9,000 psi) maximum pressure.

4.12.9. The wire cutter shall be of size 1830mm (6') and weigh 10Kg (21.56lbs.). It shall be able to cut up to 500mm^2 ACSR or copper wires.

4.12.10. The tool shall be supplied complete with a waterproof storage bag that helps guard against contaminants and abrasion to help maintain the insulating properties of hotline tools.

4.12.11. The bag shall be a yellow heavy-duty vinyl-impregnated fabric that lasts for years of rugged service with snaps, closures and custom-tailored pockets that fit the tool.

4.12.12. Maintenance and operating instructions manuals shall be included with each tool supplied.

4.13. INSULATED WIRE CUTTER

4.13.1. The wire cutter (insulated) shall be in accordance with the general arrangement shown in Figure 11.

4.13.2. .The wire cutter (insulated) shall come in three models to a choice of insulated long or short handles on cutters for soft wire and insulated long handles on cutters for ACSR conductors.

4.13.3. The wire cutter (insulated) shall be orange in colour; the handles shall be 1½" (38mm) diameter epoxy glass rod with black rubber cushion grips.

4.13.4. The wire cutter (insulated) shall have shear-type blades that cut without deforming cable.

4.13.5. The wire cutter (insulated) shall have heat-treated tool-steel cutter heads that are the same as those for ratchet cable cutters and may be interchanged in the field. Replacement or spare cutter heads shall be supplied as a separate item.

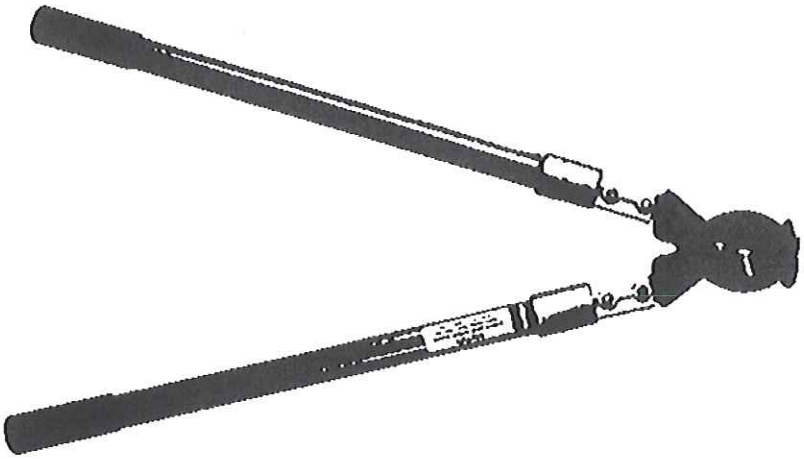


Figure 11: Wire cutter, insulated

4.14. HOT STICK TENSION PULLER

4.14.1. The hot stick tension puller shall be in accordance with the general arrangement shown in Figure 12.

4.14.2. The hot stick tension puller shall be equipped with rings so that it can be handled and operated with the grip-all clamp stick or with rubber gloves.

4.14.3. It shall have a hook on each end that is non-swiveling for positive hot stick operation and it shall also have a spring-loaded gate which will rotate 135 degrees left or right from closed position.

4.14.4. For operational ease there shall be a selector lever on the ratchet wrench of the models suitable to accommodate hot sticks of different sizes.

4.14.5. The hot stick tension puller shall have the following ratings and approximate weights as per fig 12 and the table below.

Table 8: Ratings of tension puller

Description	Weight
34.5 kV, Safety Hook both ends	12 lb. / 5.4 kg
69 kV, Safety Hook both ends	12 1/2 lb./ 5.6 kg

Specifications:	34.5 kV	69 kV
Capacity	4,000 lb.	4,000 lb.
Working range	58-70 in.	66-76 in.
Maximum take-up	12 in.	12 in.
Insulation		
Maximum	43 in.	51 in.
Minimum	31 in.	39 in.
Length	60 in.	66 in.

Figure 12: Hot stick tension puller

4.15. TREE TRIMMER TOOL C/W MALE SPLICE

4.15.1. The tree trimmer tool shall be in accordance with the general arrangement shown in Figure 13.

4.15.2. The tree trimmer tool shall be designed to cut up to 1.5" (38mm) diameter tree branches and shall be especially useful around energized conductors or in hard to get places.

4.15.3. The Tree trimmer head shall have sharpened stationary and movable blades made of dropforged steel.

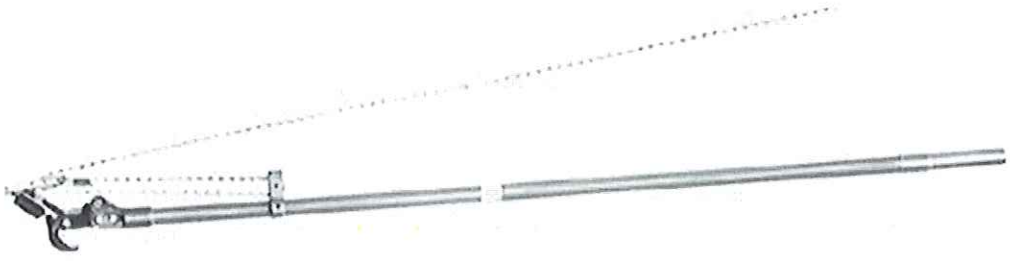


Figure 13: Tree trimmer tool

4.15.4. The rope and pulley arrangement shall be designed to give the operator a mechanical advantage of 3 to 1.

4.15.5. For example, a 10-lb (45N) pull on the rope will exert a 30-lb (135N) force on the cutter head lever. Ball bearing pulleys shall be employed for free operation.

4.15.6. Each tree trimmer shall be furnished with a rope of 25' (7620mm) long; which shall accommodate a 6' (1830mm) extension on the basic tool.

4.15.7. The trimmer shall be able to work with a universal pruning saw being added to the universal fitting on the side of the head mount.

4.15.8. It shall come complete with extension splices. The splices shall telescope snugly and fasten securely to the splice fitting on the tool. A leaf spring button lock, shown in Fig. 15, shall be used on the epoxy glass models.

Fig. 15: Leaf spring button lock

4.16. QUALITY MANAGEMENT SYSTEM

4.16.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the tools design, material, workmanship, tests, service capability, maintenance and documentation, will fulfill the requirements stated in the contract documents, standards, specifications and regulations.

4.16.2. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008.

4.16.3. The Manufacturer's Declaration of Conformity to applicable 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.

4.16.4. The bidder shall indicate the delivery time of the tools, manufacturer's monthly & annual production capacity and experience in the production of the type and size of items being offered.

5. TESTS AND INSPECTION

5.1. The insulated hand tools shall be inspected and tested in accordance with the requirements of IEC 60885-1, IEC 61235, 60832-1 & 2, IEC 62193, ASTM F711-02, ASTM F1826-00, ASTM D877 and OSHA Regulation 1910.269: Part J standards 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 previous Test Reports for the tools 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. The insulated hand tools shall be inspected and tested as per this specification before acceptance to The Kenya Power & Lighting Company stores. The supplier shall replace any tools which fail to meet any of the requirements during inspection/test at stores or when used.

5.4. Copies of type test reports to be submitted with the tender (by bidder) for evaluation shall be as stated below:

5.4.1. Type Tests

5.4.1.1. Electrical tests

- Dielectric test under dry condition
- Dielectric test after exposure to water
- Wet test

5.4.1.2. Mechanical tests

- Cold impact test on the end fitting
- Torsion test
- Tension test
- Compression test
- Bending test
- Torsion test of wing screw(s)
- Dye penetration test
- Durability of marking

5.4.1.3. Chemical Analysis of materials

5.5. On receipt of the goods KPLC may perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC the instruments and meters, which upon examination, test or use; fail to meet any of the requirements in the specification.

5.6. Tests to be witnessed by KPLC Engineers at the factory before shipment shall be in accordance with IEC 60885-1, 60832-1 & 2,IEC 61235, IEC 62193, ASTM F711-02, ASTM F1826-00, ASTM D877 and OSHA Regulation 1910.269: Part J standards and this specification and shall include the following:

5.6.1. **Routine Tests**

- Visual and dimensional checks

5.6.1.1. **Electrical tests**

- Dielectric test under dry condition
- Wet test.
- Electrical test after water conditioning
- Dielectric strength of internal insulation

5.6.1.2. **Mechanical tests**

- Bending test
- Torsion test
- Crushing test on tube
- Mechanical ageing tests
- Electrical test after mechanical ageing
- Dye penetration test
- Durability of marking

5.6.1.3. **Specific tests**

- Cold impact test on the end fittings
- Tension of the rotary blade and the hook of the tie stick
- Operating rod functioning test.
- Tensile strength test for the connecting clamp.
- Tightening capability of the wire holding stick.
- Torsion test of the support and operating handles of the cutters
- Resistance to abrasion of the measuring stick
- Hydraulic pressure test for hydraulic cutters.

6. MARKING AND PACKING

6.1. MARKINGS

All sticks shall be permanently marked with a manufactures trademark and a serial number on a top part of the stick for traceability in English Language.

a) Identity of the manufacturer
b) Type reference or catalogue number of the tool.
c) The standard of manufacture (IEC 60885-1, IEC 61235, IEC 62193, ASTM F711-02, ASTM F1826-00)
d) Warning or notices if applicable for specific tools.
e) Words "**PROPERTY OF KPLC**".

6.2. PACKAGING

6.2.1. The insulated hand tools shall be packed in such a manner so as to avoid damage during transportation and storage.

6.2.2. The tools shall be packaged in a waterproof storage bags that help guard against contaminants and abrasion. This shall help maintain the insulating properties of hotline tools.

6.2.3. The bags shall be of yellow heavy-duty vinyl-impregnated fabrics that last for years of rugged service.

6.2.4. Snaps, rubber closures and custom-tailored pockets shall be provided to fit the appropriate loose parts of the tools.

6.2.5. The following information shall be printed on a suitable label firmly attached to each packaging:

a) Purchase order number/tender
b) Manufacturer's name
c) Year of manufacture
d) The words, "**PROPERTY OF KENYA POWER & LIGHTING CO.**"

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) Guaranteed Technical Particulars 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 at least four customer reference letters;
d) Details of 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, ISO 9001:2008 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 the insulated hand tools 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. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008
d) Detailed test program to be used during factory testing;
e) Marking details and method to be used in marking the insulated hand tools;
f) 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 insulated hand tools for The Kenya Power & Lighting Company;
g) Packaging details (including packaging materials).

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 insulated hand tools to KPLC stores.

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, four customer reference letters, the manufacturer's experience and copies of complete type test reports for tender evaluation, all in English Language)*

Tender No. .....

Clause number	**Bidder's offer** (indicate full details of the offered tools for each requirement of the specification)
Manufacturer's Name and address	
Country of Manufacture	
Bidder's Name and address	
1. Scope	
(1.1-1.6)	
2. Applicable Standards	
3. Terms & Definitions	
4. REQUIREMENTS	
4.1 Service Conditions	
4.1.1 Physical service conditions	
4.1.2. Approach & Insulation Distance Information	
4.2 DESIGN & CONSTRUCTION	
4.2.1. GENERAL REQUIREMENTS	
(4.2.1.1-4.2.1.10)	
4.2.2. TECHNICAL REQUIREMENTS	
4.3 Grip-all Clamp Stick	
(4.3.1- 4.3.10)	
4.4 Wire-Holding Stick	
(4.4.1-4.4.9)	
4.5.Telescoping Operating Sticks	
(4.5.1-4.5.12)	
4.6.Tie Sticks	
(4.6.1-4.6.5)	
4.7.All-Angle Cog Wrench	
(4.7.1-4.7.8)	
4.8. Torque Extension Stick	
(4.8.1-4.8.6)	
4.9.Hex Socket Sets	
(4.9.1-4.9.4)	
4.10.Universal Pole	
(4.10.1-4.10.6)	

Clause number	**Bidder's offer** (indicate full details of the offered tools for each requirement of the specification)
4.11. Cross Arm Tool Hanger	
(4.11.1-4.11.4)	
4.12. Hydraulic Wire Cutter,	
(4.12.1-4.12.12)	
4.13. Insulated Wire Cutter,	
(4.13.1-4.13.5)	
4.14. Hot Stick Tension Puller	
(4.14.1-4.14.5)	
4.15. Tree Trimmer Tool	
(4.15.1-4.15.8)	
4.16. QUALITY MANAGEMENT SYSTEM	
(4.16.1 – 4.16.5)	
5. TESTS AND INSPECTION	
(5.1 -5.6)	
6. MARKING & PACKING	
6.1 Markings	
6.2 Packaging	
(6.2.1-6.2.5)	
7. DOCUMENTATION	
7.1	
7.2	
7.3	

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Manufacturer's Name, Signature, Stamp and Date