

**SECTION VI**

**TECHNICAL SCHEDULES**

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## **TECHNICAL SCHEDULES**

### **PREAMBLE**

- 1.1 The Technical Schedules shall be filled in and completed by the Bidder, and submitted with the Bid. The type test reports and the relevant manufacturer's technical documents shall be provided for reference.
- 1.2 All documentation necessary to evaluate whether the equipment offered is in accordance with this Specification shall be submitted with the Bid.
- 1.3 All data entered in the Schedules of Technical Guarantees are guaranteed values by the Bidder and cannot be departed from whatsoever.
- 1.4 All data entered in the Schedules of Informative. Data are also guaranteed values by the Bidder. These data may only be altered following the Project Manager's written consent.

**Earthing Conductor**

Sheet 1 of 1

<b>EARTHING SYSTEM</b>			
<b>Particulars</b>	<b>Unit</b>	<b>Data</b>	<b>Reference Doc</b>
- Reference standard			
- Material of earth conductor			
- Max. temp of any earth conductor during 1 sec. rated phase - ground fault			
- Method of interconnecting earth grid conductors			

**Guaranteed Technical specifications for OPGW**

<b>Particulars</b>	<b>Unit</b>	<b>Employer's requirement</b>	<b>Tender value</b>
Number of fibres	OPGW	$\geq 48$	
	ADSS	$\geq 48$	
Core diameter	$\mu\text{m}$	8.3 or 9 with a 3% tolerance	
Cladding design, either matched or depressed			
Clad diameter	$\mu\text{m}$	$125.0 \pm 2$	
Core-clad concentricity		$< 2\%$	
Coating diameter	$\mu\text{m}$	$250.0 \pm 15$	
Coating concentricity	$\geq$	0.70	
Attenuation: 1310 nm	dB/km	$\leq 0.40$	
1550 nm		$\leq 0.25$	
Bending attenuation: 1310 nm	dB/km	$\leq 0.40$	

Particulars	Unit	Employer's requirement	Tender value
1550 nm		$\leq 0.25$	
Temperature dependence	dB/km	$\leq 0.05 (-20^{\circ}\text{C} \rightarrow +85^{\circ}\text{C})$	
Cut-off wavelength	nm	$\leq 1250$	
Chromatic dispersion:			
Zero dispersion at	nm	$1310 \pm 12$ $1550 \pm 15$	
Zero dispersion slope (max.)	ps/nm <sup>2</sup> (km)	0.092 0.085	
Mode field diameter:			
1300 nm	mm	$9.30 \pm 0.50$	
1550 nm	mm	$10.50 \pm 1.00$	
IL-proof test level	g/m <sup>2</sup>	$35 \times 10^6$	
Splice attenuation	dB/ splice	0.02	
Connector loss	dB/connecto r	< 0.5	
<i>Wall Mounted ODF</i>			
Manufacturer	-		
Type	-		
Number of fiber interconnections	-	96	
Connector loss	dB/connecto r	< 0.5	
Screw on type connectors	-	yes	

Particulars	Unit	Employer's requirement	Tender value
designed for 19" cubicles	-	yes	

**300mm<sup>2</sup> All Aluminium Alloy Conductor (AAA)**

	Description	Guaranteed Technical Particulars for Conductor offered
1	Type and Size	
2	Service Conditions	
3	Materials	Composition
		Grade designation as per IEC 61089
		Resistivity of wires and % IACS
		Grease
4	Construction & Standard	
5	Nominal area of aluminium, mm <sup>2</sup>	
6	Overall diameter of bare conductor, mm	
7	Stranding	No./mm
		Tolerance on diameter
8	Maximum d.c. resistance at 20°C, ohm/km	
9	Minimum breaking load, kN	
10	Approximate mass of conductor, kg/km	
11	Current carrying capacity, A (state applicable conditions)	
12	Packing, Marking & Length on drum	

**66KV Disconnectors (Air Break Switches)**

Requirements		Guaranteed Particulars	Comments	
Name of the manufacturer and country of manufacture				
Applicable standards				
Service (indoor/outdoor), altitude, temperature range, humidity, environment (pollution severity level), wind speed etc				
Type	Model/Type Reference Number			
	Breaking medium			
Steelwork & components to be supplied (including components and mounting stalk for mounting on wooden or concrete poles at a height of 12m above ground level)				
Operating mechanism				
Contacts	Materials			
	Thickness of silver coating			
	Contact resistance			
	Current Density	Moving blade		
		Terminal pad		
		Contacts		
		Terminal connector		
	Spare contacts (five male & five female)			
Rating				
Nominal System Voltage and frequency				
Highest System Voltage of equipment				
Rated continuous current				
Rated short circuit withstand current & time				
Rated short circuit making current				
Breaking capacity of capacitive current				
Rated inductive current switching capacity				
Max temperature rise under rated voltage and current				
Breaking capacity at rated voltage				
Lightning impulse withstand	With contacts closed			

voltage, 1.2/50 $\mu$ s, dry, +ve	Across open contacts		
One minute power frequency withstand voltage, 50Hz, 60s	With contacts closed		
	Across open contacts		
Creepage distance of insulator			
Minimum clearance between phases (phase centres)			
Minimum clearance to earth			
Mechanical endurance (number of close-open cycles without using spare parts)			
Padlocking facility in both open and closed position			
Degree of protection			
Any special assembly tools			
Corona prevention			
Manufacturer's Guarantee and Warranty			
List catalogues, brochures, technical data, drawings submitted to support the offer.			
List customer sales records submitted to support the offer.			
List Type Test Certificates and Type Test Reports submitted with tender (indicate test report numbers, date, Testing Institution and contact addresses)			
<ul style="list-style-type: none"> <li>• Dielectric tests (Lightning Impulse and Power Frequency Withstand Tests),</li> <li>• Short time withstand and peak withstand current tests,</li> <li>• Temperature rise test,</li> <li>• Measurement of the resistance of circuits,</li> <li>• Verification of the protection,</li> <li>• Tightness tests,</li> <li>• Electromagnetic compatibility tests,</li> <li>• Operation and mechanical endurance tests,</li> <li>• Operation at the temperature limits.</li> </ul>			



List Acceptance Tests to be witnessed by KPLC Engineers at the factory		
List test reports (for disconnectors and components) to be submitted to KPLC for approval before shipment		
Copy of ISO 9001:2008 Certificate submitted (indicate relevance and validity)		
Quality Assurance Plan		
Manufacturer's Declaration of Conformity to Standards (including IEC 62271-102)		
Statement of compliance to tender specifications		
Guaranteed reliability and maintenance indicators: <ul style="list-style-type: none"> <li>a) reliability (MTBF)</li> <li>b) availability (A)</li> <li>c) maintainability (MTTR)</li> <li>d) service life</li> <li>e) warranty period of actuating under normal service conditions without maintenance</li> </ul>		
Deviations from tender specifications and supporting data, test reports, technical documents etc.		
List and details of auxiliaries, fittings, components and accessories included in scope of supply.		

### 66kV Composite Insulators

Description	Bidder's offer
Service Conditions	
Applicable Standards	
Maximum System Voltage (kV) and frequency (Hz)	
One-minute power frequency withstand voltage, 50Hz, wet (kV)	
Lighting impulse withstand voltage, 1.2/50 $\mu$ s pos. (kV)	
Minimum creepage distance (mm)	
Specified mechanical load, tension (kN)	
Length of insulator set with fittings (mm)	
Minimum Arcing Distance (mm)	
Material of fittings and level of corrosion protection	
Material of rod	

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Material of housing and sheds	
Socket, size & standard	
Ball, size & standard	
List of copies of Design and Type Test Reports submitted (indicate Test	
List of Acceptance Tests to be witnessed by KPLC Engineers at the factory	
List of catalogues, brochures, technical data, drawings and customer sales	
Inspection for Acceptance to Stores & Guarantee	
Statement of compliance to specifications	

**66kV Cable**

**ANNEX A: Guaranteed Technical Particulars** *(to be filled and signed by the Manufacturer for all clauses and submitted together with copies of manufacturer's catalogues, brochures, drawings, technical data, sales records and type test reports for tender evaluation)*

**Tender No.....**

	Description	Bidder's offer
	Manufacturer	
	Country of manufacture	
	Service Conditions & application	
	Applicable Standard(s)	
	Type and design	
	Conductor	
	Conductor screen	
	Insulation	
	Insulation screen	
	Water barriers	
	Metallic sheath	
	Oversheath	Material
		Marking
	<b>RATINGS/CHARACTERISTICS</b>	

	Conductor nominal cross-sectional area		
	Voltage designation U <sub>0</sub> /U(U <sub>m</sub> )		
	Conductor shape		
	Thickness of insulation		
	Thickness of metallic sheath		
	Thickness of oversheath		
	Maximum conductor resistance at 20°C		
	Current carrying capacity	underground	
		In air	
	Power frequency withstand voltage		
	Impulse withstand voltage and power frequency withstand voltage for cable		
	Impulse withstand voltage and power frequency withstand voltage for terminations		
	Cable accessories (type & design)		
	Quality Assurance Program		
	Copy of ISO 9001:2008 submitted		
	List of Type Test Reports submitted (indicate Test Report Numbers)		
	List of Tests to be witnessed by KPLC Engineers at the factory before shipment		
	Marking on cable & drum (parameters to be indicated and method of marking)		
	Packing		

	Installation and technical manuals to be provided during delivery	
	List of catalogues, brochures, drawings, technical data and customer sales records submitted to support the offer.	
	Statement of compliance and or deviations from Tender Specifications	
	Inspection/test by KPLC during delivery before acceptance to stores/site	

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

## **GPS Data Gathering Units**

### **THE TECHNICAL SPECIFICATIONS**

Technical specifications describe the basic requirements for goods. In addition to the information and documentation in the Tender Document regarding the technical aspects of this tender, all Tenderers shall comply with the following -

#### **PART A - GENERAL REQUIREMENTS**

1. Technical documentation shall be in English language. The specific items on offer shall be marked clearly for the goods they intend to supply.
2. The Tenderer shall submit the Schedule of Guaranteed Technical Particulars (GTP) completed by the Manufacturer. In submitting the GTP, cross-references should be made to the documents submitted.
3. Deviations from the tender specifications, if any, shall be explained in detail in writing, with supporting data including calculation sheets, detailed drawings and certified test reports and submitted together with the Tender. In submitting the deviations, cross-references should be made to the documents submitted. Kenya Power reserves the right to reject the goods if such deviations shall be found critical to the use and operation of the goods.
4. Detailed contact information including title, e-mail, facsimile, telephone or any other form of acceptable communication of the testing and standards body used shall be provided.
5. Where Type Test Certificates and their Reports and or Test Certificates and their Reports are translated into English, all pages of the translations must be signed and stamped by the testing authority.
6. A Copy of the manufacturer's valid quality management system certification i.e. ISO 9001 shall be submitted for evaluation.
7. In all cases where the level of galvanizing and painting is not specifically stated in the detailed Technical Specifications, the general requirement shall be for a uniform coating of thickness not less than 80 microns.
8. Suppliers are required to provide information on proper representative(s) and or workshop for back-up service and or repair and maintenance including their names, telephone, facsimile, e-mail, physical and postal addresses, along with their offers.

**PART B – DETAILED TECHNICAL SPECIFICATIONS (DTS)**

The Detailed Technical Specifications are as attached on the next page.

**THE TECHNICAL SPECIFICATIONS FOR GPS DATA GATHERING UNITS**

Technical specifications describe the basic requirements for goods. In addition to the information and documentation in the Tender Document regarding the technical aspects of this tender, all Tenderers shall comply with the following -

**PART A - GENERAL REQUIREMENTS**

1. Technical documentation shall be in English language. The specific items on offer shall be marked clearly for the goods they intend to supply.
2. The Tenderer shall submit the Schedule of Guaranteed Technical Particulars (GTP) completed by the Manufacturer. In submitting the GTP, cross-references should be made to the documents submitted.
3. Deviations from the tender specifications, if any, shall be explained in detail in writing, with supporting data including calculation sheets, detailed drawings and certified test reports and submitted together with the Tender. In submitting the deviations, cross-references should be made to the documents submitted. Kenya Power reserves the right to reject the goods if such deviations shall be found critical to the use and operation of the goods.
4. Detailed contact information including title, e-mail, facsimile, telephone or any other form of acceptable communication of the testing and standards body used shall be provided.
5. Where Type Test Certificates and their Reports and or Test Certificates and their Reports are translated into English, all pages of the translations must be signed and stamped by the testing authority.
6. A Copy of the manufacturer's valid quality management system certification i.e. ISO 9001 shall be submitted for evaluation.
7. In all cases where the level of galvanizing and painting is not specifically stated in the detailed Technical Specifications, the general requirement shall be for a uniform coating of thickness not less than 80 microns.

8. Suppliers are required to provide information on proper representative(s) and or workshop for back-up service and or repair and maintenance including their names, telephone, facsimile, e-mail, physical and postal addresses, along with their offers.

#### **PART B – DETAILED TECHNICAL SPECIFICATIONS (DTS)**

The Detailed Technical Specifications are as attached on the next page.



<b><u>SPECIFICATIONS</u></b>	<b><u>PROVIDED</u></b>
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**GNSS CHARACTERISTICS**

- 120 GNSS channels
  - GPS L1 C/A L1/L2 P-code, L2 C, L5, L1/L2/L5 full wavelength carrier
  - GLONASS L1 C/A and L2 C/A, L1/L2 full wavelength carrier
  - GALILEO E1 and E5 (including GIOVE-A/GIOVE-B test satellites)
  - SBAS: code and carrier (WAAS/EGNOS/MSAS)
- New z-BLADE technology for optimal GNSS performance
  - New Ashtech GNSS centric algorithm: Fully independent GNSS satellites tracking and processing
  - Fully independent code and phase measurements
  - Quick signal detection engines for fast acquisition and re-acquisition of GNSS signals
  - Advanced multi-path mitigation
- Up to 20 Hz real-time raw data (code and carrier) and position output
- Supported data formats: ATOM (Ashtech Optimized Messaging), RTCM 2.3, RTCM 3.1, CMR, CMR+, DBEN, LRK
- NMEA 0183 messages output
- RTK networks: VRS, FKP, MAC

**Real-Time Accuracy (RMS)**

- **SBAS (WAAS/EGNOS/MSAS)**
  - Horizontal < 50 cm (1.64 ft)
- **Real-Time DGPS position**
  - Horizontal 25 cm (0.82 ft) + 1 ppm in typical conditions
- **Real-Time Kinematic Position (fine mode)**
  - Horizontal 10 mm (0.033 ft) + 1.0 ppm
  - Vertical 20 mm (0.065 ft) + 1.0 ppm

**Real-Time Performance**

- **Instant-RTK® Initialization**
  - Independent of GPS availability when other GNSS signals are available
  - Typically 2-second initialization for baselines < 20 km
  - 99.9% reliability

**RTK Initialization range**

- 40 km

<p><b>Post-Processing Accuracy (RMS)</b></p> <ul style="list-style-type: none"> <li>➤ <b>Static, Rapid Static</b> <ul style="list-style-type: none"> <li>• Horizontal 5 mm (0.016 ft) + 0.5 ppm</li> <li>• Vertical 10 mm (0.033 ft) + 0.5 ppm</li> </ul> </li> <li>➤ <b>Long Static</b> <ul style="list-style-type: none"> <li>• Horizontal 3 mm (0.009 ft) + 0.5 ppm</li> <li>• Vertical 6 mm (0.019 ft) + 0.5 ppm</li> </ul> </li> <li>➤ <b>Post-Processed Kinematic</b> <ul style="list-style-type: none"> <li>• Horizontal 10 mm (0.033 ft) + 1.0 ppm</li> <li>• Vertical 20 mm (0.065 ft) + 1.0 ppm</li> </ul> </li> </ul>	
<p><b>Data logging Characteristics</b></p> <ul style="list-style-type: none"> <li>➤ <b>Recording Interval</b> <ul style="list-style-type: none"> <li>• 0.05 - 999 seconds</li> </ul> </li> </ul>	
<p><b>Physical Characteristics</b></p> <ul style="list-style-type: none"> <li>➤ <b>Size</b> <ul style="list-style-type: none"> <li>• Unit: 22.8x18.8x8.4 cm (9x7.4x3.3 in)</li> </ul> </li> <li>➤ <b>Weight</b> <ul style="list-style-type: none"> <li>• GNSS receiver: 1.4 kg (3.1 lb)</li> </ul> </li> </ul>	
<p><b>User Interface</b></p> <ul style="list-style-type: none"> <li>• Graphical OLED display</li> </ul>	
<p><b>I/O Interface</b></p> <ul style="list-style-type: none"> <li>• RS232, RS422, USB, Bluetooth</li> <li>• PPS</li> </ul>	
<p><b>Memory</b></p> <ul style="list-style-type: none"> <li>• 128 MB internal memory</li> <li>• (expandable through USB)</li> <li>• Up to 400 hours of 15 sec. raw GNSS data</li> <li>• from 18 satellites</li> </ul>	
<p><b>Operation</b></p> <ul style="list-style-type: none"> <li>• RTK rover/base, post-processing</li> <li>• RTK network rover: VRS, FKP, MAC</li> <li>• Point-to-point through Real-Time Data Server (RTDS) software</li> <li>• Limited RTK in standard (baseline 3 km)</li> <li>• RTC Bridge</li> <li>• NTRIP protocol</li> </ul>	
<p><b>Environmental Characteristics</b></p> <ul style="list-style-type: none"> <li>• Operating temperature: -30° to +55°C</li> <li>• (-22° to +131°F)</li> <li>• Storage temperature: -40° to +70°C</li> <li>• (-40° to +158°F)</li> <li>• Humidity: 100% condensing</li> <li>• Waterproof, sealed against sand and dust</li> <li>• Shock: ETS300 019</li> </ul>	

<ul style="list-style-type: none"> <li>• Vibration: EN60945</li> </ul>	
<b>Power Characteristics</b> <ul style="list-style-type: none"> <li>• Li-Ion battery, 4600 mAh</li> <li>• Battery life time: 8 hrs (GSM and UHF off)</li> <li>• 6-28 VDC input</li> </ul>	
<b>Optional System Components</b> <ul style="list-style-type: none"> <li>➤ <b>Communication Modules</b> <ul style="list-style-type: none"> <li>• U-Link Rx</li> <li>• Pacific Crest UHF</li> <li>• GSM/GPRS/EDGE/3.5G quad-band</li> </ul> </li> <li>➤ <b>Transmitter Kits</b> <ul style="list-style-type: none"> <li>• U-Link TRx</li> <li>• Pacific Crest UHF</li> </ul> </li> <li>➤ <b>Rechargeable Battery kit</b></li> </ul>	

<b><u>SPECIFICATIONS</u></b>	<b><u>PROVIDED</u></b>
<b><u>FAST SURVEY FIELD SOFTWARE</u></b> <p><b>Key software functions include:</b></p> <ul style="list-style-type: none"> <li>• GNSS support</li> <li>• Volume computation</li> <li>• Background raster image</li> <li>• Network connectivity</li> <li>• Coordinate system support: predefined grid systems, predefined datums, projections, geoids, local grid</li> <li>• Map view with colored lines</li> <li>• Geodetic geometry: intersection, azimuth/ distance, offsetting, poly-line, curve, area</li> <li>• Data import/Export: DXF, SHP, RW5, LandXML ...</li> <li>• Survey utilities: calculator, RW5 file viewing</li> <li>• Optical surveying instruments (optional)</li> <li>• Road construction (optional)</li> <li>• Robotic total stations (optional)</li> </ul>	

**SURVEY PRO<sup>6</sup>****Key software functions include:**

- Complete GPS/GNSS instrument support
- Complete mechanical instrument support
- All data collection features
- Basic point stakeout
- Basic COGO including inverses, intersections, manual traverse, area and much more
- Advanced COGO and curve solutions including station offsets,
- Average points, and spiral tools
- Advanced stakeout including offset staking, slope staking and stake to a DTM
- Road Layout – Complete road layout and staking tool set
- Extensive data collection routines with easy to use, step-by-step setup features
- All GNSS staking routines are supported
- Support for RTK, network RTK, static and PPK surveys
- Survey Pro Robotic (optional)

**FDB DATA SPECIFICATIONS**

Coordinate system: UTM

Datum : Arc 1960

Zone : Zone 37°south (for the whole country)

Drawing Format: AutoCAD DXF lowest version (LT 2000)