TABLE OF CONTENTS

0.1 Circulation List

0.2 Amendment Record

FOREWORD

1. SCOPE
2. REFERENCES
3. TERMS AND DEFINITIONS
4. REQUIREMENTS
5. TESTS AND INSPECTION
6. MARKING, LABELLING AND PACKING

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

0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Procurement Manager
3	Stores & Transport Manager
4	Transmission Manager
5	Technical Services Manager
6	Deputy Manager, Technical Audit

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)

FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with the Technical Services and Transmission Departments all of the Kenya Power & Lighting Company Ltd (KPLC) and it lays down requirements for 132kV Disconnector. The specification is intended for use by KPLC in purchasing the equipment.

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

1. SCOPE

This specification is for newly manufactured outdoor 132kV, 1600 Amps, 50Hz Disconnector (Isolator) for use on line disconnection and isolation of substation equipment. The specification covers both the 132 kV isolator with and without earth switch.

The specification also covers inspection and test of the Disconnector as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.

The specification stipulates the minimum requirements for 132kV Disconnector acceptable for use in the company and it shall be the responsibility of the Manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the Disconnector for KPLC.

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

2. REFERENCES

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

ISO 1461:	Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods.
IEC 62271-102:	High Voltage Switchgear and Controlgear Part 102: Alternating Current Disconnectors and Earthing Switches.
IEC 60273:	Characteristic of indoor and outdoor post insulators for systems with nominal voltages greater than 1000V.

3. TERMS AND DEFINITIONS

The terms and definitions given in the reference standards shall apply.

4. REQUIREMENTS

4.1 Service Conditions

The disconnector shall be suitable for continuous outdoor operation in tropical areas with the following conditions.

(a) Altitude: Up to 2200 metres above sea level.

(b) Temperature: average of +30°C with a minimum of -1°C and max +40 °C

(c) Humidity: up to 95%,

(d) Pollution: Design pollution level to be taken as "Very *Heavy*" (Pollution level IV) according to IEC 815 (31mm/kV)

(e) Isokeraunic level: 180 thunderstorm days per year

4.2 General Requirements

4.2.1 The disconnector shall be designed and manufactured to IEC 62271-102 and the requirements of this specification. The breaking medium shall be air.

4.2.2 The disconnector shall be horizontal side opening, double side break with rotating centre post insulator type for use on a 132kV, 50 Hz, 3 - phase system.

4.2.3 The isolator shall be complete with supporting steelwork, base, phase coupling details, operating rod, unions and guides and operating mechanism.

4.2.4 The isolator shall be motorised and also fitted with manual operation facility. There shall be a remote selection to allow for operation of the isolator (disconnector) from the control room. The remote selection shall block any local electrical or manual operation.

4.2.5 The isolator shall be arranged so that the phase units are mounted independently and then finally interconnected with coupling tubes so as to ensure simultaneous operation of all switches by drive rods and operating handle for both manual and motor operation.

4.2.6 The operating mechanism shall be fixed at the base frame, in a weather proof, vermin proof and dust proof housing. The degree of protection shall be class IP 54 as per IEC. The operating mechanism shall be provided with a universal joint to allow for a reasonable degree of out-of alignment of the operating rod.

4.2.7 The foundation details shall also be provided. These will include drawings made to scale and the bolts required for anchoring the structure to the plinth.

4.2.8 The design shall incorporate every reasonable precaution and provision for the safety of all those concerned in the operation and maintenance of the equipment keeping in view the regulatory requirements in Kenya.

4.2.9 All material used shall be of the best quality and of the class most suitable for working under the conditions specified and shall withstand the variations of temperatures and atmospheric conditions arising under working conditions without undue distortion or deterioration or the setting up of undue stresses in any part, and also without affecting the strength and suitability of the various parts for the work which they have to perform.

In choosing materials and their finishes, due regard shall be given to the humid tropical conditions under which the equipment will be called upon to work. The supplier shall submit details of his usual practice which have proven satisfactory and which he recommends for application to the parts of the work, which may be affected by tropical conditions. All switchgear and control cubicles shall be rodent and vermin proof.

4.2.10 Corresponding parts liable to be replaced shall be interchangeable.

4.2.11 All components, including insulators with their mountings, shall be designed so as to avoid pockets in which water can collect.

4.2.12 All connections and contacts shall be of ample section and surface for carrying continuously the specified currents without undue heating and fixed connections shall be secured by bolts or set screws of ample size, adequately locked. Lock nuts shall be used on stud connections carrying current.

4.2.13 Auxiliary dry contacts, five normally open and five normally closed shall be provided for electrical interlocks such that the isolator and associated 132kV circuit breaker(s) can be interlocked with each other. The isolator shall be provided with provisions to interlock with two breakers. The contacts shall be rated to continuously carry at least 10Amps at voltages up to 500V dc/ac.

4.2.14 All ferrous parts shall be galvanized by the hot-dip process to ISO 1461 and for all parts other than steel wires shall consist of a thickness of zinc coating equivalent to not less than 610g of zinc per square meter of surface. The zinc coating shall be smooth, clean and of uniform thickness and free from defects. The preparation of galvanizing and the galvanizing itself shall not adversely affect the mechanical properties of the coated material. The quality will be established by tests as per ISO 1461.

4.2.15 Each phase shall be mounted on a spiral type solid core porcelain post insulator conforming to IEC 60273, and shall be fitted with clamp connector for ACSR conductor up to 18.2 mm diameter and copper or aluminium busbar tube of up to 76mm diameter.

4.2.16 The isolator shall be designed such that in fully open position, it shall provide adequate electrical isolation between the contacts on all the three switches.

4.2.17 All current carrying parts shall be made of electrolytic high conductivity hard drawn copper with switch contacts silver plated. Five spare male and five spare female contacts shall be supplied with each disconnector.

4.2.18 The earth switch shall consist of a hinged type earthing switch fixed at the base frame. The earth switch shall have the same rating as the isolator.

4.2.19 The isolator shall be provided with both mechanical and electrical interlocking devices between the isolator and earth switch so that during operations, it is only possible to operate the earth switch with the isolator in the open position and the isolator with the earth switches in the open position.

4.2.20 Ten normally open and ten normally closed auxiliary contacts shall be provided on the switch for future use.

4.2.21 Five normally open and five normally closed auxiliary contacts shall be provided on the earth switch for future use.

4.2.22 The disconnector and earth switch shall be provided with a padlocking facility such that the mechanism can be locked in OPEN or CLOSED position.

4.2.23 The design of the disconnector and earth switch shall be such that the operating mechanism of the disconnector and the operating handle of the earth switch shall be located at opposite ends of the mounting structure.

4.2.24 Both the disconnector and the earth switch shall have an earthing point for connection to the earthing Grid and clearly visible closed and open status indicators.

4.3 Ratings

The ratings of the disconnector, including its operating devices and auxiliary equipments shall be as indicated below.

Nominal Voltage and frequency		132 kV, 50Hz
Highest System Voltage		145 kV
Normal current		1600 Amps
Rated short circuit withstand current & time		31.5 kA, 3s
Rated short circuit making current		80 kA
Auxiliary Voltage	A.C.	415/240 V, 50 Hz
	D.C.	110V±10%
Lightning impulse withstand voltage	With contacts closed	750 kV peak
	Across open contacts	870kV peak
One minute power frequency withstand voltage	With contacts closed	325 kV r.m.s.
	Across open contacts	370kV
Minimum creepage distance of insulator		4495mm
Minimum clearance phase-to-phase		2900mm
Minimum clearance phase-to-earth		2900mm
Mechanical endurance (number of close-open cycles without using spare parts)		2000 (minimum)

4.4. QUALITY MANAGEMENT SYSTEM

4.4.1 The supplier shall submit a quality assurance programme (QAP) that will be used to ensure that the disconnector design, material, workmanship, tests, service capability, maintenance and documentation, will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil 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 relevant and valid ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.

5. TESTS AND INSPECTION

5.1 The Disconnector shall be inspected and tested in accordance with the requirements of IEC 62271-102 and this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified. Tenderers shall confirm the

manufacturer's capabilities in this regard when submitting tenders. Any limitations shall be clearly specified.

5.2 Copies of previous Type Test Certificates and Type Test Reports issued by the relevant International or National Testing/ Standards Authority or Independent and ISO/IEC 17025 accredited testing laboratory shall be submitted with the offer for evaluation (all in English Language). A copy of the accreditation certificate for the laboratory shall also be submitted. Any translations of type test certificates and type test reports into English language shall be signed and stamped by the Testing Authority.

Copies of type test certificates and type test reports to IEC 62271-102 for the disconnector offered to be submitted for tender evaluation shall include:

- Dielectric tests (Lightning Impulse and Power Frequency Withstand Tests),
- Short time withstand and peak withstand current tests,
- Temperature rise test,
- Measurement of the resistance of circuits,
- Verification of the protection,
- Tightness tests,
- Electromagnetic compatibility tests,
- Test to prove the short circuit making performance of earthing switches,
- Operation and mechanical endurance tests,
- Operation at the temperature limits.

5.3 The disconnector shall be subject to acceptance tests at the manufacturer's works before dispatch. Acceptance tests shall be witnessed by two Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC) and shall include the following Routine Tests to IEC 62271-102:

- Dielectric test on main circuit,
- Dielectric test on auxiliary and control circuits,
- Measurement of the resistance of the main circuit,
- Tightness test,
- Design and visual checks and
- Mechanical operating tests.

5.4 Testing Facility

The bidder shall provide current e-mail address, fax and telephone numbers and contact person at the International or National Standards/Testing Facility or testing laboratory of the country where the disconnector is manufactured and tested.

5.5 Test reports for each disconnector (including its individual components) shall be submitted to The Kenya Power and Lighting Company for approval before shipment.

5.6 On receipt of the disconnector, KPLC will inspect it and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The manufacturer shall replace/rectify without charge to KPLC, equipment which upon examination, test or use fail to meet any or all of the requirements in the specification.

6. MARKING, LABELLING AND PACKING

6.1 The disconnector and associated components shall be packed in a manner as to protect it from any damage in transportation and handling.

6.2 Each assembly and package of items associated with the disconnector shall be suitably marked for ease of identification.

6.3 In addition to markings and labels required elsewhere in the specification, each equipment and component shall be marked in accordance with the relevant IEC standard. Each disconnector shall be provided with a rating plate of weatherproof material, fitted in a visible position, showing the appropriate details listed in IEC 62271-102. The entries on the plate shall be indelibly marked (either by etching, engraving or stamping).

----------THIS SPACE LEFT BLANK----------

Annex A

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR DISCONNECTOR OFFERED (pls indicate units of measure)

No.	REQUIREMENTS			GUARANTEED PARTICULARS	COMMENTS
1.	Name of the manufacturer and country of manufacture				
2.	Applicable standards				
3.	Service (indoor/outdoor), altitude, temperature range, humidity, environment (pollution severity level), wind speed etc				
4.	Type	Model/Type Reference Number			
		Breaking medium			
5.	Supporting steelwork & components to be supplied				
6.	Operating mechanism				
7.	Contacts	Materials			
		Thickness of silver coating			
		Contact resistance			
		Current Density	Moving blade		
			Terminal pad		
			Contacts		
			Terminal connector		
		Spare contacts (five male & five female)			
8.	Auxilliaries	Auxilliary supplies	DC		
			AC		
		No. of spare auxiliary contacts	Disconnector		
			Earthing switch		
		Auxilliary contacts current rating			
9.	Earthing switch				
10.	Motor Rating and MCB				
11.	Level of galvanizing				
12.	Rating				
	Nominal Voltage and frequency				
	Highest System Voltage				
	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 voltage	With contacts closed		
		Across open contacts		
	One minute power frequency withstand voltage	With contacts closed		
		Across open contacts		
	Creepage distance of insulator			
	Minimum clearance between phases			
	Minimum clearance to earth			
	Mechanical endurance (number of close-open cycles without using spare parts)			
13.	Padlocking facility in both open and closed position			
14.	Degree of protection of control box			
15.	Operation	Local (manual)		
		Local (motorized)		
		Remote (motorized)		
		Interlocking with breaker (electrical/mechanical)		
		Interlocking with earth switch (mechanical)		
		Position indication on control box		
16.	Any special assembly tools			
17.	Corona prevention			
18.	Manufacturer's Guarantee and Warranty			
19.	List catalogues, brochures, technical data, drawings submitted to support the offer.			
20.	List customer sales records submitted to support the offer.			
21.	List Type Test Certificates and Type Test Reports submitted with tender (indicate test report numbers, date, Testing Institution and contact addresses) • Dielectric tests (Lightning Impulse and Power Frequency Withstand Tests), • Short time withstand and peak withstand current tests, • Temperature rise test, • Measurement of the resistance of circuits, • Verification of the protection, • Tightness tests, • Electromagnetic compatibility tests,			

	• Test to prove the short circuit making performance of earthing switches, • Operation and mechanical endurance tests, • Operation at the temperature limits.		
22.	List Acceptance Tests to be witnessed by KPLC Engineers at the factory		
23.	List test reports (for disconnector and components) to be submitted to KPLC for approval before shipment		
24.	Copy of ISO 9001:2008 Certificate submitted (indicate validity)		
25.	Quality Assurance Programme		
26.	Manufacturer's Declaration of Conformity to Standards (including IEC 62271-102)		
27.	Statement of compliance to tender specifications		
28.	Guaranteed reliability and maintenance indicators: a) reliability (MTBF) b) availability (A) c) maintainability (MTTR) d) service life e) warranty period of actuating under normal service conditions without maintenance		
29.	Deviations from tender specifications and supporting data, test reports, technical documents etc.		
30.	Inspection of the disconnector and components at KPLC stores/site.		
31.	List and details of auxiliaries, fittings and accessories included in supply.		

.....

Manufacturer's Name, Signature, Stamp and Date