



## **VOLUME II**

### **SECTION V- WORK REQUIREMENT AND PARTICULAR TECHNICAL SPECIFICATIONS**

**FOR**

**KIPEVU-MBARAKI 132KV SINGLE CIRCUIT TRANSMISSION  
LINE**

**NCB NO: KP1/6A.1/OT/4/25/C04**

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## **SECTION V**

### **1. GENERAL SPECIFICATIONS**

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## **1 GENERAL SPECIFICATIONS**

### **1.1 General**

The scope of work, data sheets, special and general specifications constitute the complete technical specifications and must be read as a whole. If more than one contractor contributes to the completion of the plant each contractor is obliged to cooperate, adapt solutions and exchange information so that the plant forms a functional and optimised entirety.

### **1.2 Document Priority**

If in conflict, the ranking of documents in the technical specifications, in decreasing priority, is as follows:

1. Scope of Works
2. Technical Specifications for materials and equipment
3. Project Specific Design Data
4. General technical specifications
5. General specifications
6. Internationally accepted Standards

In the event of any difference between the Drawings and the Specifications, the latter shall prevail. In the event of any difference between scaled dimensions and figures on the drawings, the figures shall prevail.

If the Bidder is of the opinion that there is conflict or disagreement between the particulars of the documents, standards etc. this must be clearly stated in the Bid, failing to which, the materials and equipment offered shall be deemed to comply in every respect with the current Specification both in manufacture and in performance, and compliance thereof shall be insisted upon without additional cost to the Employer.

### **1.3 Completeness of Works**

1.3.1 All apparatus, accessories or fittings which may not have been specifically mentioned, but which are usual or necessary in the respective equipment for the completeness of the finished work in an operable status, shall be deemed to be included in the Contract and shall be provided by the Contractor without any extra charge. All equipment shall be complete in all details, whether such details are mentioned in the Specifications or not. This includes fixation details and connection clamps and/or terminals.

1.3.2 All materials and skilled labour, whether of temporary or permanent nature, required by the Contractor for the design, manufacture, erection and testing at site of the equipment shall be supplied and paid for by the Contractor. All computer equipment shall be delivered with all software and licences necessary to achieve the specified functionality as well as the software necessary for programming, testing, service and maintenance through the lifetime of the equipment.

- 1.3.3 Any reference in the quantity and price schedules, the delivery period schedule or in the various clauses and schedules of the text of either the Specification or the Bid, to any equipment shall imply equipment that is complete with all accessories, apparatus and fittings as outlined in sub **clause 1.3.1** and **1.3.2** above.

The Contractor shall be responsible for ensuring that the equipment supplied is fit for the purpose intended. Available information on the characteristics of the system, to which the works will be connected and associated, will be supplied on request to the contractor who shall be responsible for obtaining and determining all applicable knowledge relevant to the works.

## **1.4 Space Requirement**

The contractor shall utilise space economically and the arrangement of equipment in rooms and outdoor plots shall take into considerations future extensions and accessibility of equipment. The rooms and plots must accommodate the equipment as well as having workspace for operators and maintenance personnel.

## **1.5 Documentation and Drawings**

### **1.5.1 General**

Contractor's obligations with regard to preparation and submission of drawings, calculations, samples, patterns, models, etc. are stated in the Conditions of Contract.

The Contractor shall prepare and submit to the Project Manager for approval dimensioned general and detailed design drawings and other pertinent information of all the Plant and equipment specified in the Bid Documents. Unless otherwise agreed the information shall be exchanged on paper.

Approval of drawings shall not relieve the Contractor of his obligations to supply the Plant in accordance with the Specifications. The Contractor is responsible for any errors that may appear in the approved documents. He shall as soon as an error has been detected, deliver the corrected documents to the Project Manager for re-approval.

If the plant is to be connected to existing equipment the connection shall be documented in a coherent and overlapping way at least containing terminal identification in old equipment. Schematic diagrams shall contain complete loops within new and old equipment.

All text on documents provided by the Contractor shall be in the English language in addition, if necessary, to that of the country of origin. All drawings shall be dimensioned in millimetres.

The Contractor shall, during the total project time, maintain a List of Documentation to be updated by him whenever needed. The List of Documentation shall include the date of original issue of each document

submitted as well as the dates of every revision. The List of Documentation shall also include a time schedule for the submittal of the documentation.

Symbols used for electrical equipment shall be in accordance with IEC 60617. The Contractor shall establish a coherent system for physical and functional reference designation in **accordance with IEC61346**. A similar systematic scheme shall be defined for cable numeration. These schemes shall be used throughout on the drawings and documentation and the designation shall be labelled on the components and cables.

In addition to what is stated in Conditions of Contract, the following shall apply:

- The sizes of all documents and drawings shall conform to the ISO standard, i.e.:

A1	594mm x 841mm	A2	420mm x 594mm
A3	297mm x 420mm	A4	210mm x 297mm
- Sizes larger than A1 shall be avoided. The schematic diagrams, apparatus and cable lists shall be of size of A4 except for one original and possible transparency copies of schematic diagrams that shall be in A3. Scales to be used on the drawings shall be 1:10, 1:20, 1:40, 1:50 and multiples of this series.
- All drawings made special for this project including civil works drawings, mechanical drawings, layout drawings and circuit diagrams shall be compiled on a computer aided drawing system and as part of the as built documentation be handed over on a CD and external hard disk with a format readable in the latest AutoCAD version or another format to be agreed upon by the project manager in addition to the paper copies.
- All drawings shall be bound in hard covers.

### 1.5.2 Drawings

The Employer's drawings attached to the Bid Documents are of informative character. These drawings are intended to illustrate the basic requirements to be satisfied. It is the responsibility of the contractor to prepare a detailed layout showing the manner in which the various items of equipment can be accommodated to best advantage within the available area.

The contractor is at liberty to offer arrangements based on significantly different principles where it is considered that these offer economic or technical advantages. It is emphasised, however, that the layout shall be subject to employer's acceptance.

### 1.5.3 Progress Plans

The Progress Plans shall at least contain the following milestones:

- Essential information delivered from Employer
- Documentation for approval from Contractor to Employer
- Release of factory documentation

- Factory Tests
- Shipment
- Site ready for erection
- Start erection
- Ready for pre-commissioning
- Ready for commissioning
- Test run
- Taking over
- Submittal of final documentation

#### **1.5.4 Exchange of Interface Information**

The Contractors shall in due time supply interface information to other sub-contractors where needed. The Contractor is in particular required to check that all foundations and fixations of his equipment is sufficiently dimensioned to meet the forces acting upon it. If the Contractor feels that he lacks such information from other contractors, he is obliged to request such from the Project Manager. The Contractor cannot claim liability exemption for his own contractual responsibilities because of actions performed or omitted by other sub-contractors.

#### **1.5.5 Final Documentation**

The Contractor shall also deliver manuals for operation and maintenance. These shall at least contain the following information:

- Detailed description of the equipment, the individual components, relevant clearances, tolerances, allowable temperatures, settings etc.
- Descriptions of main principles including flow diagrams, single line diagrams, circuit diagram, connection diagram, cable schedules, software documentation etc.
- Operational instruction. These shall illustrate the operational sequences in a clear and concise way.
- Test and adjustment procedures containing instruction for test and adjustment of the equipment under operation, after inspection and maintenance
- Test reports
- Spare part lists
- Maintenance instructions split into:
  - Manuals for preventive maintenance indicating periodic inspections, cleaning, lubrication and other routine maintenance.
  - Repair manuals describing fault location, dismantling, re-assembly etc.

The documentation shall leave the operators and maintenance personnel in position to operate the plant in a safe and optimal way and to perform repairs usual done by such personnel.

The Contractor shall supply three copies of final “as built” documentation taking into account all changes done under erection and commissioning.

The documents shall be submitted in both hard copies and soft copy in external hard disk and flash drives.

The Project Manager shall approve the documents before the final submission.

#### **1.6 Contractor's Quality Assurance Procedures**

The Contractor shall have established a quality assurance system based on ISO 9001 also covering sub-contractors. The Contractor shall provide a documentation of the system with a list of current procedures, an organisation chart of the quality organisation and the name of the quality manager. He shall also submit a list of quality revisions performed in the last twelve months with a list of closed and unclosed findings as well as planned revisions during the coming twelve months as well as a list of findings. The documentation shall give special emphasises on how subcontracts are included in the quality assurance system. The Employer shall be entitled to perform quality revision at the Contractor or any subcontractor with two weeks' notice.

#### **1.7 Guarantees and Particulars**

The Works shall comply with the technical guaranteed data stated in the Bid. The Contractor shall be responsible for any discrepancies, errors and omissions in the particulars and guarantees.

#### **1.8 Manufacturing and Shipment**

##### **1.8.1 Places of Manufacture and Sub-Contractors**

All equipment offered should be the product of recognised and experienced manufacturers and shall be of basic design and size similar to such that has been in successful continuous operation for at least three years preferably under similar climatic conditions. Proven plant reliability and high availability are of prime importance and the attention of the Bidder is drawn to these particular requirements.

The manufacturer's identity and places of manufacture, testing and inspection before shipment for the various portions of the Contract Works shall be specified in the Technical Schedules and shall not be departed from without the agreement of the Project Manager.

As soon as practicable after entering into the Contract, the Contractor shall, having obtained the Project Manager's consent in accordance with the Conditions of Contract, enter into the Sub-contracts he considers necessary for the satisfactory completion of the Contract Works.

All Sub-contractors and Sub-suppliers of components and materials shall be subject to the approval of the Project Manager. Information shall be given on each Sub-order sufficient to identify the material or equipment to which the sub-order relates, stating that the material is subject to inspection by the Project Manager before despatch.



If the Employer at any stage in the design and production period finds out that the sub-contractors do not fulfil the requirements in the specifications and it is obvious that the required quality cannot be achieved by corrective measures, he can request the subcontract to be suspended and the works to be produced elsewhere without extra cost for the Employer.

### **1.8.2 Inspection and Testing**

The Contractor shall submit for approval a programme of quality control and inspection procedures to assure that the product during manufacture and on completion comply with the specified requirements. The programme shall relate the quality control and inspection activities to the production cycle. The Contractor shall provide details of quality control and inspection procedures used. The Contractor shall retain responsibility for quality control and inspection activities made by his sub-contractors and shall indicate on the programme, which items are to be sub-contracted and how they are to be inspected and tested both at subcontractor's works and by Contractor's acceptance control.

All materials used in the Contract Works are subject to inspection by the Project Manager and it is the Contractor's responsibility to advise the Project Manager when equipment and materials are available for inspection, at least one month in advance. Factory tests on equipment shall be made according to the applicable IEC Standards, or as specifically specified or according to standards approved by the Project Manager. Routine tests shall be made on each unit of all equipment.

Type tests shall be made on one unit of each type of different equipment. Instead of carrying out the type tests the Contractor may submit suitable certificates of tests made on equipment of the same type; however, the Purchaser reserves the right of accepting these certificates or to reject them partially or totally.

On complex systems the Bidder shall propose factory acceptance tests (FAT) to be performed.

The Project Manager shall be at liberty to demand any additional testing at the manufacturer's works, at site or elsewhere in order to verify that the equipment complies with the conditions of the Specifications.

A test programme shall be submitted to the Project Manager for approval at least one month ahead of the commencement of testing. The program shall include tests to be performed at subcontractor's works.

Measuring apparatus shall be approved by the Project Manager and if required shall be calibrated at the expense of the Contractor at an approved laboratory.

### **1.8.3 Packing, Transportation and Storage**

The Supplier shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit and temporary storage

up to their final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling and exposure to extreme temperatures, salt and precipitation. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit. Indoor electrical equipment must be enclosed in welded polythene envelopes inside packing cases and the envelopes shall be evacuated or have a desiccant inside.

The following information must be clearly stencilled or printed on each packing case, crate, cask, drum, bundle or loose piece; care being taken that the number and other particulars on each package agree with those entered in the packing list accompanying the Invoice:

- Employer's Identity
- Supplier's Identity
- Destination
- Contract No.
- Package No.
- Item Code
- Weight, dimensions
- Sub-Project (Plant Identity).

The marking shall be durable. The marking shall be upon the body of the package. Marking upon a batten fastened on the case, etc. shall not be used.

In the case of bags, bundles and loose pieces, the shapes of which do not permit the marks to be put on the actual package, each bag, bundle or loose piece shall have two metal labels each with two holes. Securely fastened by independent wires. Each label shall be die-stamped with the above particulars.

Goods belonging to different plants shall not be mixed, but kept in separate packing cases, bundles or similar.

The Contractor shall be responsible for all transportation; from works to port of shipment and onwards to port of unloading, as well as all handling and transport to sites and handling on site.

## **1.9 Erection, Installation and Commissioning**

### **1.9.1 Storage at Site**

The Contractor shall be responsible for proper storage of equipment when delivered at the different sites until taking over. Care shall be taken to assure adequate storage to avoid damage to equipment due to rain or strong sunshine. The responsibility also covers security measures against theft and vandalism.

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### 1.9.2 **Work on Live Substations**

If work is to be done on substations in operation the following factors are of paramount importance:

- (i) Minimisation of outage time and
- (ii) Adaptation to operational constraints.

All work must be planned with this in mind. The Contractor must obey to all instructions and safety rules given by the Government and the Employer and must strictly follow all instructions from the Employer's supervisory personnel. The Contractor shall appoint his Resident Project Manager/Technician who will be authorised to receive work permits at the work sites as required by safety rules.

All outages shall be discussed with the Employer and the Project Manager at least one week before the outage is required. The Contractor will normally only be allowed to have only one high voltage circuit out of operation at a time.

No work must start before Employer's site manager has authorised the work, established the required earthing and marked the safe area. All switching on live parts shall be done by the Employer. In the rare cases where more than one circuit have to be taken out of operation the Contractor must be prepared to do the work during nights or at off-peak time. The Contractor and his personnel must respect the physical constraints as well as constraints for scheduling set by these circumstances. However, the Employer will co-operate in making the work conditions and the scheduling as efficient as possible for the Contractor and keep a responsible person with switching authority at site during all working hours (including night time).

If physical constraints make it necessary to replace cabinets needed for operation, the Contractor must as far as possible erect and connect the new cabinets temporarily adjacent to the one in operation. A quick disconnection and removal of the old cabinets can then be performed and the new cabinets pulled in with most of its cables already fitted. Location of new cabinets shall be approved by the Project Manager and a proposal for such shall be given by the Contractor one month prior to erection.

### 1.9.3 **Erection, Testing at Site, Commissioning**

The Contractor shall carry out erection, testing at site and commissioning of the Plants specified in the Specifications. All work, methods of work and workmanship, whether fully specified herein or not, shall be of the highest order in all respects, the generally accepted requirements and commonly recognised good practice for first-class work of the nature are adhered to.

The Contractor shall provide all staff, such as engineers, supervisory staff, skilled and unskilled labour necessary to carry out and complete the Contract Works on schedule as specified. Information regarding site staff shall be shown in the relevant Schedule.

The Contractor shall provide all vehicles, erection, tools and equipment necessary to carry out the Contract Works, including personnel transport. At the completion of the Contract, the Employer reserves the right, at his discretion, to take over vehicles, any tools, special tools, test equipment and other construction equipment used by the Contractor in connection with the Contract, at depreciated prices to be mutually agreed upon at that time.

Testing at site shall be carried out by experienced test engineers. Functional tests shall be inherent in all test procedures. The Contractor shall record the test results in an approved form in such a manner that the test reports can be used as the basis for future maintenance tests. Test methods and equipment shall be noted on the test sheets.

A complete test report in 4 sets shall be handed over to the Project Manager not later than one month after the Plant being commissioned. The test engineers shall at site keep a complete record of correction made during testing and one set of corrected drawings shall be kept at site after commissioning and one set handed over to the Project Manager.

Commissioning shall be carried out by the Contractor in the presence of the Employer's engineers and the Project Manager. The Contractor shall prior to commissioning draw up a detailed commissioning schedule for approval showing the sequence to follow step by step in all connections, including control of phase sequence and other pertinent factors. Switching of energized components will be performed by the Employer.

#### **1.9.4 Accommodation of Contractor's Personnel**

The Contractor shall make his own full provision for temporary accommodation of own and sub-contractor's employees to suit their requirements.

#### **1.9.5 Health, environment and safety**

The Contractor shall follow all local rules and regulations related to workers' safety and health as well as regarding protection of the environment.

The Contractor is responsible for employing a health worker to inform the workforce and affected villages about the increased health risks, especially HIV/AIDS and COVID 19.

The Contractor is also responsible for equipping all his workers with necessary safety equipment as helmets, eye protection glasses and safety belts and enforce the use of such.

No toxic material (such as Halon, PCB, Asbestos) shall be utilised neither during construction nor under operation and maintenance.

The Contractor shall at all times during the course of work prevent accumulation of debris caused by the work. He shall also remove all debris and temporary structures when finishing the work. The Contractor shall also be responsible for removal of old equipment and cables. All surplus material

should be disposed in an environmental satisfying way. Particular attention should be given to safe disposal of environmentally hazardous substances such as battery acid, transformer oil and capacitors. Workable equipment shall be handed over to the Employer.

#### **1.10 Time of Delivery and Completion**

The Implementation Schedule shown in the Bid Documents shows the completion of the project of which the equipment forms an integral part. The equipment must thus be delivered and erected in accordance with this schedule.

The guaranteed completion and delivery times shall be stated in the Bid and the guarantee therein signed by the Bidder. In addition, the Bidder shall submit an erection program and estimate the necessary man-weeks for erection, alternatively erection supervision, testing and commissioning.

#### **1.11 On the Job Training**

The Employer shall be allowed to take part in erection, pre-commissioning and commissioning thus taking part in a transfer of knowledge scheme. Before the erection starts, the Contractor shall arrange a one-day course in understanding of the Contractors documentation and reference system.

The contractor shall also demonstrate to the operators all the operations of the substation before the tests run of the station.

#### **1.12 Tools**

The Supplier shall supply in lockable boxes, for the Employer's use, any special tools that may be required for assembly, dismantling adjustments and maintenance of the equipment. The tools shall be unused and in new condition at the time of handover. Suitable special spanners shall be provided for bolts and nuts, which are not properly accessible by means of an ordinary spanner.

#### **1.13 Spare Parts**

Spare parts supplied under the contract shall be packed and preserved for long time storage. before handover to the Employer as per the specifications.

Transportation cost of the spare parts to any store of KPLC as directed by the Project Manager shall be borne by contractor at no additional cost to the Employee.